Annual Energy Outlook 2017

with projections to 2050

Independent Statistics & Analysis
U.S. Energy Information Administration

#AEO2017

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Overview/key takeaways

EIA's Annual Energy Outlook provides modeled projections of domestic energy markets through 2050, and includes cases with different assumptions of macroeconomic growth, world oil prices, technological progress, and energy policies. With strong domestic production and relatively flat demand, the United States becomes a net energy exporter over the projection period in most cases.

The Annual Energy Outlook provides long-term energy projections for the United States

- Projections in the *Annual Energy Outlook 2017* (AEO2017) are not predictions of what will happen, but rather modeled projections of what may happen given certain assumptions and methodologies.
- The AEO is developed using the National Energy Modeling System (NEMS), an integrated model that aims to capture various interactions of economic changes and energy supply, demand, and prices.
- Energy market projections are subject to much uncertainty, as many of the events that shape energy markets and future developments in technologies, demographics, and resources cannot be foreseen with certainty.
- More information about the assumptions used in developing these projections is available shortly after the release of each AEO.
- The AEO is published pursuant to the Department of Energy Organization Act of 1977, which requires the U.S. Energy Information Administration (EIA) Administrator to prepare annual reports on trends and projections for energy use and supply.

What is the Reference case?

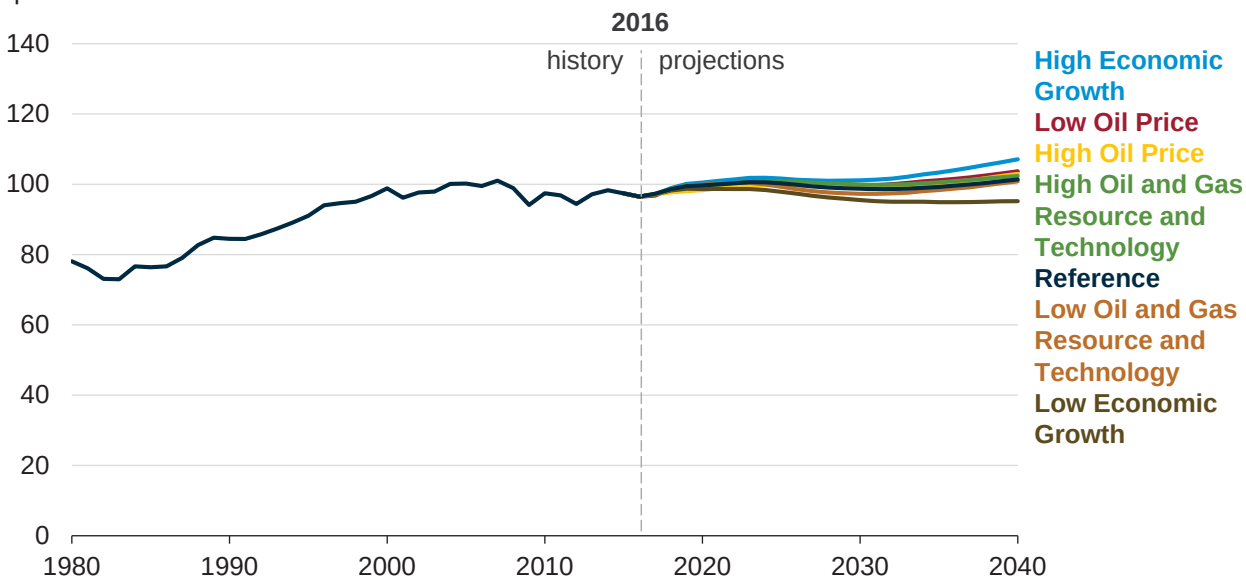
- The Reference case projection assumes trend improvement in known technologies, along with a view of economic and demographic trends reflecting the current central views of leading economic forecasters and demographers.
- It generally assumes that current laws and regulations affecting the energy sector, including sunset dates for laws that have them, are unchanged throughout the projection period.
- The potential impacts of proposed legislation, regulations, or standards are not reflected in the Reference case.
- EIA addresses the uncertainty inherent in energy projections by developing side cases with different assumptions of macroeconomic growth, world oil prices, technological progress, and energy policies.
- Projections in the AEO should be interpreted with a clear understanding of the assumptions that inform them and the limitations inherent in any modeling effort.

What are the side cases?

- Oil prices are driven by global market balances that are mainly influenced by factors external to the NEMS model. In the High Oil Price case, the price of Brent crude in 2016 dollars reaches $226 per barrel (b) by 2040, compared to $109/b in the Reference case and $43/b in the Low Oil Price case.
- In the High Oil and Gas Resource and Technology case, lower costs and higher resource availability than in the Reference case allow for higher production at lower prices. In the Low Oil and Gas Resource and Technology case, more pessimistic assumptions about resources and costs are applied.
- The effects of economic assumptions on energy consumption are addressed in the High and Low Economic Growth cases, which assume compound annual growth rates for U.S. gross domestic product of 2.6% and 1.6%, respectively, from 2016–40, compared with 2.2% annual growth in the Reference case.
- A case assuming that the Clean Power Plan (CPP) is not implemented can be compared with the Reference case to show how the absence of that policy could affect energy markets and emissions.

Energy consumption varies minimally across all AEO cases—

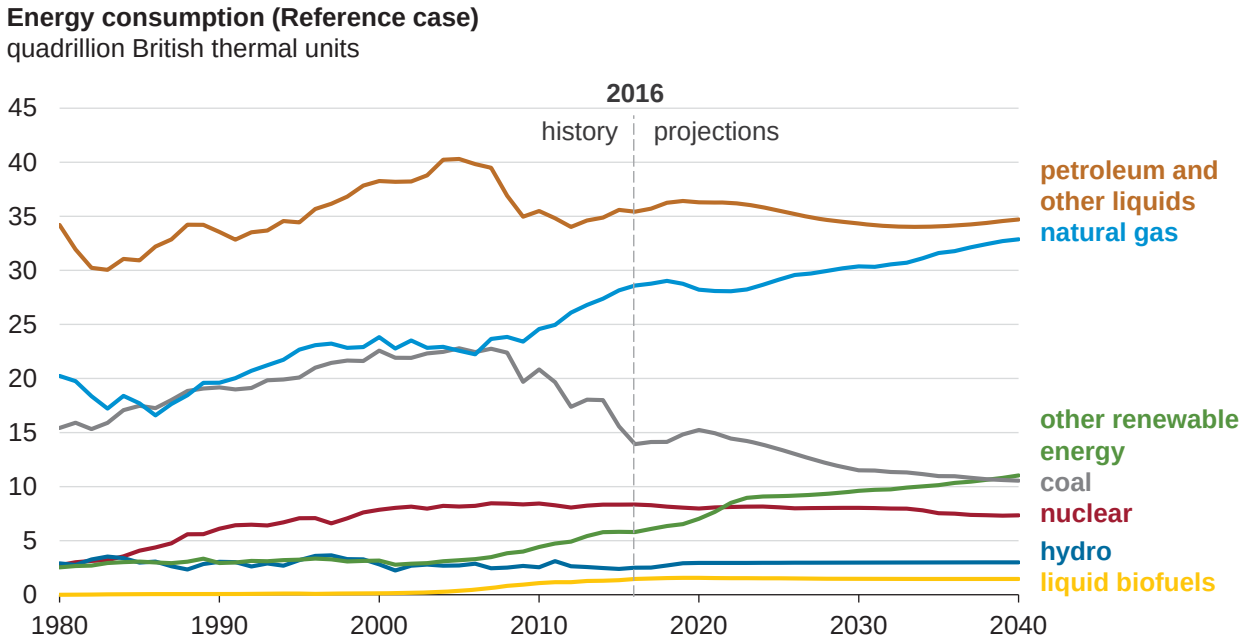
Total energy consumption
quadrillion British thermal units



—bounded by the High and Low Economic Growth cases

- In the Reference case, total energy consumption increases by 5% between 2016 and 2040.
- Because a significant portion of energy consumption is related to economic activity, energy consumption is projected to increase by approximately 11% in the High Economic Growth case and to remain nearly flat in the Low Economic Growth case.
- Although the Oil and Gas Resource and Technology cases affect the production of energy, the impact on domestic energy consumption is less significant.
- In all AEO cases, the electric power sector remains the largest consumer of primary energy.
- Projections of total energy consumption (and supply) are sensitive to the conversions used to represent the primary energy content of noncombustible energy resources. AEO2017 uses fossil-equivalence to represent the energy content of renewable fuels.

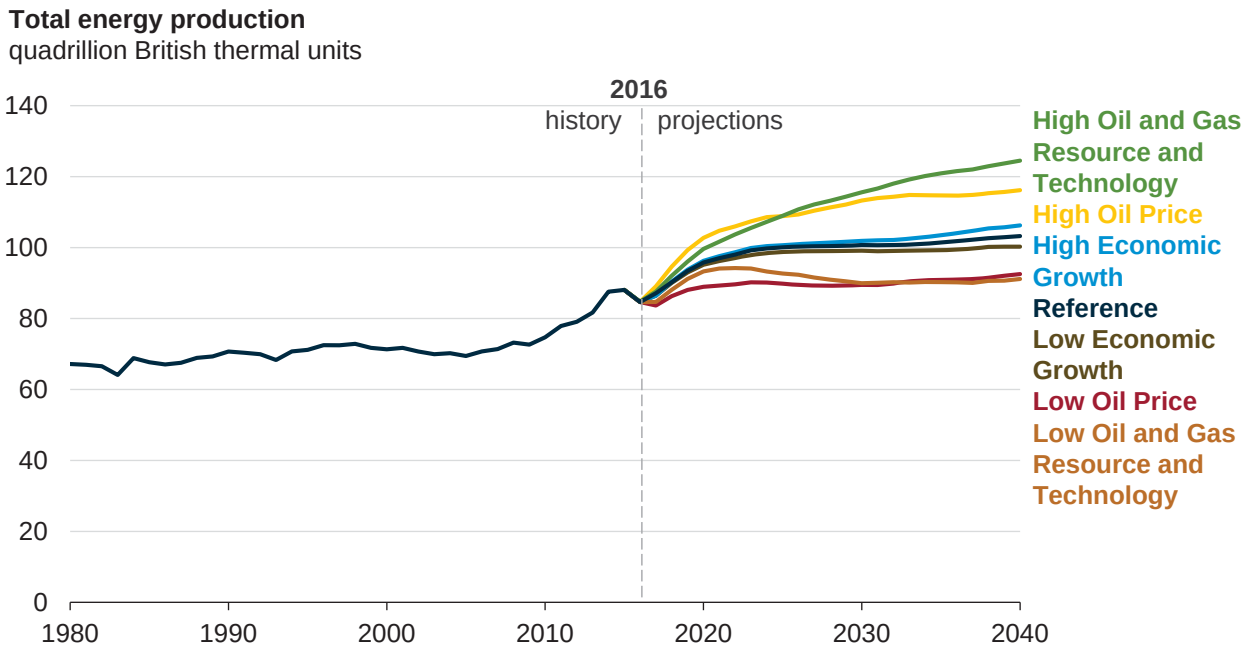
Domestic energy consumption remains relatively flat in the Reference case—



—but the fuel mix changes significantly

- Overall U.S. energy consumption remains relatively flat in the Reference case, rising 5% from the 2016 level by 2040 and somewhat close to its previous peak. Varying assumptions about economic growth rates or energy prices considered in the AEO2017 side cases affect projected consumption.
- Natural gas use increases more than other fuel sources in terms of quantity of energy consumed, led by demand from the industrial and electric power sectors.
- Petroleum consumption remains relatively flat as increases in energy efficiency offset growth in the transportation and industrial activity measures.
- Coal consumption decreases as coal loses market share to natural gas and renewable generation in the electric power sector.
- On a percentage basis, renewable energy grows the fastest because capital costs fall with increased penetration and because current state and federal policies encourage its use.
- Liquid biofuels growth is constrained by relatively flat transportation energy use and blending limitations.

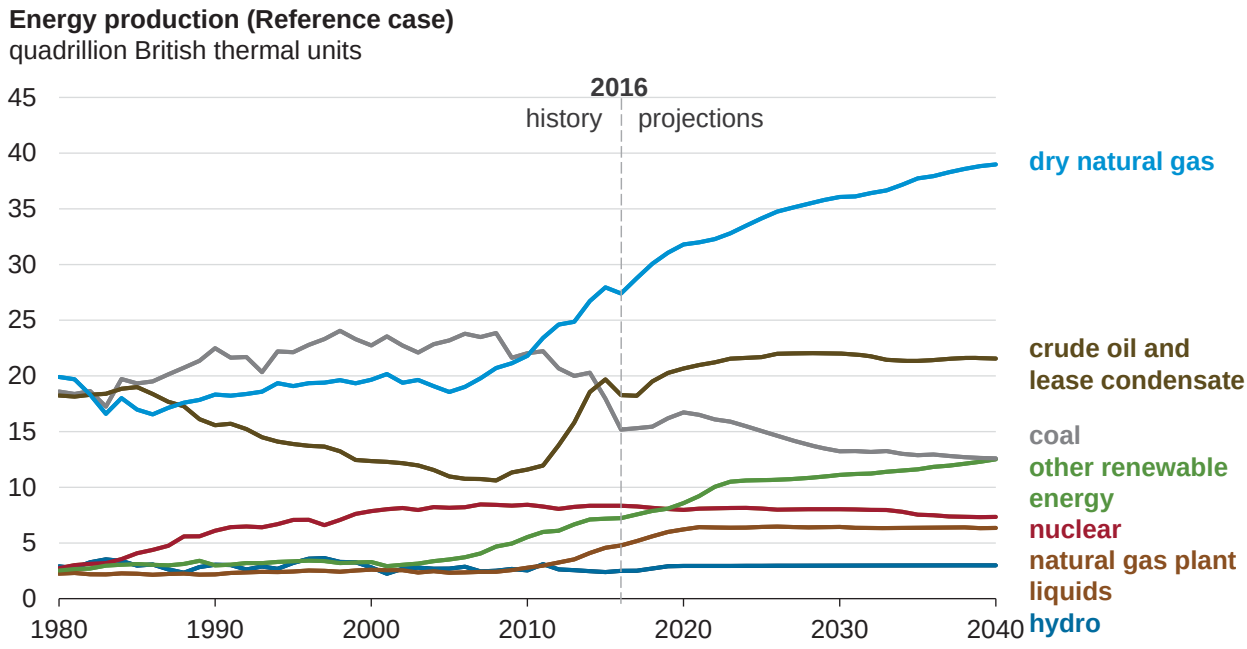
Energy production ranges from nearly flat in the Low Oil and Gas Resource and Technology case—



—to continued growth in the High Resource and Technology case

- Unlike energy consumption, which varies less across AEO2017 cases, projections of energy production vary widely.
- Total energy production increases by more than 20% from 2016 through 2040 in the Reference case, led by increases in renewables, natural gas, and crude oil production.
- Production growth is dependent on technology, resources, and market conditions.
- The High Oil and Gas Resource and Technology case assumes higher estimates of unproved Alaska resources; offshore Lower 48 resources; and onshore Lower 48 tight oil, tight gas, and shale gas resources than in the Reference case. This case also assumes lower costs of producing these resources. The Low Oil and Gas Resource and Technology case assumes the opposite.
- The High Oil Price case illustrates the impact of higher world demand for petroleum products, lower Organization of the Petroleum Exporting Countries (OPEC) upstream investment, and higher non-OPEC exploration and development costs. The Low Oil Price case assumes the opposite.

U.S. energy production continues to increase in the Reference case—



—led by growth in natural gas and renewables

- Natural gas production accounts for nearly 40% of U.S. energy production by 2040 in the Reference case. Varying assumptions about resources, technology, and prices in alternative cases significantly affect the projection for U.S. production.

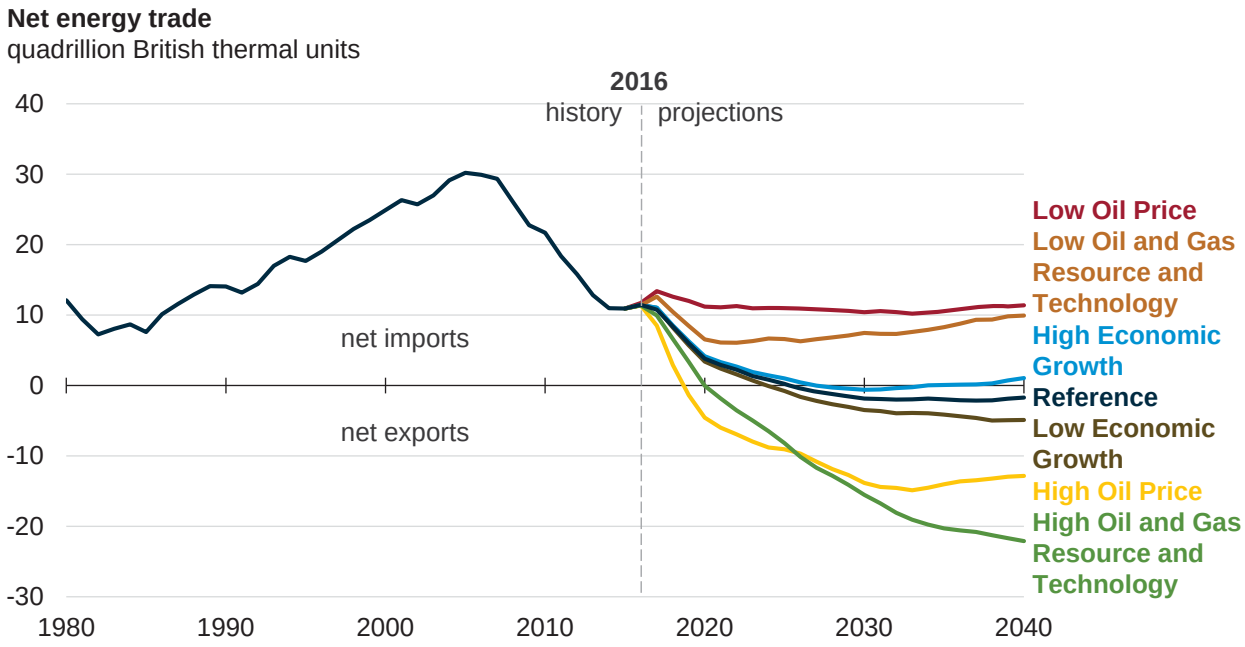
- Crude oil production in the Reference case increases from current levels, then levels off around 2025 as tight oil development moves into less productive areas. Like natural gas, projected crude oil production varies considerably with assumptions about resources and technology.

- Coal production trends in the Reference case reflect the domestic regulatory environment, including the implementation of the Clean Power Plan, and export market constraints.

- Nonhydroelectric renewable energy production grows, reflecting cost reductions and existing policies at the federal and state level that promote the use of wind and solar energy.

- Nuclear generation declines modestly over 2017–40 in the Reference case as new builds already being developed and plant uprates nearly offset retirements. The decline in nuclear generation accelerates beyond 2040 as a significant share of existing plants is assumed to be retired at age 60.

The United States becomes a net energy exporter in most cases—



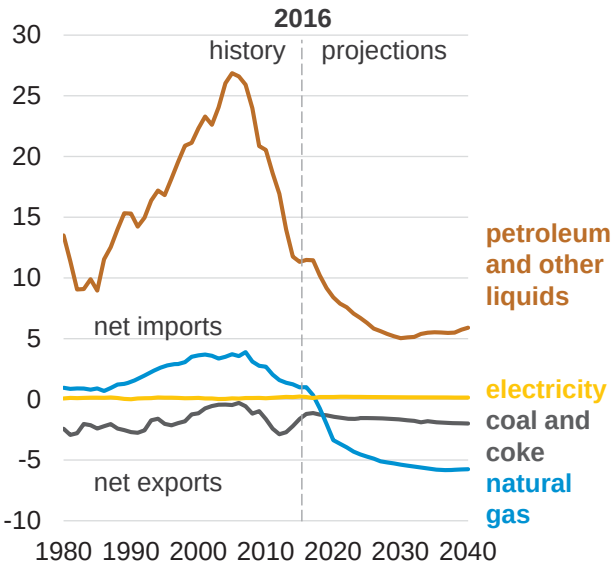
—and under high resource and technology assumptions, net exports are significantly higher than in the Reference case

- The United States is projected to become a net energy exporter by 2026 in the Reference case projections, but the transition occurs earlier in three of the AEO2017 side cases.
- Net exports are highest in the High Oil and Gas Resource and Technology case as favorable geology and technological developments combine to produce oil and natural gas at lower prices.
- The High Oil Price case includes favorable economic conditions for producers, but consumption is lower in response to higher prices. Without substantial improvements in technology and more favorable resource availability, U.S. energy production declines in the 2030s.
- In the Low Oil Price and Low Oil and Gas Resource and Technology cases, the United States remains a net importer over the analysis period.
- In the Low Oil and Gas Resource and Technology case, the conditions are unfavorable for U.S. crude oil production at levels that support exports.
- In the Low Oil Price case, prices are too low to provide a strong incentive for high U.S. production.

The United States becomes a net energy exporter in the Reference case—

Energy trade (Reference case)
quadrillion British thermal units

Net energy trade (Reference case)
quadrillion British thermal units

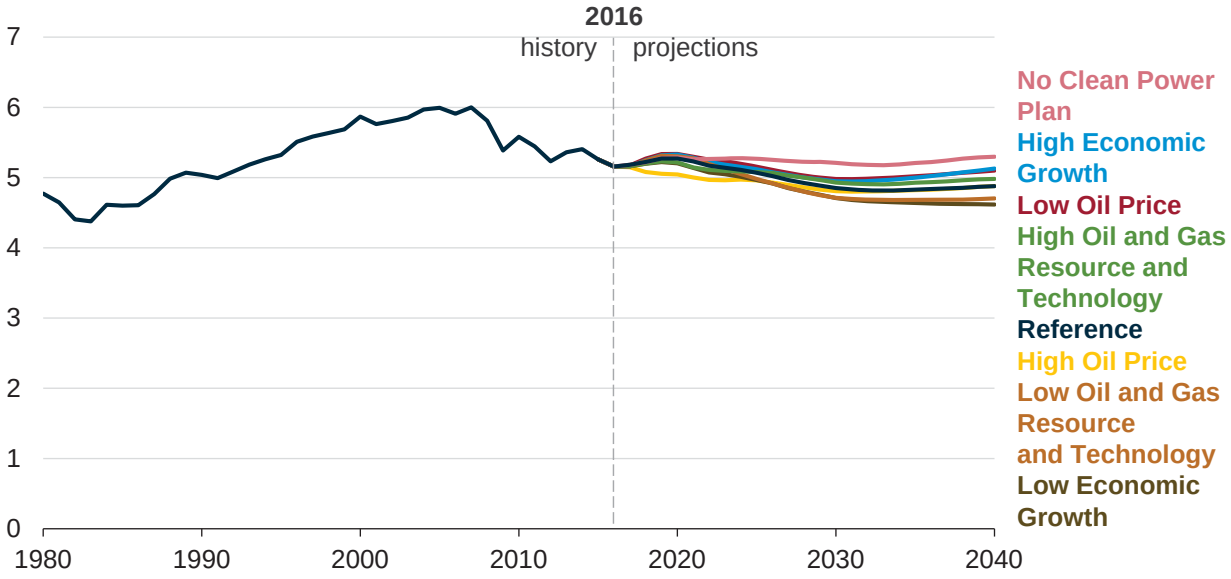


—as natural gas exports increase and net petroleum imports decrease

- The United States has been a net energy importer since 1953, but declining energy imports and growing energy exports make the United States a net energy exporter by 2026 in the Reference case projection.
- Crude oil and petroleum products dominate U.S. energy trade. The United States is both an importer and exporter of petroleum liquids, importing mostly crude oil and exporting mostly petroleum products such as gasoline and diesel throughout the Reference case projection.
- Natural gas trade, which has historically been mostly shipments by pipeline from Canada and to Mexico, is projected to be increasingly dominated by liquefied natural gas exports to more distant destinations.
- The United States continues to be a net exporter of coal (including coal coke), but its exports growth is not expected to increase significantly because of competition from other global suppliers closer to major markets.

Energy-related carbon dioxide emissions decline in most AEO cases—

Energy-related carbon dioxide emissions
billion metric tons of carbon dioxide



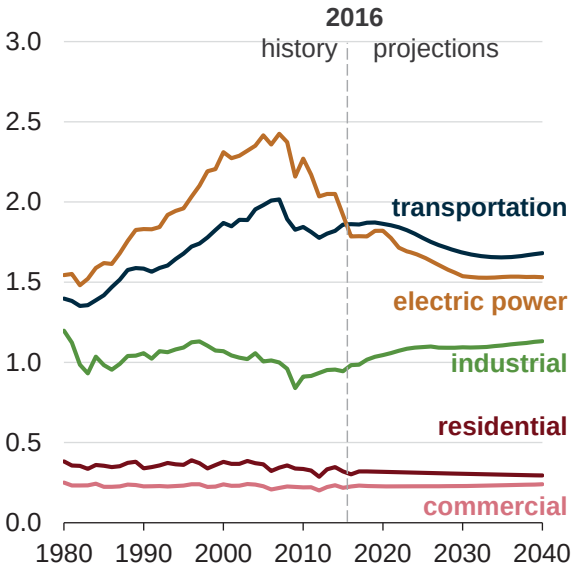
—with the highest emissions projected in the No Clean Power Plan case

- The electric power sector accounted for about 40% of the U.S. total energy-related carbon dioxide (CO2) emissions in 2011, with a declining share in recent years.
- The Clean Power Plan (CPP), which is currently stayed pending judicial review, requires states to develop plans to reduce CO2 emissions from existing generating units that use fossil fuels.
- Combined with lower natural gas prices and the extension of renewable tax credits, the CPP accelerates a shift toward less carbon-intensive electricity generation.
- The Reference case includes the CPP and assumes that states select the mass-based limits on CO2 emissions. An alternative case in AEO2017 assumes that the CPP is not implemented.
- AEO2016 included extensive analysis of the CPP and presented several side cases that examined various compliance options available to states.

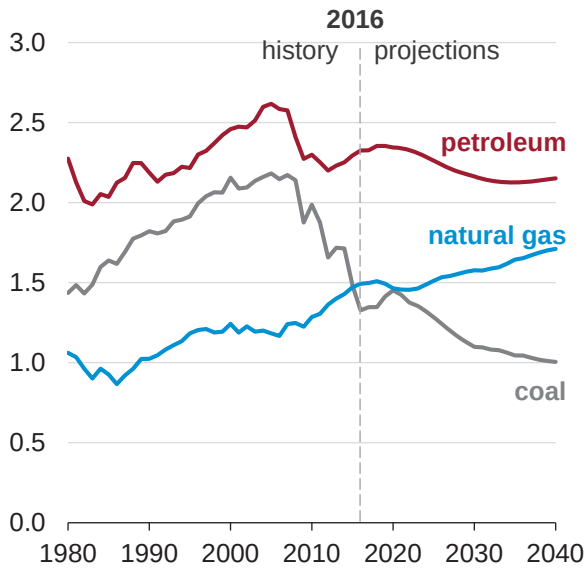
Reference case energy-related carbon dioxide emissions fall—

U.S. energy-related carbon dioxide emissions (Reference case)

billion metric tons of carbon dioxide



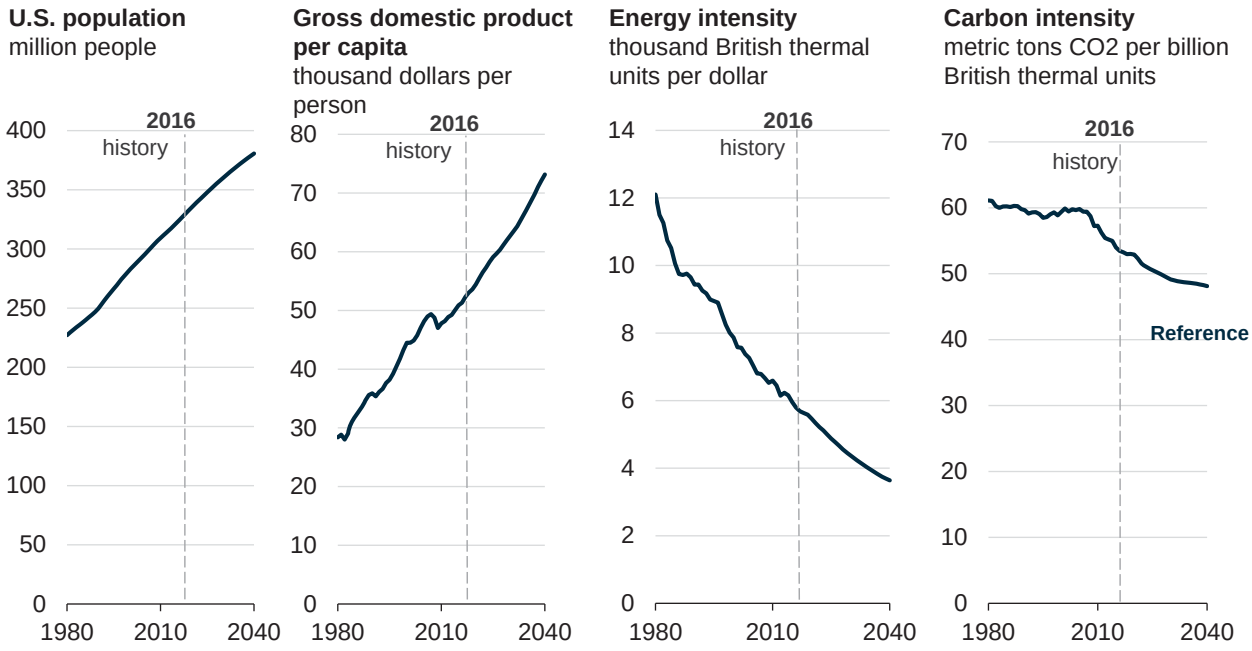
billion metric tons of carbon dioxide



—but at a slower rate than in the recent past

- From 2005 to 2016, energy-related carbon dioxide (CO_2) emissions fell at an average annual rate of 1.4%. From 2016 to 2040, energy-related CO_2 emissions fall 0.2% annually in the Reference case.
- In the industrial sector, growth in domestic industries, such as bulk chemicals, leads to higher energy consumption and emissions.
- In the electric power sector, coal-fired plants are replaced primarily with new natural gas, solar, and wind capacity, which reduces electricity-related CO_2 emissions.
- Direct emissions in the residential and commercial building sectors are largely from space heating, water heating, and cooking equipment. The CO_2 emissions associated with the use of electricity in these sectors exceed the direct emissions from these sectors.
- Energy-related CO_2 emissions from the transportation sector surpassed those from the electric power sector in 2016. Transportation CO_2 emissions remain relatively flat after 2030 as consumption and the carbon intensity of transportation fuels stay relatively constant.

Although population and economic output per capita are assumed to continue rising—

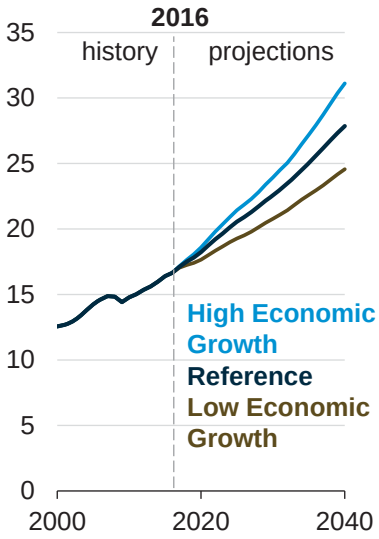


—energy intensity and carbon intensity are projected to continue falling in the Reference case

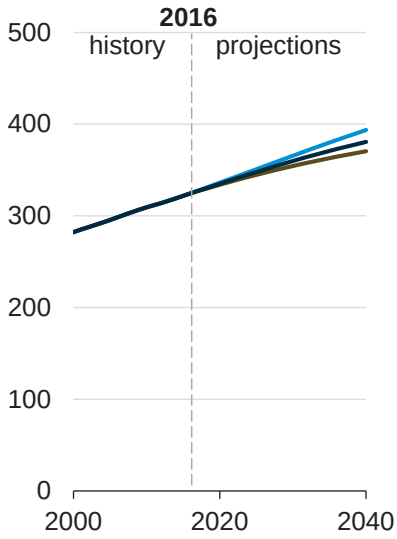
- In the United States, the amount of energy used per unit of economic growth (energy intensity) has declined steadily for many years, while the amount of CO2 emissions associated with energy consumption (carbon intensity) has generally declined since 2008.
- These trends are projected to continue as energy efficiency, fuel economy improvements, and structural changes in the economy all lower energy intensity.
- Carbon intensity declines largely as a result of changes in the U.S. energy mix that reduce the consumption of carbon-intensive fuels and increase the use of low- or no-carbon fuels.
- By 2040, energy intensity and carbon intensity are 37% and 10% lower than their respective 2016 values in the Reference case, which assumes only the laws and regulations currently in place.

Different macroeconomic assumptions address the energy implications of the uncertainty—

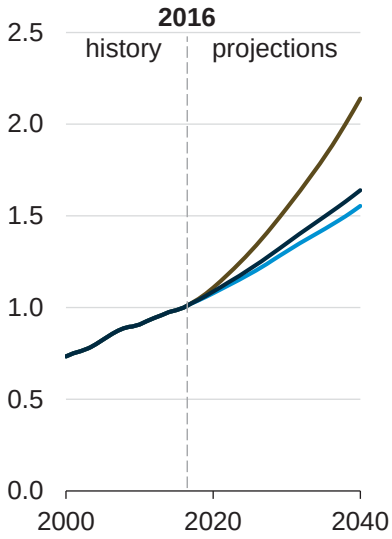
Gross domestic product
trillion 2009 dollars



Population
millions



Price index (2016 = 1.0)
GDP chain-type price index



—surrounding future economic trends

- The Reference, High Economic Growth, and Low Economic Growth cases illustrate three possible paths for U.S. economic growth. The High Economic Growth case assumes higher annual growth and lower annual inflation rates (2.6% and 1.9%, respectively) than in the Reference case (2.2% and 2.1%, respectively), while the Low Economic Growth case assumes lower growth and higher inflation rates (1.6% and 3.2%, respectively).

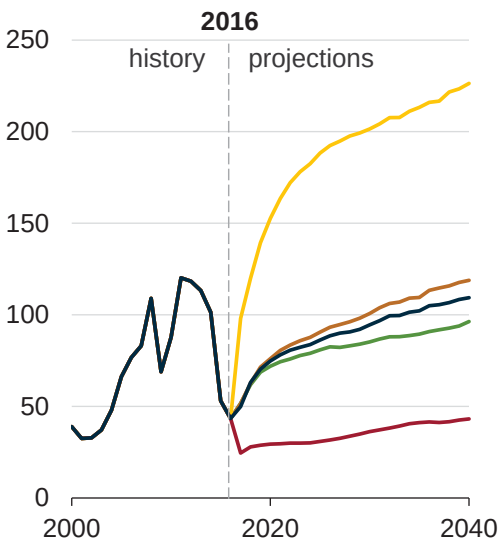
- In general, higher economic growth (as measured by gross domestic product) leads to greater investment, increased consumption of goods and services, more trade, and greater energy consumption.

- Differences among the cases reflect different expectations for growth in population, labor force, capital stock, and productivity. These changes affect growth rates in household formation, industrial activity, and amounts of travel, as well as investment decisions for energy production.

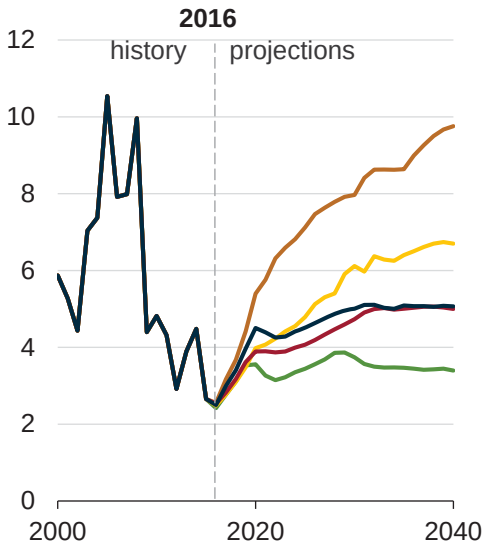
- All three cases assume smooth economic growth and do not anticipate business cycles or large economic shocks.

Reference case oil prices rise from current levels while natural gas prices remain relatively low—

North Sea Brent oil price
2016 dollars per barrel



Henry Hub natural gas price
2016 dollars per million Btu



Low Oil and Gas Resource and Technology
High Oil Price
Reference
Low Oil Price
High Oil and Gas Resource and Technology

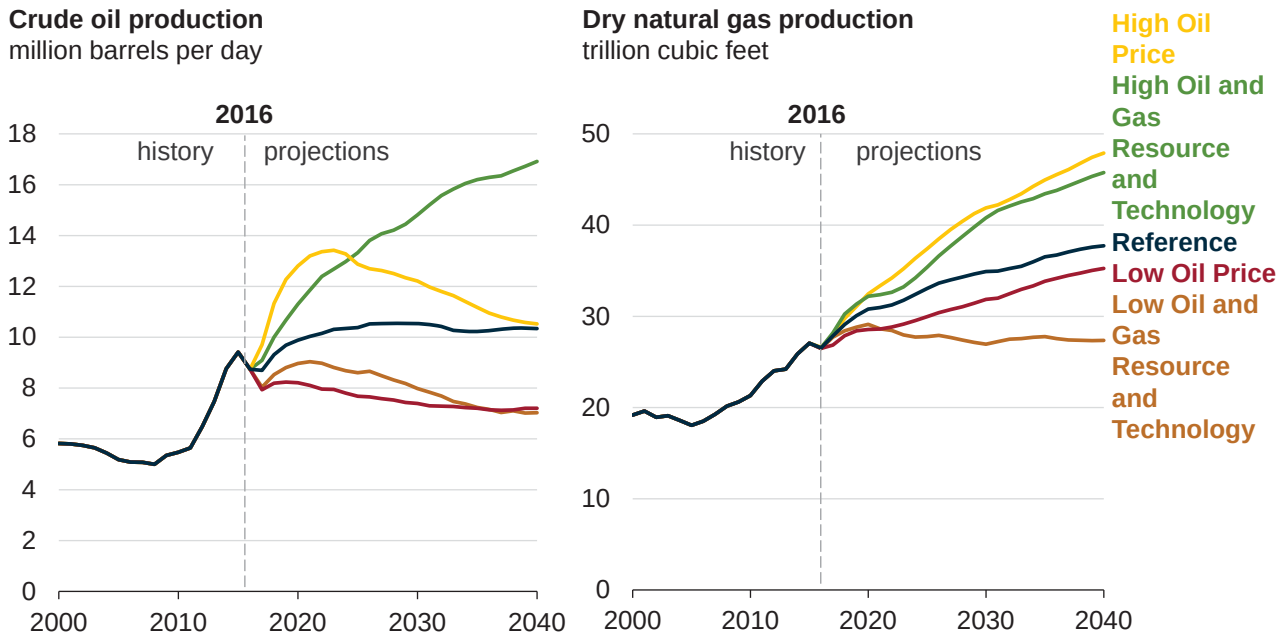
—price paths in the side cases are very different from those in the Reference case

- In real terms, crude oil prices in 2016 (based on the global benchmark North Sea Brent) were at their lowest levels since 2004, and natural gas prices (based on the domestic benchmark Henry Hub) were the lowest since prior to 1990. Both prices are projected to increase over the projection period.

- Crude oil prices in the Reference case are projected to rise at a faster rate in the near term than in the long term. However, price paths vary significantly across the AEO2017 side cases that differ in assumptions about U.S. resources and technology and global market conditions.

- Natural gas prices in the Reference case also rise and then remain relatively flat at about $5 per million British thermal units (MMBtu) over 2030–40, then rise again over the following decade (not shown on the graph). Projected U.S. natural gas prices are highly sensitive to assumptions about domestic resource and technology explored in the side cases.

United States crude oil and natural gas production depends on oil prices—



—as well as resource availability and technological improvements

- Projections of tight oil and shale gas production are uncertain because large portions of the known formations have relatively little or no production history, and extraction technologies and practices continue to evolve rapidly. Continued high rates of drilling technology improvement could increase well productivity and reduce drilling, completion, and production costs.

- In the High Oil and Gas Resource and Technology case, both crude oil and natural gas production continue to grow.

- Crude oil prices affect natural gas production primarily through changes in global natural gas consumption/exports, as well as increases in natural gas production from oil formations (associated gas).

- In the High Oil Price case, the difference between the crude oil and natural gas prices creates more incentive to consume natural gas in energy-intensive industries and for transportation, and to export it overseas as liquefied natural gas, all of which drive U.S. production upward. Without the more favorable resources and technological developments found in the High Oil and Gas Resource and Technology case, U.S. crude oil production begins to decline in the High Oil Price case, and by 2040, production is nearly the same as in the Reference case.

Critical drivers and uncertainty

Various factors influence the model results in AEO2017, including: new and existing laws and regulations, updated data, changing market conditions, and model improvements since AEO2016.

New laws and regulations reflected in the Reference Case

- California state law SB-32, which was passed in 2016, requires statewide greenhouse gas emissions to be 40% below the 1990 level by 2030. This law has cross-cutting effects in California, particularly on electricity and transportation emissions, and also has national implications because of the size of California's energy market.

- The second phase of Federal Greenhouse Gas and Fuel Efficiency standards for medium- and heavy-duty vehicles was issued in 2016. These standards, which ramp up through model year 2027, reduce energy consumption in the transportation sector in the midterm.

Significant data updates

- Data from the 2012 Commercial Buildings Energy Consumption Survey (CBECS) were released in 2016, leading to revised estimates of commercial building mix and energy consumption.

- Updated data on lower battery costs increased EIA's outlook for sales of battery electric vehicles and plug-in hybrid electric vehicles.

Model improvements

- This AEO is the first projection to include model results through 2050, which are available on the AEO page of the EIA website. The graphics in this presentation focus on projections through 2040.

- AEO2017 better captures the dynamics of well productivity that occur when tight oil development moves into less productive areas and as tighter well spacing in established areas diminishes the productivity of each well.

- In contrast to prior AEOs, the AEO2017 Reference case does not assume all nuclear plants that operate through the end of a 60-year period (a 40-year initial operating license plus a 20-year license renewal period) will apply for and receive a subsequent license renewal (SLR) and operate for an additional 20 years. Instead, 25% of reactors reaching age 60 are assumed to retire.

Changing market conditions

- Continuing the trend in previous AEOs, demand for crude oil imports weakens as Lower 48 onshore tight oil development continues to be the main driver of total U.S. crude oil production, accounting for about 60% of cumulative domestic production between 2016 and 2040 in the Reference case.

- Policy-driven economic incentives accelerate renewable generation. With a continued (but reduced) tax credit, solar capacity growth continues throughout the projection period, while tax credits provided for plants entering service until, but no later than 2024, provide incentives for new wind capacity in the near term.

- With solar energy's declining capital costs and solar electricity output that is highest during times of high (on-peak) demand, solar capacity is anticipated to grow throughout the projection period.

EIA will continue to update and refine the market dynamics and technologies in future AEOs, especially with the projection extended to 2050. Ongoing work aims to:

Electric Power

- Energy storage: Improve the representation of energy storage to accommodate multiple grid services including spinning reserve and renewables integration.

- Renewable generation: Include improved representation of intermittent generation resources such as wind and solar. Examine the potential for transmission enhancements to mitigate regional effects of high levels of wind and solar generation. Develop higher resolution time-of-day and seasonal value and operational impact of wind.

- Utility rate structure: Estimate the impact of high levels of distributed photovoltaic generation on utility rate structure.

- Generator retirement: Assess the vintage of the electric generation fleet and potential for future retirements and life extension for all technologies, including existing nuclear, coal, natural gas, and renewable fleets.

EIA will continue to update and refine the market dynamics and technologies in future AEOs, especially with the projection extended to 2050. Ongoing work aims to:

Liquid Fuels

- Natural gas plant liquids: Re-examine and improve natural gas plant liquids production to allow for changing proportions in produced natural gas over time.

- Technology: Update biofuels and emerging technological assumptions for gas-to-liquids, coal-to-liquids, and carbon sequestration. Improve feedstock curves for all biofuel technologies.

Natural Gas

- Transmission: Improve representation of natural gas market flows with a redesigned NEMS module, allowing for increased flexibility to respond to changing market dynamics (i.e., changing regional flows/bi-directional flow). Improve regional and temporal granularity.

EIA will continue to update and refine the market dynamics and technologies in future AEOs, especially with the projection extended to 2050. Ongoing work aims to:

Transportation

- Technology: Add autonomous vehicle technologies in the transportation sector and consider their implications for on-road fuel economy and total travel demand. Develop the capability to evaluate scenarios where commercial delivery vehicles can operate without human operators and do not require occupant protection features.

- Behavior: Examine the impact of ridesharing programs on travel behavior, including the amount of travel and vehicle choice decisions.

- Fleet mix: Examine determinants of the evolution of the light-duty vehicle fleet mix, which can affect fuel use given the different fuel economy standards for passenger cars and light trucks.

EIA will continue to update and refine the market dynamics and technologies in future AEOs, especially with the projection extended to 2050. Ongoing work aims to:

Buildings

- Distributed generation: Conduct further research and enhance building representation of distributed generation such as photovoltaic, including battery technologies.
- Technology: Review the spread of light emitting diodes and other efficient technologies in buildings. Investigate the adoption of sensor technologies for lights and heating/air conditioning in buildings.

Industrial

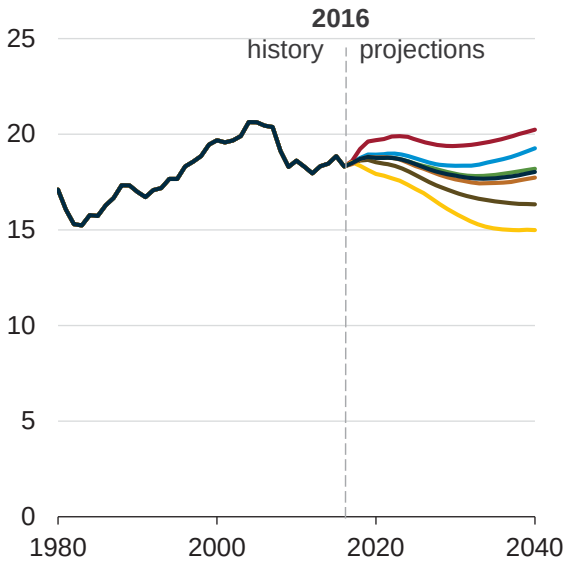
- Technology: Incorporate technological change into the industrial model. Apply ongoing technology assessment research in metal-based durables and bulk chemicals to revise energy-intensity projections in those industries.
- Environment: Research the feasibility of carbon capture and storage and implement for carbon-intensive industries such as bulk chemicals, steel, and cement.

Petroleum and other liquids

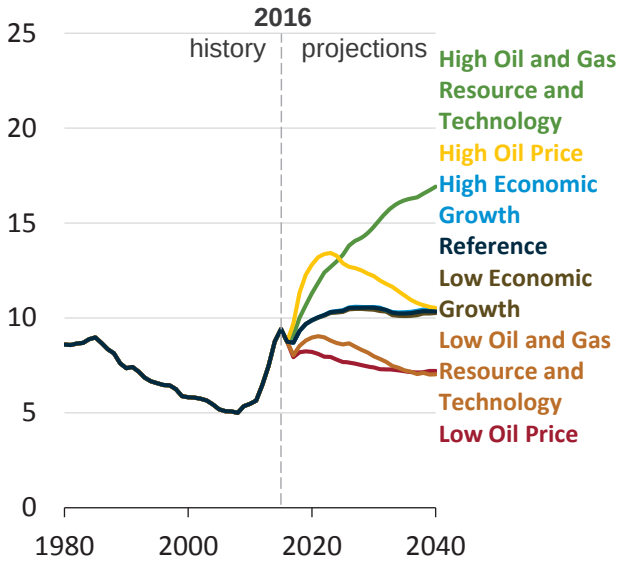
U.S. crude oil production rebounds from recent lows, driven by continued development of tight oil resources. With consumption flat to down compared to recent history, net crude oil and petroleum product imports as a percentage of U.S. product supplied decline across most cases.

U.S. petroleum product consumption remains below 2005 levels through 2040 in most AEO2017 cases—

Petroleum product consumption
million barrels per day



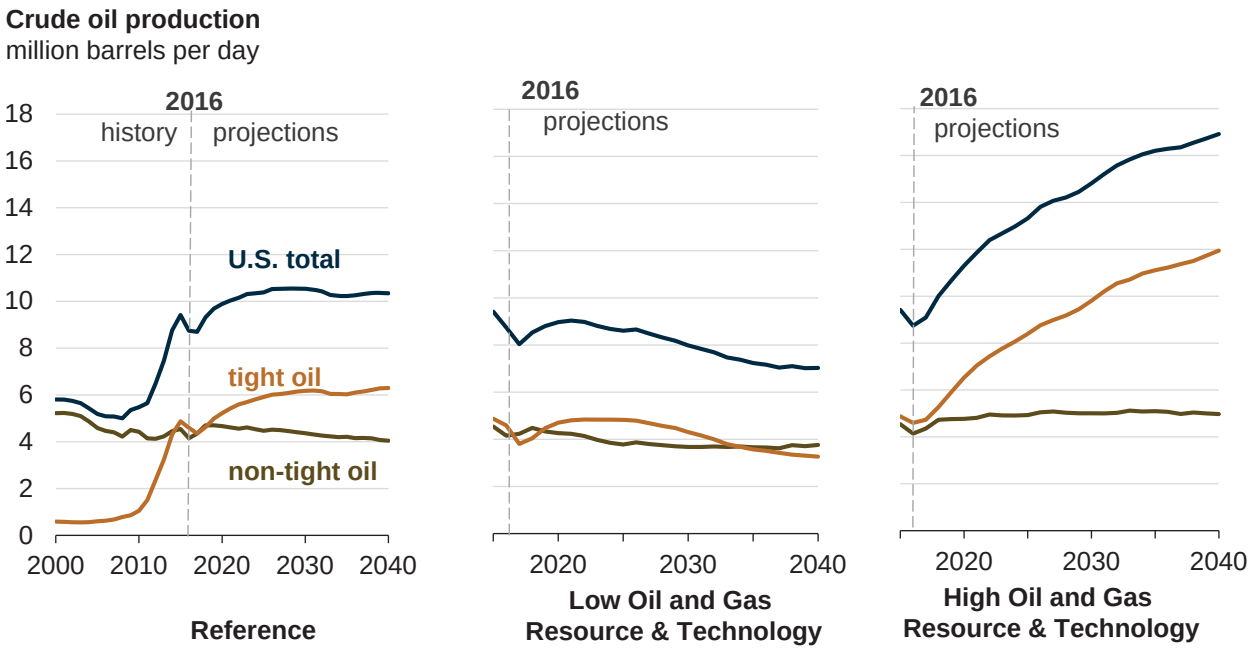
Crude oil production
million barrels per day



—while crude oil production rebounds from recent declines

- In all cases, U.S. petroleum consumption is projected to remain below the 2005 level, the highest recorded to date, through 2040.
- Low oil prices result in increased domestic consumption in the Low Oil Price case. Simultaneously, low prices drive down domestic production, resulting in generally higher import levels.
- The domestic wellhead price does not change significantly in the economic growth cases, resulting in consumption that is similar to the Reference case level.
- Reference case U.S. crude oil production is projected to recover from recent declines, as upstream producers increase output because of the combined effects of the rise in prices from recent lows and cost reductions.
- In the Reference case, higher refinery inputs in the near term absorb higher forecast levels of U.S. crude oil production, limiting changes to imports. Eventually, net crude oil imports increase because domestic crude production does not keep pace with refinery inputs as domestic refiners expand product exports.

Tight oil dominates U.S. production in the Reference case—



—but other types of oil production continue to yield significant volumes

- Despite rising prices, Reference case U.S. crude oil production levels off between 10 and 11 million barrels per day as tight oil development moves into less productive areas and as well productivity gradually decreases.

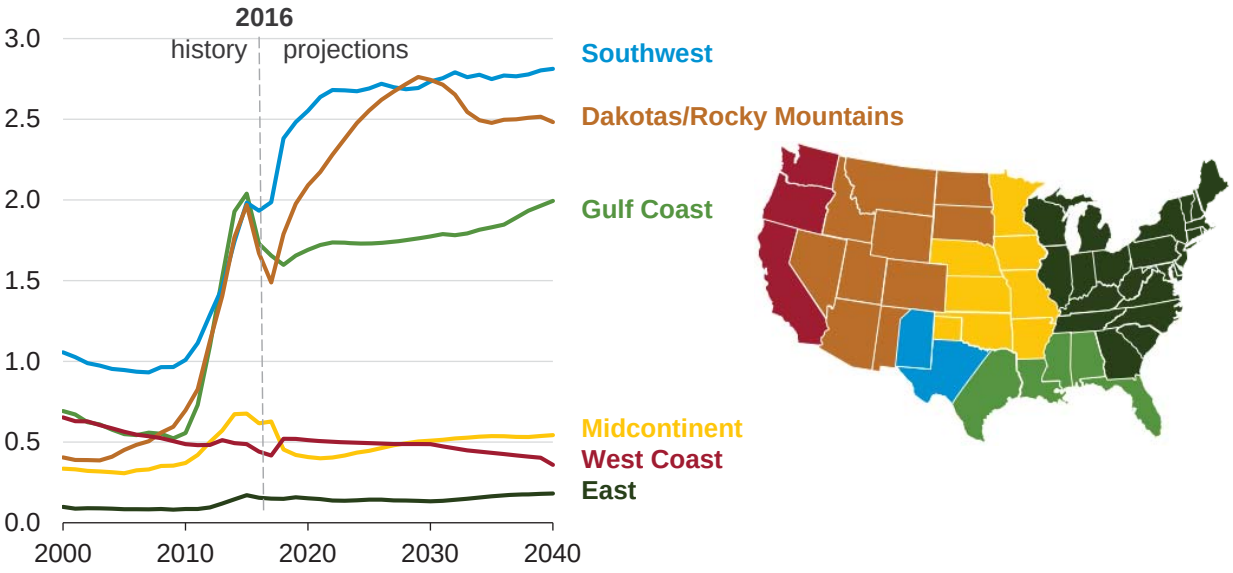
- Lower 48 onshore tight oil development continues to be the main driver of total U.S. crude oil production, accounting for about 60% of the total cumulative domestic production in the Reference case domestic between 2016 and 2040.

- Announced discoveries in deepwater Gulf of Mexico lead to production increases in the Lower 48 states offshore through 2020. Reference case offshore production then declines until 2034, with the rate of decline slowing through 2040 as production from new discoveries offset declines in legacy fields.

- In the High Oil and Gas Resource and Technology case, higher well productivity reduces development and production costs per unit, resulting in more resource development than in the Reference case. These assumptions are based on higher initial estimated ultimate recovery per well, larger volumes of onshore Lower 48 tight oil and shale gas resources, and higher rates of long-term technology improvement.

The Southwest and Dakotas/Rocky Mountains regions lead growth in tight oil production in the Reference case—

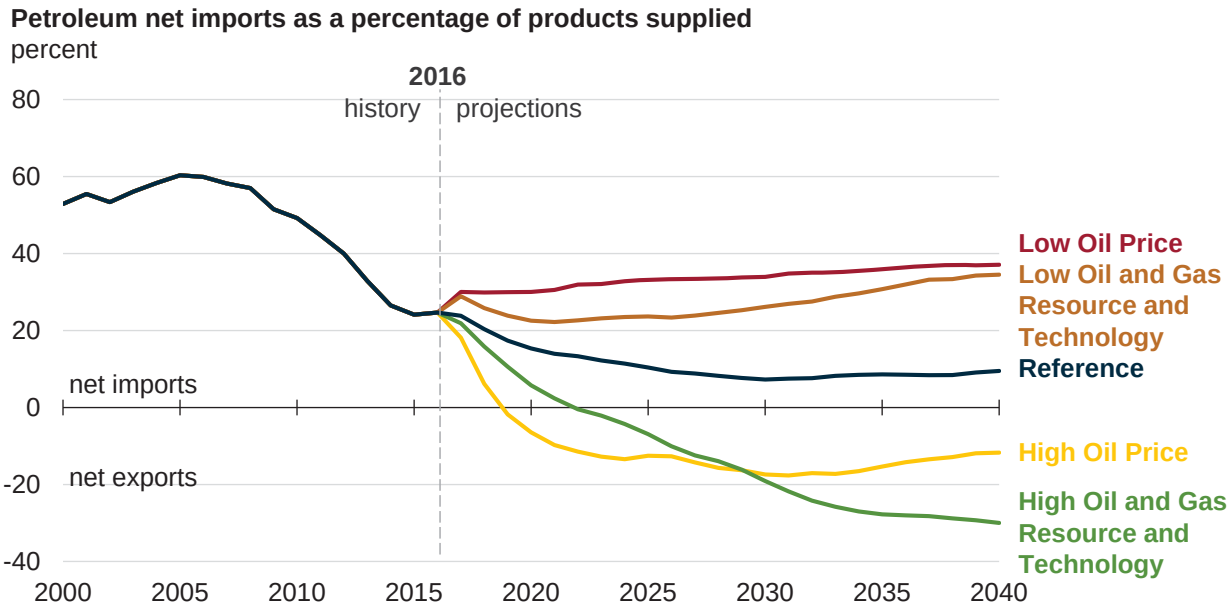
Lower 48 onshore crude oil production by region (Reference case)
million barrels per day



—and the Gulf Coast region remains an important contributor to overall production levels

- Growth in Lower 48 onshore crude oil production is projected to occur mainly in the Southwest, Dakotas/Rocky Mountains, and Gulf Coast regions.
- Growth in crude oil production in the Southwest is supported by increases in the Permian basin, which includes both tight and non-tight formations.
- Growth in the Dakotas/Rocky Mountains crude oil production is driven by increased production from the Bakken play, which is exclusively tight oil.
- Production in the Gulf Coast region, primarily from the Eagle Ford and Austin Chalk plays, increases throughout most of the projection period.

In most cases, the United States remains a net petroleum importer—



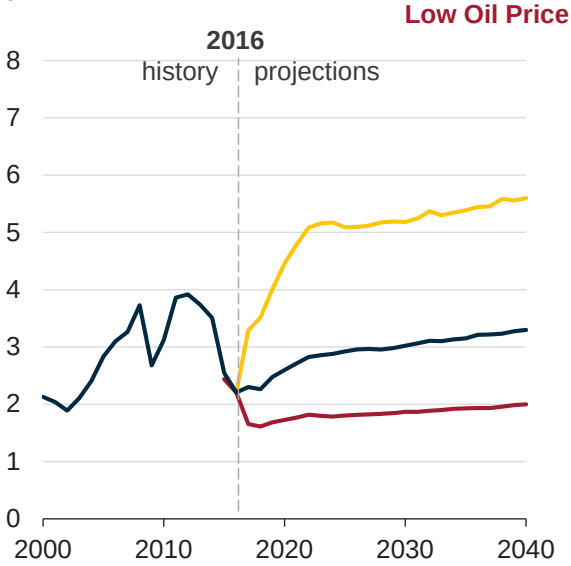
—but in the High Oil Price and the High Oil and Gas Resource and Technology cases, the United States becomes a net exporter

- In the Reference case, net crude oil and petroleum product imports as a percentage of U.S. product supplied fall through 2030.
- The Low Oil Price case results in lower U.S. crude oil production because of the lack of economic incentive for producers to drill in higher-cost tight oil formations and offshore crude oil reserves. Relatively lower prices in this case result in higher domestic product demand that promotes higher crude oil and petroleum product imports.
- In the High Oil Price case, high crude oil prices lead to increased U.S. crude oil production from higher-cost production areas and result in lower domestic petroleum product demand, which leads to lower product imports.
- In the High Oil and Gas Resource and Technology case, U.S. crude oil and petroleum liquids exports are higher compared with the Reference case.

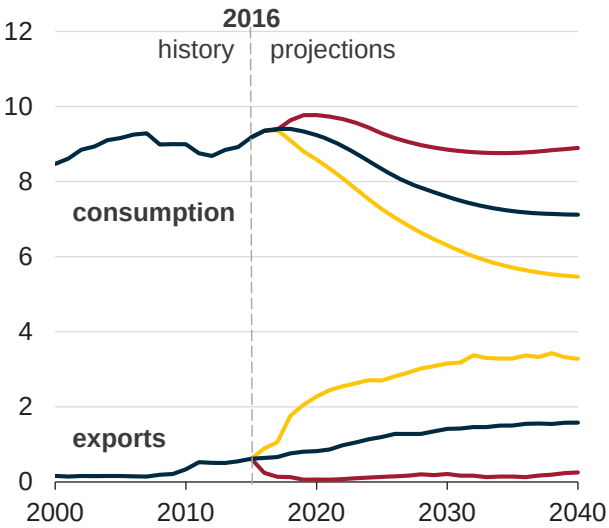
U.S. motor gasoline consumption and exports are sensitive to changes in prices—

Motor gasoline retail prices

Reference
High Oil Price
Low Oil Price



Motor gasoline consumption and gross exports
million barrels per day



—although efficiency improvements result in declining consumption across all cases

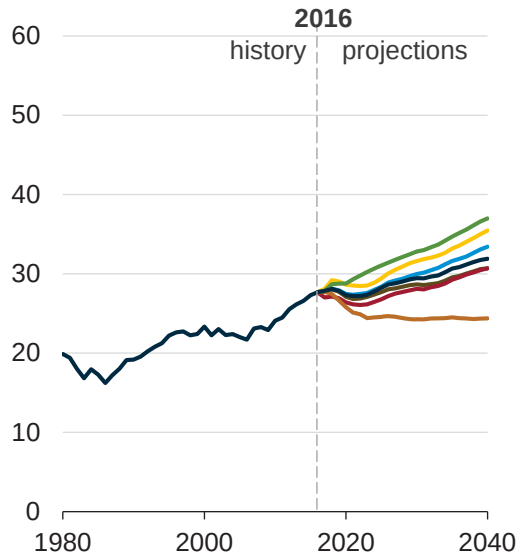
- U.S. average retail prices for motor gasoline are driven largely by changes in crude oil prices because crude oil is the main input used to produce motor gasoline.
- Improvements in vehicle fuel efficiency contribute to falling U.S. motor gasoline consumption, while high levels of refinery output result in continued growth of motor gasoline exports through 2040.
- In the Low Oil Price case, greater domestic motor gasoline consumption and lower domestic crude oil production results in lower exports of motor gasoline.
- The High Oil Price case results in lower domestic motor gasoline consumption and greater exports, reflecting the domestic gasoline demand response to higher prices as well as the U.S. refining industry's competitive advantage.

Natural gas

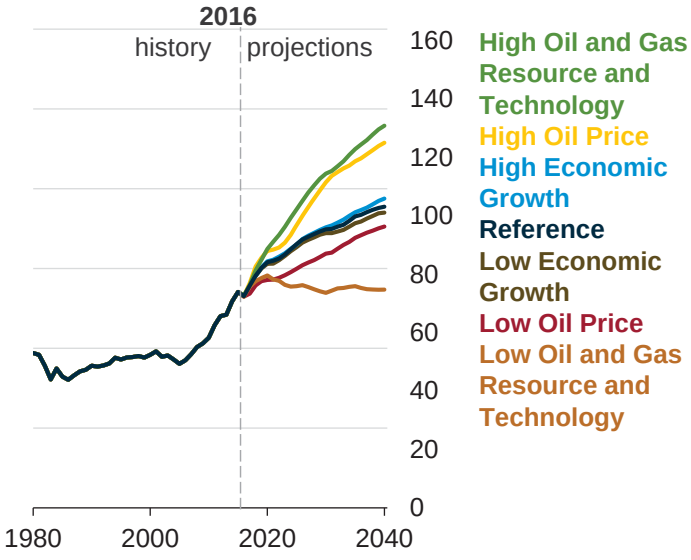
Across most cases, natural gas production increases despite relatively low and stable natural gas prices, supporting higher levels of domestic consumption and natural gas exports. Projections are sensitive to resource and technology assumptions.

U.S. natural gas consumption increases across most cases through most of the projection period—

Natural gas consumption
trillion cubic feet



Natural gas production
billion cubic feet per day



—and in combination with growing net exports, supports production growth

- In the Reference case, natural gas production over the 2016–20 period is projected to grow at about the same rapid rate (nearly 4% annual average) as it has since 2005. Since 2005, technologies to more efficiently produce natural gas from shale and tight formations have driven prices down, spurring growth in consumption and net exports.

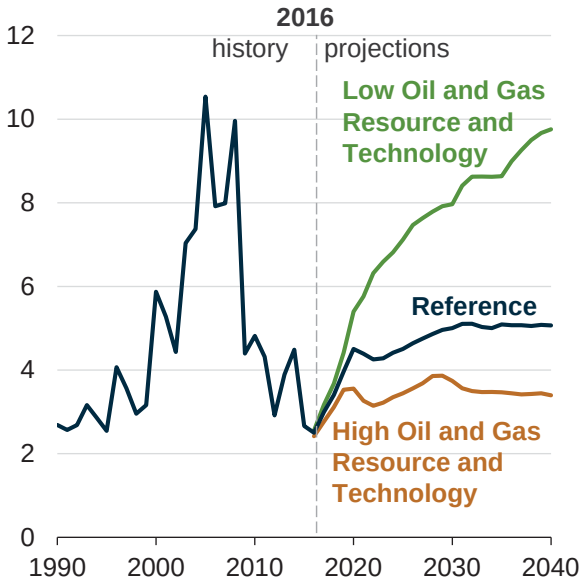
- Beyond 2020, natural gas production in the Reference case is projected to grow at a lower rate (1.0% annual average) as net export growth moderates, domestic natural gas use becomes more efficient, and prices slowly rise. Rising prices are moderated by assumed advances in oil and natural gas extraction technologies.

- Near-term production growth is supported by large, capital-intensive projects, such as new liquefaction export terminals and petrochemical plants, built in response to low natural gas prices.

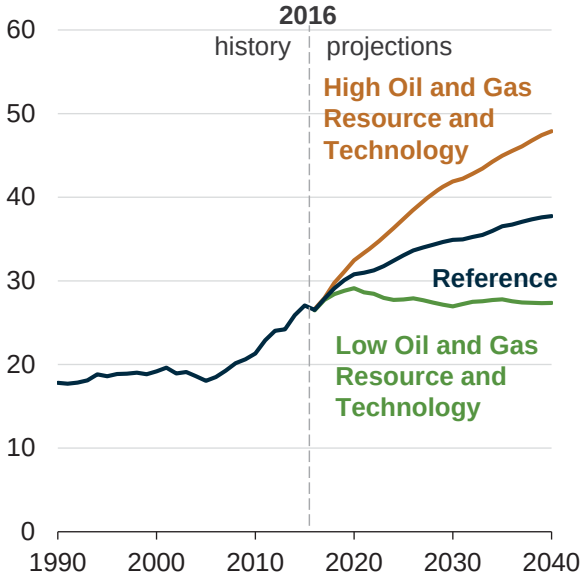
- Despite decreasing in the near term, in all cases, other than the Low Oil and Gas Resource and Technology case, U.S. natural gas consumption is expected to increase during much of the projection period.

Natural gas prices are projected to increase—

Natural gas spot price at Henry Hub
2016 dollars per million British thermal units



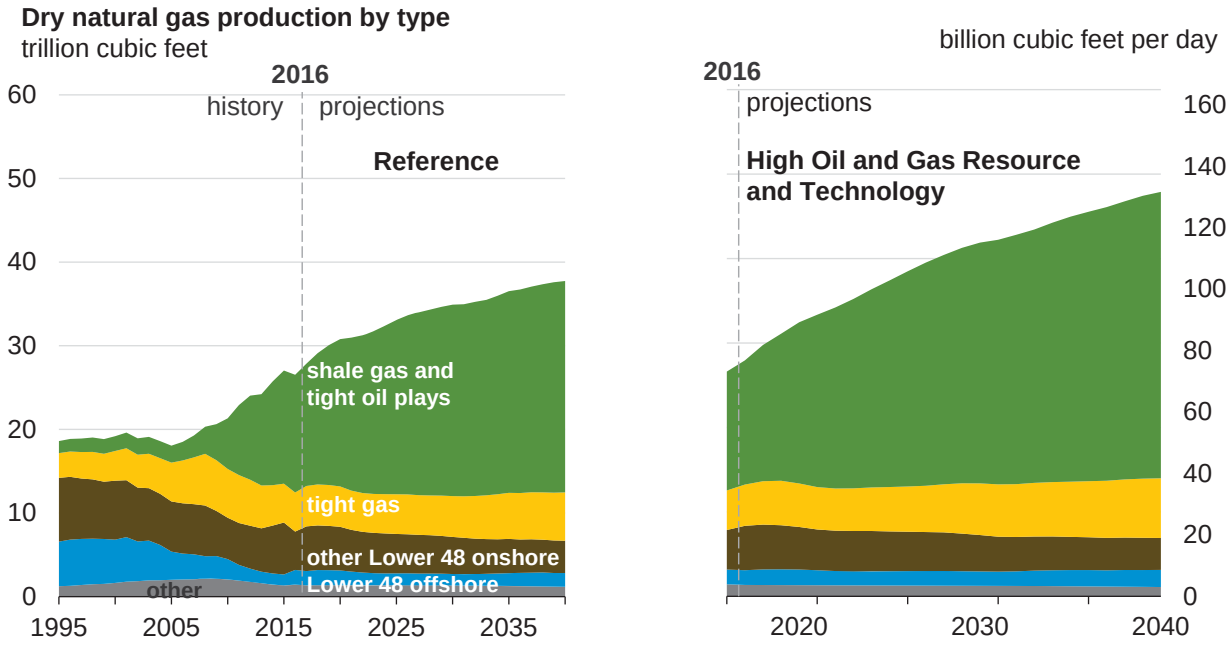
Dry natural gas production
trillion cubic feet



—and are sensitive to the availability of new technology and resources

- The range of projected Henry Hub natural gas prices depends on the assumptions about the availability of oil and natural gas resources and drilling technology.
- In the Reference case, the natural gas spot prices at the U.S. benchmark Henry Hub in Louisiana rise because of increased drilling levels, production expansion into less prolific and more expensive-to-produce areas, and demand from both petrochemical and liquefied natural gas export facilities.
- Reference case prices rise modestly from 2020 through 2030 as electric power consumption increases; however, natural gas prices stay relatively flat after 2030 as technology improvements keep pace with rising demand.
- In the High Oil and Gas Resource and Technology case, lower costs and higher resource availability allow for increased levels of production at lower prices, increasing domestic consumption and exports.
- In the Low Oil and Gas Resource and Technology case, prices near historical highs drive down domestic consumption and exports.

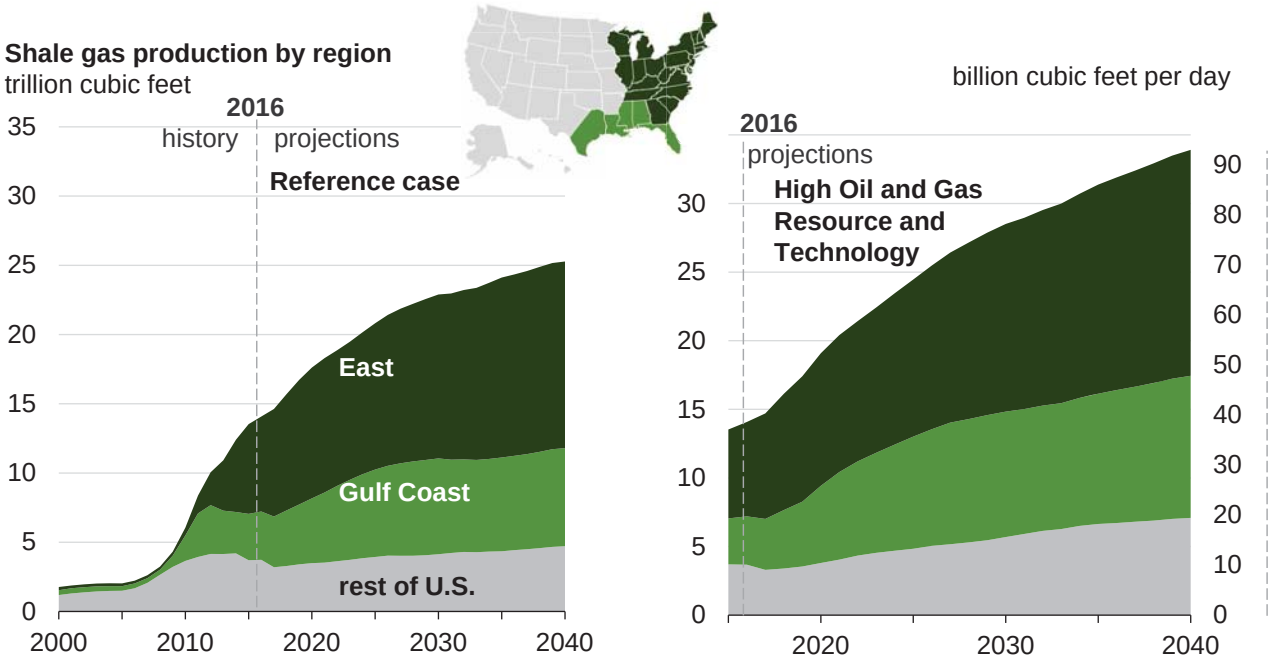
U.S. natural gas production growth is the result of continued development of shale gas and tight oil plays—



—which account for nearly two-thirds of natural gas production by 2040

- Production from shale gas and associated gas from tight oil plays is the largest contributor to natural gas production growth, accounting for nearly two-thirds of total U.S. production by 2040 in the Reference case.
- Tight gas production is the second-largest source of domestic natural gas supply in the Reference case, but its share falls through the late-2020s as the result of growing development of shale gas and tight oil plays.
- As new discoveries offset declines in legacy fields, offshore natural gas production in the United States increases over the projection period.
- Production of coalbed methane generally continues to decline through 2040 because of unfavorable economic conditions for producing that resource.

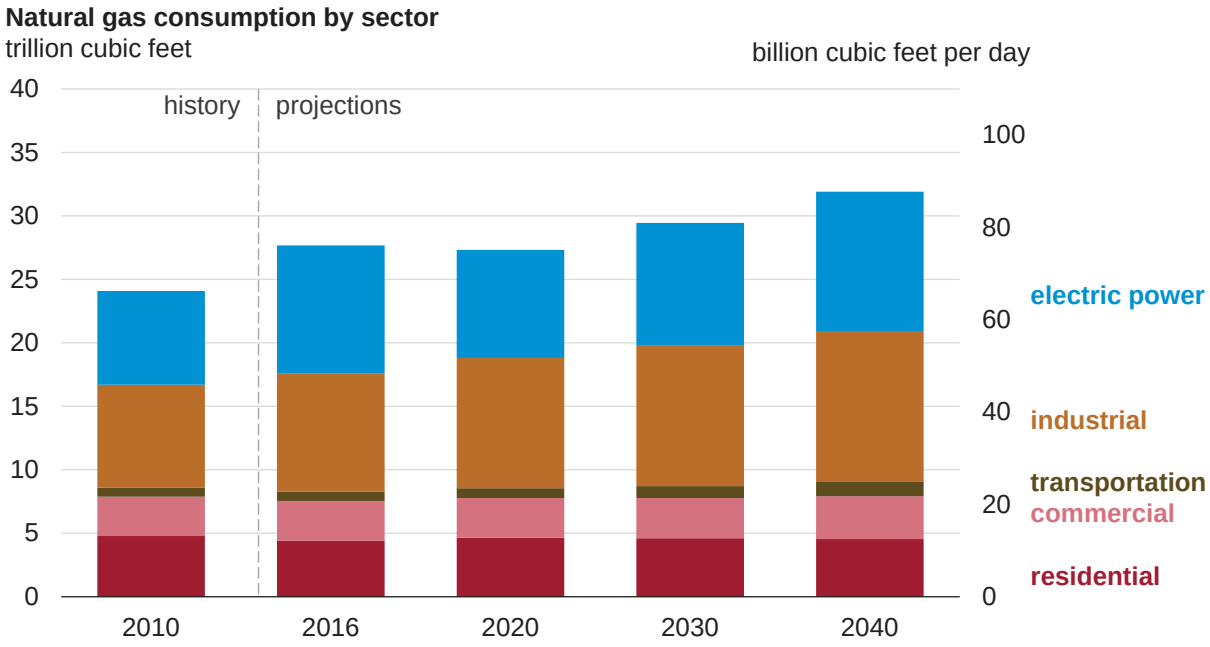
Plays in the East lead production of U.S. natural gas from shale resources in the Reference case—



—but Gulf Coast onshore production also grows

- Continued development of the Marcellus and Utica plays in the East is the main driver of growth in total U.S. shale gas production and the main source of total U.S. dry natural gas production.
- Production from the Eagle Ford and Haynesville plays along the Gulf Coast is a secondary contributor to domestic dry natural gas production, with production largely leveling off in the 2030s.
- Continued technological advancement and improvement in industry practices is expected to lower costs and to increase the expected ultimate recovery per well. These changes have a significant cumulative effect in plays that extend over wide areas and have large undeveloped resources (Marcellus, Utica, and Haynesville).

Increasing demand from industrial and electric power markets drive rising domestic consumption of natural gas in the Reference case—



—with comparatively little growth in the residential and commercial sectors

- The industrial sector is the largest consumer of natural gas during most years in the Reference case projections. Major natural gas consumers include the petrochemical industry (where natural gas is used as a feedstock in the production of methanol, ammonia, and fertilizer), other energy-intensive industries that use natural gas for heat and power, and liquefied natural gas producers.

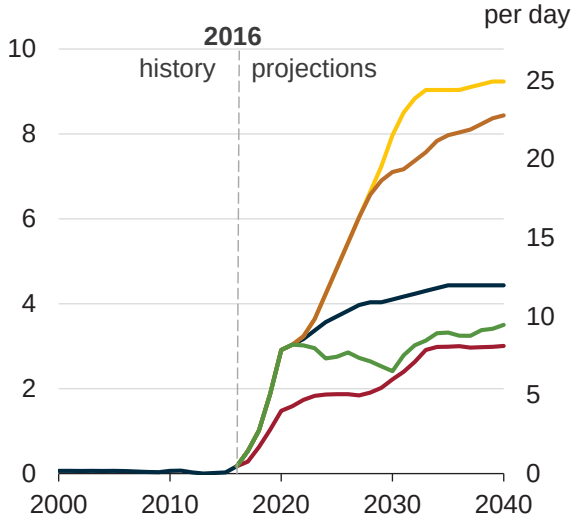
- After a brief near-term decline attributable to strong growth in renewables generation and price competition with coal, natural gas used for electric power generation generally increases after 2020. In particular, the Clean Power Plan (CPP) and the scheduled expiration of renewable tax credits in the mid-2020s result in an increase in the electric power sector's natural gas use. Natural gas consumption in the electric power sector is about 6% higher in the Reference case in 2040 than the No CPP case.

- Natural gas consumption in the residential and commercial sectors remains largely flat as a result of efficiency gains that balance increases in the number of housing units and commercial floor space.

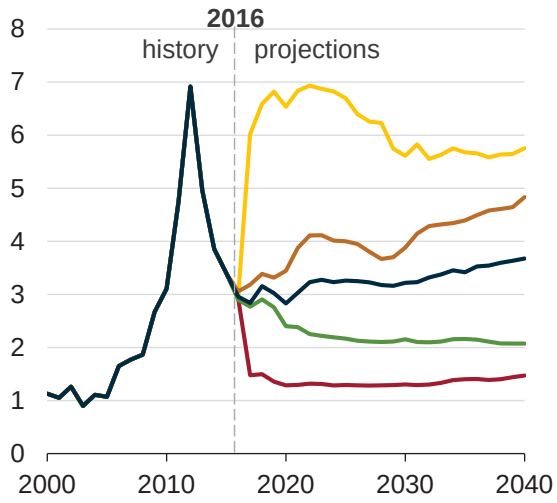
- Although natural gas use rises in the transportation sector, it remains a small share of both total natural gas consumption and transportation fuel demand.

U.S. LNG export levels vary across cases and reflect both the level of global demand—

Liquefied natural gas exports
trillion cubic feet | billion cubic feet per day



Oil-to-natural gas price ratio
energy-equivalent terms



Reference | **High and Low Oil and Gas Resource and Technology** | **High and Low Oil Price**

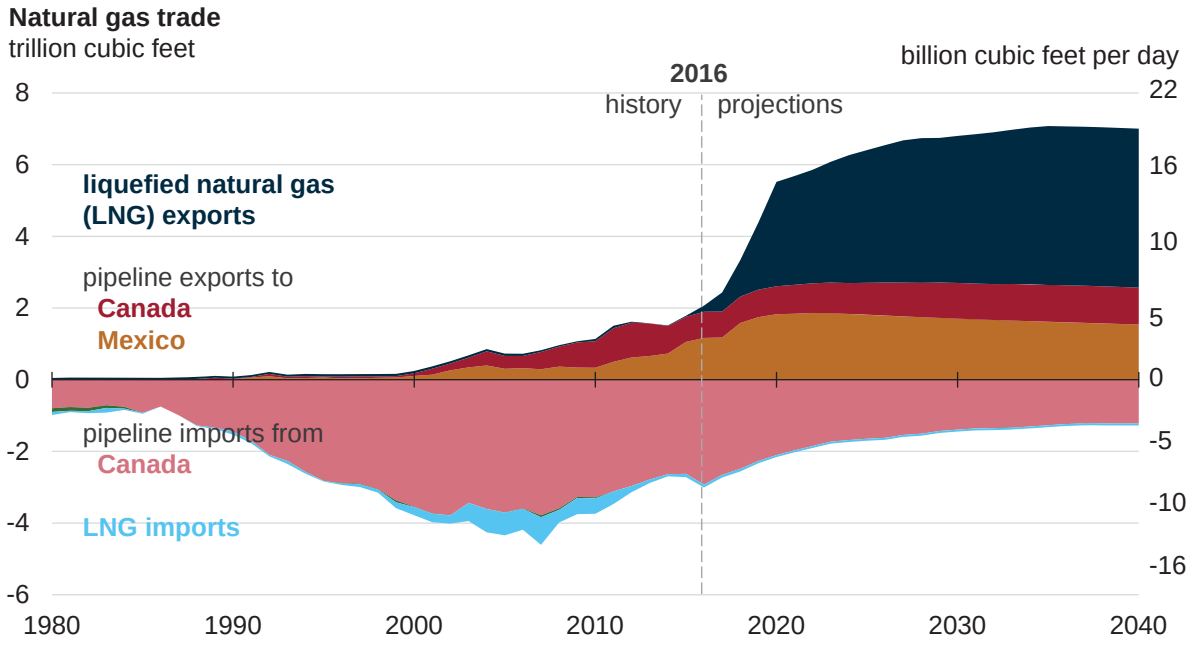
—and the difference between domestic and global natural gas prices, with the latter more heavily influenced by oil prices

- Currently, most liquefied natural gas (LNG) is traded under oil price-linked contracts, in part because oil can substitute for natural gas in industry and for power generation. However, as the LNG market expands, contracts are expected to change, weakening their ties to oil prices.

- When the oil-to-natural gas price ratio is highest, as in the High Oil Price case, U.S. LNG exports are at their highest levels. Demand for LNG generally increases as consumers move away from petroleum products, and LNG produced in the United States has the advantage of domestic spot prices that are less sensitive to global oil prices than supplies from other sources. In the Low Oil Price case, LNG exports from the United States are at their lowest levels throughout the projection period.

- In the High Oil and Gas Resource and Technology case, low U.S. natural gas prices make U.S. LNG exports competitive relative to other suppliers. Conversely, higher U.S. natural gas prices in the Low Oil and Gas Resource and Technology case result in lower U.S. LNG exports.

Increased natural gas trade is dominated by liquefied natural gas exports in the Reference case—



—while pipeline imports into the United States continue to decline

- In the Reference case, liquefied natural gas (LNG) is projected to dominate U.S. natural gas exports by the early-2020s. The first LNG export facility in the Lower 48, Sabine Pass, began operations in 2016, and four more LNG export facilities are scheduled to be completed by 2020.

- After 2020, U.S. exports of LNG grow at a more modest rate as U.S.-sourced LNG becomes less competitive in global energy markets.

- U.S. natural gas exports to Mexico continue to rise in the short term as pipeline infrastructure currently under development allows for rising exports to meet Mexico's increased demand for natural gas to fuel electric power generation.

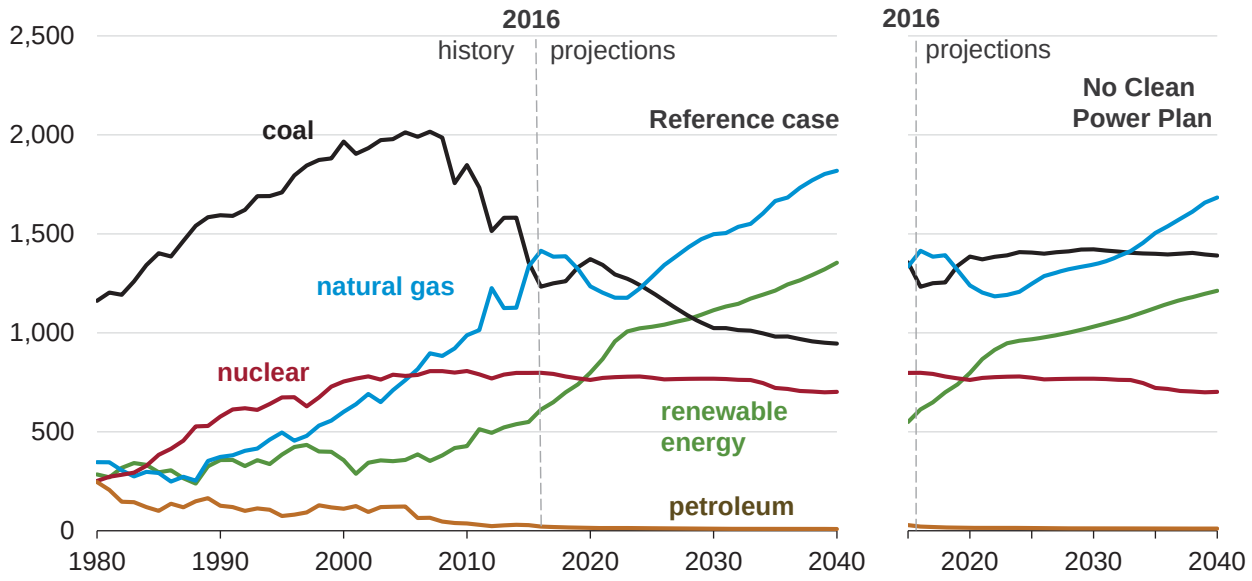
- U.S. imports of natural gas from Canada, primarily from the West where most of Canada's natural gas is produced, continue to decline, while U.S. exports to Canada—primarily to the East—continue to increase because of Eastern Canada's proximity to abundant natural gas resources in the Marcellus basin.

Electricity

As demand grows modestly, the primary driver for new capacity in the Reference case is the retirement of older, less efficient fossil fuel units—largely spurred by the Clean Power Plan (CPP)—and the near-term availability of renewable energy tax credits. Even if the CPP is not implemented, low natural gas prices and the tax credits result in natural gas and renewables as the primary sources of new generation capacity. The future generation mix is sensitive to the price of natural gas and the growth in electricity demand.

Fuel prices and current laws and regulations drive growing shares of renewables and natural gas in the electricity generation mix—

U.S. net electricity generation from select fuels
billion kilowatthours

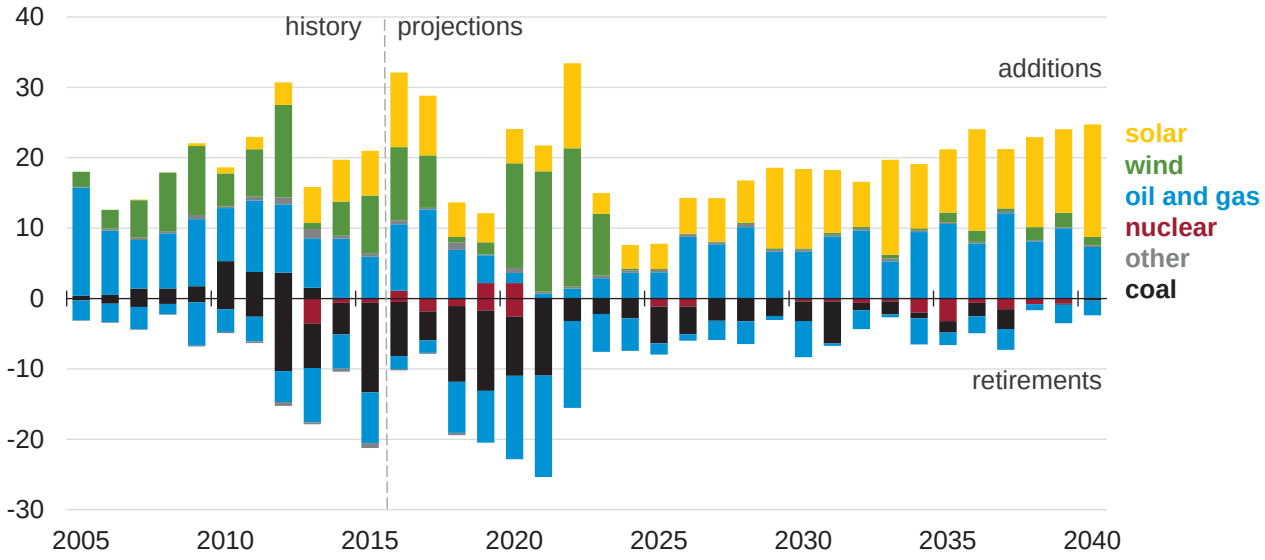


—as coal's share declines over time in the Reference case

- Fuel prices drive near-term natural gas and coal shares. As natural gas prices rebound from their 20-year lows which occurred in 2016, coal regains a larger generation share over natural gas through 2020.
- Federal tax credits drive near-term growth in renewable generation, displacing growth in natural gas.
- In the longer term, policy (Clean Power Plan, renewables tax credits, and California's SB32) and unfavorable economic conditions compared with natural gas and renewables result in declining coal generation and growing natural gas and renewables generation in the Reference case.

Lower capital costs and the availability of tax credits boost near-term wind additions and sustain solar additions—

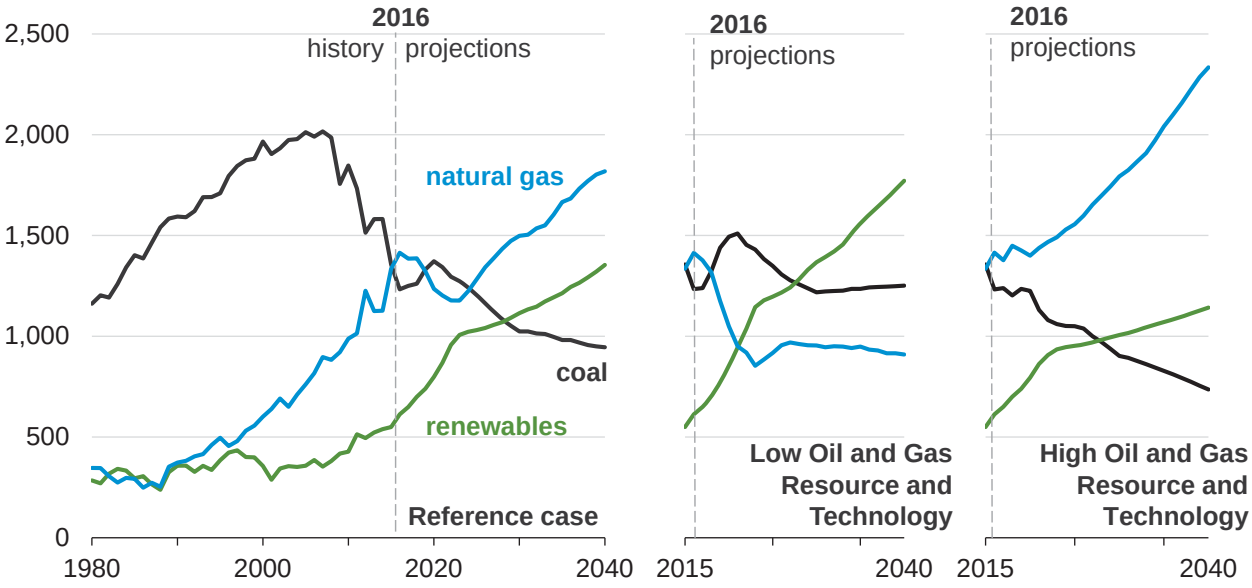
Annual electricity generating capacity additions and retirements (Reference case)
gigawatts



—whereas coal-fired unit retirements in the Reference case are driven by low natural gas prices and the Clean Power Plan

- In the Reference case, nearly 70 gigawatts (GW) of new wind and solar photovoltaic (PV) capacity is added over 2017–21, encouraged by declining capital costs and the availability of tax credits.
- Most of the wind capacity used to comply with the Clean Power Plan (CPP) is built prior to the scheduled expiration of the production tax credit for wind plants coming online by the end of 2023, although wind is still likely to be competitive without the tax credits.
- Continued retirements of older, less efficient fossil fuel units under the CPP support a consistent market for new generating capacity throughout the projection period.
- After 2030, new generation capacity additions are split primarily between solar and natural gas, with solar capacity representing more than 50% of new capacity additions in the Reference case between 2030 and 2040.

Natural gas resource availability affects prices that plays a critical role in determining the mix of coal, natural gas, and renewable generation—



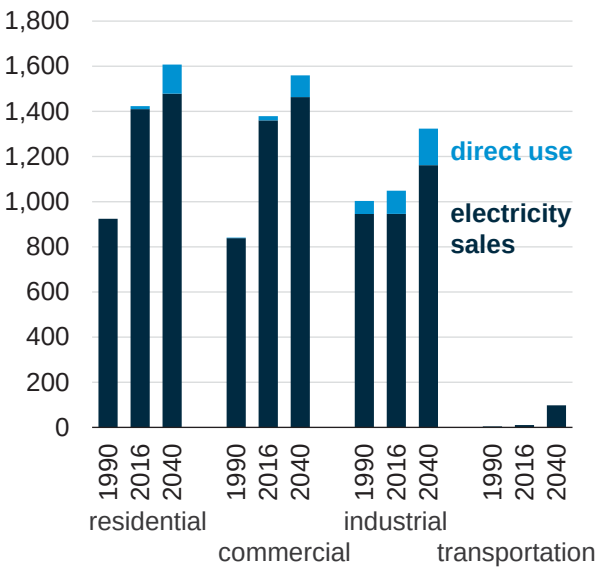
—as seen in the resource and technology cases

- Lower natural gas prices, which occur in the High Oil and Gas Resource and Technology case, lead to natural gas-fired electricity generation displacing coal-fired generation. In this case, and relative to the Reference case, natural gas maintains its market-share lead over coal through 2040, and it displaces some renewables market share relative to the Reference case.

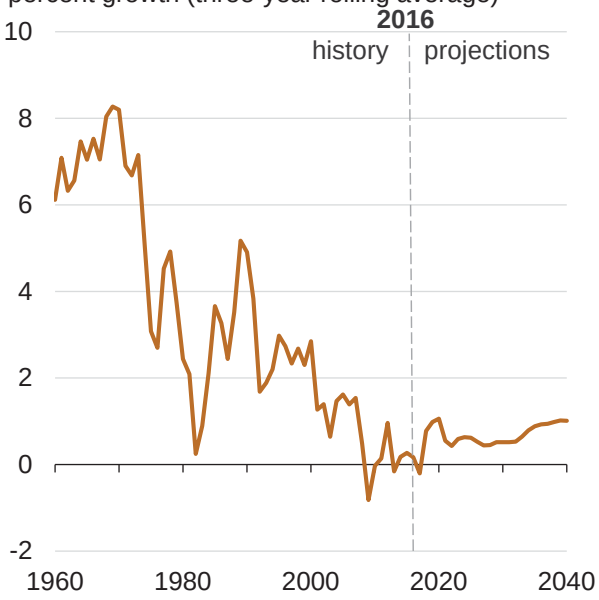
- Higher natural gas prices, which occur in the Low Oil and Gas Resource and Technology case, favor growth of renewables. Relative to the Reference case, coal-fired generation regains market share from natural gas in the near term, but because of carbon emission limits imposed by the Clean Power Plan, renewables ultimately gain a larger market share.

Electricity use continues to increase—

Electricity use by end-use demand sector
billion kilowatthours



Electricity use growth rate
percent growth (three-year rolling average)



—but the rate of growth remains lower than historic averages in the Reference case

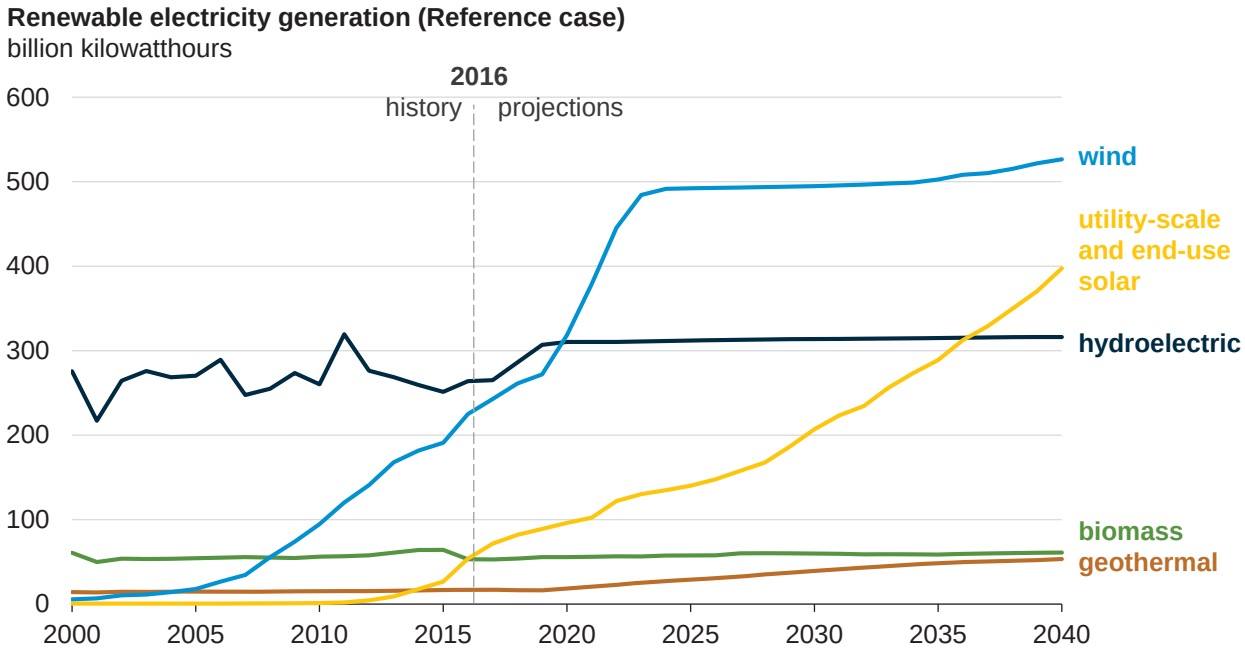
- In recent history, the growth in electricity demand has slowed as older equipment was replaced with newer, more efficient stock, as efficiency standards were implemented and technology change occurred, particularly in lighting and other appliances. The demographic and economic factors driving this trend included slowing population growth and a shifting economy toward less energy-intensive industries.

- While growth in the economy and electricity demand remain linked, historically the linkage has continued to shift toward much slower electricity demand growth relative to economic growth.

- Growth in electricity demand, while relatively low historically, begins to rise slowly across the projection period as demand for electric services is only partially offset by regulatory compliance and efficiency gains in electricity-using equipment.

- Growth in direct use generation above growth in sales is primarily the result of the adoption of rooftop photovoltaic (PV) and natural gas-fired combined heat and power (CHP).

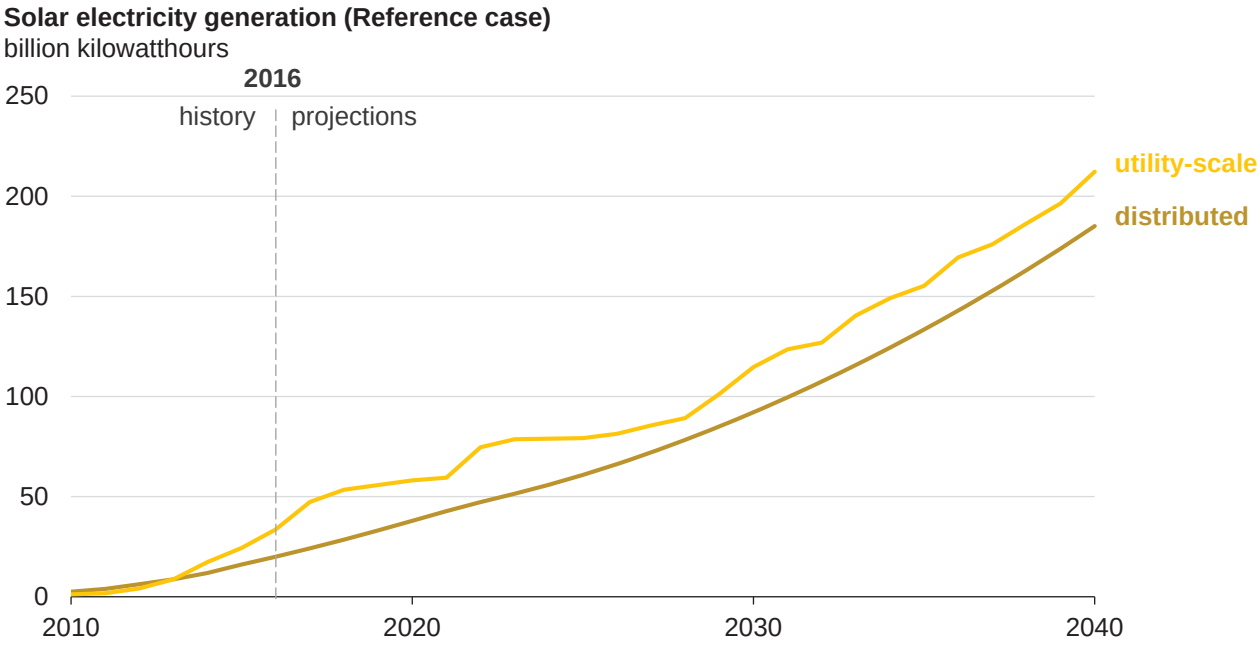
Wind and solar generation become the predominant sources of renewable generation in the Reference case—



—with each surpassing hydroelectric generation

- The Clean Power Plan (CPP) and state-defined Renewable Portfolio Standards (RPS) increase demand for wind and solar electricity generation throughout the projection period.
- The scheduled expiration of production tax credits encourages an increase in wind capacity additions ahead of CPP implementation. While many wind projects would be economic without the tax credits, most of the profitable wind capacity will be added to take advantage of the tax credits prior to their expiration.
- Substantial cost reductions, performance improvements, and a permanent 10% investment tax credit support solar generation growth throughout the projection period.
- Some geothermal resources are also competitive sources of new generation, but these lowest-cost resources are geographically limited and are only expected to be exploited slowly.

Most electric generation from solar resources comes from utility-scale installations—



—but generation from distributed photovoltaics is a significant contributor

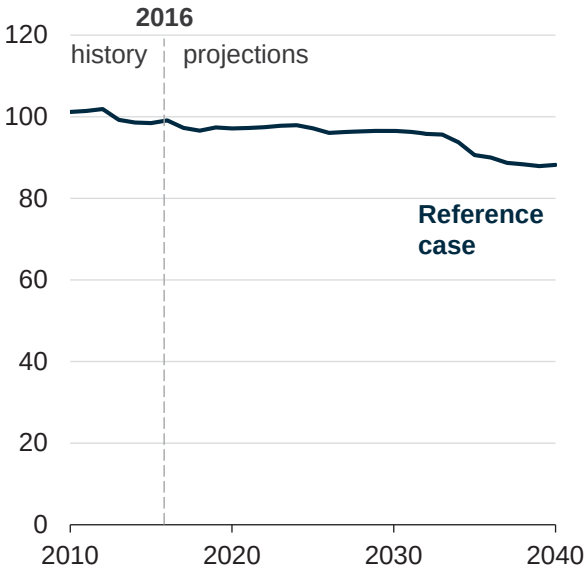
- Although utility-scale photovoltaic (PV) generation typically costs less than distributed PV, in some circumstances distributed PV remains economically attractive. Distributed PV competes against higher retail electricity prices, which do not necessarily reflect time-of-day or seasonal variation in the cost of electricity.

- With a continued (but reduced) tax credit, declining costs, and on-peak generation profile, both utility and distributed solar builds occur throughout the projection period.

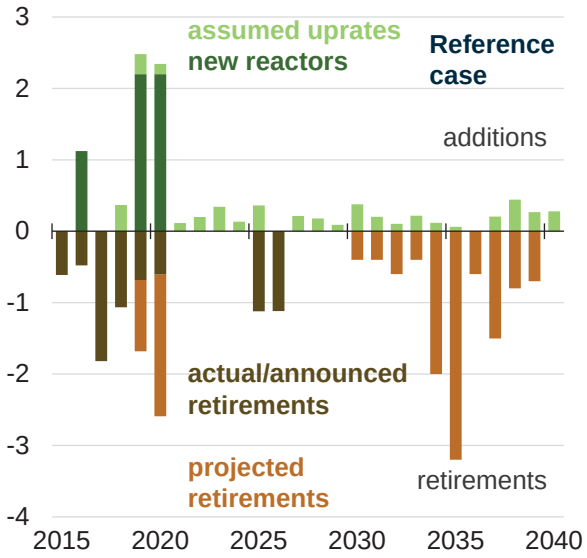
- AEO2017 projections include higher time-of-day and seasonal resolution of both utility-scale and distributed solar output as compared to AEO2016, as well as higher geographic resolution (at the ZIP code level) of distributed solar. The net result of these model changes is to reduce projected utility-scale solar generation and increase distributed solar generation, although not to the same degree.

Assumptions about license renewals in AEO2017 increase nuclear retirements—

Nuclear electricity generating capacity
gigawatts



Year-over-year nuclear capacity changes
gigawatts



—leading to net nuclear capacity decreases

- No new, unannounced nuclear capacity is added in the Reference case over the projection period because of the combination of low natural gas prices, higher renewables penetration, low electricity load growth, and relatively high capital costs.

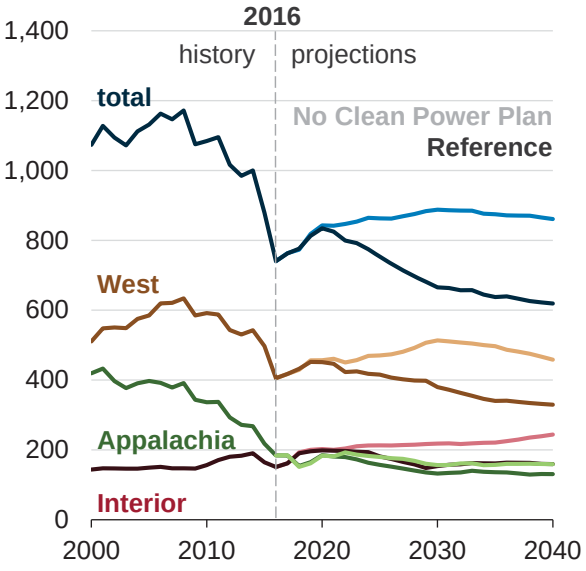
- New capacity additions are limited to reactors under construction from 2017 onward and to projected uprates at existing reactors. From 2018 through 2040, 4.7 gigawatts (GW) of additional capacity at existing units is projected to come online, based on an assessment of the remaining uprate potential.

- A significant reduction in nuclear capacity occurs because of 6.4 GW of total announced retirements; 3.0 GW of projected retirements in 2019–20 to address near-term, market uncertainty; and approximately 10.6 GW of long-term retirements through 2040 to address the uncertainty of reactors achieving a subsequent license renewal. As many nuclear plants reach the 60-year subsequent license renewal decision after 2040, retirements continue, with another 11.7 GW of nuclear capacity projected to retire by 2050.

- All nuclear plant retirements other than those already announced were modeled as capacity reductions for the regional nuclear fleets (i.e., as generic derates), rather than as retirements of specific plants.

Coal production decreases—

Coal production
million short tons



Coal consumption in electric power sector
million short tons

—primarily in the Western region

- The impacts of the Clean Power Plan (CPP) are not shared equally across the major coal supply regions because of differences in coal quality, regional natural gas and coal prices, and how the electricity markets served by each region are affected with respect to coal retirements and renewables penetration.

- Coal production increases through 2020 to more than 800 million short tons in the Reference case as a projected rise in natural gas prices improves the competitiveness of existing coal generating units.

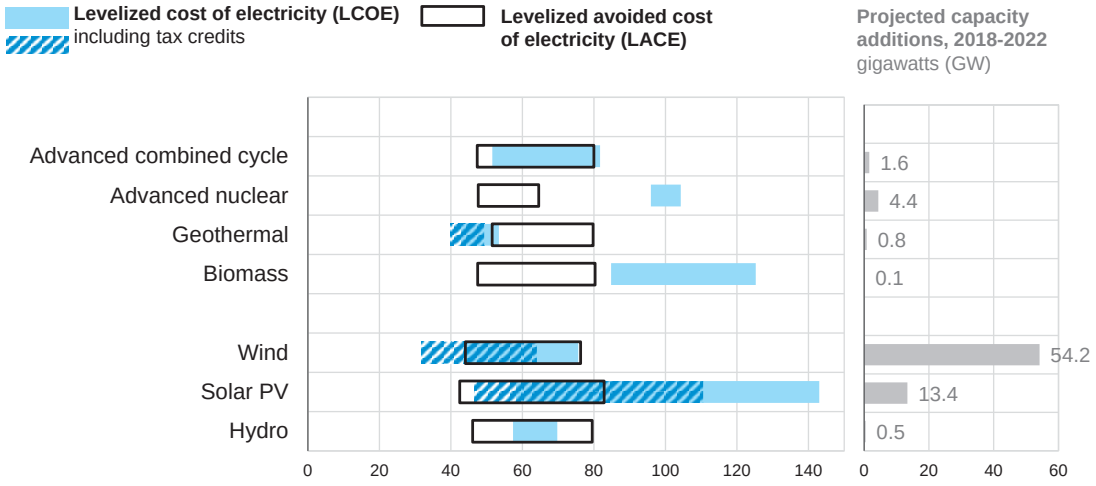
- After 2020, coal production in the Reference case declines, reaching nearly 620 million short tons per year in 2040, which is lower than the over 850 million short tons per year projected to be produced in 2040 in the No CPP case.

- The Interior region market share grows from 20% of U.S. coal production in 2016 to 26% by 2040, with Appalachia and Western production losing market share in both the Reference and No CPP cases.

- Coal production declines gradually after 2030 in the Reference case as retiring nuclear capacity is replaced, in part, by natural gas-fired electricity generation, requiring a reduction in existing carbon-emitting generation to maintain the CPP emission cap.

Including available federal tax credits, wind and solar units will be among the most competitive sources of new generation in 2022—

Levelized cost projections by technology, 2022
2016 dollars per megawatthour



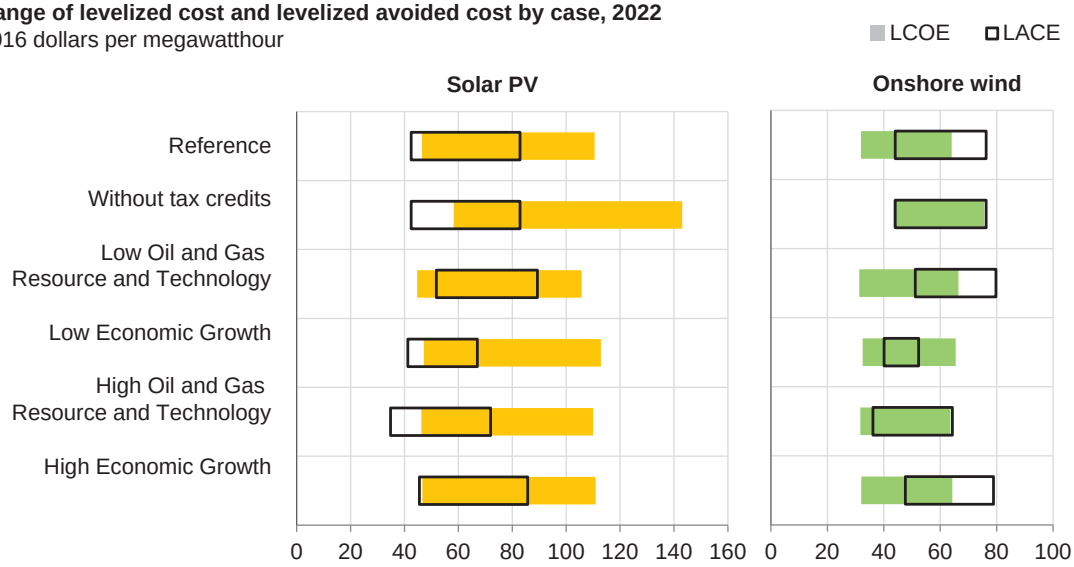
Source: *U.S. Energy Information Administration, Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2017*
Note: *Capacity additions include planned and unplanned additions.*

—when levelized costs of electricity and levelized avoided costs of electricity are considered

- Comparisons of levelized cost of electricity (LCOE) across technologies can be misleading as different technologies serve different market segments.
- Levelized avoided cost of electricity (LACE) can be used to compare the cost (LCOE) of an electricity generation resource against the value (LACE) of the electricity generation and capacity that it displaces.
- Wind plants entering service in 2022 that started construction in 2018 will receive an inflation-adjusted $14/MWh federal production tax credit; solar plants entering service in 2022 will receive a 26% investment tax credit, assuming a two-year construction lead time.
- See more information in EIA's LACE/LCOE report on EIA's website.

The value of energy (LACE) for wind and solar is more sensitive to differences in policy and market assumptions than the cost (LCOE)—

Range of levelized cost and levelized avoided cost by case, 2022
2016 dollars per megawatthour



—particularly assumptions that affect natural gas price projections

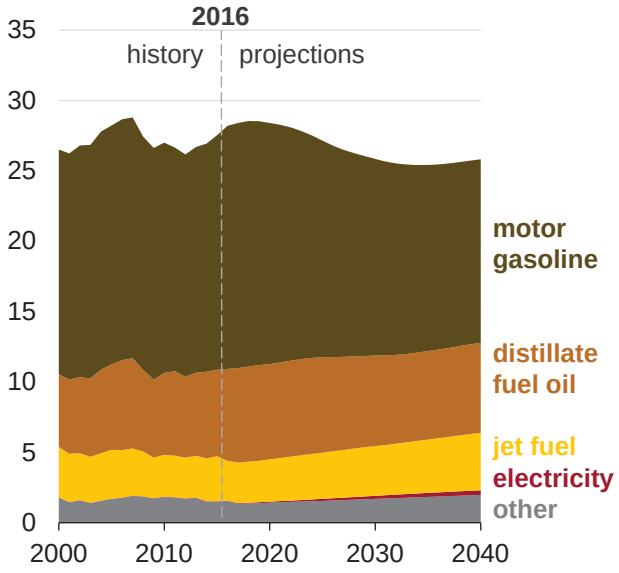
- The availability of tax credits affects the effective cost of generation from solar and wind, but other policies may affect value.
- High or low natural gas prices, as respectively reflected in the Low and High Oil and Gas Resource and Technology cases, affect the cost of generation that wind or solar displaces, and thus play a big role in determining the value of these resources to the electric grid.
- Faster demand growth under high macroeconomic growth conditions increases the value of new generation resources. Slower macroeconomic growth, leads to relatively flat demand growth and less demand for new generation.

Transportation

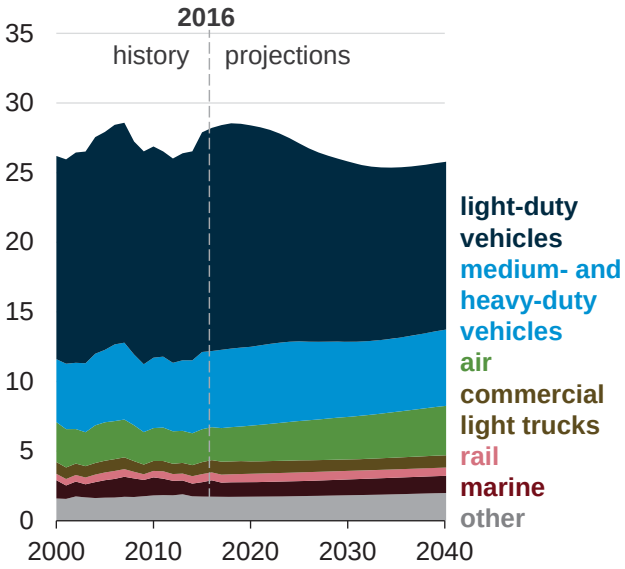
Transportation energy consumption peaks in 2018 in the Reference case because rising fuel efficiency outweighs increases in total travel and freight movements throughout the projection period.

Transportation energy use declines between 2018 and 2034 in the Reference case—

Transportation sector consumption
quadrillion British thermal units



Transportation sector consumption
quadrillion British thermal units

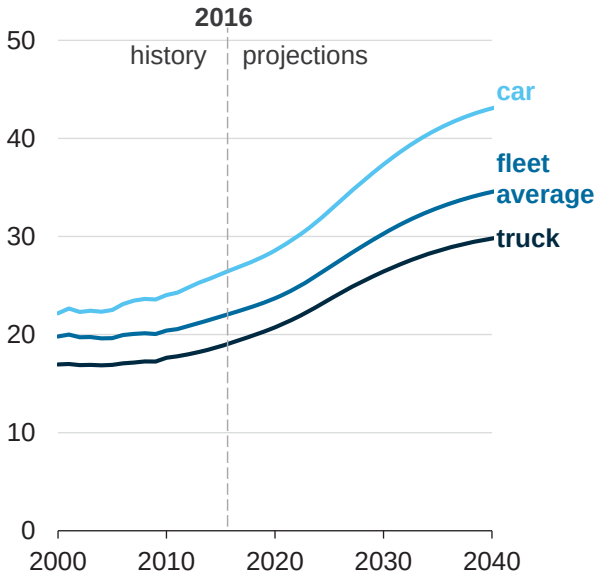


—driven by improvements in fuel economy

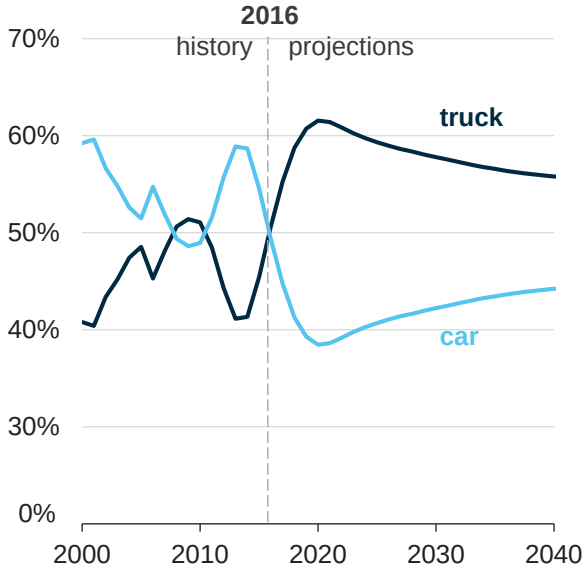
- Total transportation-related energy consumption peaks in 2018 in the Reference case and then declines through 2034 even as total travel and freight movement increases.
- Similarly, despite increases in light-duty travel, light-duty vehicle energy use also peaks in 2018 and then declines through 2040 as a result of higher fuel efficiency.
- Because the increase in freight travel demand is offset by rising fuel economy standards, heavy-duty vehicle energy consumption is approximately the same in 2040 as it was in 2016.
- Demand for air transport rises over the projection period, leading to an increase in energy used by air travel despite efficiency improvements.

Average light-duty fuel economy improves in the Reference case—

Light-duty stock fleet fuel economy
miles per gallon



Light-duty vehicle sales shares
percent



—even as the share of light-duty trucks increases

- Light-duty stock fuel economy is projected to rise from 22.2 miles per gallon (mpg) in 2016 to 34.6 mpg in 2040 in the Reference case. Current regulations require annual increases in fuel economy and reductions in greenhouse gas emissions through model year 2025, leading to a significant decrease in gasoline consumption.

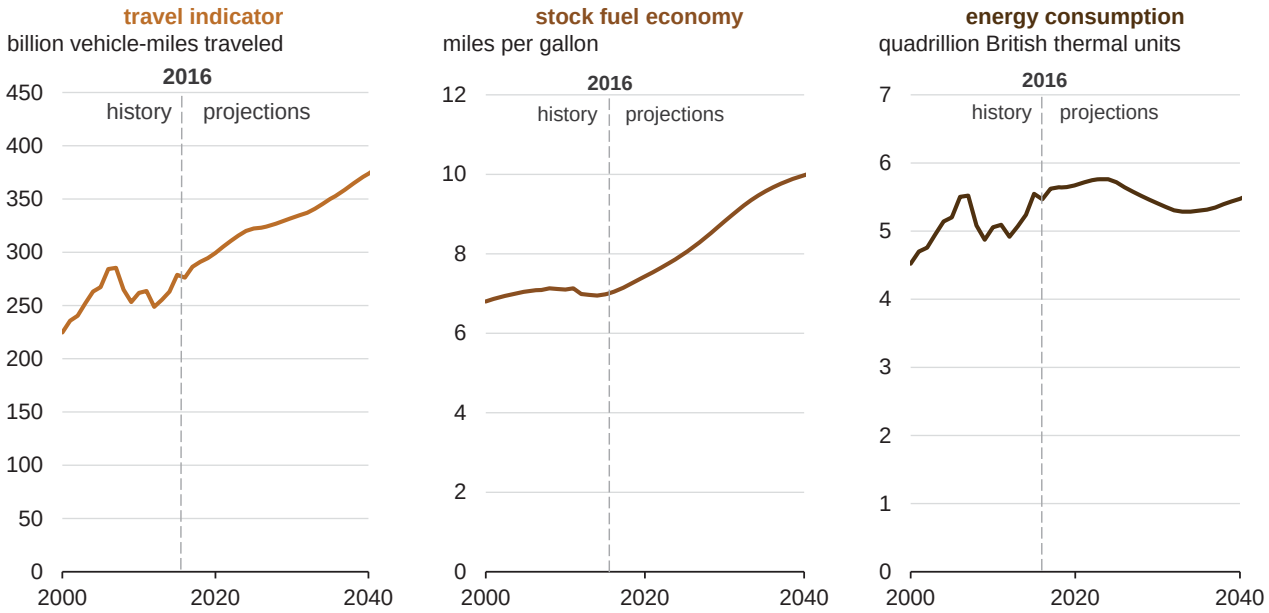
- The sales share of light-duty trucks, which have lower fuel economy compared with passenger vehicles, limits the increase of the average fuel economy of the light-duty fleet.

- The shift toward light-duty trucks is driven by lower fuel costs and a changing preference for pickup trucks and sport utility vehicles rather than cars.

- Light-duty truck sales decrease after 2018 with the rise in popularity of front-wheel drive crossover vehicles that are classified as passenger cars.

With the second phase of fuel efficiency regulations, medium- and heavy-duty vehicle energy consumption declines over 2023–33—

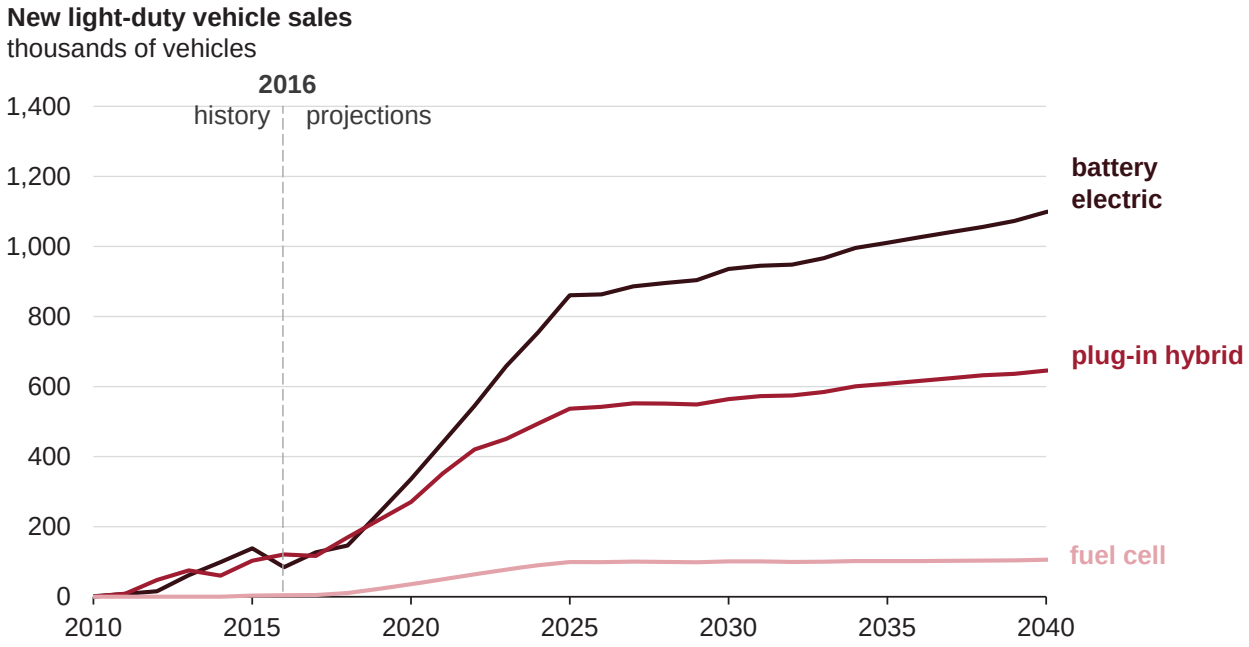
Medium- and heavy-duty vehicle metrics



—despite continued increase in miles traveled

- The second phase of the fuel efficiency and greenhouse gas regulations for medium- and heavy-duty vehicles takes full effect in 2027.
- Fuel economy of new medium- and heavy-duty vehicles increases by 38% from 2016–32 before leveling off, but stock fuel economy continues to increase through 2040 as less fuel efficient vehicles retire.
- Energy consumption from medium- and heavy-duty vehicles decreases from 2023 through 2033 before increasing in the Reference case, where fuel economy standards for trucks do not increase beyond 2027.
- Diesel remains the dominant fuel for trucks despite increasing use of alternative fuels.

Sales of battery electric, plug-in electric hybrid, and fuel cell vehicles increase in the Reference case—



—because of lower projected battery costs and existing state policies

- Battery electric vehicles (BEV) sales increase from less than 1% to 6% of total light-duty vehicles sold in the United States over 2016–40, and plug-in hybrid electric vehicle (PHEV) sales increase from less than 1% to 4% over the same period. Hydrogen fuel cell vehicle (FCV) sales grow to approximately 0.6% of sales by 2040.

- In 2025, projected sales of light-duty battery electric, plug-in hybrid electric, and hydrogen fuel cell vehicles reach 1.5 million, about 9% of projected total sales of light-duty vehicles.

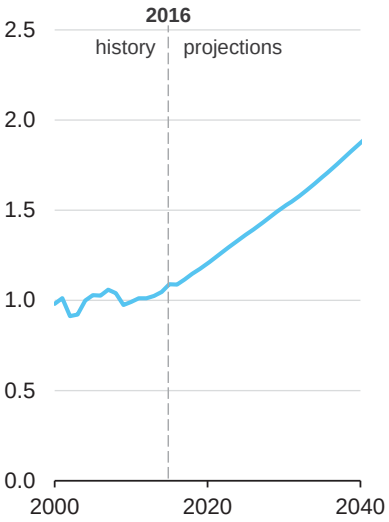
- Regional programs such as California's Zero-Emission Vehicle regulation, which has been adopted by nine additional states, and California's SB-32, which requires a reduction in greenhouse gas emissions, spur alternative vehicle sales, especially electric and fuel cell vehicles.

- Updated data that indicate lower battery costs have increased EIA's outlook for BEV and PHEV sales.

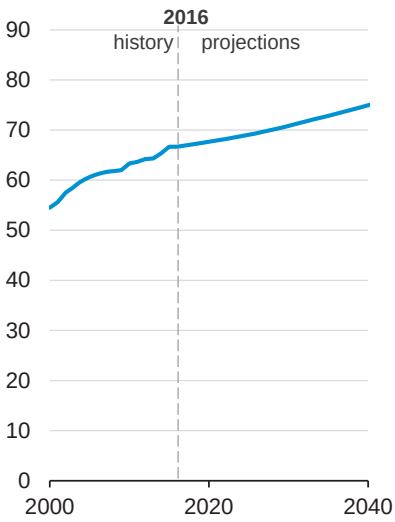
Even with improving commercial aircraft efficiency—

Air transportation metrics

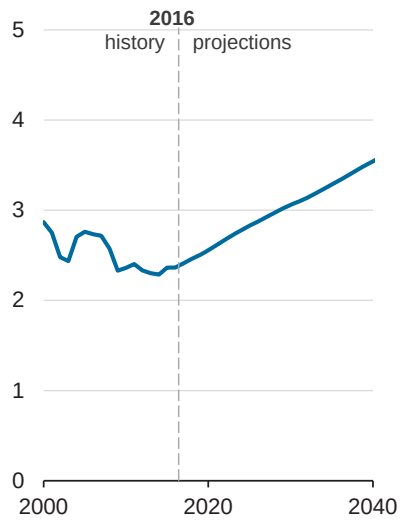
travel indicator
trillion seat-miles available



stock fuel economy
seat-miles per gallon



jet fuel consumption
quadrillion British thermal units



—jet fuel use rises in the Reference case with increased travel

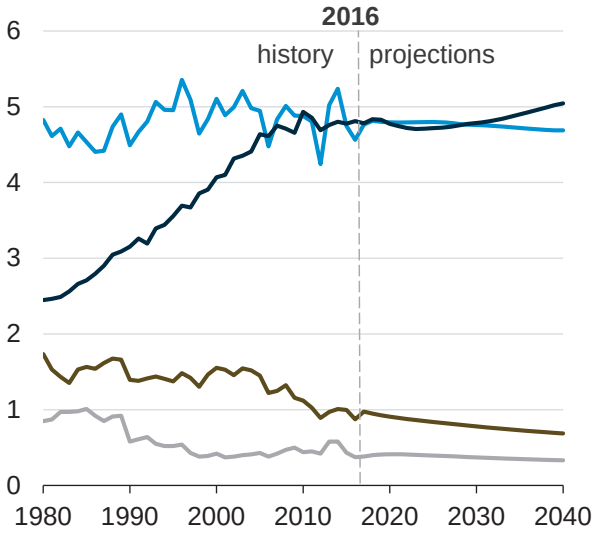
- Jet fuel consumption increases more than 40% between 2016 and 2040 in the Reference case, as demand for air travel more than offsets projected efficiency gains in aircraft.
- With slow fleet turnover, aircraft stock efficiencies rise more than 12% between 2016 and 2040, as measured by seat-miles per gallon.
- U.S. load factors (fraction of filled seats and cargo space) for domestic and U.S. international routes, which increased significantly over 1995–2010, are projected to remain relatively flat over 2016-40.
- Even with the rise in aircraft efficiency, U.S. seat-miles more than double and freight revenue ton-miles nearly double through 2040, yielding a net increase in jet fuel consumption in the transportation sector.

Buildings

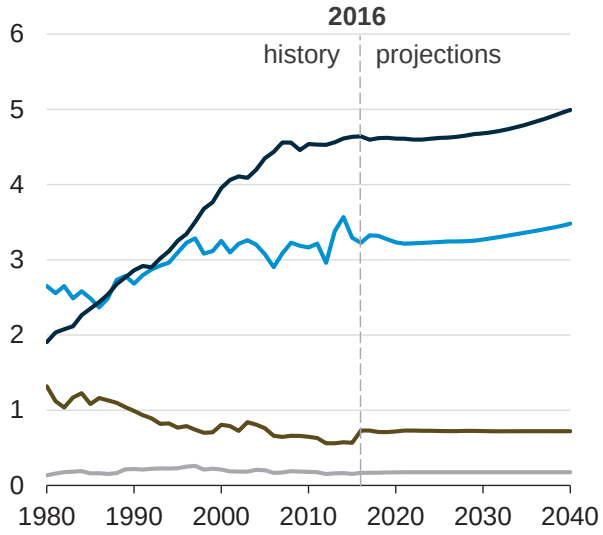
Despite growth in the number of households and the amount of commercial floorspace, improved equipment and efficiency standards contribute to residential and commercial consumption remaining relatively flat or declining slightly from 2016 to 2040 in the Reference case.

Residential and commercial fuel consumption are relatively stable in the Reference case—

Residential sector delivered energy consumption
quadrillion British thermal units



Commercial sector delivered energy consumption
quadrillion British thermal units



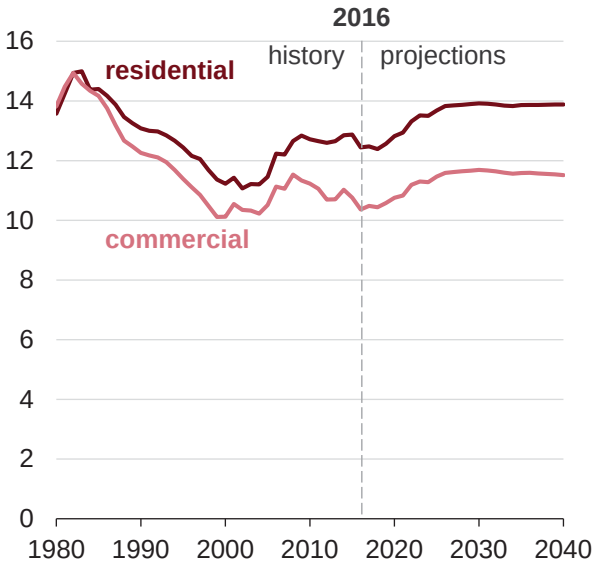
electricity **natural gas** **petroleum and other liquids** **other**

—as energy efficiency and other factors offset growth in end-use energy service demand

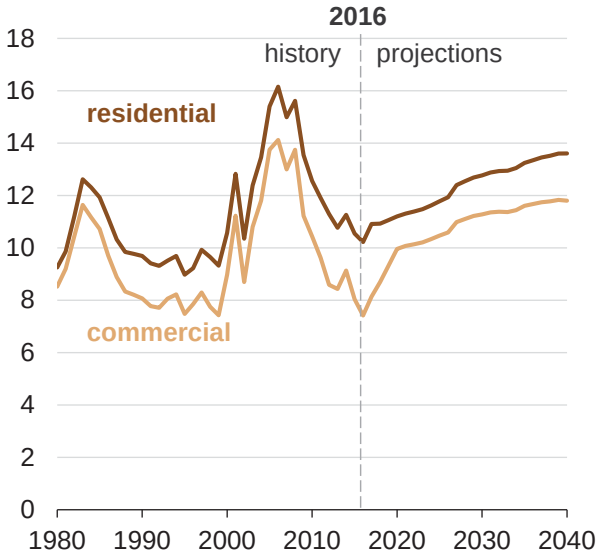
- Laws and regulations to introduce and update appliance standards and building codes have continued to increase energy efficiency in the residential and commercial sectors.
- Electricity demand in both sectors has been relatively flat in recent years, and it continues to be flat in the near term. Eventually, the increased adoption and saturation of new uses not currently covered by appliance standards increases consumption.
- Continued population shifts toward warmer parts of the country tend to lower heating demand and increase cooling demand. More energy is used for heating, so the result is a decrease in net delivered energy.
- Consumption of natural gas, used primarily for space heating, water heating, and cooking, has historically grown slower than electricity, and this trend generally continues through the projection.
- Use of petroleum-based fuels such as propane and heating oil continues to decline in the residential sector and remains relatively flat in the commercial sector.

Gradual increases in electricity and natural gas prices—

Electricity prices
2016 cents per kilowatthour



Natural gas prices
2016 dollars per thousand cubic feet

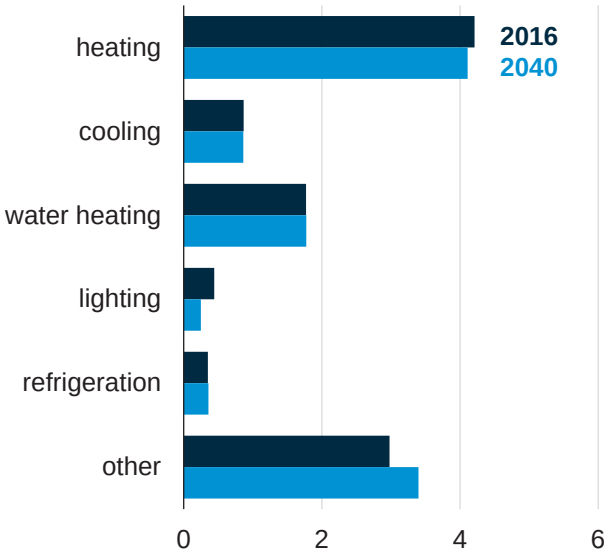


—affect residential and commercial energy consumption

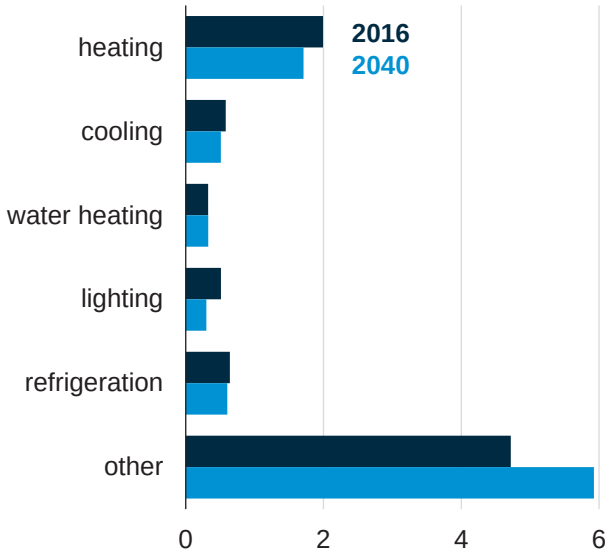
- Following modest price increases from 2016 to 2030 in both residential and commercial sectors, electricity prices stabilize after 2030.
- As electricity prices flatten from 2030 to 2040, along with factors such as geographic population shifts and floorspace growth, electricity consumption rises at an increased rate in both sectors.
- Residential natural gas consumption is relatively stable, despite steadily increasing residential natural gas prices.
- Commercial natural gas prices increase in the near term, while commercial natural gas consumption remains flat; in the longer term, as price increases slow after 2030, commercial natural gas consumption begins to increase.

Energy consumption decreases for most major end uses in the residential and commercial sectors—

Residential sector delivered energy consumption
quadrillion British thermal units



Commercial sector delivered energy consumption
quadrillion British thermal units

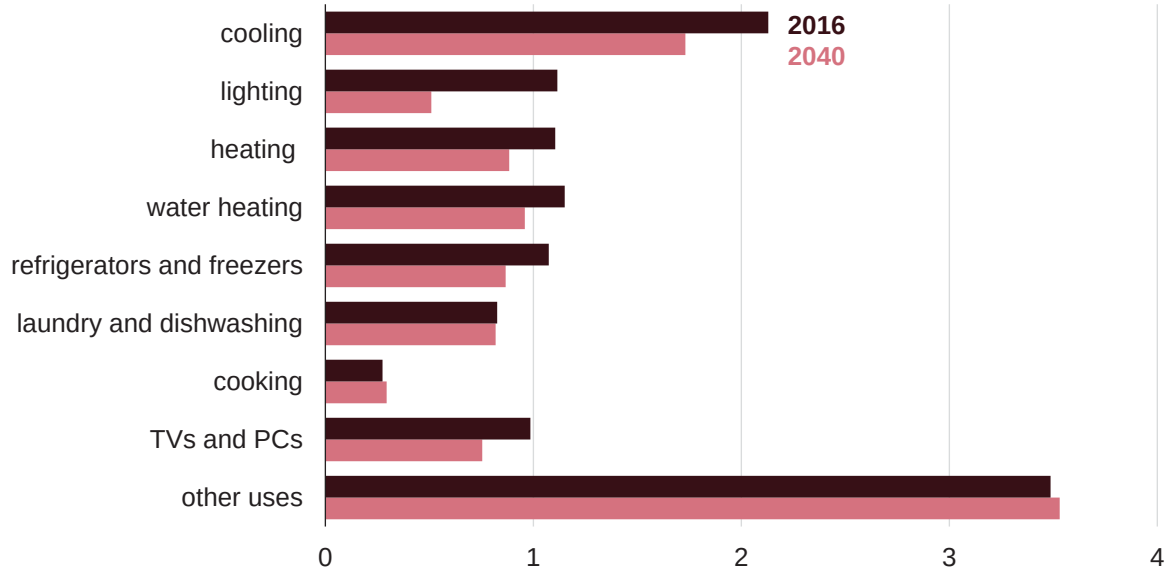


—with improved equipment efficiency and standards in the Reference case

- Energy consumption for lighting declines in the residential and commercial sectors as light-emitting diodes and compact fluorescent lamps continue to replace incandescent lamps and other bulb types.
- Energy consumption most residential and commercial applications either remains flat or declines slightly from 2016 to 2040 in the Reference case, despite growth in the number of households and the amount of commercial floorspace.
- Utility rebates contribute to a decrease in energy consumption. These rebates are expected to increase with the implementation of the Clean Power Plan (CPP) because energy efficiency programs are one of the available compliance strategies, and they are expected to grow more than they would in the absence of the CPP.
- In the residential sector, most of the growth in the *Other* category comes from increasing market penetration of smaller electric devices, most of which are not covered by efficiency standards.
- In the commercial sector, increased energy consumption for *Other* primarily reflects an increase in non-building uses such as telephone and technology networks.

Per-household electricity use continues to decline in the Reference case—

Residential electricity use per household
thousand kilowatthours per household

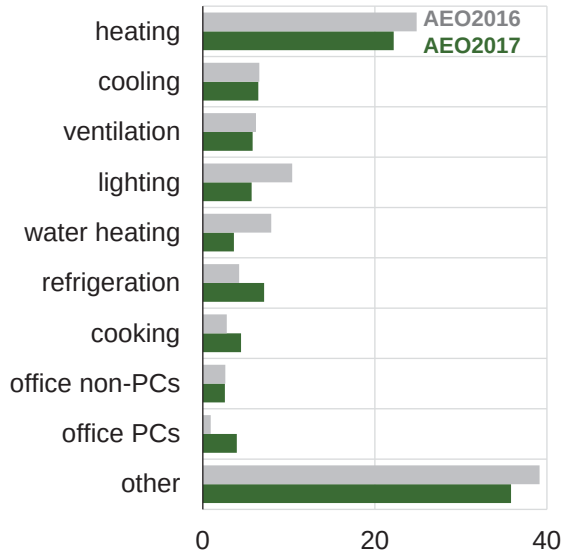


—led by efficiency improvements in lighting, cooling, and heating

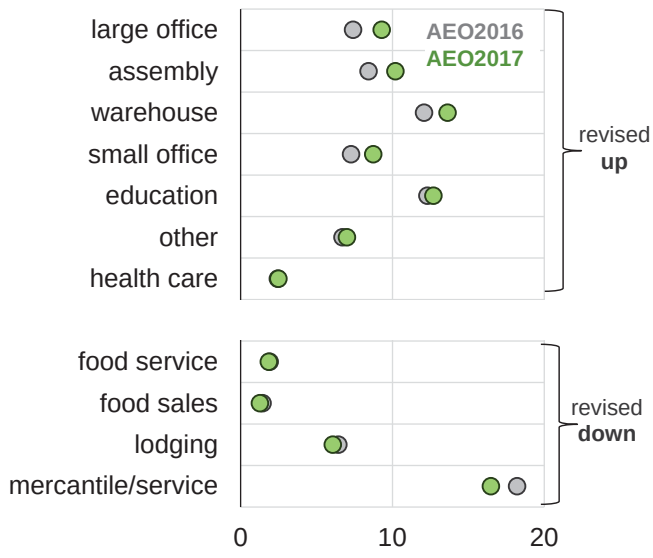
- Electricity use per household continues to decrease in the Reference case, as household growth exceeds growth in residential electricity use.
- By 2040, the average household uses less than half as much electricity for lighting as they did in 2016, as customers replace incandescent bulbs with more energy efficient light-emitting diodes (LEDs) and compact fluorescent lamps (CFLs).
- Space cooling consumption for the average household declines by nearly 20%, as energy efficiency improvements more than offset the increased demand for space cooling.
- Per household electricity use by miscellaneous loads, a category that encompasses a wide range of equipment such as small electronic devices, home security systems, and pool pumps, increases slightly as efficiency improvements only partially offset the increased adoption and market penetration of new devices.
- Residential on-site electricity generation, mostly from photovoltaic solar panels, lowers total purchased delivered electricity from the electric grid.

AEO2017 includes new data from EIA's Commercial Buildings Energy Consumption Survey—

Commercial energy intensities, 2016
thousand British thermal units per square foot



Commercial floorspace by type, 2016
million square feet



—leading to revisions in commercial building mix and energy consumption

- AEO2017 is based on the latest Commercial Buildings Energy Consumption Survey (CBECS), which was released during 2015 and 2016 and is the first update to be included in the AEO since AEO2007. The sample of buildings surveyed was drawn from the set of commercial buildings as of 2012.

- The latest CBECS provides a better understanding of the makeup of the commercial sector as well as the energy consumption associated with different end uses.

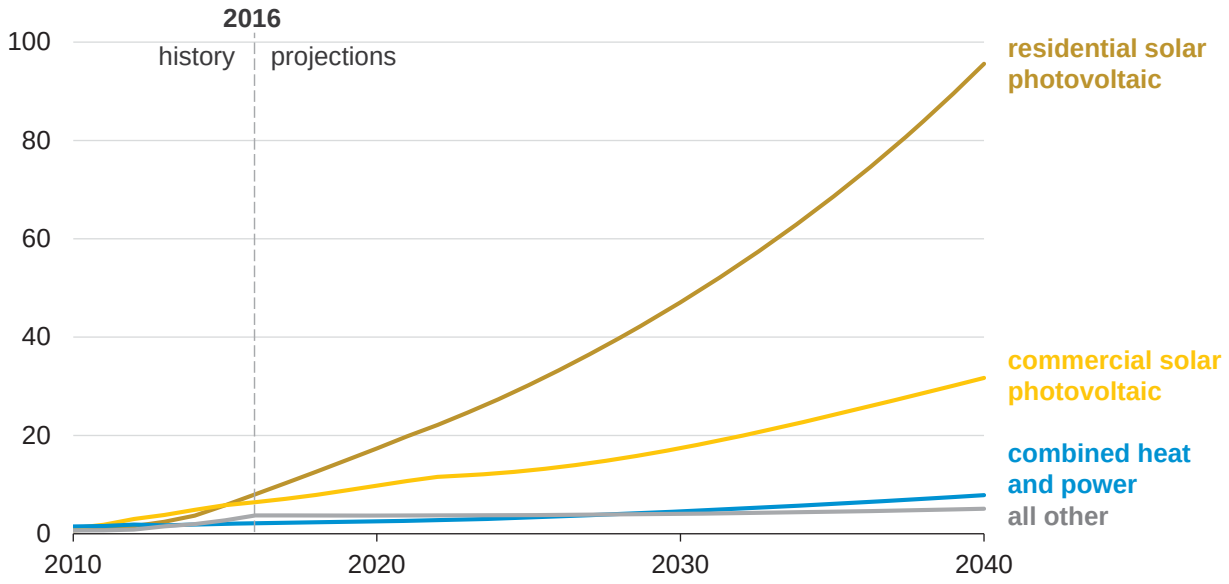
- Overall commercial floorspace is larger than previous estimates, especially for large offices and assembly buildings.

- Some end uses, particularly lighting and water heating, have changed significantly since the previous CBECS, which was based on the set of commercial buildings as of 2003 and did not consider as many building types as the latest CBECS.

- Categorization of some end uses in commercial buildings has changed. For instance, the category of office personal computers (PCs) now includes data center servers and all video screens; this equipment was previously categorized as *other end-uses*.

On-site electricity generation in residential and commercial buildings increases in the Reference case—

Buildings sector on-site electric generating capacity
gigawatts



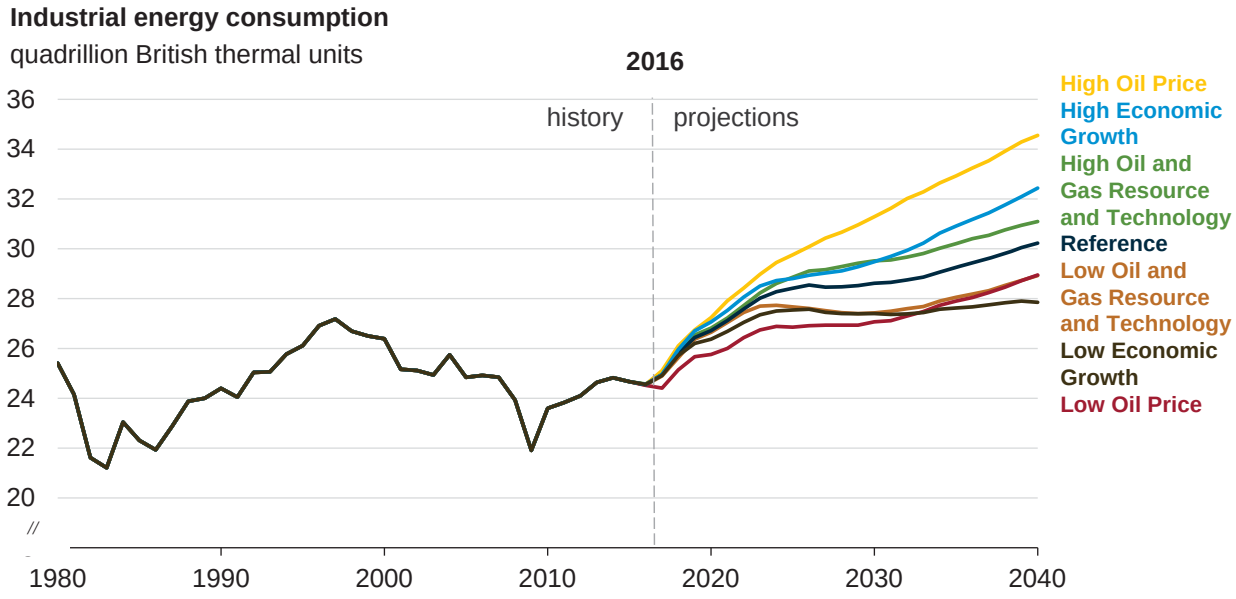
—reflecting declining technology costs and the continued availability of incentives for solar technologies to all sectors through 2021

- Solar photovoltaic (PV) systems account for most of the growth in buildings-sector on-site (or distributed) electricity generation in the AEO2017.
- Solar PV adoption grows from a 2010 base of less than 2 gigawatts (GW) in the residential and commercial sectors to more than 125 GW of capacity in 2040 in the Reference case.
- Other technologies such as small wind and combined heat and power, mostly in the commercial sector, grow more slowly and reach about 13 GW of capacity by 2040.
- Federal investment tax credits for solar technologies currently cover 30% of installed cost through 2019, dropping to 26% in 2020 and to 22% in 2021. In 2022, residential tax credits expire, and commercial credits are reduced to 10%.
- The differences from AEO2016 come from expected technology cost declines and changes in the way that EIA projects buildings will employ solar PV over time (adoption modeling). Additionally, EIA's new residential PV adoption projection uses econometric modeling of ZIP code-level solar resources, electricity rates, and financial metrics.

Industrial

With economic growth and relatively low energy prices, energy consumption in EIA's three industrial sub-sectors (energy-intensive manufacturing, non-energy-intensive manufacturing, and nonmanufacturing) increases during the projection period across all cases. Energy intensity declines across all cases as a result of technological improvements.

Industrial delivered energy consumption grows in all cases—



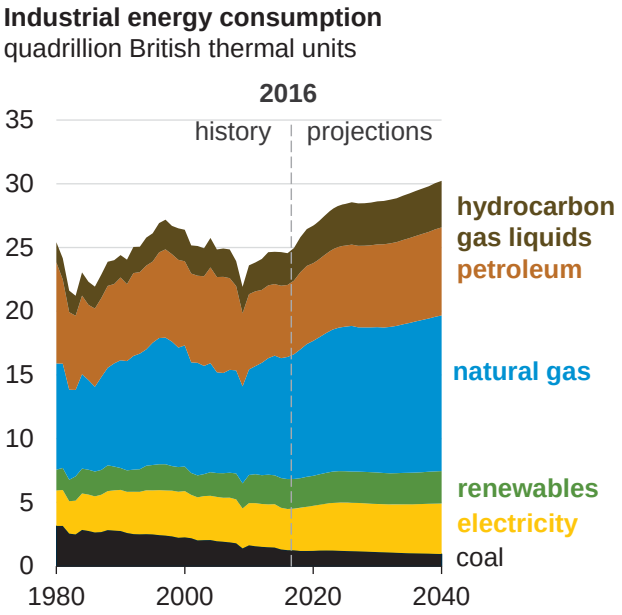
—but is highest in the High Oil Price case and the High Economic Growth cases over most of the projection

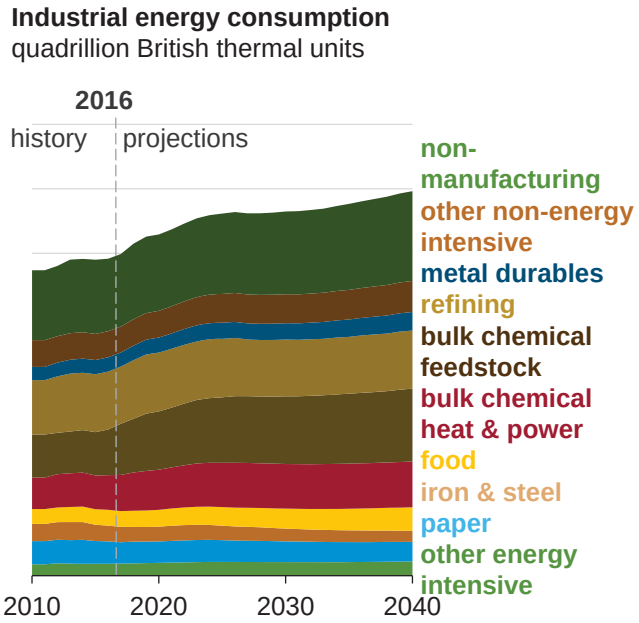
- Reference case industrial energy consumption is projected to grow more than 25%, from 26 to 32 quadrillion British thermal units between 2016 and 2040.

- Industrial energy consumption is greatest in the High Oil Price case. Although industrial energy use grows in all cases, more energy is used to produce steel, fabricated metal products, and machinery in the High Oil Price case than the Reference case because of greater demand for these products.

- Combined heat and power (CHP) generation in the High Oil Price case is about 26%, or about 53 billion kilowatthours, above the Reference case by 2040 largely because of higher CHP generation for coal-to-liquids and gas-to-liquids. Coal-to-liquids and gas-to-liquids are economical in the High Oil Price case in the mid-2020s and after.

Industrial sector energy consumption grows faster than in other demand sectors in the Reference case—





—led by increases in petroleum and natural gas consumption

- Driven by economic growth and supported by relatively low energy prices, industrial energy consumption in EIA's three main industrial sub-sectors (nonmanufacturing, energy-intensive manufacturing, and non-energy-intensive manufacturing) increases during the projection period across all cases.

- Natural gas (used for heat and power in many industries) and petroleum (a feedstock for bulk chemicals) make up the majority of delivered industrial energy consumption, followed by purchased electricity, renewables, and coal.

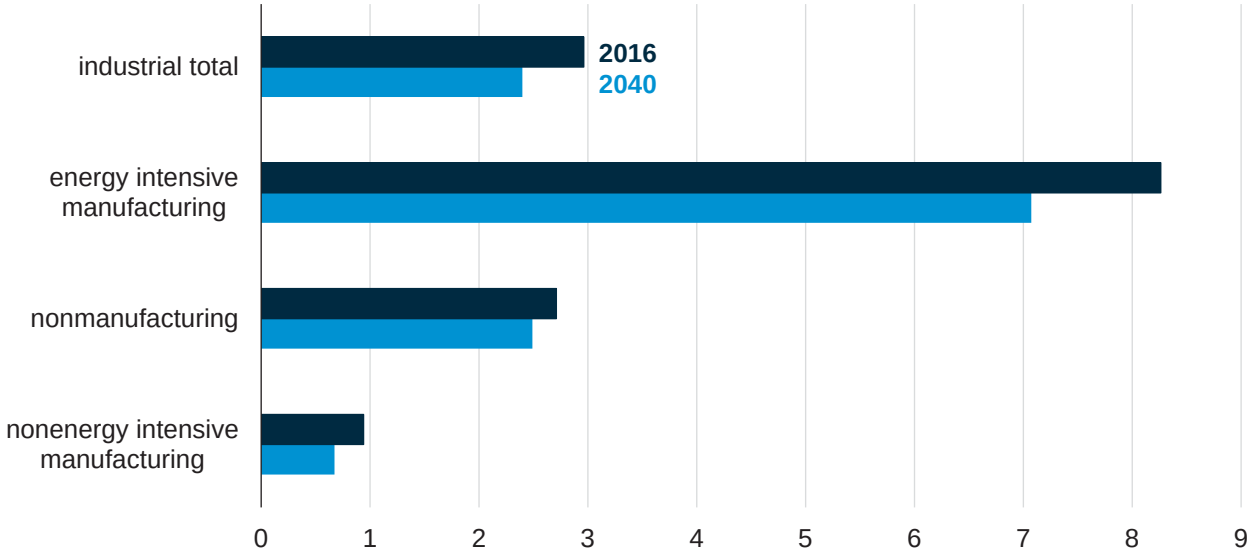
- Total industrial energy consumption growth averages nearly 1% per year from 2016–40 in the Reference case, the highest growth rate of any demand sector, as economic growth exceeds efficiency gains.

- Industrial coal usage declines by 24% over the projection period as its use in combined heat and power (CHP) is largely replaced by lower-cost natural gas.

- Hydrocarbon gas liquids (HGL) such as ethane, propane, and butane are largely produced by processing liquids from wet natural gas wells. HGL, which are widely used as feedstock in chemical processes, are a major source of growth in overall industrial use of petroleum.

Industrial energy intensity declines across all subsectors—

Industrial energy intensity (Reference case)
trillion British thermal units per billion dollars of shipments



—moderating energy consumption increases

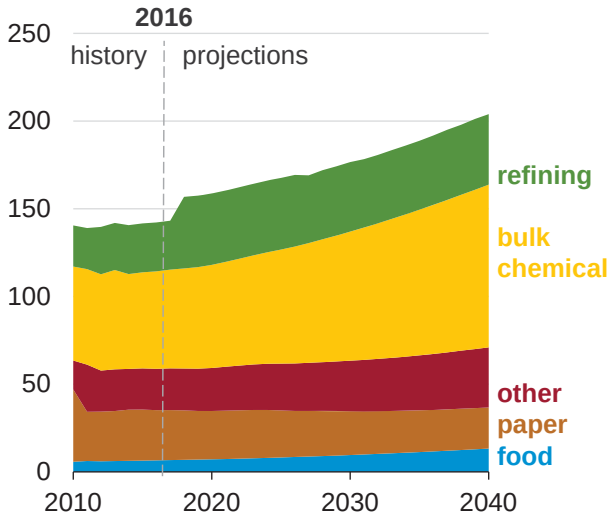
- Overall industrial energy intensity, measured as energy consumption per industrial shipment, declines by approximately 0.9% per year from 2016 to 2040 in the Reference case, consistent with historic trends.

- Manufacturing energy intensity declines as a result of continued efficiency gains in industrial equipment as well as a shift in the share of shipments from energy-intensive manufacturing industries to other industries.

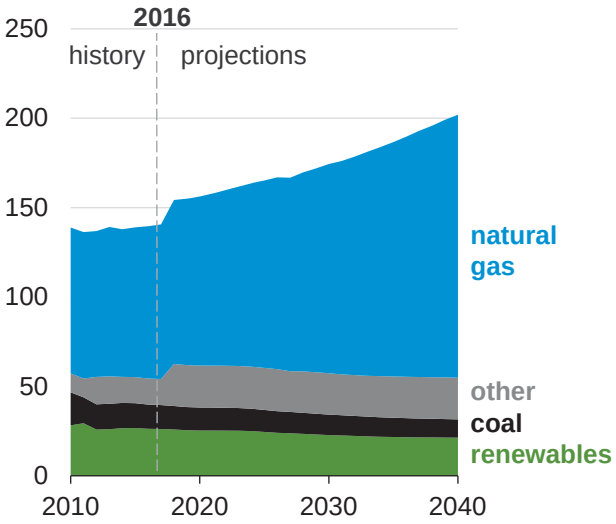
- Energy-intensive industries, which include food, paper, bulk chemical, glass, cement, iron and steel, and aluminum products, dominate overall industrial energy use consumption, accounting for less than 25% of industrial shipments but more than 60% of industrial energy use.

Industrial combined heat and power use grows in the Reference case—

Combined heat and power output
billion kilowatthours



Combined heat and power output
billion kilowatthours



—as bulk chemicals and food are the fastest growing industries through 2040

- Natural gas is the most common fuel used in combined heat and power (CHP), but renewables are used in the paper industry. Specialty fuels such as blast furnace gas and still gas are used in the iron and steel industry and the refining industry, respectively.

- Industrial CHP is most commonly found in large, steam-intensive industries, such as bulk chemicals, refining, paper, and food.

- The median size of an industrial sector CHP facility is 30 megawatts (MW), and an average size of 65 MW. CHP offsets approximately 0.5 quadrillion British thermal units (Btu) of purchased electricity in 2016 and 0.7 quadrillion Btu in 2040.

References

Contacts

AEO Working Groups
https://www.eia.gov/outlooks/aeo/workinggroup/

AEO Analysis and Forecasting Experts
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For more information

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Short-Term Energy Outlook | www.eia.gov/steo

Annual Energy Outlook | www.eia.gov/aeo

International Energy Outlook | www.eia.gov/ieo

Monthly Energy Review | www.eia.gov/mer

Today in Energy | www.eia.gov/todayinenergy

Table A1. Total energy supply, disposition, and price summary
(quadrillion Btu per year, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Production								
Crude oil and lease condensate	19.69	18.28	21.69	22.02	21.37	21.56	20.53	0.3%
Natural gas plant liquids	4.47	4.78	6.45	6.44	6.36	6.36	6.29	0.8%
Dry natural gas	27.92	27.40	34.15	36.06	37.73	38.98	41.61	1.2%
Coal[1]	16.99	15.18	15.06	13.24	12.88	12.59	11.99	-0.7%
Nuclear / uranium[2]	8.34	8.34	8.09	8.03	7.54	7.34	6.36	-0.8%
Conventional hydroelectric power	2.36	2.50	2.95	2.97	2.98	2.99	3.02	0.6%
Biomass[3]	4.30	4.20	4.45	4.45	4.41	4.48	4.54	0.2%
Other renewable energy[4]	2.64	3.04	6.20	6.66	7.20	8.04	9.73	3.5%
Other[5]	0.46	0.92	1.03	0.85	0.87	0.91	0.92	0.0%
Total	**87.16**	**84.64**	**100.06**	**100.73**	**101.36**	**103.24**	**104.98**	**0.6%**
Imports								
Crude oil	16.33	17.49	16.63	16.41	16.83	17.12	18.87	0.2%
Petroleum and other liquids[6]	4.25	4.18	4.26	4.03	3.96	3.94	3.75	-0.3%
Natural gas[7]	2.79	3.08	1.74	1.48	1.36	1.31	1.29	-2.5%
Other imports[8]	0.47	0.45	0.29	0.23	0.19	0.18	0.18	-2.7%
Total	**23.83**	**25.20**	**22.93**	**22.15**	**22.34**	**22.55**	**24.08**	**-0.1%**
Exports								
Petroleum and other liquids[9]	9.17	10.19	14.60	15.41	15.27	15.16	13.17	0.8%
Natural gas[10]	1.80	2.09	6.47	6.86	7.14	7.07	6.88	3.6%
Coal	1.96	1.46	1.64	1.73	1.89	2.03	2.13	1.1%
Total	**12.93**	**13.74**	**22.70**	**24.00**	**24.30**	**24.26**	**22.17**	**1.4%**
Discrepancy[11]	**1.14**	**-0.37**	**0.05**	**0.15**	**0.19**	**0.15**	**0.20**	**- -**
Consumption								
Petroleum and other liquids[12]	36.57	36.89	37.03	35.81	35.54	36.16	38.54	0.1%
Natural gas	28.19	28.59	29.14	30.36	31.61	32.87	35.65	0.7%
Coal[13]	15.47	13.93	13.47	11.51	10.97	10.55	9.85	-1.0%
Nuclear / uranium[2]	8.34	8.34	8.09	8.03	7.54	7.34	6.36	-0.8%
Conventional hydroelectric power	2.36	2.50	2.95	2.97	2.98	2.99	3.02	0.6%
Biomass[14]	2.92	2.76	2.91	2.94	2.93	3.00	3.10	0.3%
Other renewable energy[4]	2.64	3.04	6.20	6.66	7.20	8.04	9.73	3.5%
Other[15]	0.45	0.42	0.45	0.44	0.43	0.43	0.44	0.2%
Total	**96.93**	**96.47**	**100.24**	**98.73**	**99.21**	**101.38**	**106.70**	**0.3%**
Prices (2016 dollars per unit)								
Crude oil spot prices (dollars per barrel)								
Brent	53	43	86	95	102	109	117	3.0%
West Texas Intermediate	49	43	80	88	96	103	110	2.8%
Natural gas at Henry Hub (dollars per million Btu)	2.66	2.50	4.51	5.00	5.09	5.07	5.83	2.5%
Coal (dollars per ton)								
at the minemouth[16]	34.2	33.9	34.7	34.3	36.5	37.9	40.1	0.5%
Coal (dollars per million Btu)								
at the minemouth[16]	1.72	1.69	1.75	1.74	1.82	1.87	1.96	0.4%
Average end-use[17]	2.45	2.34	2.54	2.54	2.55	2.58	2.57	0.3%
Average electricity (cents per kilowatthour)	10.6	10.3	11.2	11.4	11.4	11.4	11.6	0.4%

Table A1. Total energy supply, disposition, and price summary (continued)
(quadrillion Btu per year, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Prices (nominal dollars per unit)								
Crude oil spot prices (dollars per barrel)								
Brent	52	43	104	128	152	179	236	5.1%
West Texas Intermediate	49	43	97	118	143	169	223	5.0%
Natural gas at Henry Hub (dollars per million Btu)	2.62	2.50	5.45	6.76	7.60	8.31	11.80	4.7%
Coal (dollars per ton)								
at the minemouth[16]	33.7	33.9	42.0	46.3	54.5	62.1	81.1	2.6%
Coal (dollars per million Btu)								
at the minemouth[16]	1.70	1.69	2.11	2.34	2.71	3.07	3.97	2.5%
Average end-use[17]	2.42	2.34	3.07	3.43	3.81	4.23	5.20	2.4%
Average electricity (cents per kilowatthour)	10.4	10.3	13.5	15.4	17.0	18.6	23.5	2.5%

[1]Includes waste coal.
[2]These values represent the energy obtained from uranium when it is used in light water reactors. The total energy content of uranium is much larger, but alternative processes are required to take advantage of it.
[3]Includes grid-connected electricity from wood and wood waste; biomass, such as corn, used for liquid fuels production; and non-electric energy demand from wood. Refer to Table A17 for details.
[4]Includes grid-connected electricity from landfill gas; biogenic municipal waste; wind; photovoltaic and solar thermal sources; and non-electric energy from renewable sources, such as active and passive solar systems. Excludes electricity imports using renewable sources and nonmarketed renewable energy. See Table A17 for selected nonmarketed residential and commercial renewable energy data.
[5]Includes non-biogenic municipal waste, liquid hydrogen, methanol, and some domestic inputs to refineries.
[6]Includes imports of finished petroleum products, unfinished oils, alcohols, ethers, blending components, and renewable fuels such as ethanol.
[7]Includes imports of liquefied natural gas that are later re-exported.
[8]Includes coal, coal coke (net), and electricity (net). Excludes imports of fuel used in nuclear power plants.
[9]Includes crude oil, petroleum products, ethanol, and biodiesel.
[10]Includes re-exported liquefied natural gas.
[11]Balancing item. Includes unaccounted for supply, losses, gains, and net storage withdrawals.
[12]Estimated consumption. Includes petroleum-derived fuels and non-petroleum derived fuels, such as ethanol and biodiesel, and coal-based synthetic liquids. Petroleum coke, which is a solid, is included. Also included are hydrocarbon gas liquids and crude oil consumed as a fuel. Refer to Table A17 for detailed renewable liquid fuels consumption.
[13]Excludes coal converted to coal-based synthetic liquids and natural gas.
[14]Includes grid-connected electricity from wood and wood waste, non-electric energy from wood, and biofuels heat and coproducts used in the production of liquid fuels, but excludes the energy content of the liquid fuels.
[15]Includes non-biogenic municipal waste, liquid hydrogen, and net electricity imports.
[16]Includes reported prices for both open market and captive mines. Prices weighted by production, which differs from average minemouth prices published in EIA data reports where it is weighted by reported sales.
[17]Prices weighted by consumption; weighted average excludes export free-alongside-ship (f.a.s.) prices.
Btu = British thermal unit.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 natural gas supply values: U.S. Energy Information Administration (EIA), *Natural Gas Monthly*, December 2015). 2015 coal minemouth and delivered coal prices: EIA, *Annual Coal Report 2013*. 2015 petroleum supply values: EIA, *Petroleum Supply Annual 2015*. 2015 crude oil spot prices and natural gas spot price at Henry Hub: Thomson Reuters. Other 2015 coal values: *Quarterly Coal Report, October-December 2015*. Other 2015 values: EIA, *Monthly Energy Review*, October 2016. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.
Projections: EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A2. Energy consumption by sector and source
(quadrillion Btu per year, unless otherwise noted)

Sector and source	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Energy consumption								
Residential								
Propane	0.47	0.43	0.43	0.41	0.39	0.38	0.36	-0.5%
Kerosene	0.01	0.01	0.01	0.01	0.01	0.01	0.00	-2.0%
Distillate fuel oil	0.51	0.43	0.40	0.36	0.33	0.30	0.25	-1.6%
Petroleum and other liquids subtotal	1.00	0.87	0.84	0.78	0.73	0.69	0.62	-1.0%
Natural gas	4.76	4.56	4.80	4.76	4.72	4.69	4.69	0.1%
Renewable energy[1]	0.44	0.37	0.40	0.37	0.35	0.33	0.30	-0.6%
Electricity	4.78	4.81	4.72	4.78	4.90	5.05	5.19	0.2%
Delivered energy	**10.97**	**10.62**	**10.75**	**10.69**	**10.70**	**10.75**	**10.80**	**0.1%**
Electricity related losses	9.57	9.39	9.10	8.90	8.88	8.96	8.82	-0.2%
Total	**20.54**	**20.01**	**19.85**	**19.60**	**19.58**	**19.71**	**19.63**	**-0.1%**
Commercial								
Propane	0.16	0.19	0.19	0.20	0.21	0.22	0.23	0.5%
Motor gasoline[2]	0.06	0.07	0.06	0.06	0.07	0.07	0.08	0.5%
Kerosene	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.4%
Distillate fuel oil	0.34	0.41	0.40	0.39	0.38	0.37	0.35	-0.4%
Residual fuel oil	0.01	0.06	0.07	0.06	0.06	0.06	0.06	0.5%
Petroleum and other liquids subtotal	0.57	0.73	0.72	0.72	0.72	0.72	0.74	0.0%
Natural gas	3.30	3.23	3.24	3.27	3.36	3.48	3.79	0.5%
Coal	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.7%
Renewable energy[3]	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.0%
Electricity	4.63	4.64	4.62	4.68	4.80	4.99	5.53	0.5%
Delivered energy	**8.67**	**8.77**	**8.76**	**8.85**	**9.06**	**9.37**	**10.23**	**0.5%**
Electricity related losses	9.29	9.06	8.91	8.71	8.70	8.87	9.41	0.1%
Total	**17.96**	**17.82**	**17.67**	**17.56**	**17.77**	**18.24**	**19.64**	**0.3%**
Industrial[4]								
Liquefied petroleum gases and other[5]	2.49	2.49	3.27	3.38	3.51	3.65	3.82	1.3%
Motor gasoline[2]	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.2%
Distillate fuel oil	1.34	1.29	1.54	1.55	1.58	1.63	1.75	0.9%
Residual fuel oil	0.04	0.05	0.05	0.05	0.05	0.04	0.05	-0.2%
Petrochemical feedstocks	0.66	0.66	0.98	1.02	1.07	1.13	1.19	1.8%
Other petroleum[6]	3.39	3.42	3.57	3.65	3.73	3.87	4.19	0.6%
Petroleum and other liquids subtotal	8.14	8.14	9.63	9.87	10.16	10.56	11.24	1.0%
Natural gas	7.78	7.95	9.17	9.12	9.38	9.77	10.44	0.8%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Lease and plant fuel[7]	1.63	1.62	1.79	1.86	1.92	1.98	2.09	0.8%
Natural gas liquefaction for export[8]	0.00	0.02	0.38	0.42	0.46	0.46	0.46	10.3%
Natural gas subtotal	9.41	9.58	11.34	11.40	11.75	12.21	12.98	0.9%
Metallurgical coal	0.56	0.52	0.43	0.39	0.33	0.28	0.20	-2.8%
Other industrial coal	0.76	0.73	0.75	0.71	0.67	0.66	0.66	-0.3%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Net coal coke imports	-0.02	0.00	0.00	0.00	0.01	0.01	0.01	- -
Coal subtotal	1.31	1.25	1.19	1.11	1.01	0.95	0.87	-1.1%
Biofuels heat and coproducts	0.85	0.90	0.86	0.85	0.84	0.84	0.80	-0.3%
Renewable energy[9]	1.49	1.45	1.60	1.62	1.64	1.70	1.84	0.7%
Electricity	3.27	3.23	3.80	3.78	3.84	3.96	4.22	0.8%
Delivered energy	**24.45**	**24.55**	**28.42**	**28.62**	**29.24**	**30.23**	**31.95**	**0.8%**
Electricity related losses	6.55	6.30	7.32	7.03	6.96	7.04	7.17	0.4%
Total	**31.01**	**30.85**	**35.74**	**35.65**	**36.21**	**37.27**	**39.12**	**0.7%**

Table A2. Energy consumption by sector and source (continued)
(quadrillion Btu per year, unless otherwise noted)

Sector and source	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Transportation								
Propane	0.01	0.01	0.01	0.01	0.01	0.02	0.02	2.0%
Motor gasoline[2]	17.02	17.27	15.38	13.98	13.23	13.04	13.56	-0.7%
of which: E85[10]	0.02	0.03	0.07	0.14	0.18	0.16	0.17	5.1%
Jet fuel[11]	2.83	2.83	3.29	3.54	3.79	4.08	4.66	1.5%
Distillate fuel oil[12]	6.63	6.54	6.78	6.43	6.29	6.40	6.96	0.2%
Residual fuel oil	0.45	0.60	0.52	0.57	0.63	0.66	0.74	0.6%
Other petroleum[13]	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.1%
Petroleum and other liquids subtotal	27.10	27.40	26.14	24.68	24.11	24.36	26.10	-0.1%
Pipeline fuel natural gas	0.69	0.69	0.71	0.73	0.76	0.78	0.83	0.6%
Compressed / liquefied natural gas	0.06	0.07	0.13	0.18	0.23	0.29	0.42	5.3%
Liquid hydrogen	0.00	0.00	0.03	0.04	0.05	0.06	0.08	15.6%
Electricity	0.03	0.04	0.14	0.22	0.28	0.33	0.41	7.4%
Delivered energy	**27.89**	**28.20**	**27.15**	**25.85**	**25.43**	**25.82**	**27.85**	**0.0%**
Electricity related losses	0.06	0.07	0.28	0.41	0.51	0.59	0.70	7.0%
Total	**27.95**	**28.27**	**27.43**	**26.27**	**25.95**	**26.41**	**28.54**	**0.0%**
Unspecified sector[14]	**-0.52**	**-0.48**	**-0.44**	**-0.35**	**-0.29**	**-0.25**	**-0.23**	**-2.1%**
Delivered energy consumption for all sectors								
Liquefied petroleum gases and other[5]	3.13	3.13	3.90	4.00	4.13	4.27	4.44	1.0%
Motor gasoline[2]	16.93	17.28	15.33	13.96	13.24	13.06	13.58	-0.7%
of which: E85[10]	0.02	0.03	0.07	0.14	0.18	0.16	0.17	5.1%
Jet fuel[11]	3.18	3.28	3.70	3.98	4.27	4.60	5.25	1.4%
Kerosene	0.01	0.02	0.01	0.01	0.01	0.01	0.01	-0.7%
Distillate fuel oil	8.32	8.02	8.61	8.24	8.10	8.20	8.78	0.3%
Residual fuel oil	0.50	0.71	0.63	0.68	0.73	0.77	0.86	0.6%
Petrochemical feedstocks	0.66	0.66	0.98	1.02	1.07	1.13	1.19	1.8%
Other petroleum[15]	3.54	3.58	3.73	3.81	3.89	4.04	4.36	0.6%
Petroleum and other liquids subtotal	36.28	36.67	36.89	35.71	35.44	36.07	38.47	0.1%
Natural gas	15.90	15.81	17.33	17.32	17.69	18.23	19.33	0.6%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Lease and plant fuel[7]	1.63	1.62	1.79	1.86	1.92	1.98	2.09	0.8%
Natural gas liquefaction for export[8]	0.00	0.02	0.38	0.42	0.46	0.46	0.46	10.3%
Pipeline fuel natural gas	0.69	0.69	0.71	0.73	0.76	0.78	0.83	0.6%
Natural gas subtotal	18.22	18.13	20.22	20.34	20.82	21.45	22.71	0.7%
Metallurgical coal	0.56	0.52	0.43	0.39	0.33	0.28	0.20	-2.8%
Other coal	0.80	0.77	0.80	0.75	0.72	0.71	0.71	-0.2%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Net coal coke imports	-0.02	0.00	0.00	0.00	0.01	0.01	0.01	- -
Coal subtotal	1.34	1.29	1.23	1.15	1.06	0.99	0.92	-1.0%
Biofuels heat and coproducts	0.85	0.90	0.86	0.85	0.84	0.84	0.80	-0.3%
Renewable energy[16]	2.06	1.95	2.13	2.12	2.12	2.17	2.27	0.4%
Liquid hydrogen	0.00	0.00	0.03	0.04	0.05	0.06	0.08	15.6%
Electricity	12.71	12.72	13.28	13.47	13.82	14.34	15.35	0.6%
Delivered energy	**71.46**	**71.66**	**74.63**	**73.67**	**74.15**	**75.92**	**80.60**	**0.3%**
Electricity related losses	25.47	24.81	25.61	25.06	25.06	25.46	26.10	0.1%
Total	**96.93**	**96.47**	**100.24**	**98.73**	**99.21**	**101.38**	**106.70**	**0.3%**
Electric power[17]								
Distillate fuel oil	0.07	0.09	0.09	0.07	0.06	0.06	0.05	-1.7%
Residual fuel oil	0.22	0.13	0.05	0.04	0.04	0.03	0.02	-5.4%
Petroleum and other liquids subtotal	0.29	0.22	0.13	0.11	0.10	0.09	0.07	-3.2%
Natural gas	9.97	10.46	8.93	10.03	10.78	11.43	12.94	0.6%
Steam coal	14.13	12.64	12.24	10.36	9.92	9.55	8.93	-1.0%
Nuclear / uranium[18]	8.34	8.34	8.09	8.03	7.54	7.34	6.36	-0.8%
Renewable energy[19]	5.01	5.44	9.08	9.61	10.16	11.02	12.78	2.5%
Non-biogenic municipal waste	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.0%
Electricity imports	0.23	0.19	0.19	0.17	0.15	0.14	0.14	-0.9%
Total	**38.19**	**37.53**	**38.89**	**38.53**	**38.88**	**39.80**	**41.45**	**0.3%**

Table A2. Energy consumption by sector and source (continued)
(quadrillion Btu per year, unless otherwise noted)

Sector and source	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Total energy consumption								
Liquefied petroleum gases and other[5]	3.13	3.13	3.90	4.00	4.13	4.27	4.44	1.0%
Motor gasoline[2]	16.93	17.28	15.33	13.96	13.24	13.06	13.58	-0.7%
of which: E85[10]	0.02	0.03	0.07	0.14	0.18	0.16	0.17	5.1%
Jet fuel[11]	3.18	3.28	3.70	3.98	4.27	4.60	5.25	1.4%
Kerosene	0.01	0.02	0.01	0.01	0.01	0.01	0.01	-0.7%
Distillate fuel oil	8.39	8.11	8.69	8.31	8.16	8.26	8.83	0.3%
Residual fuel oil	0.72	0.83	0.68	0.72	0.77	0.80	0.88	0.1%
Petrochemical feedstocks	0.66	0.66	0.98	1.02	1.07	1.13	1.19	1.8%
Other petroleum[15]	3.54	3.58	3.73	3.81	3.89	4.04	4.36	0.6%
Petroleum and other liquids subtotal	36.57	36.89	37.03	35.81	35.54	36.16	38.54	0.1%
Natural gas	25.87	26.27	26.26	27.35	28.48	29.65	32.27	0.6%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Lease and plant fuel[7]	1.63	1.62	1.79	1.86	1.92	1.98	2.09	0.8%
Natural gas liquefaction for export[8]	0.00	0.02	0.38	0.42	0.46	0.46	0.46	10.3%
Pipeline fuel natural gas	0.69	0.69	0.71	0.73	0.76	0.78	0.83	0.6%
Natural gas subtotal	28.19	28.59	29.14	30.36	31.61	32.87	35.65	0.7%
Metallurgical coal	0.56	0.52	0.43	0.39	0.33	0.28	0.20	-2.8%
Other coal	14.93	13.41	13.04	11.11	10.63	10.26	9.64	-1.0%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Net coal coke imports	-0.02	0.00	0.00	0.00	0.01	0.01	0.01	- -
Coal subtotal	15.47	13.93	13.47	11.51	10.97	10.55	9.85	-1.0%
Nuclear / uranium[18]	8.34	8.34	8.09	8.03	7.54	7.34	6.36	-0.8%
Biofuels heat and coproducts	0.85	0.90	0.86	0.85	0.84	0.84	0.80	-0.3%
Renewable energy[20]	7.06	7.39	11.20	11.73	12.28	13.18	15.05	2.1%
Liquid hydrogen	0.00	0.00	0.03	0.04	0.05	0.06	0.08	15.6%
Non-biogenic municipal waste	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.0%
Electricity imports	0.23	0.19	0.19	0.17	0.15	0.14	0.14	-0.9%
Total	**96.93**	**96.47**	**100.24**	**98.73**	**99.21**	**101.38**	**106.70**	**0.3%**
Energy use and related statistics								
Delivered energy use	71.46	71.66	74.63	73.67	74.15	75.92	80.60	0.3%
Total energy use	96.93	96.47	100.24	98.73	99.21	101.38	106.70	0.3%
Ethanol consumed in motor gasoline and E85	1.18	1.22	1.17	1.12	1.10	1.10	1.25	0.1%
Population (millions)	322	324	348	360	371	381	399	0.6%
Gross domestic product (billion 2009 dollars)	16,397	16,652	20,558	22,585	25,054	27,852	33,653	2.1%
Carbon dioxide emissions (million metric tons)	5,259	5,157	5,069	4,851	4,827	4,878	5,084	0.0%

[1]Includes wood used for residential heating. See Table A4 and/or Table A17 for estimates of nonmarketed renewable energy consumption for geothermal heat pumps, solar thermal water heating, and electricity generation from wind and solar photovoltaic sources.
[2]Includes ethanol and ethers blended into gasoline.
[3]Excludes ethanol. Includes commercial sector consumption of wood and wood waste, landfill gas, municipal waste, and other biomass for combined heat and power. See Table A5 and/or Table A17 for estimates of nonmarketed renewable energy consumption for solar thermal water heating and electricity generation from wind and solar photovoltaic sources.
[4]Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[5]Includes ethane, natural gasoline, and refinery olefins.
[6]Includes petroleum coke, asphalt, road oil, lubricants, still gas, and miscellaneous petroleum products.
[7]Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.
[8]Fuel used in facilities that liquefy natural gas for export.
[9]Includes consumption of energy produced from hydroelectric, wood and wood waste, municipal waste, and other biomass sources. Excludes ethanol in motor gasoline.
[10]E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for these projections.
[11]Includes only kerosene type.
[12]Diesel fuel for on- and off- road use.
[13]Includes aviation gasoline and lubricants.
[14]Represents consumption unattributed to the sectors above.
[15]Includes aviation gasoline, petroleum coke, asphalt, road oil, lubricants, still gas, and miscellaneous petroleum products.
[16]Includes electricity generated for sale to the grid and for own use from renewable sources, and non-electric energy from renewable sources. Excludes ethanol and nonmarketed renewable energy consumption for geothermal heat pumps, buildings photovoltaic systems, and solar thermal water heaters.
[17]Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.
[18]These values represent the energy obtained from uranium when it is used in light water reactors. The total energy content of uranium is much larger, but alternative processes are required to take advantage of it.
[19]Includes conventional hydroelectric, geothermal, wood and wood waste, biogenic municipal waste, other biomass, wind, photovoltaic, and solar thermal sources. Excludes net electricity imports.
[20]Includes conventional hydroelectric, geothermal, wood and wood waste, biogenic municipal waste, other biomass, wind, photovoltaic, and solar thermal sources. Excludes ethanol, net electricity imports, and nonmarketed renewable energy consumption for geothermal heat pumps, buildings photovoltaic systems, and solar thermal water heaters.
Btu = British thermal unit.
- - = Not applicable.
Note: Includes estimated consumption for petroleum and other liquids. Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 consumption based on: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, October 2016. 2015 and 2016 population and gross domestic product: IHS Markit, Macroeconomic model, August 2016. 2015 carbon dioxide emissions and emission factors: EIA, *Monthly Energy Review*, October 2016. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A3. Energy prices by sector and source
(nominal dollars per million Btu, unless otherwise noted)

Sector and source	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Residential								
Propane	17.18	16.26	18.13	18.58	19.60	20.85	22.50	1.0%
Distillate fuel oil	19.63	15.40	24.05	25.34	26.69	28.02	29.37	1.9%
Natural gas	10.25	9.91	11.42	12.37	12.83	13.18	14.34	1.1%
Electricity	37.60	36.47	40.10	40.80	40.64	40.69	42.18	0.4%
Commercial								
Propane	15.33	14.54	16.15	16.53	17.42	18.49	19.91	0.9%
Distillate fuel oil	17.25	13.52	20.37	21.77	23.08	24.22	25.40	1.9%
Residual fuel oil	7.28	5.38	11.01	12.10	13.18	14.16	15.28	3.1%
Natural gas	8.03	7.19	10.14	10.93	11.25	11.44	12.27	1.6%
Electricity	31.63	30.38	33.61	34.26	33.96	33.75	33.98	0.3%
Industrial[1]								
Propane	12.43	11.49	13.41	13.87	14.92	16.20	17.89	1.3%
Distillate fuel oil	17.25	13.53	20.80	22.25	23.57	24.69	25.86	1.9%
Residual fuel oil	7.01	5.15	12.95	14.05	15.12	16.09	17.20	3.6%
Natural gas[2]	3.73	3.50	5.48	5.90	5.94	5.93	6.58	1.9%
Metallurgical coal	5.43	5.64	6.58	7.10	7.36	7.40	7.13	0.7%
Other industrial coal	3.40	3.34	3.46	3.45	3.43	3.45	3.55	0.2%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	20.54	20.36	22.10	22.80	22.71	22.74	23.33	0.4%
Transportation								
Propane	18.25	17.33	19.19	19.64	20.67	21.91	23.56	0.9%
E85[3]	29.03	25.93	29.80	25.76	25.66	28.74	31.15	0.5%
Motor gasoline[4]	21.16	18.34	24.31	25.15	26.22	27.47	28.60	1.3%
Jet fuel[5]	12.22	9.75	17.68	19.22	20.66	22.10	23.92	2.7%
Diesel fuel (distillate fuel oil)[6]	20.06	16.80	25.73	27.23	28.55	29.62	30.75	1.8%
Residual fuel oil	8.06	5.96	11.71	12.88	13.99	15.08	16.35	3.0%
Natural gas[7]	16.43	16.45	16.44	15.86	15.33	15.09	15.63	-0.2%
Electricity	30.61	29.68	39.36	40.31	39.70	39.24	38.89	0.8%
Electric power[8]								
Distillate fuel oil	15.26	11.95	19.48	20.75	21.98	23.26	24.62	2.1%
Residual fuel oil	10.13	8.09	15.41	16.63	17.69	18.53	18.90	2.5%
Natural gas	3.29	3.02	4.81	5.29	5.39	5.44	6.13	2.1%
Steam coal	2.28	2.14	2.33	2.30	2.32	2.37	2.39	0.3%
Uranium	0.54	0.56	0.74	0.82	0.94	1.08	1.43	2.8%
Average price to all users[9]								
Propane	14.84	14.05	15.95	16.35	17.31	18.49	20.02	1.0%
E85[3]	29.03	25.93	29.80	25.76	25.66	28.74	31.15	0.5%
Motor gasoline[4]	21.14	18.33	24.31	25.15	26.22	27.48	28.60	1.3%
Jet fuel[5]	12.22	9.75	17.68	19.22	20.66	22.10	23.92	2.7%
Distillate fuel oil	19.43	15.98	24.47	25.91	27.20	28.30	29.49	1.8%
Residual fuel oil	8.62	6.19	11.98	13.09	14.17	15.20	16.37	2.9%
Natural gas	5.34	4.91	6.98	7.49	7.60	7.65	8.34	1.6%
Metallurgical coal	5.43	5.64	6.58	7.10	7.36	7.40	7.13	0.7%
Other coal	2.34	2.21	2.40	2.38	2.40	2.45	2.48	0.3%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	31.02	30.14	32.69	33.47	33.32	33.28	33.96	0.4%
Non-renewable energy expenditures by sector (billion 2016 dollars)								
Residential	247	234	262	271	276	284	302	0.7%
Commercial	183	174	202	211	216	224	252	1.1%
Industrial[1]	171	158	248	263	279	299	340	2.3%
Transportation	522	450	609	602	617	656	739	1.5%
Total non-renewable expenditures	1,122	1,016	1,320	1,347	1,389	1,463	1,633	1.4%
Transportation renewable expenditures	1	1	2	4	5	5	5	5.7%
Total expenditures	**1,123**	**1,017**	**1,322**	**1,351**	**1,393**	**1,468**	**1,638**	**1.4%**

Table A3. Energy prices by sector and source (continued)
(nominal dollars per million Btu, unless otherwise noted)

Sector and source	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Residential								
Propane	16.94	16.26	21.94	25.10	29.26	34.19	45.53	3.1%
Distillate fuel oil	19.36	15.40	29.10	34.24	39.83	45.96	59.44	4.1%
Natural gas	10.11	9.91	13.81	16.72	19.16	21.62	29.03	3.2%
Electricity	37.08	36.47	48.52	55.12	60.66	66.73	85.37	2.5%
Commercial								
Propane	15.12	14.54	19.54	22.34	26.00	30.32	40.29	3.0%
Distillate fuel oil	17.01	13.52	24.64	29.42	34.46	39.72	51.40	4.0%
Residual fuel oil	7.18	5.38	13.32	16.34	19.67	23.22	30.92	5.3%
Natural gas	7.92	7.19	12.27	14.76	16.79	18.75	24.83	3.7%
Electricity	31.18	30.38	40.67	46.29	50.70	55.34	68.78	2.4%
Industrial[1]								
Propane	12.26	11.49	16.22	18.73	22.27	26.56	36.21	3.4%
Distillate fuel oil	17.01	13.53	25.17	30.06	35.18	40.48	52.34	4.1%
Residual fuel oil	6.91	5.15	15.67	18.99	22.57	26.38	34.80	5.8%
Natural gas[2]	3.68	3.50	6.64	7.98	8.87	9.73	13.32	4.0%
Metallurgical coal	5.36	5.64	7.96	9.59	10.98	12.13	14.44	2.8%
Other industrial coal	3.36	3.34	4.19	4.66	5.12	5.65	7.19	2.3%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	20.25	20.36	26.75	30.80	33.90	37.29	47.22	2.5%
Transportation								
Propane	17.99	17.33	23.22	26.54	30.85	35.93	47.68	3.0%
E85[3]	28.63	25.93	36.06	34.80	38.31	47.13	63.05	2.6%
Motor gasoline[4]	20.86	18.34	29.42	33.97	39.14	45.06	57.88	3.4%
Jet fuel[5]	12.04	9.75	21.39	25.97	30.85	36.24	48.41	4.8%
Diesel fuel (distillate fuel oil)[6]	19.78	16.80	31.14	36.79	42.61	48.58	62.23	3.9%
Residual fuel oil	7.95	5.96	14.17	17.39	20.89	24.73	33.08	5.2%
Natural gas[7]	16.20	16.45	19.89	21.43	22.88	24.75	31.63	1.9%
Electricity	30.18	29.68	47.63	54.46	59.26	64.34	78.72	2.9%
Electric power[8]								
Distillate fuel oil	15.05	11.95	23.57	28.03	32.81	38.14	49.84	4.3%
Residual fuel oil	9.99	8.09	18.65	22.47	26.40	30.38	38.25	4.7%
Natural gas	3.24	3.02	5.82	7.15	8.05	8.92	12.41	4.2%
Steam coal	2.24	2.14	2.82	3.10	3.47	3.89	4.83	2.4%
Uranium	0.53	0.56	0.89	1.10	1.40	1.77	2.90	5.0%

Table A3. Energy prices by sector and source (continued)
(nominal dollars per million Btu, unless otherwise noted)

Sector and source	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Average price to all users[9]								
Propane	14.63	14.05	19.29	22.09	25.85	30.32	40.52	3.2%
E85[3]	28.63	25.93	36.06	34.80	38.31	47.13	63.05	2.6%
Motor gasoline[4]	20.85	18.33	29.42	33.97	39.14	45.06	57.88	3.4%
Jet fuel[5]	12.04	9.75	21.39	25.97	30.85	36.24	48.41	4.8%
Distillate fuel oil	19.16	15.98	29.61	35.01	40.61	46.41	59.68	4.0%
Residual fuel oil	8.50	6.19	14.49	17.69	21.16	24.93	33.13	5.1%
Natural gas	5.27	4.91	8.45	10.12	11.35	12.54	16.88	3.7%
Metallurgical coal	5.36	5.64	7.96	9.59	10.98	12.13	14.44	2.8%
Other coal	2.31	2.21	2.91	3.22	3.59	4.02	5.02	2.4%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	30.58	30.14	39.55	45.21	49.73	54.57	68.73	2.5%
Non-renewable energy expenditures by sector (billion nominal dollars)								
Residential	243	234	316	366	412	465	611	2.9%
Commercial	180	174	244	284	323	368	509	3.2%
Industrial[1]	169	158	300	356	417	491	689	4.4%
Transportation	514	450	736	814	922	1,075	1,496	3.6%
Total non-renewable expenditures	1,107	1,016	1,597	1,820	2,073	2,399	3,305	3.5%
Transportation renewable expenditures	1	1	2	5	7	7	10	7.9%
Total expenditures	**1,107**	**1,017**	**1,599**	**1,825**	**2,080**	**2,407**	**3,315**	**3.5%**

[1]Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[2]Excludes use for lease and plant fuel.
[3]E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for these projections.
[4]Sales weighted-average price for all grades. Includes Federal, State, and local taxes.
[5]Kerosene-type jet fuel. Includes Federal and State taxes while excluding county and local taxes.
[6]Diesel fuel for on-road use. Includes Federal and State taxes while excluding county and local taxes.
[7]Natural gas used as fuel in motor vehicles, trains, and ships. Includes estimated motor vehicle fuel taxes and estimated dispensing costs or charges.
[8]Includes electricity-only and combined heat and power plants that have a regulatory status.
[9]Weighted averages of end-use fuel prices are derived from the prices shown in each sector and the corresponding sectoral consumption.
Btu = British thermal unit.
- - = Not applicable.
Note: Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 prices for motor gasoline, distillate fuel oil, and jet fuel are based on prices in the U.S. Energy Information Administration (EIA), *Petroleum Marketing Monthly*, October 2016. 2015 residential, commercial, and industrial natural gas delivered prices: EIA, *Natural Gas Monthly*, December 2015). 2015 transportation sector natural gas delivered prices are model results. 2015 electric power sector distillate and residual fuel oil prices: EIA, *Monthly Energy Review*, October 2016. 2015 electric power sector natural gas prices: EIA, *Electric Power Monthly*, July 2016, Table 4.13.B, and EIA, *State Energy Data Report 2014*. 2015 coal prices based on: EIA, *Quarterly Coal Report, October-December 2015* and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. 2015 electricity prices: EIA, *Monthly Energy Review*, October 2016. 2015 E85 prices derived from monthly prices in the Clean Cities Alternative Fuel Price Report. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A4. Residential sector key indicators and consumption

(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Key indicators								
Households (millions)								
Single-family	80.55	81.10	88.65	92.62	96.20	99.99	107.93	0.8%
Multifamily	28.87	29.11	32.35	34.26	36.18	38.09	41.52	1.0%
Mobile homes	5.97	5.84	5.36	5.15	4.93	4.81	4.56	-0.7%
Total	**115.38**	**116.06**	**126.36**	**132.03**	**137.31**	**142.89**	**154.01**	**0.8%**
Average house square footage	**1,695**	**1,703**	**1,772**	**1,806**	**1,838**	**1,869**	**1,933**	**0.4%**
Energy intensity								
(million Btu per household)								
Delivered energy consumption	95.1	91.5	85.1	81.0	77.9	75.2	70.2	-0.8%
Total energy consumption	178.0	172.4	157.1	148.4	142.6	138.0	127.4	-0.9%
(thousand Btu per square foot)								
Delivered energy consumption	56.1	53.7	48.0	44.8	42.4	40.3	36.3	-1.1%
Total energy consumption	105.0	101.2	88.6	82.2	77.6	73.8	65.9	-1.3%
Delivered energy consumption by fuel								
Purchased electricity								
Space heating	0.33	0.33	0.35	0.34	0.33	0.33	0.32	-0.1%
Space cooling	0.79	0.84	0.77	0.79	0.82	0.84	0.86	0.1%
Water heating	0.45	0.46	0.47	0.47	0.47	0.47	0.49	0.2%
Refrigeration	0.36	0.35	0.33	0.33	0.34	0.36	0.39	0.3%
Cooking	0.11	0.11	0.12	0.13	0.14	0.14	0.16	1.1%
Clothes dryers	0.20	0.21	0.22	0.23	0.24	0.26	0.28	0.9%
Freezers	0.08	0.07	0.07	0.07	0.06	0.06	0.07	-0.2%
Lighting	0.45	0.44	0.29	0.26	0.25	0.25	0.24	-1.8%
Clothes washers[1]	0.03	0.03	0.02	0.02	0.02	0.02	0.02	-1.0%
Dishwashers[1]	0.09	0.09	0.10	0.11	0.12	0.13	0.14	1.2%
Televisions and related equipment[2]	0.29	0.28	0.25	0.26	0.29	0.31	0.34	0.5%
Computers and related equipment[3]	0.11	0.11	0.08	0.07	0.06	0.05	0.04	-3.2%
Furnace fans and boiler circulation pumps	0.11	0.11	0.12	0.11	0.11	0.10	0.10	-0.2%
Other uses[4]	1.37	1.38	1.54	1.60	1.66	1.72	1.75	0.7%
Delivered energy	**4.78**	**4.81**	**4.72**	**4.78**	**4.90**	**5.05**	**5.19**	**0.2%**
Natural gas								
Space heating	3.02	2.82	3.01	2.96	2.93	2.91	2.85	0.0%
Space cooling	0.02	0.02	0.02	0.02	0.02	0.02	0.02	-0.7%
Water heating	1.21	1.21	1.26	1.28	1.27	1.26	1.32	0.2%
Cooking	0.21	0.21	0.21	0.22	0.22	0.23	0.24	0.4%
Clothes dryers	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.7%
Other uses[5]	0.25	0.25	0.24	0.23	0.22	0.22	0.21	-0.5%
Delivered energy	**4.76**	**4.56**	**4.80**	**4.76**	**4.72**	**4.69**	**4.69**	**0.1%**
Distillate fuel oil								
Space heating	0.46	0.38	0.37	0.34	0.30	0.28	0.23	-1.4%
Water heating	0.04	0.04	0.02	0.02	0.02	0.01	0.01	-3.8%
Other uses[6]	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-0.6%
Delivered energy	**0.51**	**0.43**	**0.40**	**0.36**	**0.33**	**0.30**	**0.25**	**-1.6%**
Propane								
Space heating	0.34	0.30	0.30	0.29	0.27	0.26	0.24	-0.7%
Water heating	0.06	0.06	0.05	0.04	0.04	0.04	0.03	-1.8%
Cooking	0.03	0.03	0.03	0.02	0.02	0.02	0.02	-0.6%
Other uses[6]	0.04	0.05	0.05	0.06	0.06	0.06	0.07	1.4%
Delivered energy	**0.47**	**0.43**	**0.43**	**0.41**	**0.39**	**0.38**	**0.36**	**-0.5%**
Marketed renewables (wood)[7]	0.44	0.37	0.40	0.37	0.35	0.33	0.30	-0.6%
Kerosene	0.01	0.01	0.01	0.01	0.01	0.01	0.00	-2.0%

Table A4. Residential sector key indicators and consumption (continued)
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Delivered energy consumption by end use								
Space heating	4.60	4.21	4.43	4.30	4.20	4.11	3.94	-0.2%
Space cooling	0.82	0.87	0.79	0.81	0.84	0.86	0.88	0.0%
Water heating	1.76	1.77	1.80	1.81	1.79	1.77	1.85	0.1%
Refrigeration	0.36	0.35	0.33	0.33	0.34	0.36	0.39	0.3%
Cooking	0.34	0.35	0.36	0.37	0.38	0.39	0.42	0.6%
Clothes dryers	0.26	0.26	0.28	0.29	0.30	0.32	0.34	0.9%
Freezers	0.08	0.07	0.07	0.07	0.06	0.06	0.07	-0.2%
Lighting	0.45	0.44	0.29	0.26	0.25	0.25	0.24	-1.8%
Clothes washers[1]	0.03	0.03	0.02	0.02	0.02	0.02	0.02	-1.0%
Dishwashers[1]	0.09	0.09	0.10	0.11	0.12	0.13	0.14	1.2%
Televisions and related equipment[2]	0.29	0.28	0.25	0.26	0.29	0.31	0.34	0.5%
Computers and related equipment[3]	0.11	0.11	0.08	0.07	0.06	0.05	0.04	-3.2%
Furnace fans and boiler circulation pumps	0.11	0.11	0.12	0.11	0.11	0.10	0.10	-0.2%
Other uses[8]	1.67	1.68	1.83	1.89	1.95	2.01	2.03	0.6%
Delivered energy	**10.97**	**10.62**	**10.75**	**10.69**	**10.70**	**10.75**	**10.80**	**0.1%**
Electricity related losses	**9.57**	**9.39**	**9.10**	**8.90**	**8.88**	**8.96**	**8.82**	**-0.2%**
Total energy consumption by end use								
Space heating	5.27	4.85	5.10	4.93	4.80	4.69	4.48	-0.2%
Space cooling	2.41	2.51	2.26	2.27	2.32	2.36	2.35	-0.2%
Water heating	2.67	2.66	2.71	2.69	2.64	2.60	2.67	0.0%
Refrigeration	1.07	1.04	0.97	0.94	0.96	0.99	1.06	0.1%
Cooking	0.56	0.56	0.60	0.61	0.63	0.65	0.69	0.6%
Clothes dryers	0.67	0.66	0.70	0.72	0.74	0.77	0.82	0.6%
Freezers	0.23	0.22	0.20	0.19	0.18	0.18	0.19	-0.5%
Lighting	1.35	1.30	0.84	0.76	0.70	0.69	0.65	-2.0%
Clothes washers[1]	0.08	0.08	0.05	0.05	0.05	0.05	0.05	-1.3%
Dishwashers[1]	0.28	0.28	0.30	0.32	0.33	0.35	0.39	1.0%
Televisions and related equipment[2]	0.87	0.83	0.74	0.74	0.80	0.87	0.91	0.3%
Computers and related equipment[3]	0.33	0.32	0.24	0.20	0.17	0.15	0.10	-3.5%
Furnace fans and boiler circulation pumps	0.34	0.32	0.35	0.32	0.30	0.29	0.28	-0.5%
Other uses[8]	4.42	4.38	4.80	4.86	4.95	5.07	5.00	0.4%
Total	**20.54**	**20.01**	**19.85**	**19.60**	**19.58**	**19.71**	**19.63**	**-0.1%**
Nonmarketed renewables[9]								
Geothermal heat pumps	0.01	0.01	0.02	0.02	0.02	0.02	0.03	2.7%
Solar hot water heating	0.01	0.01	0.02	0.02	0.02	0.02	0.03	2.8%
Solar photovoltaic	0.08	0.11	0.41	0.64	0.94	1.32	2.50	9.7%
Wind	0.02	0.03	0.03	0.03	0.04	0.04	0.04	1.0%
Total	**0.12**	**0.16**	**0.47**	**0.71**	**1.02**	**1.41**	**2.60**	**8.6%**
Heating degree days[10]	**4,084**	**3,989**	**4,105**	**4,044**	**3,984**	**3,923**	**3,804**	**-0.1%**
Cooling degree days[10]	**1,489**	**1,528**	**1,518**	**1,568**	**1,619**	**1,670**	**1,774**	**0.4%**

[1]Does not include water heating portion of load.
[2]Includes televisions, set-top boxes, home theater systems, DVD players, and video game consoles.
[3]Includes desktop and laptop computers, monitors, and networking equipment.
[4]Includes small electric devices, heating elements, and motors not listed above. Electric vehicles are included in the transportation sector.
[5]Includes such appliances as outdoor grills, exterior lights, pool heaters, spa heaters, and backup electricity generators.
[6]Includes such appliances as pool heaters, spa heaters, and backup electricity generators.
[7]Includes wood used for primary and secondary heating in wood stoves or fireplaces as reported in the *Residential Energy Consumption Survey 2009*.
[8]Includes small electric devices, heating elements, outdoor grills, exterior lights, pool heaters, spa heaters, backup electricity generators, and motors not listed above. Electric vehicles are included in the transportation sector.
[9]Consumption determined by using the fossil fuel equivalent of 9,510 Btu per kilowatthour.
[10]See Table A5 for regional detail.
Btu = British thermal unit.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 consumption based on: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, October 2016. 2015 degree days based on state-level data from the National Oceanic and Atmospheric Administration's Climatic Data Center and Climate Prediction Center. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A5. Commercial sector key indicators and consumption
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Key indicators								
Total floorspace (billion square feet)								
Surviving	87.1	87.7	97.1	102.3	107.7	113.1	123.9	1.0%
New additions	1.8	2.0	2.3	2.3	2.4	2.4	2.6	0.8%
Total	**88.9**	**89.7**	**99.3**	**104.7**	**110.1**	**115.5**	**126.5**	**1.0%**
Energy consumption intensity (thousand Btu per square foot)								
Delivered energy consumption	97.6	97.7	88.2	84.6	82.3	81.1	80.9	-0.6%
Electricity related losses	104.5	100.9	89.7	83.2	79.0	76.8	74.4	-0.9%
Total energy consumption	202.1	198.6	177.9	167.8	161.4	157.9	155.2	-0.7%
Delivered energy consumption by fuel								
Purchased electricity								
Space heating[1]	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.0%
Space cooling[1]	0.54	0.55	0.49	0.49	0.49	0.49	0.50	-0.3%
Water heating[1]	0.02	0.02	0.02	0.01	0.01	0.01	0.01	-0.8%
Ventilation	0.52	0.52	0.49	0.44	0.40	0.38	0.36	-1.1%
Cooking	0.08	0.08	0.08	0.07	0.07	0.07	0.07	-0.7%
Lighting	0.52	0.51	0.41	0.37	0.33	0.30	0.26	-2.0%
Refrigeration	0.63	0.64	0.63	0.61	0.60	0.60	0.63	0.0%
Office equipment (PC)	0.37	0.35	0.30	0.29	0.29	0.29	0.25	-1.0%
Office equipment (non-PC)	0.22	0.23	0.26	0.29	0.31	0.34	0.41	1.7%
Other uses[2]	1.61	1.62	1.84	2.00	2.18	2.40	2.94	1.8%
Delivered energy	**4.63**	**4.64**	**4.62**	**4.68**	**4.80**	**4.99**	**5.53**	**0.5%**
Natural gas								
Space heating[1]	1.64	1.63	1.59	1.51	1.46	1.41	1.29	-0.7%
Space cooling[1]	0.03	0.03	0.02	0.02	0.02	0.02	0.02	-1.4%
Water heating[1]	0.30	0.31	0.30	0.30	0.31	0.31	0.32	0.1%
Cooking	0.31	0.32	0.34	0.36	0.38	0.40	0.44	1.0%
Other uses[3]	1.03	0.94	0.99	1.08	1.20	1.35	1.72	1.8%
Delivered energy	**3.30**	**3.23**	**3.24**	**3.27**	**3.36**	**3.48**	**3.79**	**0.5%**
Distillate fuel oil								
Space heating[1]	0.24	0.24	0.22	0.21	0.20	0.19	0.17	-1.0%
Water heating[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Other uses[4]	0.10	0.16	0.18	0.17	0.17	0.17	0.18	0.3%
Delivered energy	**0.34**	**0.41**	**0.40**	**0.39**	**0.38**	**0.37**	**0.35**	**-0.4%**
Marketed renewables (biomass)	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.0%
Other fuels[5]	0.26	0.36	0.37	0.38	0.39	0.40	0.43	0.5%
Delivered energy consumption by end use								
Space heating[1]	2.00	1.99	1.92	1.84	1.77	1.71	1.58	-0.7%
Space cooling[1]	0.57	0.58	0.51	0.51	0.51	0.51	0.52	-0.3%
Water heating[1]	0.32	0.32	0.32	0.32	0.32	0.33	0.34	0.1%
Ventilation	0.52	0.52	0.49	0.44	0.40	0.38	0.36	-1.1%
Cooking	0.39	0.40	0.42	0.43	0.45	0.47	0.51	0.7%
Lighting	0.52	0.51	0.41	0.37	0.33	0.30	0.26	-2.0%
Refrigeration	0.63	0.64	0.63	0.61	0.60	0.60	0.63	0.0%
Office equipment (PC)	0.37	0.35	0.30	0.29	0.29	0.29	0.25	-1.0%
Office equipment (non-PC)	0.22	0.23	0.26	0.29	0.31	0.34	0.41	1.7%
Other uses[6]	3.13	3.22	3.51	3.77	4.08	4.45	5.40	1.5%
Delivered energy	**8.67**	**8.77**	**8.76**	**8.85**	**9.06**	**9.37**	**10.23**	**0.5%**

Table A5. Commercial sector key indicators and consumption (continued)
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Electricity related losses	**9.29**	**9.06**	**8.91**	**8.71**	**8.70**	**8.87**	**9.41**	**0.1%**
Total energy consumption by end use								
Space heating[1]	2.24	2.22	2.14	2.04	1.98	1.91	1.77	-0.7%
Space cooling[1]	1.64	1.66	1.47	1.42	1.40	1.38	1.37	-0.6%
Water heating[1]	0.35	0.36	0.35	0.34	0.35	0.35	0.36	0.0%
Ventilation	1.56	1.53	1.43	1.25	1.13	1.05	0.96	-1.4%
Cooking	0.56	0.56	0.56	0.57	0.58	0.59	0.62	0.3%
Lighting	1.57	1.51	1.19	1.05	0.92	0.83	0.70	-2.2%
Refrigeration	1.90	1.89	1.84	1.75	1.68	1.67	1.70	-0.3%
Office equipment (PC)	1.10	1.05	0.87	0.83	0.82	0.81	0.67	-1.3%
Office equipment (non-PC)	0.68	0.68	0.76	0.82	0.88	0.93	1.10	1.4%
Other uses[6]	6.35	6.38	7.06	7.49	8.04	8.71	10.39	1.4%
Total	**17.96**	**17.82**	**17.67**	**17.56**	**17.77**	**18.24**	**19.64**	**0.3%**
Nonmarketed renewable fuels[7]								
Solar thermal	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.4%
Solar photovoltaic	0.08	0.08	0.17	0.24	0.33	0.44	0.67	6.3%
Wind	0.01	0.01	0.01	0.01	0.01	0.02	0.03	4.9%
Total	**0.15**	**0.16**	**0.26**	**0.32**	**0.42**	**0.53**	**0.78**	**4.7%**
Heating degree days								
New England	6,514	5,995	6,065	5,980	5,895	5,809	5,637	-0.2%
Middle Atlantic	5,774	5,442	5,483	5,412	5,341	5,271	5,132	-0.2%
East North Central	6,169	5,913	6,210	6,193	6,177	6,160	6,127	0.1%
West North Central	6,093	6,067	6,517	6,510	6,504	6,496	6,479	0.2%
South Atlantic	2,487	2,591	2,551	2,513	2,475	2,439	2,369	-0.3%
East South Central	3,217	3,316	3,413	3,404	3,395	3,386	3,368	0.0%
West South Central	2,089	1,903	2,033	2,006	1,980	1,955	1,904	0.0%
Mountain	4,602	4,670	4,826	4,770	4,709	4,647	4,522	-0.1%
Pacific	2,889	2,941	3,294	3,260	3,226	3,193	3,124	0.2%
United States	**4,084**	**3,989**	**4,105**	**4,044**	**3,984**	**3,923**	**3,804**	**-0.1%**
Cooling degree days								
New England	558	631	591	620	649	678	737	0.5%
Middle Atlantic	804	898	815	847	880	912	976	0.2%
East North Central	728	947	782	792	801	810	829	-0.4%
West North Central	940	1,056	978	987	997	1,007	1,027	-0.1%
South Atlantic	2,403	2,367	2,261	2,305	2,350	2,394	2,481	0.1%
East South Central	1,723	1,902	1,719	1,743	1,768	1,792	1,840	-0.1%
West South Central	2,745	2,769	2,898	2,970	3,041	3,113	3,257	0.5%
Mountain	1,480	1,477	1,587	1,635	1,686	1,739	1,845	0.7%
Pacific	1,074	926	1,027	1,071	1,115	1,158	1,245	0.9%
United States	**1,489**	**1,528**	**1,518**	**1,568**	**1,619**	**1,670**	**1,774**	**0.4%**

[1]Includes fuel consumption for district services.
[2]Includes (but is not limited to) miscellaneous uses such as transformers, medical imaging and other medical equipment, elevators, escalators, off-road electric vehicles, laboratory fume hoods, laundry equipment, coffee brewers, and water services.
[3]Includes miscellaneous uses, such as emergency generators, combined heat and power in commercial buildings, and manufacturing performed in commercial buildings.
[4]Includes miscellaneous uses, such as cooking, emergency generators, and combined heat and power in commercial buildings.
[5]Includes residual fuel oil, propane, coal, motor gasoline, and kerosene.
[6]Includes (but is not limited to) miscellaneous uses such as transformers, medical imaging and other medical equipment, elevators, escalators, off-road electric vehicles, laboratory fume hoods, laundry equipment, coffee brewers, water services, emergency generators, combined heat and power in commercial buildings, manufacturing performed in commercial buildings, and cooking (distillate), plus residual fuel oil, propane, coal, motor gasoline, kerosene, and marketed renewable fuels (biomass).
[7]Consumption determined by using the fossil fuel equivalent of 9,510 Btu per kilowatthour.
Btu = British thermal unit.
PC = Personal computer.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 consumption based on: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, October 2016. 2015 degree days based on state-level data from the National Oceanic and Atmospheric Administration's Climatic Data Center and Climate Prediction Center. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A6. Industrial sector key indicators and consumption

Shipments, prices, and consumption	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Key indicators								
Value of shipments (billion 2009 dollars)								
Manufacturing	5,325	5,374	6,602	7,016	7,674	8,512	10,441	2.0%
Agriculture, mining, and construction	2,049	2,079	2,545	2,639	2,802	2,978	3,395	1.5%
Total	**7,374**	**7,453**	**9,147**	**9,655**	**10,476**	**11,491**	**13,836**	**1.8%**
Energy prices								
(2016 dollars per million Btu)								
Propane	12.43	11.49	13.41	13.87	14.92	16.20	17.89	1.3%
Motor gasoline	20.67	17.87	24.35	25.20	26.29	27.55	28.69	1.4%
Distillate fuel oil	17.25	13.53	20.80	22.25	23.57	24.69	25.86	1.9%
Residual fuel oil	7.01	5.15	12.95	14.05	15.12	16.09	17.20	3.6%
Asphalt and road oil	3.53	2.51	9.91	10.77	11.58	12.41	13.28	5.0%
Natural gas heat and power	3.40	3.23	5.31	5.72	5.76	5.75	6.41	2.0%
Natural gas feedstocks	4.04	3.73	5.63	6.06	6.10	6.09	6.75	1.8%
Metallurgical coal	5.43	5.64	6.58	7.10	7.36	7.40	7.13	0.7%
Other industrial coal	3.40	3.34	3.46	3.45	3.43	3.45	3.55	0.2%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	20.54	20.36	22.10	22.80	22.71	22.74	23.33	0.4%
(nominal dollars per million Btu)								
Propane	12.26	11.49	16.22	18.73	22.27	26.56	36.21	3.4%
Motor gasoline	20.39	17.87	29.46	34.05	39.25	45.18	58.06	3.5%
Distillate fuel oil	17.01	13.53	25.17	30.06	35.18	40.48	52.34	4.1%
Residual fuel oil	6.91	5.15	15.67	18.99	22.57	26.38	34.80	5.8%
Asphalt and road oil	3.48	2.51	11.99	14.55	17.28	20.35	26.88	7.2%
Natural gas heat and power	3.35	3.23	6.43	7.73	8.60	9.44	12.98	4.2%
Natural gas feedstocks	3.98	3.73	6.81	8.19	9.11	9.99	13.65	3.9%
Metallurgical coal	5.36	5.64	7.96	9.59	10.98	12.13	14.44	2.8%
Other industrial coal	3.36	3.34	4.19	4.66	5.12	5.65	7.19	2.3%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	20.25	20.36	26.75	30.80	33.90	37.29	47.22	2.5%
Energy consumption (quadrillion Btu)[1]								
Industrial consumption excluding refining								
Propane heat and power	0.50	0.41	0.40	0.40	0.41	0.42	0.44	0.2%
Liquefied petroleum gas and other feedstocks[2]	1.99	2.07	2.87	2.98	3.10	3.24	3.38	1.4%
Motor gasoline	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.2%
Distillate fuel oil	1.33	1.29	1.54	1.55	1.58	1.63	1.75	0.9%
Residual fuel oil	0.04	0.05	0.05	0.05	0.05	0.04	0.05	-0.1%
Petrochemical feedstocks	0.66	0.66	0.98	1.02	1.07	1.13	1.19	1.8%
Petroleum coke	0.15	0.16	0.15	0.15	0.15	0.15	0.16	0.0%
Asphalt and road oil	0.83	0.86	0.91	1.00	1.13	1.25	1.56	1.7%
Miscellaneous petroleum[3]	0.43	0.43	0.40	0.39	0.39	0.40	0.42	-0.1%
Petroleum and other liquids subtotal	6.14	6.16	7.52	7.76	8.09	8.49	9.19	1.2%
Natural gas heat and power	5.63	5.75	6.57	6.61	6.80	7.08	7.72	0.9%
Natural gas feedstocks	0.72	0.81	1.23	1.24	1.25	1.28	1.28	1.3%
Lease and plant fuel[4]	1.63	1.62	1.79	1.86	1.92	1.98	2.09	0.8%
Natural gas liquefaction for export[5]	0.00	0.02	0.38	0.42	0.46	0.46	0.46	10.3%
Natural gas subtotal	7.98	8.19	9.97	10.13	10.43	10.80	11.55	1.0%
Metallurgical coal and coke[6]	0.54	0.52	0.43	0.40	0.34	0.29	0.21	-2.7%
Other industrial coal	0.74	0.71	0.75	0.71	0.67	0.66	0.66	-0.2%
Coal subtotal	1.28	1.23	1.19	1.11	1.01	0.95	0.87	-1.0%
Renewables[7]	1.49	1.45	1.60	1.62	1.64	1.70	1.84	0.7%
Purchased electricity	3.07	3.03	3.61	3.60	3.66	3.78	4.04	0.8%
Delivered energy	**19.96**	**20.06**	**23.88**	**24.21**	**24.83**	**25.72**	**27.48**	**0.9%**
Electricity related losses	6.16	5.91	6.96	6.70	6.64	6.72	6.86	0.4%
Total	**26.12**	**25.98**	**30.84**	**30.91**	**31.47**	**32.44**	**34.35**	**0.8%**

Table A6. Industrial sector key indicators and consumption (continued)

Shipments, prices, and consumption	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Refining consumption								
Liquefied petroleum gas heat and power[2]	0.01	0.01	0.00	0.00	0.00	0.00	0.00	- -
Distillate fuel oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Residual fuel oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Petroleum coke	0.52	0.46	0.37	0.39	0.38	0.37	0.36	-0.7%
Still gas	1.46	1.50	1.74	1.72	1.69	1.70	1.69	0.4%
Miscellaneous petroleum[3]	0.01	0.01	0.00	0.00	0.00	0.00	0.00	-16.7%
Petroleum and other liquids subtotal	2.00	1.98	2.11	2.11	2.07	2.07	2.05	0.1%
Natural gas heat and power	1.25	1.20	1.08	1.00	1.03	1.08	1.10	-0.3%
Natural gas feedstocks	0.18	0.18	0.30	0.27	0.30	0.33	0.33	1.8%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Natural gas subtotal	1.43	1.39	1.38	1.27	1.33	1.41	1.44	0.1%
Other industrial coal	0.02	0.02	0.00	0.00	0.00	0.00	0.00	- -
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Coal subtotal	0.02	0.02	0.00	0.00	0.00	0.00	0.00	- -
Biofuels heat and coproducts	0.85	0.90	0.86	0.85	0.84	0.84	0.80	-0.3%
Purchased electricity	0.20	0.20	0.19	0.18	0.18	0.18	0.18	-0.2%
Delivered energy	**4.49**	**4.49**	**4.54**	**4.41**	**4.41**	**4.50**	**4.47**	**0.0%**
Electricity related losses	0.39	0.38	0.36	0.33	0.32	0.32	0.31	-0.6%
Total	**4.89**	**4.87**	**4.90**	**4.73**	**4.73**	**4.83**	**4.78**	**-0.1%**
Total industrial sector consumption								
Liquefied petroleum gas heat and power[2]	0.51	0.42	0.40	0.40	0.41	0.42	0.44	0.1%
Liquefied petroleum gas and other feedstocks[2]	1.99	2.07	2.87	2.98	3.10	3.24	3.38	1.4%
Motor gasoline	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.2%
Distillate fuel oil	1.34	1.29	1.54	1.55	1.58	1.63	1.75	0.9%
Residual fuel oil	0.04	0.05	0.05	0.05	0.05	0.04	0.05	-0.2%
Petrochemical feedstocks	0.66	0.66	0.98	1.02	1.07	1.13	1.19	1.8%
Petroleum coke	0.66	0.63	0.52	0.53	0.53	0.52	0.52	-0.5%
Asphalt and road oil	0.83	0.86	0.91	1.00	1.13	1.25	1.56	1.7%
Still gas	1.46	1.50	1.74	1.72	1.69	1.70	1.69	0.4%
Miscellaneous petroleum[3]	0.44	0.43	0.40	0.39	0.39	0.40	0.42	-0.1%
Petroleum and other liquids subtotal	8.14	8.14	9.63	9.87	10.16	10.56	11.24	1.0%
Natural gas heat and power	6.88	6.95	7.65	7.61	7.83	8.16	8.83	0.7%
Natural gas feedstocks	0.90	0.99	1.52	1.51	1.55	1.61	1.61	1.4%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Lease and plant fuel[4]	1.63	1.62	1.79	1.86	1.92	1.98	2.09	0.8%
Natural gas liquefaction for export[5]	0.00	0.02	0.38	0.42	0.46	0.46	0.46	10.3%
Natural gas subtotal	9.41	9.58	11.34	11.40	11.75	12.21	12.98	0.9%
Metallurgical coal and coke[6]	0.54	0.52	0.43	0.40	0.34	0.29	0.21	-2.7%
Other industrial coal	0.76	0.73	0.75	0.71	0.67	0.66	0.66	-0.3%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Coal subtotal	1.31	1.25	1.19	1.11	1.01	0.95	0.87	-1.1%
Biofuels heat and coproducts	0.85	0.90	0.86	0.85	0.84	0.84	0.80	-0.3%
Renewables[7]	1.49	1.45	1.60	1.62	1.64	1.70	1.84	0.7%
Purchased electricity	3.27	3.23	3.80	3.78	3.84	3.96	4.22	0.8%
Delivered energy	**24.45**	**24.55**	**28.42**	**28.62**	**29.24**	**30.23**	**31.95**	**0.8%**
Electricity related losses	6.55	6.30	7.32	7.03	6.96	7.04	7.17	0.4%
Total	**31.01**	**30.85**	**35.74**	**35.65**	**36.21**	**37.27**	**39.12**	**0.7%**

Table A6. Industrial sector key indicators and consumption (continued)

Key indicators and consumption	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Energy consumption per dollar of shipments (thousand Btu per 2009 dollar)								
Petroleum and other liquids	1.10	1.09	1.05	1.02	0.97	0.92	0.81	-0.9%
Natural gas	1.28	1.29	1.24	1.18	1.12	1.06	0.94	-0.9%
Coal	0.18	0.17	0.13	0.11	0.10	0.08	0.06	-2.8%
Renewable fuels[7]	0.32	0.32	0.27	0.26	0.24	0.22	0.19	-1.5%
Purchased electricity	0.44	0.43	0.42	0.39	0.37	0.34	0.30	-1.0%
Delivered energy	**3.32**	**3.29**	**3.11**	**2.96**	**2.79**	**2.63**	**2.31**	**-1.0%**
Industrial combined heat and power[1]								
Capacity (gigawatts)	26.1	26.2	28.9	30.8	33.1	35.9	41.9	1.4%
Generation (billion kilowatthours)	139	140	165	174	187	202	234	1.5%

[1]Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[2]Includes ethane, natural gasoline, and refinery olefins.
[3]Includes lubricants and miscellaneous petroleum products.
[4]Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.
[5]Fuel used in facilities that liquefy natural gas for export.
[6]Includes net coal coke imports.
[7]Includes consumption of energy produced from hydroelectric, wood and wood waste, municipal waste, and other biomass sources.
Btu = British thermal unit.
- - = Not applicable.

Note: Includes estimated consumption for petroleum and other liquids. Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.

Sources: 2015 prices for motor gasoline and distillate fuel oil are based on: U.S. Energy Information Administration (EIA), *Petroleum Marketing Monthly*, October 2016. 2015 petrochemical feedstock and asphalt and road oil prices are based on: EIA, *State Energy Data Report 2014*. 2015 coal prices are based on: EIA, *Quarterly Coal Report*, *October-December 2015* and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. 2015 electricity prices: EIA, *Monthly Energy Review*, October 2016. 2015 natural gas prices: *Natural Gas Monthly*, December 2015). 2015 refining consumption based on: *Petroleum Supply Annual 2015*. Other 2015 consumption values are based on: EIA, *Monthly Energy Review*, October 2016. 2015 shipments: IHS Markit, Industry model, August 2016. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A7. Transportation sector key indicators and delivered energy consumption

Key indicators and consumption	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Key indicators								
Travel indicators								
(billion vehicle miles traveled)								
Light-duty vehicles less than 8,501 pounds	2,755	2,841	3,060	3,136	3,225	3,331	3,567	0.7%
Commercial light trucks[1]	95	97	115	120	129	139	163	1.5%
Freight trucks greater than 10,000 pounds	279	276	322	332	350	374	427	1.3%
(billion seat miles available)								
Air	1,090	1,088	1,364	1,519	1,683	1,873	2,275	2.2%
(billion ton miles traveled)								
Rail	1,849	1,804	2,142	2,160	2,168	2,205	2,366	0.8%
Domestic shipping	495	482	415	352	319	283	251	-1.9%
Energy efficiency indicators								
(miles per gallon)								
New light-duty vehicle CAFE standard[2]	30.6	31.5	43.7	43.9	44.0	44.1	44.1	1.0%
New car[2]	35.5	36.9	53.1	53.1	53.1	53.1	53.1	1.1%
New light truck[2]	27.3	28.5	38.4	38.4	38.4	38.4	38.4	0.9%
Compliance new light-duty vehicle[3]	31.9	31.8	44.4	45.0	45.3	45.4	45.3	1.0%
New car[3]	38.8	38.3	54.8	55.4	55.4	55.5	55.3	1.1%
New light truck[3]	27.6	28.3	38.7	39.1	39.2	39.2	39.1	1.0%
Tested new light-duty vehicle[4]	31.0	31.0	44.3	45.0	45.3	45.4	45.3	1.1%
New car[4]	38.3	37.8	54.8	55.4	55.4	55.5	55.3	1.1%
New light truck[4]	26.6	27.5	38.7	39.0	39.2	39.2	39.1	1.0%
On-road new light-duty vehicle[5]	25.0	25.0	35.7	36.3	36.5	36.6	36.5	1.1%
New car[5]	31.3	30.9	44.8	45.3	45.2	45.3	45.2	1.1%
New light truck[5]	21.3	22.0	30.9	31.3	31.4	31.4	31.3	1.0%
Light-duty stock[6]	21.8	22.2	26.8	30.3	32.9	34.6	35.8	1.4%
New commercial light truck[1]	13.0	13.1	19.5	20.5	20.5	20.6	20.6	1.3%
Stock commercial light truck[1]	13.9	13.8	16.8	18.1	19.1	19.8	20.3	1.1%
Freight truck	7.0	7.0	8.0	8.8	9.6	10.0	10.3	1.1%
(seat miles per gallon)								
Aircraft	66.7	66.7	69.0	70.9	72.9	74.9	79.1	0.5%
(ton miles per thousand Btu)								
Rail	3.4	3.5	3.7	3.8	4.0	4.1	4.5	0.8%
Domestic shipping	4.9	4.9	5.4	5.6	5.9	6.2	6.8	0.9%
Energy use by mode (quadrillion Btu)								
Light-duty vehicles	15.78	16.03	14.22	12.93	12.25	12.05	12.48	-0.7%
Commercial light trucks[1]	0.86	0.88	0.85	0.83	0.84	0.88	1.01	0.4%
Bus transportation	0.26	0.26	0.28	0.29	0.30	0.31	0.32	0.6%
Freight trucks	5.55	5.47	5.72	5.41	5.30	5.47	6.20	0.4%
Rail, passenger	0.04	0.04	0.05	0.05	0.06	0.06	0.06	1.1%
Rail, freight	0.54	0.52	0.58	0.56	0.54	0.53	0.53	0.0%
Shipping, domestic	0.10	0.10	0.08	0.06	0.05	0.05	0.04	-2.9%
Shipping, international	0.68	0.81	0.73	0.78	0.84	0.88	0.96	0.5%
Recreational boats	0.25	0.25	0.28	0.29	0.30	0.31	0.32	0.7%
Air	2.36	2.36	2.83	3.06	3.29	3.54	4.05	1.6%
Military use	0.65	0.66	0.64	0.67	0.71	0.76	0.88	0.9%
Lubricants	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.1%
Pipeline fuel	0.69	0.69	0.71	0.73	0.76	0.78	0.83	0.6%
Total	**27.89**	**28.21**	**27.10**	**25.80**	**25.38**	**25.77**	**27.82**	**0.0%**

Table A7. Transportation sector key indicators and delivered energy consumption (continued)

Key indicators and consumption	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Energy use by mode (million barrels per day oil equivalent)								
Light-duty vehicles	8.55	8.69	7.71	7.02	6.66	6.55	6.79	-0.7%
Commercial light trucks[1]	0.45	0.46	0.45	0.44	0.44	0.46	0.54	0.4%
Bus transportation	0.13	0.13	0.14	0.14	0.14	0.15	0.16	0.6%
Freight trucks	2.67	2.63	2.76	2.61	2.56	2.65	3.00	0.4%
Rail, passenger	0.02	0.02	0.02	0.03	0.03	0.03	0.03	1.1%
Rail, freight	0.26	0.25	0.27	0.27	0.26	0.25	0.25	0.0%
Shipping, domestic	0.05	0.05	0.04	0.03	0.03	0.02	0.02	-2.8%
Shipping, international	0.31	0.36	0.32	0.35	0.38	0.39	0.43	0.5%
Recreational boats	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.8%
Air	1.14	1.14	1.37	1.48	1.59	1.71	1.96	1.6%
Military use	0.31	0.31	0.31	0.32	0.34	0.36	0.42	0.9%
Lubricants	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.1%
Pipeline fuel	0.33	0.33	0.34	0.35	0.36	0.37	0.39	0.6%
Total	**14.40**	**14.56**	**13.94**	**13.25**	**13.01**	**13.18**	**14.23**	**-0.1%**

[1]Commercial trucks 8,501 to 10,000 pounds gross vehicle weight rating.
[2]CAFE standard based on projected new vehicle sales.
[3]Includes CAFE credits for alternative fueled vehicle sales and credit banking.
[4]Environmental Protection Agency rated miles per gallon.
[5]Tested new vehicle efficiency revised for on-road performance.
[6]Combined"on-the-road" estimate for all cars and light trucks.
CAFE = Corporate average fuel economy.
Btu = British thermal unit.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, October 2016; EIA, Alternatives to Traditional Transportation Fuels 2009 (Part II - User and Fuel Data), April 2011; Federal Highway Administration, *Highway Statistics 2014*; Oak Ridge National Laboratory, *Transportation Energy Data Book: Edition 34*; National Highway Traffic and Safety Administration, *Summary of Fuel Economy Performance*, June 2015; U.S. Department of Commerce, Bureau of the Census, "Vehicle Inventory and Use Survey," EC02TV; EIA, U.S. Department of Transportation, Research and Special Programs Administration, *Air Carrier Statistics Monthly, December 2010/2009*; and United States Department of Defense, Defense Fuel Supply Center, Factbook, January 2010. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A8. Electricity supply, disposition, prices, and emissions
(billion kilowatthours, unless otherwise noted)

Supply, disposition, prices, and emissions	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Net generation by fuel type								
Electric power sector[1]								
Power only[2]								
Coal	1,323	1,197	1,172	992	950	915	852	-1.0%
Petroleum	24	19	11	9	8	7	6	-3.5%
Natural gas[3]	1,110	1,169	1,012	1,208	1,350	1,473	1,738	1.2%
Nuclear power	797	798	773	768	721	702	608	-0.8%
Pumped storage/other[4]	2	3	3	3	3	3	3	0.1%
Renewable sources[5]	507	554	933	987	1,045	1,134	1,317	2.6%
Distributed generation (natural gas)	0	0	0	0	1	2	4	- -
Total	**3,764**	**3,740**	**3,906**	**3,967**	**4,079**	**4,236**	**4,529**	**0.6%**
Combined heat and power[6]								
Coal	17	22	20	20	20	20	20	-0.3%
Petroleum	2	1	1	1	1	1	1	0.0%
Natural gas	131	144	139	139	139	139	137	-0.2%
Renewable sources	4	5	5	5	5	5	5	0.0%
Total	**158**	**171**	**165**	**165**	**164**	**164**	**162**	**-0.2%**
Total net electric power sector generation	**3,921**	**3,911**	**4,071**	**4,132**	**4,243**	**4,400**	**4,691**	**0.5%**
Less direct use	17	21	20	20	20	20	20	-0.1%
Net available to the grid	**3,904**	**3,890**	**4,050**	**4,112**	**4,223**	**4,380**	**4,670**	**0.5%**
End-use sector[7]								
Coal	14	14	13	12	11	11	10	-1.1%
Petroleum	1	1	1	1	1	1	1	-1.2%
Natural gas	100	102	130	151	176	205	271	2.9%
Other gaseous fuels[8]	11	11	21	20	20	20	21	1.8%
Renewable sources[9]	49	53	93	122	163	215	366	5.8%
Other[10]	3	3	3	3	3	3	3	0.0%
Total end-use sector net generation	**178**	**185**	**260**	**310**	**375**	**456**	**671**	**3.9%**
Less direct use	129	135	213	257	316	387	567	4.3%
Total sales to the grid	**50**	**50**	**47**	**52**	**59**	**69**	**105**	**2.2%**
Total net electricity generation by fuel								
Coal	1,354	1,233	1,205	1,024	981	946	882	-1.0%
Petroleum	28	21	13	10	10	9	7	-3.1%
Natural gas	1,341	1,414	1,282	1,499	1,666	1,818	2,150	1.2%
Nuclear power	797	798	773	768	721	702	608	-0.8%
Renewable sources[5,9]	560	612	1,031	1,114	1,213	1,354	1,687	3.0%
Other[11]	20	17	27	27	26	27	27	1.3%
Total net electricity generation	**4,100**	**4,096**	**4,331**	**4,442**	**4,618**	**4,856**	**5,362**	**0.8%**
Net generation to the grid	**3,954**	**3,940**	**4,097**	**4,164**	**4,282**	**4,449**	**4,775**	**0.6%**
Net imports	**66**	**57**	**57**	**50**	**45**	**42**	**41**	**-0.9%**
Electricity sales by sector								
Residential	1,400	1,410	1,383	1,402	1,436	1,479	1,521	0.2%
Commercial	1,358	1,360	1,354	1,372	1,407	1,463	1,622	0.5%
Industrial	959	946	1,113	1,107	1,126	1,162	1,236	0.8%
Transportation	9	11	42	65	83	98	120	7.4%
Total	**3,726**	**3,727**	**3,892**	**3,947**	**4,052**	**4,202**	**4,499**	**0.6%**
Direct use	146	156	233	278	336	407	587	4.0%
Total electricity use	**3,872**	**3,882**	**4,125**	**4,225**	**4,388**	**4,609**	**5,086**	**0.8%**

Table A8. Electricity supply, disposition, prices, and emissions (continued)
(billion kilowatthours, unless otherwise noted)

Supply, disposition, prices, and emissions	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
End-use prices								
(2016 cents per kilowatthour)								
Residential	12.8	12.4	13.7	13.9	13.9	13.9	14.4	0.4%
Commercial	10.8	10.4	11.5	11.7	11.6	11.5	11.6	0.3%
Industrial	7.0	6.9	7.5	7.8	7.7	7.8	8.0	0.4%
Transportation	10.4	10.1	13.4	13.8	13.5	13.4	13.3	0.8%
All sectors average	**10.6**	**10.3**	**11.2**	**11.4**	**11.4**	**11.4**	**11.6**	**0.4%**
(nominal cents per kilowatthour)								
Residential	12.7	12.4	16.6	18.8	20.7	22.8	29.1	2.5%
Commercial	10.6	10.4	13.9	15.8	17.3	18.9	23.5	2.4%
Industrial	6.9	6.9	9.1	10.5	11.6	12.7	16.1	2.5%
Transportation	10.3	10.1	16.3	18.6	20.2	22.0	26.9	2.9%
All sectors average	**10.4**	**10.3**	**13.5**	**15.4**	**17.0**	**18.6**	**23.5**	**2.5%**
Prices by service category								
(2016 cents per kilowatthour)								
Generation	6.5	5.9	6.6	7.1	6.9	6.8	7.2	0.6%
Transmission	1.1	1.1	1.3	1.3	1.4	1.4	1.4	0.6%
Distribution	2.9	3.3	3.3	3.1	3.2	3.2	3.2	-0.1%
(nominal cents per kilowatthour)								
Generation	6.4	5.9	7.9	9.6	10.3	11.2	14.6	2.7%
Transmission	1.1	1.1	1.6	1.8	2.0	2.3	2.9	2.8%
Distribution	2.9	3.3	4.0	4.2	4.7	5.3	6.4	2.0%
Electric power sector emissions[1]								
Sulfur dioxide (million short tons)	2.19	1.10	1.11	0.93	0.95	0.93	0.88	-0.7%
Nitrogen oxide (million short tons)	1.35	1.01	0.96	0.88	0.84	0.82	0.80	-0.7%
Mercury (short tons)	23.46	4.90	4.72	3.97	3.77	3.59	3.31	-1.1%

[1]Includes electricity-only and combined heat and power plants that have a regulatory status.
[2]Includes plants that only produce electricity and that have a regulatory status.
[3]Includes electricity generation from fuel cells.
[4]Includes non-biogenic municipal waste. The U.S. Energy Information Administration estimates that in 2016 approximately 7 billion kilowatthours of electricity were generated from a municipal waste stream containing petroleum-derived plastics and other non-renewable sources. See U.S. Energy Information Administration, *Methodology for Allocating Municipal Solid Waste to Biogenic and Non-Biogenic Energy*, (Washington, DC, May 2007).
[5]Includes conventional hydroelectric, geothermal, wood, wood waste, biogenic municipal waste, landfill gas, other biomass, solar, and wind power.
[6]Includes combined heat and power plants whose primary business is to sell electricity and heat to the public (i.e., those that report North American Industry Classification System code 22 or that have a regulatory status).
[7]Includes combined heat and power plants and electricity-only plants in the commercial and industrial sectors that have a non-regulatory status; and small on-site generating systems in the residential, commercial, and industrial sectors used primarily for own-use generation, but which may also sell some power to the grid.
[8]Includes refinery gas and still gas.
[9]Includes conventional hydroelectric, geothermal, wood, wood waste, all municipal waste, landfill gas, other biomass, solar, and wind power.
[10]Includes batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.
[11]Includes pumped storage, non-biogenic municipal waste, refinery gas, still gas, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 electric power sector generation; sales to the grid; net imports; electricity sales; and electricity end-use prices: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, October 2016, and supporting databases. 2015 emissions: U.S. Environmental Protection Agency, Clean Air Markets Database. 2015 electricity prices by service category: EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections**: EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A9. Electricity generating capacity
(gigawatts)

Net summer capacity[1]	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Electric power sector[2]								
Power only[3]								
Coal[4]	273.6	261.7	199.8	183.0	171.6	166.5	156.5	-1.5%
Oil and natural gas steam[4,5]	93.0	95.7	61.0	51.8	46.3	41.3	36.7	-2.8%
Combined cycle	202.0	208.4	218.9	248.1	277.4	301.9	349.8	1.5%
Combustion turbine/diesel	136.5	138.7	131.6	135.7	141.5	149.6	171.2	0.6%
Nuclear power[6]	98.5	99.1	97.2	96.5	90.6	88.2	76.5	-0.8%
Pumped storage	22.6	22.6	22.6	22.6	22.6	22.6	22.6	0.0%
Fuel cells	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2%
Renewable sources[7]	173.0	190.5	283.0	303.7	326.3	362.5	432.4	2.4%
Distributed generation (natural gas)[8]	0.0	0.0	0.5	0.9	1.9	4.0	9.5	- -
Total	**999.2**	**1,016.8**	**1,014.5**	**1,042.4**	**1,078.4**	**1,136.7**	**1,255.4**	**0.6%**
Combined heat and power[9]								
Coal	3.6	3.6	3.3	3.3	3.3	3.3	3.3	-0.3%
Oil and natural gas steam[5]	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2%
Combined cycle	24.3	24.3	24.6	24.6	24.6	24.6	24.6	0.0%
Combustion turbine/diesel	3.1	3.1	3.1	3.1	3.1	3.1	3.1	0.0%
Renewable sources[7]	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.0%
Total	**32.6**	**32.7**	**32.7**	**32.7**	**32.7**	**32.7**	**32.7**	**0.0%**
Cumulative planned additions[10]								
Coal	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Oil and natural gas steam[5]	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Combined cycle	- -	- -	18.0	18.0	18.0	18.0	18.0	- -
Combustion turbine/diesel	- -	- -	2.3	2.3	2.3	2.3	2.3	- -
Nuclear power	- -	- -	4.4	4.4	4.4	4.4	4.4	- -
Pumped storage	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Fuel cells	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Renewable sources[7]	- -	- -	15.8	15.8	15.8	15.8	15.8	- -
Distributed generation[8]	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Total	**- -**	**- -**	**40.6**	**40.6**	**40.6**	**40.6**	**40.6**	**- -**
Cumulative unplanned additions[10]								
Coal	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Oil and natural gas steam[5]	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Combined cycle	- -	- -	7.8	37.2	67.7	96.5	153.1	- -
Combustion turbine/diesel	- -	- -	4.2	10.4	18.3	28.1	52.6	- -
Nuclear power	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Pumped storage	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Fuel cells	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Renewable sources[7]	- -	- -	76.9	97.6	120.2	156.4	226.3	- -
Distributed generation[8]	- -	- -	0.5	0.9	1.9	4.0	9.5	- -
Total	**- -**	**- -**	**89.3**	**146.1**	**208.2**	**285.0**	**441.6**	**- -**
Cumulative electric power sector additions[10]	**- -**	**- -**	**129.9**	**186.7**	**248.8**	**325.6**	**482.1**	**- -**
Cumulative retirements[11]								
Coal	- -	- -	59.1	74.7	86.0	91.2	100.5	- -
Oil and natural gas steam[5]	- -	- -	38.0	48.3	53.9	58.9	64.0	- -
Combined cycle	- -	- -	14.9	15.1	16.3	20.7	29.3	- -
Combustion turbine/diesel	- -	- -	13.7	15.8	17.9	19.5	22.5	- -
Nuclear power	- -	- -	8.3	9.8	16.4	20.0	31.7	- -
Pumped storage	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Fuel cells	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Renewable sources[7]	- -	- -	0.5	0.5	0.5	0.5	0.6	- -
Total	**- -**	**- -**	**134.4**	**164.2**	**191.0**	**210.8**	**248.6**	**- -**
Total electric power sector capacity	**1,031.8**	**1,049.5**	**1,047.2**	**1,075.1**	**1,111.1**	**1,169.3**	**1,288.0**	**0.6%**

Table A9. Electricity generating capacity (continued)
(gigawatts)

Net summer capacity[1]	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
End-use generators[12]								
Coal	3.6	3.5	3.2	3.0	2.8	2.7	2.4	-1.1%
Petroleum	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-0.2%
Natural gas	16.6	17.0	20.7	24.3	28.6	33.3	44.1	2.8%
Other gaseous fuels[13]	2.4	2.4	3.0	3.0	3.0	3.0	3.0	0.7%
Renewable sources[7]	19.0	22.8	51.4	72.7	101.0	136.3	236.4	7.1%
Other[14]	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.0%
Total	**42.8**	**46.9**	**79.4**	**104.1**	**136.5**	**176.5**	**287.1**	**5.5%**
Cumulative capacity additions[10]	**- -**	**- -**	**34.4**	**59.9**	**92.7**	**132.9**	**243.9**	**- -**

[1]Net summer capacity is the steady hourly output that generating equipment is expected to supply to system load (exclusive of auxiliary power), as demonstrated by tests during summer peak demand.
[2]Includes electricity-only and combined heat and power plants that have a regulatory status.
[3]Includes plants that only produce electricity and that have a regulatory status. Includes capacity increases (uprates) at existing units.
[4]Total coal and oil and natural gas steam capacity account for the conversion of coal capacity to gas steam capacity, but the conversions are not included explicitly as additions or retirements. The totals reflect 2.2 gigawatts of planned conversions as well as additional model-projected conversions.
[5]Includes oil-, gas-, and dual-fired capacity.
[6]Nuclear capacity includes 4.7 gigawatts of uprates.
[7]Includes conventional hydroelectric, geothermal, wood, wood waste, all municipal waste, landfill gas, other biomass, solar, and wind power. Facilities co-firing biomass and coal are classified as coal.
[8]Primarily peak load capacity fueled by natural gas.
[9]Includes combined heat and power plants whose primary business is to sell electricity and heat to the public (i.e., those that report North American Industry Classification System code 22 or that have a regulatory status).
[10]Cumulative additions after December 31, 2016.
[11]Cumulative retirements after December 31, 2016.
[12]Includes combined heat and power plants and electricity-only plants in the commercial and industrial sectors that have a non-regulatory status; and small on-site generating systems in the residential, commercial, and industrial sectors used primarily for own-use generation, but which may also sell some power to the grid.
[13]Includes refinery gas and still gas.
[14]Includes batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 capacity and projected planned additions: U.S. Energy Information Administration (EIA), Form EIA-860, "Annual Electric Generator Report" (preliminary). 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A10. Electricity trade

(billion kilowatthours, unless otherwise noted)

Electricity trade	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Interregional electricity trade								
Gross domestic sales								
Firm power	102	99	92	73	53	49	47	-2.1%
Economy	223	194	255	235	228	227	217	0.3%
Total	**326**	**292**	**347**	**308**	**281**	**275**	**264**	**-0.3%**
Gross domestic sales (million 2016 dollars)								
Firm power	6,672	6,425	5,963	4,757	3,428	3,169	3,091	-2.1%
Economy	7,525	5,963	11,843	12,720	12,617	12,306	13,495	2.4%
Total	**14,196**	**12,388**	**17,806**	**17,477**	**16,045**	**15,475**	**16,586**	**0.9%**
International electricity trade								
Imports from Canada and Mexico								
Firm power	19.6	28.5	27.9	25.9	22.6	19.5	18.5	-1.3%
Economy	56.0	41.2	43.7	37.6	36.0	35.9	36.0	-0.4%
Total	**75.6**	**69.7**	**71.6**	**63.5**	**58.6**	**55.4**	**54.5**	**-0.7%**
Exports to Canada and Mexico								
Firm power	2.7	1.8	1.8	0.9	0.0	0.0	0.0	- -
Economy	6.5	10.8	12.7	13.0	13.2	13.2	13.2	0.6%
Total	**9.2**	**12.7**	**14.5**	**13.9**	**13.2**	**13.2**	**13.2**	**0.1%**

- - = Not applicable.

Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports. Firm power sales are capacity sales, meaning the delivery of the power is scheduled as part of the normal operating conditions of the affected electric systems. Economy sales are subject to curtailment or cessation of delivery by the supplier in accordance with prior agreements or under specified conditions.

Sources: 2015 interregional firm electricity trade data: Federal Energy Regulatory Commission, Form 1, "Electric Utility Annual Report", and 2014 seasonal reliability assessments from North American Electric Reliability Council regional entities and Independent System Operators. 2015 interregional economy electricity trade data are model results. 2015 Mexican electricity trade data: U.S. Energy Information Administration (EIA), *Electric Power Annual 2015*. 2015 Canadian international electricity trade data: National Energy Board, *Electricity Exports and Imports Statistics, 2015*. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A11. Petroleum and other liquids supply and disposition
(million barrels per day, unless otherwise noted)

Supply and disposition	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Crude oil								
Domestic crude production[1]	9.42	8.74	10.38	10.54	10.23	10.34	9.86	0.4%
Alaska	0.48	0.48	0.54	0.60	0.53	0.47	0.30	-1.4%
Lower 48 states	8.93	8.27	9.84	9.94	9.71	9.87	9.57	0.4%
Net imports	6.90	7.47	6.87	6.75	6.93	7.06	7.87	0.2%
Gross imports	7.36	7.93	7.51	7.38	7.56	7.69	8.50	0.2%
Exports	0.47	0.46	0.63	0.63	0.63	0.64	0.63	0.9%
Other crude supply[2]	-0.12	0.09	0.07	0.00	0.00	0.00	0.00	- -
Total crude supply	**16.19**	**16.30**	**17.32**	**17.29**	**17.16**	**17.40**	**17.73**	**0.2%**
Net product imports	-2.17	-2.64	-4.78	-5.29	-5.24	-5.17	-4.32	1.5%
Gross refined product imports[3]	0.89	0.83	1.10	1.07	1.20	1.33	1.37	1.5%
Unfinished oil imports	0.55	0.57	0.50	0.46	0.43	0.39	0.34	-1.5%
Blending component imports	0.60	0.62	0.52	0.46	0.38	0.32	0.27	-2.4%
Exports	4.21	4.66	6.89	7.29	7.25	7.21	6.30	0.9%
Refinery processing gain[4]	1.06	1.08	1.02	1.00	1.00	1.01	0.99	-0.3%
Product stock withdrawal	-0.18	0.00	0.00	0.00	0.00	0.00	0.00	- -
Natural gas plant liquids	3.27	3.52	4.82	4.81	4.76	4.76	4.71	0.9%
Supply from renewable sources	1.01	1.05	1.06	1.03	1.01	1.01	1.13	0.2%
Ethanol	0.89	0.91	0.87	0.84	0.82	0.82	0.94	0.1%
Domestic production	0.94	0.96	0.96	0.94	0.92	0.92	0.88	-0.3%
Net imports	-0.05	-0.05	-0.08	-0.10	-0.10	-0.09	0.06	- -
Stock withdrawal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Biodiesel	0.11	0.14	0.09	0.05	0.05	0.05	0.05	- -
Domestic production	0.08	0.10	0.05	0.01	0.01	0.01	0.01	-8.0%
Net imports	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.1%
Stock withdrawal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Other biomass-derived liquids[5]	0.00	0.00	0.10	0.14	0.14	0.14	0.14	16.7%
Domestic production	0.00	0.00	0.10	0.14	0.14	0.14	0.14	16.7%
Net imports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Stock withdrawal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Liquids from gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Liquids from coal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Other[6]	0.21	0.22	0.28	0.27	0.28	0.30	0.30	0.9%
Total primary supply[7]	**19.39**	**19.54**	**19.74**	**19.11**	**18.97**	**19.31**	**20.54**	**0.1%**
Product supplied								
by fuel								
Liquefied petroleum gases and other[8]	2.55	2.52	3.11	3.18	3.28	3.41	3.53	1.0%
Motor gasoline[9]	9.19	9.35	8.33	7.60	7.21	7.12	7.43	-0.7%
of which: E85[10]	0.02	0.02	0.05	0.10	0.12	0.11	0.11	5.1%
Jet fuel[11]	1.55	1.59	1.79	1.93	2.07	2.23	2.54	1.4%
Distillate fuel oil[12]	4.00	3.82	4.13	3.95	3.87	3.92	4.20	0.3%
of which: Diesel	3.83	3.66	3.67	3.52	3.46	3.53	3.81	0.1%
Residual fuel oil	0.26	0.34	0.30	0.31	0.34	0.35	0.38	0.3%
Other[13]	2.01	1.97	2.11	2.16	2.22	2.31	2.48	0.7%
by sector								
Residential and commercial	0.90	0.91	0.89	0.86	0.84	0.81	0.79	-0.4%
Industrial[14]	4.53	4.54	5.57	5.71	5.89	6.12	6.48	1.1%
Transportation	14.01	14.17	13.47	12.69	12.38	12.49	13.39	-0.2%
Electric power[15]	0.13	0.10	0.06	0.05	0.05	0.04	0.03	-3.2%
Unspecified sector[16]	-0.27	-0.24	-0.23	-0.18	-0.15	-0.14	-0.13	-1.9%
Total product supplied	**19.55**	**19.59**	**19.77**	**19.13**	**19.00**	**19.34**	**20.57**	**0.1%**
Discrepancy[17]	-0.15	-0.05	-0.03	-0.02	-0.03	-0.03	-0.02	-1.9%

Table A11. Petroleum and other liquids supply and disposition (continued)
(million barrels per day, unless otherwise noted)

Supply and disposition	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Domestic refinery distillation capacity[18]	18.1	18.4	19.0	19.0	19.0	19.0	19.0	0.1%
Capacity utilization rate (percent)[19]	91.0	90.1	92.8	92.5	91.7	92.8	94.4	0.1%
Net import share of product supplied (percent)	24.3	24.7	10.4	7.3	8.6	9.5	17.7	-1.0%
Expenditures for imported crude oil and petroleum products (billion 2016 dollars)	131	127	233	249	274	299	352	3.0%

[1]Includes lease condensate.
[2]Strategic petroleum reserve stock additions plus unaccounted for crude oil and crude oil stock withdrawals.
[3]Includes other hydrocarbons and alcohols.
[4]The volumetric amount by which total output is greater than input due to the processing of crude oil into products which, in total, have a lower specific gravity than the crude oil processed.
[5]Includes pyrolysis oils, biomass-derived Fischer-Tropsch liquids, biobutanol, and renewable feedstocks used for the on-site production of diesel and gasoline.
[6]Includes domestic sources of other blending components, other hydrocarbons, and ethers.
[7]Total crude supply, net product imports, refinery processing gain, product stock withdrawal, natural gas plant liquids, supply from renewable sources, liquids from gas, liquids from coal, and other supply.
[8]Includes ethane, natural gasoline, and refinery olefins.
[9]Includes ethanol and ethers blended into gasoline.
[10]E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for these projections.
[11]Includes only kerosene type.
[12]Includes distillate fuel oil from petroleum and biomass feedstocks.
[13]Includes kerosene, aviation gasoline, petrochemical feedstocks, lubricants, waxes, asphalt, road oil, still gas, special naphthas, petroleum coke, crude oil product supplied, methanol, and miscellaneous petroleum products.
[14]Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[15]Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.
[16]Represents consumption unattributed to the sectors above.
[17]Balancing item. Includes unaccounted for supply, losses, and gains.
[18]End-of-year operable capacity.
[19]Rate is calculated by dividing the gross annual input to atmospheric crude oil distillation units by their operable refining capacity in barrels per calendar day.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 product supplied based on: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, October 2016. Other 2015 data: EIA, *Petroleum Supply Annual 2014*. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.
Projections: EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A12. Petroleum and other liquids prices
(2016 dollars per gallon, unless otherwise noted)

Sector and fuel	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Crude oil prices (2016 dollars per barrel)								
Brent spot	53	43	86	95	102	109	117	3.0%
West Texas Intermediate spot	49	43	80	88	96	103	110	2.8%
Average imported refiners acquisition cost[1]	47	38	79	86	93	100	108	3.1%
Brent / West Texas Intermediate spread	4	1	6	7	7	7	6	7.0%
Delivered sector product prices								
Residential								
Propane	1.57	1.49	1.66	1.70	1.79	1.90	2.05	1.0%
Distillate fuel oil	2.70	2.12	3.31	3.48	3.67	3.85	4.04	1.9%
Commercial								
Distillate fuel oil	2.37	1.86	2.80	2.99	3.17	3.33	3.49	1.9%
Residual fuel oil	1.09	0.80	1.65	1.81	1.97	2.12	2.29	3.1%
Residual fuel oil (2016 dollars per barrel)	46	34	69	76	83	89	96	3.1%
Industrial[2]								
Propane	1.14	1.05	1.22	1.27	1.36	1.48	1.63	1.3%
Distillate fuel oil	2.37	1.86	2.86	3.06	3.24	3.39	3.55	1.9%
Residual fuel oil	1.05	0.77	1.94	2.10	2.26	2.41	2.57	3.6%
Residual fuel oil (2016 dollars per barrel)	44	32	81	88	95	101	108	3.6%
Transportation								
Propane	1.67	1.58	1.75	1.79	1.89	2.00	2.15	0.9%
E85[3]	2.75	2.46	2.84	2.45	2.44	2.73	2.96	0.6%
Ethanol wholesale price	2.25	2.22	2.83	2.61	2.51	2.42	2.31	0.1%
Motor gasoline[4]	2.55	2.21	2.92	3.02	3.15	3.30	3.42	1.3%
Jet fuel[5]	1.65	1.32	2.39	2.60	2.79	2.98	3.23	2.7%
Diesel fuel (distillate fuel oil)[6]	2.76	2.31	3.54	3.74	3.92	4.07	4.23	1.8%
Residual fuel oil	1.21	0.89	1.75	1.93	2.09	2.26	2.45	3.0%
Residual fuel oil (2016 dollars per barrel)	51	37	74	81	88	95	103	3.0%
Electric power[7]								
Distillate fuel oil	2.10	1.64	2.68	2.85	3.02	3.20	3.38	2.1%
Residual fuel oil	1.52	1.21	2.31	2.49	2.65	2.77	2.83	2.5%
Residual fuel oil (2016 dollars per barrel)	64	51	97	105	111	116	119	2.5%
Average prices, all sectors[8]								
Propane	1.36	1.28	1.46	1.49	1.58	1.69	1.83	1.0%
Motor gasoline[4]	2.55	2.21	2.92	3.02	3.15	3.30	3.42	1.3%
Jet fuel[5]	1.65	1.32	2.39	2.60	2.79	2.98	3.23	2.7%
Distillate fuel oil	2.67	2.20	3.36	3.56	3.74	3.89	4.05	1.8%
Residual fuel oil	1.29	0.93	1.79	1.96	2.12	2.28	2.45	2.9%
Residual fuel oil (2016 dollars per barrel)	54	39	75	82	89	96	103	2.9%
Average	**2.21**	**1.87**	**2.55**	**2.64**	**2.75**	**2.88**	**3.04**	**1.4%**

Table A12. Petroleum and other liquids prices (continued)
(nominal dollars per gallon, unless otherwise noted)

Sector and fuel	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Crude oil prices (nominal dollars per barrel)								
Brent spot	52	43	104	128	152	179	236	5.1%
West Texas Intermediate spot	49	43	97	118	143	169	223	5.0%
Average imported refiners acquisition cost[1]	46	38	95	116	139	165	218	5.2%
Delivered sector product prices								
Residential								
Propane	1.55	1.49	2.00	2.29	2.67	3.12	4.16	3.1%
Distillate fuel oil	2.66	2.12	4.00	4.71	5.48	6.32	8.17	4.0%
Commercial								
Distillate fuel oil	2.34	1.86	3.39	4.04	4.74	5.46	7.06	4.0%
Residual fuel oil	1.08	0.80	1.99	2.45	2.94	3.48	4.63	5.3%
Residual fuel oil (nominal dollars per barrel)	45	34	84	103	124	146	194	5.3%
Industrial[2]								
Propane	1.12	1.05	1.48	1.71	2.03	2.43	3.31	3.4%
Distillate fuel oil	2.34	1.86	3.46	4.13	4.84	5.57	7.19	4.1%
Residual fuel oil	1.04	0.77	2.35	2.84	3.38	3.95	5.21	5.8%
Residual fuel oil (nominal dollars per barrel)	43	32	99	119	142	166	219	5.8%
Transportation								
Propane	1.64	1.58	2.12	2.42	2.82	3.28	4.35	3.0%
E85[3]	2.72	2.46	3.43	3.31	3.65	4.48	6.00	2.7%
Ethanol wholesale price	2.22	2.22	3.42	3.53	3.74	3.97	4.67	2.2%
Motor gasoline[4]	2.51	2.21	3.54	4.08	4.70	5.41	6.92	3.4%
Jet fuel[5]	1.63	1.32	2.89	3.51	4.16	4.89	6.53	4.8%
Diesel fuel (distillate fuel oil)[6]	2.72	2.31	4.28	5.06	5.86	6.68	8.55	3.9%
Residual fuel oil	1.19	0.89	2.12	2.60	3.13	3.70	4.95	5.2%
Residual fuel oil (nominal dollars per barrel)	50	37	89	109	131	155	208	5.2%
Electric power[7]								
Distillate fuel oil	2.07	1.64	3.24	3.85	4.51	5.24	6.85	4.3%
Residual fuel oil	1.50	1.21	2.79	3.36	3.95	4.55	5.73	4.7%
Residual fuel oil (nominal dollars per barrel)	63	51	117	141	166	191	240	4.7%
Average prices, all sectors[8]								
Propane	1.34	1.28	1.76	2.02	2.36	2.77	3.70	3.2%
Motor gasoline[4]	2.51	2.21	3.54	4.08	4.70	5.41	6.92	3.4%
Jet fuel[5]	1.63	1.32	2.89	3.51	4.16	4.89	6.53	4.8%
Distillate fuel oil	2.64	2.20	4.07	4.81	5.58	6.38	8.20	3.9%
Residual fuel oil	1.27	0.93	2.17	2.65	3.17	3.73	4.96	5.1%
Residual fuel oil (nominal dollars per barrel)	53	39	91	111	133	157	208	5.1%
Average	**2.18**	**1.87**	**3.08**	**3.56**	**4.10**	**4.72**	**6.15**	**3.6%**

[1]Weighted average price delivered to U.S. refiners.
[2]Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[3]E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for these projections.
[4]Sales weighted-average price for all grades. Includes Federal, State, and local taxes.
[5]Includes only kerosene type.
[6]Diesel fuel for on-road use. Includes Federal and State taxes while excluding county and local taxes.
[7]Includes electricity-only and combined heat and power plants that have a regulatory status.
[8]Weighted averages of end-use fuel prices are derived from the prices in each sector and the corresponding sectoral consumption.
Note: Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 Brent and West Texas Intermediate crude oil spot prices: Thomson Reuters. 2015 average imported crude oil price: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, October 2016. 2015 prices for motor gasoline, distillate fuel oil, and jet fuel are based on: EIA, *Petroleum Marketing Monthly*, October 2016. 2015 residential, commercial, industrial, and transportation sector petroleum product prices are derived from: EIA, Form EIA-782A, "Refiners'/Gas Plant Operators' Monthly Petroleum Product Sales Report." 2015 electric power prices based on: EIA, *Monthly Energy Review*, October 2016. 2015 E85 prices derived from monthly prices in the Clean Cities Alternative Fuel Price Report. 2015 wholesale ethanol prices derived from Bloomberg U.S. average rack price. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A13. Natural gas supply, disposition, and prices
(trillion cubic feet, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Supply								
Dry gas production[1]	27.03	26.53	33.06	34.91	36.52	37.74	40.28	1.2%
Supplemental natural gas[2]	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.4%
Net imports	0.93	0.94	-4.70	-5.36	-5.75	-5.73	-5.56	- -
Pipeline[3]	0.87	1.03	-1.06	-1.31	-1.37	-1.35	-1.18	- -
Liquefied natural gas	0.06	-0.09	-3.65	-4.05	-4.38	-4.38	-4.38	12.1%
Total supply	**28.03**	**27.52**	**28.41**	**29.62**	**30.83**	**32.07**	**34.78**	**0.7%**
Consumption by sector								
Residential	4.61	4.42	4.65	4.61	4.57	4.54	4.55	0.1%
Commercial	3.20	3.13	3.14	3.17	3.26	3.37	3.67	0.5%
Industrial[4]	7.53	7.70	8.89	8.84	9.09	9.47	10.11	0.8%
Natural-gas-to-liquids heat and power[5]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Natural gas to liquids production[6]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Electric power[7]	9.63	10.11	8.63	9.69	10.42	11.04	12.50	0.6%
Transportation[8]	0.06	0.07	0.16	0.23	0.30	0.37	0.52	6.0%
Pipeline fuel	0.67	0.67	0.69	0.71	0.73	0.76	0.81	0.6%
Lease and plant fuel[9]	1.58	1.56	1.73	1.80	1.85	1.92	2.02	0.8%
Liquefaction for export[10]	0.00	0.02	0.37	0.41	0.44	0.44	0.44	10.3%
Total consumption	**27.29**	**27.68**	**28.25**	**29.45**	**30.67**	**31.91**	**34.62**	**0.7%**
Discrepancy[11]	**0.74**	**-0.16**	**0.17**	**0.17**	**0.17**	**0.17**	**0.16**	**- -**
Natural gas spot price at Henry Hub								
(2016 dollars per million Btu)	2.66	2.50	4.51	5.00	5.09	5.07	5.83	2.5%
(nominal dollars per million Btu)	2.62	2.50	5.45	6.76	7.60	8.31	11.80	4.7%
Delivered prices								
(2016 dollars per thousand cubic feet)								
Residential	10.58	10.22	11.78	12.77	13.24	13.61	14.80	1.1%
Commercial	8.28	7.42	10.47	11.28	11.60	11.80	12.66	1.6%
Industrial[4]	3.85	3.61	5.66	6.09	6.13	6.12	6.79	1.9%
Electric power[7]	3.40	3.12	4.98	5.48	5.58	5.63	6.35	2.1%
Transportation[12]	16.95	16.97	16.97	16.37	15.82	15.58	16.13	-0.2%
Average[13]	**5.52**	**5.07**	**7.21**	**7.74**	**7.85**	**7.90**	**8.61**	**1.6%**
(nominal dollars per thousand cubic feet)								
Residential	10.43	10.22	14.26	17.25	19.77	22.31	29.95	3.2%
Commercial	8.17	7.42	12.67	15.24	17.32	19.35	25.62	3.7%
Industrial[4]	3.80	3.61	6.85	8.23	9.16	10.04	13.75	4.0%
Electric power[7]	3.35	3.12	6.02	7.40	8.33	9.23	12.84	4.2%
Transportation[12]	16.72	16.97	20.53	22.12	23.62	25.54	32.64	1.9%
Average[13]	**5.44**	**5.07**	**8.72**	**10.45**	**11.72**	**12.95**	**17.44**	**3.7%**

[1]Marketed production (wet) minus extraction losses.
[2]Synthetic natural gas, propane air, coke oven gas, refinery gas, biomass gas, air injected for Btu stabilization, and manufactured gas commingled and distributed with natural gas.
[3]Natural gas imported from Canada and Mexico.
[4]Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems. Excludes use for lease and plant fuel.
[5]Includes any natural gas used in the process of converting natural gas to liquid fuel that is not actually converted.
[6]Includes any natural gas converted into liquid fuel.
[7]Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.
[8]Natural gas used as fuel in motor vehicles, trains, and ships.
[9]Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.
[10]Fuel used in facilities that liquefy natural gas for export.
[11]Balancing item. Natural gas lost as a result of converting flow data measured at varying temperatures and pressures to a standard temperature and pressure and the merger of different data reporting systems which vary in scope, format, definition, and respondent type. In addition, 2015 values include net storage injections.
[12]Natural gas used as fuel in motor vehicles, trains, and ships. Price includes estimated motor vehicle fuel taxes and estimated dispensing costs or charges.
[13]Weighted average prices. Weights used are the sectoral consumption values excluding lease, plant, and pipeline fuel.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 supply values; lease, plant, and pipeline fuel consumption; and residential, commercial, and industrial delivered prices: U.S. Energy Information Administration (EIA), *Natural Gas Monthly*, December 2015). Other 2015 consumption based on: EIA, *Monthly Energy Review*, October 2016. 2015 natural gas spot price at Henry Hub: Thomson Reuters. 2015 electric power prices: EIA, *Electric Power Monthly*, July 2016, Table 4.13.B, and EIA, *State Energy Data Report 2014*. 2015 transportation sector delivered prices are model results. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A14. Oil and gas supply

Production and supply	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Crude oil								
Lower 48 average wellhead price[1] (2016 dollars per barrel)	**45**	**43**	**83**	**90**	**98**	**105**	**113**	**2.9%**
Production (million barrels per day)[2]								
United States total	9.42	8.74	10.38	10.54	10.23	10.34	9.86	0.4%
Lower 48 onshore	7.33	6.54	8.06	8.38	8.19	8.37	8.14	0.6%
Tight oil[3]	4.87	4.60	5.91	6.18	6.02	6.30	6.23	0.9%
Carbon dioxide enhanced oil recovery	0.31	0.30	0.42	0.49	0.49	0.43	0.34	0.4%
Other	2.15	1.65	1.73	1.72	1.68	1.65	1.56	-0.2%
Lower 48 offshore	1.61	1.72	1.78	1.56	1.52	1.49	1.43	-0.6%
State	0.07	0.07	0.04	0.04	0.03	0.03	0.02	-3.2%
Federal	1.54	1.65	1.73	1.52	1.48	1.46	1.40	-0.5%
Alaska	0.48	0.48	0.54	0.60	0.53	0.47	0.30	-1.4%
Onshore	0.38	0.40	0.38	0.34	0.27	0.25	0.17	-2.5%
State offshore	0.10	0.07	0.16	0.24	0.22	0.20	0.12	1.5%
Federal offshore	0.00	0.00	0.00	0.01	0.04	0.02	0.01	1.8%
Natural gas plant liquids production (million barrels per day)								
United States total	3.27	3.53	4.82	4.82	4.76	4.76	4.71	0.9%
Lower 48 onshore	2.88	3.09	4.33	4.35	4.25	4.24	4.23	0.9%
Lower 48 offshore	0.36	0.41	0.44	0.41	0.45	0.47	0.45	0.3%
Alaska	0.03	0.03	0.05	0.06	0.05	0.05	0.03	-0.3%
Natural gas								
Natural gas spot price at Henry Hub (2016 dollars per million Btu)	2.66	2.50	4.51	5.00	5.09	5.07	5.83	2.5%
Dry production (trillion cubic feet)[4]								
United States total	27.03	26.53	33.06	34.91	36.52	37.74	40.28	1.2%
Lower 48 onshore	25.39	24.48	31.32	33.23	34.67	35.79	38.43	1.3%
Tight gas	4.65	4.67	4.75	4.88	5.51	5.78	6.45	1.0%
Shale gas and tight oil plays[3]	13.53	14.08	20.82	22.89	24.12	25.28	27.45	2.0%
Coalbed methane	1.01	1.14	1.05	1.03	0.95	0.87	0.79	-1.1%
Other	6.21	4.59	4.71	4.43	4.09	3.87	3.74	-0.6%
Lower 48 offshore	1.31	1.75	1.42	1.36	1.55	1.64	1.56	-0.3%
State	0.10	0.14	0.04	0.03	0.03	0.02	0.02	-6.2%
Federal	1.21	1.62	1.38	1.33	1.52	1.62	1.54	-0.1%
Alaska	0.33	0.30	0.31	0.32	0.31	0.31	0.29	-0.1%
Supplemental gas supplies (trillion cubic feet)[5]	**0.06**	**0.05**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.4%**
Total lower 48 wells drilled (thousands)	**30.4**	**30.1**	**33.8**	**36.1**	**37.3**	**38.5**	**39.9**	**0.8%**

[1]Represents lower 48 onshore and offshore supplies.
[2]Includes lease condensate.
[3]Tight oil represents resources in low-permeability reservoirs, including shale and chalk formations. The specific plays included in the tight oil category are Bakken/Three Forks/Sanish, Eagle Ford, Woodford, Austin Chalk, Spraberry, Niobrara, Avalon/Bone Springs, and Monterey.
[4]Marketed production (wet) minus extraction losses.
[5]Synthetic natural gas, propane air, coke oven gas, refinery gas, biomass gas, air injected for Btu stabilization, and manufactured gas commingled and distributed with natural gas.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 crude oil lower 48 average wellhead price: U.S. Energy Information Administration (EIA), *Petroleum Marketing Monthly*, October 2016. 2015 lower 48 onshore, lower 48 offshore, and Alaska crude oil production: EIA, *Petroleum Supply Annual 2015*. 2015 natural gas spot price at Henry Hub: Thomson Reuters. 2015 Alaska and total natural gas production, and supplemental gas supplies: EIA, *Natural Gas Monthly*, December 2015). Other 2015 values: EIA, Office of Energy Analysis. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.
Projections: EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A15. Coal supply, disposition, and prices
(million short tons, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Production[1]								
Appalachia	218	184	157	132	136	130	120	-1.3%
Interior	164	151	181	154	161	159	165	0.3%
West	497	405	416	380	340	329	298	-0.9%
East of the Mississippi	327	293	295	252	266	264	267	-0.3%
West of the Mississippi	552	447	459	414	371	355	316	-1.0%
Total	**879**	**740**	**754**	**665**	**638**	**619**	**583**	**-0.7%**
Waste coal supplied[2]	**10**	**10**	**10**	**8**	**7**	**8**	**8**	**-0.5%**
Net imports								
Imports[3]	11	11	4	2	1	1	1	-7.0%
Exports	75	54	63	68	74	81	85	1.3%
Total	**-64**	**-44**	**-59**	**-66**	**-73**	**-80**	**-84**	**2.0%**
Total supply[4]	**825**	**707**	**704**	**608**	**572**	**547**	**507**	**-1.0%**
Consumption by sector								
Commercial and institutional	1	2	2	2	2	2	2	0.7%
Coke plants	20	18	15	14	12	10	7	-2.9%
Other industrial[5]	38	37	39	36	35	34	34	-0.2%
Coal-to-liquids heat and power	0	0	0	0	0	0	0	- -
Coal to liquids production	0	0	0	0	0	0	0	- -
Electric power[6]	750	660	649	556	523	501	464	-1.0%
Total	**809**	**716**	**704**	**608**	**572**	**547**	**507**	**-1.0%**
Discrepancy and stock change[7]	**16**	**-9**	**0**	**0**	**0**	**0**	**0**	**- -**
Average minemouth price[8]								
(2016 dollars per short ton)	34.2	33.9	34.7	34.3	36.5	37.9	40.1	0.5%
(2016 dollars per million Btu)	1.72	1.69	1.75	1.74	1.82	1.87	1.96	0.4%
Delivered prices[9]								
(2016 dollars per short ton)								
Commercial and institutional	86.0	84.3	86.1	86.2	86.0	86.3	88.1	0.1%
Coke plants	155.8	161.8	188.7	203.6	211.0	212.3	204.6	0.7%
Other industrial[5]	70.4	69.1	72.2	72.0	71.7	72.2	74.3	0.2%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electric power[6]								
(2016 dollars per short ton)	42.9	41.0	44.0	42.8	44.0	45.2	45.9	0.3%
(2016 dollars per million Btu)	2.28	2.14	2.33	2.30	2.32	2.37	2.39	0.3%
Average	**47.0**	**45.6**	**48.7**	**48.3**	**49.2**	**50.0**	**50.1**	**0.3%**
Exports[10]	88.1	85.4	83.6	81.6	85.1	84.2	89.6	0.1%

Table A15. Coal supply, disposition, and prices (continued)
(million short tons, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Average minemouth price[8]								
(nominal dollars per short ton)	33.7	33.9	42.0	46.3	54.5	62.1	81.1	2.6%
(nominal dollars per million Btu)	1.70	1.69	2.11	2.34	2.71	3.07	3.97	2.5%
Delivered prices[9]								
(nominal dollars per short ton)								
Commercial and institutional	84.8	84.3	104.2	116.4	128.3	141.5	178.4	2.2%
Coke plants	153.6	161.8	228.4	275.1	315.0	348.1	414.2	2.8%
Other industrial[5]	69.4	69.1	87.3	97.3	107.0	118.4	150.4	2.3%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electric power[6]								
(nominal dollars per short ton)	42.3	41.0	53.2	57.8	65.7	74.2	92.9	2.4%
(nominal dollars per million Btu)	2.24	2.14	2.82	3.10	3.47	3.89	4.83	2.4%
Average	**46.4**	**45.6**	**58.9**	**65.3**	**73.5**	**82.0**	**101.4**	**2.4%**
Exports[10]	86.9	85.4	101.2	110.2	127.0	138.1	181.4	2.2%

[1]Includes anthracite, bituminous coal, subbituminous coal, and lignite.
[2]Includes waste coal consumed by the electric power and industrial sectors. Waste coal supplied is counted as a supply-side item to balance the same amount of waste coal included in the consumption data.
[3]Excludes imports to Puerto Rico and the U.S. Virgin Islands.
[4]Production plus waste coal supplied plus net imports.
[5]Includes consumption for combined heat and power plants that have a non-regulatory status, and small on-site generating systems. Excludes all coal use in the coal-to-liquids process.
[6]Includes all electricity-only and combined heat and power plants that have a regulatory status.
[7]Balancing item: the sum of production, net imports, and waste coal supplied minus total consumption.
[8]Includes reported prices for both open market and captive mines. Prices weighted by production, which differs from average minemouth prices published in EIA data reports where it is weighted by reported sales.
[9]Prices weighted by consumption; weighted average excludes commercial and institutional prices, and export free-alongside-ship prices.
[10]Free-alongside-ship price at U.S. port of exit.
- - = Not applicable.
Btu = British thermal unit.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 data based on: U.S. Energy Information Administration (EIA), *Annual Coal Report 2013*; EIA, *Quarterly Coal Report, October-December 2015*; and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A16. Renewable energy generating capacity and generation
(gigawatts, unless otherwise noted)

Net summer capacity and generation	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Electric power sector[1]								
Net summer capacity								
Conventional hydroelectric power	79.0	79.3	79.8	80.1	80.4	80.5	80.9	0.1%
Geothermal[2]	2.5	2.5	4.0	5.3	6.4	7.0	7.9	3.5%
Municipal waste[3]	3.7	3.8	3.8	3.8	3.8	3.8	3.8	0.0%
Wood and other biomass[4]	3.6	3.6	3.7	3.7	3.8	4.0	4.6	0.7%
Solar thermal	1.8	1.8	2.0	2.0	2.0	2.0	2.0	0.3%
Solar photovoltaic[5]	11.6	19.4	38.5	57.1	76.1	104.7	148.0	6.2%
Wind	71.9	81.3	152.3	152.8	155.1	161.6	186.3	2.5%
Offshore wind	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Total electric power sector capacity	**174.1**	**191.6**	**284.1**	**304.8**	**327.4**	**363.6**	**433.5**	**2.4%**
Generation (billion kilowatthours)								
Conventional hydroelectric power	247.6	262.5	310.6	312.4	313.6	314.7	317.0	0.6%
Geothermal[2]	15.9	16.8	28.7	39.3	48.4	53.3	61.1	3.9%
Biogenic municipal waste[6]	18.1	19.8	21.2	21.0	20.8	21.7	22.5	0.4%
Wood and other biomass	14.5	5.2	10.0	14.2	14.3	16.1	21.0	4.2%
Dedicated plants	13.8	4.6	9.6	13.7	13.8	15.6	20.4	4.5%
Cofiring	0.7	0.6	0.4	0.5	0.5	0.5	0.5	-0.4%
Solar thermal	3.2	3.2	3.6	3.6	3.5	3.4	3.4	0.1%
Solar photovoltaic[5]	21.2	30.4	75.6	111.1	151.8	208.9	292.0	6.9%
Wind	190.6	220.8	488.0	490.2	497.5	520.6	604.6	3.0%
Offshore wind	0.0	0.0	0.1	0.1	0.1	0.1	0.1	3.7%
Total electric power sector generation	**511.1**	**558.8**	**937.9**	**991.9**	**1,050.0**	**1,138.8**	**1,321.8**	**2.6%**
End-use sectors[7]								
Net summer capacity								
Conventional hydroelectric power	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- -
Municipal waste[8]	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0%
Biomass	4.4	4.4	4.3	3.9	3.8	3.7	3.7	-0.5%
Solar photovoltaic[5]	11.6	14.4	43.1	64.5	92.5	127.3	225.7	8.4%
Wind	2.1	3.1	3.2	3.4	3.9	4.5	6.2	2.0%
Total end-use sector capacity	**19.0**	**22.8**	**51.4**	**72.7**	**101.0**	**136.3**	**236.4**	**7.1%**
Generation (billion kilowatthours)								
Conventional hydroelectric power	1.3	1.3	1.3	1.3	1.3	1.3	1.3	0.0%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- -
Municipal waste[8]	4.0	4.0	4.0	4.0	4.0	4.0	4.0	0.0%
Biomass	24.5	24.1	22.3	20.6	19.5	19.1	19.1	-0.7%
Solar photovoltaic[5]	16.1	20.0	60.9	92.1	133.4	185.2	333.3	8.6%
Wind	2.7	4.0	4.1	4.4	5.0	5.8	8.0	2.1%
Total end-use sector generation	**48.7**	**53.4**	**92.6**	**122.5**	**163.3**	**215.4**	**365.7**	**5.8%**

Table A16. Renewable energy generating capacity and generation (continued)
(gigawatts, unless otherwise noted)

Net summer capacity and generation	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Total, all sectors								
Net summer capacity								
Conventional hydroelectric power	79.2	79.6	80.1	80.4	80.6	80.8	81.2	0.1%
Geothermal	2.5	2.5	4.0	5.3	6.4	7.0	7.9	3.5%
Municipal waste	4.3	4.4	4.4	4.4	4.4	4.4	4.4	0.0%
Wood and other biomass[4]	8.0	7.9	8.0	7.7	7.5	7.7	8.3	0.1%
Solar[5]	25.0	35.6	83.6	123.6	170.5	234.0	375.7	7.2%
Wind	74.0	84.4	155.5	156.3	159.0	166.1	192.5	2.5%
Total capacity, all sectors	**193.1**	**214.4**	**335.4**	**377.5**	**428.4**	**499.9**	**669.9**	**3.4%**
Generation (billion kilowatthours)								
Conventional hydroelectric power	248.9	263.9	311.9	313.7	315.0	316.1	318.3	0.6%
Geothermal	15.9	16.8	28.7	39.3	48.4	53.3	61.1	3.9%
Municipal waste	22.1	23.8	25.2	25.1	24.8	25.7	26.6	0.3%
Wood and other biomass	39.0	29.3	32.4	34.7	33.8	35.2	40.0	0.9%
Solar[5]	40.5	53.7	140.1	206.8	288.7	397.4	628.7	7.5%
Wind	193.3	224.9	492.2	494.8	502.6	526.5	612.8	3.0%
Total generation, all sectors	**559.8**	**612.3**	**1,030.5**	**1,114.4**	**1,213.3**	**1,354.2**	**1,687.5**	**3.0%**

[1]Includes electricity-only and combined heat and power plants that have a regulatory status.
[2]Includes both hydrothermal resources (hot water and steam) and near-field enhanced geothermal systems (EGS). Near-field EGS potential occurs on known hydrothermal sites, however this potential requires the addition of external fluids for electricity generation and is only available after 2025.
[3]Includes municipal waste, landfill gas, and municipal sewage sludge. Incremental growth is assumed to be for landfill gas facilities. All municipal waste is included, although a portion of the municipal waste stream contains petroleum-derived plastics and other non-renewable sources.
[4]Facilities co-firing biomass and coal are classified as coal.
[5]Does not include off-grid photovoltaics.
[6]Includes biogenic municipal waste, landfill gas, and municipal sewage sludge. Incremental growth is assumed to be for landfill gas facilities. Only biogenic municipal waste is included. The U.S. Energy Information Administration estimates that in 2016 approximately 7 billion kilowatthours of electricity were generated from a municipal waste stream containing petroleum-derived plastics and other non-renewable sources. See U.S. Energy Information Administration, *Methodology for Allocating Municipal Solid Waste to Biogenic and Non-Biogenic Energy* (Washington, DC, May 2007).
[7]Includes combined heat and power plants and electricity-only plants in the commercial and industrial sectors that have a non-regulatory status; and small on-site generating systems in the residential, commercial, and industrial sectors used primarily for own-use generation, but which may also sell some power to the grid.
[8]Includes municipal waste, landfill gas, and municipal sewage sludge. All municipal waste is included, although a portion of the municipal waste stream contains petroleum-derived plastics and other non-renewable sources.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 capacity: U.S. Energy Information Administration (EIA), Form EIA-860, "Annual Electric Generator Report" (preliminary). 2015 generation: EIA, *Monthly Energy Review*, October 2016. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A17. Renewable energy consumption by sector and source
(quadrillion Btu per year)

Sector and source	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Marketed renewable energy[1]								
Residential (wood)	**0.44**	**0.37**	**0.40**	**0.37**	**0.35**	**0.33**	**0.30**	**-0.6%**
Commercial (biomass)	**0.13**	**0.13**	**0.13**	**0.13**	**0.13**	**0.13**	**0.13**	**0.0%**
Industrial[2]	**2.33**	**2.35**	**2.46**	**2.47**	**2.47**	**2.54**	**2.64**	**0.3%**
Conventional hydroelectric power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Municipal waste[3]	0.19	0.19	0.24	0.25	0.26	0.27	0.29	1.3%
Biomass	1.29	1.26	1.36	1.36	1.38	1.43	1.55	0.6%
Biofuels heat and coproducts	0.85	0.90	0.86	0.85	0.84	0.84	0.80	-0.3%
Transportation	**1.38**	**1.46**	**1.52**	**1.47**	**1.46**	**1.46**	**1.61**	**0.3%**
Ethanol used in E85[4]	0.01	0.02	0.04	0.09	0.12	0.10	0.11	5.1%
Ethanol used in gasoline blending	1.14	1.16	1.08	0.99	0.95	0.96	1.11	-0.1%
Biodiesel used in distillate blending	0.22	0.28	0.18	0.09	0.09	0.09	0.10	-3.0%
Biobutanol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Liquids from biomass	0.00	0.00	0.01	0.01	0.01	0.01	0.01	5.7%
Renewable diesel and gasoline[5]	0.01	0.00	0.20	0.29	0.29	0.29	0.29	- -
Electric power[6]	**5.01**	**5.44**	**9.08**	**9.61**	**10.16**	**11.02**	**12.78**	**2.5%**
Conventional hydroelectric power	2.35	2.50	2.95	2.97	2.98	2.99	3.01	0.6%
Geothermal	0.15	0.16	0.28	0.38	0.46	0.51	0.59	3.8%
Biogenic municipal waste[7]	0.25	0.26	0.28	0.28	0.28	0.29	0.31	0.5%
Biomass	0.21	0.10	0.17	0.23	0.23	0.26	0.32	3.6%
Dedicated plants	0.19	0.06	0.13	0.18	0.19	0.21	0.28	4.5%
Cofiring	0.02	0.03	0.04	0.05	0.05	0.05	0.05	1.1%
Solar thermal	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.1%
Solar photovoltaic	0.20	0.29	0.72	1.05	1.44	1.98	2.76	6.9%
Wind	1.81	2.10	4.64	4.66	4.73	4.95	5.75	3.0%
Total marketed renewable energy	**9.29**	**9.75**	**13.58**	**14.05**	**14.57**	**15.48**	**17.46**	**1.7%**
Sources of ethanol								
from corn and other starch	1.22	1.24	1.23	1.21	1.19	1.18	1.14	-0.3%
from cellulose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4%
Net imports	-0.06	-0.07	-0.11	-0.13	-0.13	-0.12	0.07	- -
Total	**1.15**	**1.18**	**1.13**	**1.08**	**1.06**	**1.06**	**1.22**	**0.1%**

Table A17. Renewable energy consumption by sector and source (continued)
(quadrillion Btu per year)

Sector and source	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Nonmarketed renewable energy[8]								
Selected consumption								
Residential	**0.12**	**0.16**	**0.47**	**0.71**	**1.02**	**1.41**	**2.60**	**8.6%**
Solar hot water heating	0.01	0.01	0.02	0.02	0.02	0.02	0.03	2.8%
Geothermal heat pumps	0.01	0.01	0.02	0.02	0.02	0.02	0.03	2.7%
Solar photovoltaic	0.08	0.11	0.41	0.64	0.94	1.32	2.50	9.7%
Wind	0.02	0.03	0.03	0.03	0.04	0.04	0.04	1.0%
Commercial	**0.15**	**0.16**	**0.26**	**0.32**	**0.42**	**0.53**	**0.78**	**4.7%**
Solar thermal	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.4%
Solar photovoltaic	0.08	0.08	0.17	0.24	0.33	0.44	0.67	6.3%
Wind	0.01	0.01	0.01	0.01	0.01	0.02	0.03	4.9%

[1]Includes nonelectric renewable energy groups for which the energy source is bought and sold in the marketplace, although all transactions may not necessarily be marketed, and marketed renewable energy inputs for electricity entering the marketplace on the electric power grid. Excludes electricity imports; see Table A2. Actual heat rates used to determine fuel consumption for all renewable fuels except hydroelectric, geothermal, solar, and wind. Consumption at hydroelectric, geothermal, solar, and wind facilities is determined by using the fossil fuel equivalent of 9,510 Btu per kilowatthour.
[2]Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[3]Includes municipal waste, landfill gas, and municipal sewage sludge. All municipal waste is included, although a portion of the municipal waste stream contains petroleum-derived plastics and other non-renewable sources.
[4]Excludes motor gasoline component of E85. E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for these projections.
[5]Renewable feedstocks for the on-site production of diesel and gasoline.
[6]Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.
[7]Includes biogenic municipal waste, landfill gas, and municipal sewage sludge. Incremental growth is assumed to be for landfill gas facilities. Only biogenic municipal waste is included. The U.S. Energy Information Administration estimates that in 2016 approximately 0.3 quadrillion Btus were consumed from a municipal waste stream containing petroleum-derived plastics and other non-renewable sources. See U.S. Energy Information Administration, *Methodology for Allocating Municipal Solid Waste to Biogenic and Non-Biogenic Energy* (Washington, DC, May 2007).
[8]Includes selected renewable energy consumption data for which the energy is not bought or sold, either directly or indirectly as an input to marketed energy. The U.S. Energy Information Administration does not estimate or project total consumption of nonmarketed renewable energy.
- - = Not applicable.
Btu = British thermal unit.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 ethanol: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, October 2016. 2015 electric power sector: EIA, Form EIA-860, "Annual Electric Generator Report" (preliminary). Other 2015 values: EIA, Office of Energy Analysis. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A18. Energy-related carbon dioxide emissions by sector and source
(million metric tons, unless otherwise noted)

Sector and source	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Residential								
Petroleum	68	59	57	53	49	46	42	-1.0%
Natural gas	252	242	255	252	250	249	249	0.1%
Electricity[1]	721	675	589	546	543	539	523	-0.7%
Total residential	**1,041**	**977**	**901**	**852**	**843**	**834**	**814**	**-0.5%**
Commercial								
Petroleum	40	52	51	51	51	51	52	0.0%
Natural gas	175	171	172	173	179	185	201	0.5%
Coal	3	3	4	4	4	4	4	0.7%
Electricity[1]	699	652	577	534	532	533	558	-0.5%
Total commercial	**917**	**878**	**804**	**763**	**766**	**773**	**814**	**-0.2%**
Industrial[2]								
Petroleum	342	376	414	417	420	428	444	0.5%
Natural gas[3]	476	484	565	568	586	610	651	0.9%
Coal	127	122	116	109	100	94	87	-1.0%
Electricity[1]	494	453	474	431	426	423	425	-0.2%
Total industrial	**1,438**	**1,436**	**1,570**	**1,525**	**1,532**	**1,555**	**1,607**	**0.3%**
Transportation								
Petroleum[4]	1,820	1,821	1,729	1,634	1,599	1,619	1,735	-0.1%
Natural gas[5]	39	40	46	52	56	61	72	1.7%
Electricity[1]	5	5	18	25	31	36	41	6.3%
Total transportation	**1,864**	**1,866**	**1,794**	**1,711**	**1,687**	**1,717**	**1,849**	**0.0%**
Electric power[6]								
Petroleum	24	17	10	8	7	7	5	-3.3%
Natural gas	530	555	474	532	572	606	685	0.6%
Coal	1,353	1,202	1,164	986	941	906	845	-1.0%
Other[7]	12	12	12	12	12	12	12	0.0%
Total electric power	**1,919**	**1,785**	**1,659**	**1,537**	**1,532**	**1,531**	**1,547**	**-0.4%**
Total by fuel								
Petroleum[4]	2,294	2,325	2,261	2,163	2,127	2,151	2,278	-0.1%
Natural gas	1,471	1,493	1,512	1,577	1,644	1,711	1,858	0.6%
Coal	1,483	1,327	1,284	1,099	1,045	1,005	936	-1.0%
Other[7]	12	12	12	12	12	12	12	0.0%
Total	**5,259**	**5,157**	**5,069**	**4,851**	**4,827**	**4,878**	**5,084**	**0.0%**
Carbon dioxide emissions (metric tons per person)	**16.3**	**15.9**	**14.6**	**13.5**	**13.0**	**12.8**	**12.7**	**-0.6%**

[1]Emissions from the electric power sector are distributed to the end-use sectors.
[2]Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[3]Includes lease and plant fuel.
[4]This includes carbon dioxide from international bunker fuels, both civilian and military, which are excluded from the accounting of carbon dioxide emissions under the United Nations convention. From 1990 through 2014, international bunker fuels accounted for 90 to 126 million metric tons annually.
[5]Includes pipeline fuel natural gas and natural gas used as fuel in motor vehicles, trains, and ships.
[6]Includes electricity-only and combined heat and power plants that have a regulatory status.
[7]Includes emissions from geothermal power and nonbiogenic emissions from municipal waste.

Note: By convention, the direct emissions from biogenic energy sources are excluded from energy-related carbon dioxide emissions. The release of carbon from these sources is assumed to be balanced by the uptake of carbon when the feedstock is grown, resulting in zero net emissions over some period of time. If, however, increased use of biomass energy results in a decline in terrestrial carbon stocks, a net positive release of carbon may occur. See Table A19, "Energy-Related Carbon Dioxide Emissions by End Use", for the emissions from biogenic energy sources as an indication of the potential net release of carbon dioxide in the absence of offsetting sequestration. Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.

Sources: 2015 emissions and emission factors: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, October 2016. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A19. Energy-related carbon dioxide emissions by end use
(million metric tons)

Sector and end use	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Residential								
Space heating	266	243	250	239	232	226	215	-0.4%
Space cooling	121	120	97	91	92	91	88	-0.9%
Water heating	139	135	130	126	123	120	122	-0.3%
Refrigeration	54	49	41	38	38	38	40	-0.6%
Cooking	29	28	28	28	28	29	30	0.2%
Clothes dryers	34	32	31	29	30	31	32	0.0%
Freezers	11	10	9	7	7	7	7	-1.2%
Lighting	68	62	36	30	28	27	24	-2.7%
Clothes washers[1]	4	4	2	2	2	2	2	-2.0%
Dishwashers[1]	14	13	13	13	13	13	14	0.2%
Televisions and related equipment[2]	43	40	31	30	32	34	34	-0.5%
Computers and related equipment[3]	17	15	10	8	7	6	4	-4.2%
Furnace fans and boiler circulation pumps	17	15	15	13	12	11	10	-1.2%
Other uses[4]	224	210	208	198	200	200	192	-0.3%
Discrepancy[5]	0	0	0	0	0	0	0	-0.5%
Total residential	**1,041**	**977**	**901**	**852**	**843**	**834**	**814**	**-0.5%**
Commercial								
Space heating[6]	123	121	115	109	105	101	93	-0.8%
Space cooling[6]	83	79	63	57	55	53	51	-1.3%
Water heating[6]	19	19	18	18	18	18	18	0.0%
Ventilation	79	73	61	50	45	41	36	-2.1%
Cooking	29	28	28	27	28	29	30	0.2%
Lighting	79	72	51	42	36	32	26	-2.9%
Refrigeration	96	90	79	70	66	64	64	-1.0%
Office equipment (PC)	55	50	37	33	32	31	25	-2.0%
Office equipment (non-PC)	34	32	32	33	35	36	41	0.7%
Other uses[7]	322	315	322	325	346	368	430	0.9%
Total commercial	**917**	**878**	**804**	**763**	**766**	**773**	**814**	**-0.2%**
Industrial[8]								
Manufacturing								
Refining	255	249	246	238	237	242	240	-0.1%
Food products	93	92	103	106	113	121	138	1.2%
Paper products	68	64	55	47	42	39	35	-1.8%
Bulk chemicals	252	255	334	330	331	335	333	0.8%
Glass	15	15	16	15	14	14	14	-0.2%
Cement and lime	25	26	32	32	32	35	41	1.3%
Iron and steel	114	107	97	84	75	69	61	-1.6%
Aluminum	39	36	35	31	30	29	27	-0.9%
Fabricated metal products	32	30	31	29	30	30	31	0.1%
Machinery	17	16	19	19	20	22	25	1.4%
Computers and electronics	18	17	18	18	18	19	21	0.6%
Transportation equipment	35	34	35	33	34	37	42	0.6%
Electrical equipment	9	9	10	10	11	11	13	1.2%
Wood products	14	13	16	15	16	17	18	0.9%
Plastics	33	31	33	33	34	36	42	0.9%
Balance of manufacturing	123	119	117	111	110	109	112	-0.2%
Total manufacturing	**1,141**	**1,114**	**1,197**	**1,149**	**1,149**	**1,164**	**1,195**	**0.2%**
Nonmanufacturing								
Agriculture	87	82	86	85	85	86	88	0.2%
Construction	69	68	77	76	79	82	91	0.9%
Mining	112	99	107	103	102	103	107	0.2%
Total nonmanufacturing	**268**	**250**	**270**	**264**	**267**	**271**	**286**	**0.4%**
Discrepancy[5]	28	72	103	112	116	119	126	1.6%
Total industrial	**1,438**	**1,436**	**1,570**	**1,525**	**1,532**	**1,555**	**1,607**	**0.3%**

Table A19. Energy-related carbon dioxide emissions by end use (continued)
(million metric tons)

Sector and end use	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Transportation								
Light-duty vehicles	1,063	1,061	940	852	806	793	814	-0.8%
Commercial light trucks[9]	59	59	57	55	55	57	65	0.2%
Bus transportation	18	17	18	18	18	18	18	0.1%
Freight trucks	388	379	390	368	360	372	421	0.3%
Rail, passenger	5	5	5	5	5	5	5	0.4%
Rail, freight	38	36	39	37	35	34	33	-0.3%
Shipping, domestic	7	7	5	4	4	3	3	-2.9%
Shipping, international	52	61	55	59	64	67	73	0.5%
Recreational boats	17	17	19	19	20	20	21	0.7%
Air	168	168	200	217	233	251	287	1.6%
Military use	46	47	45	47	50	54	62	0.8%
Lubricants	5	5	5	5	5	5	5	0.1%
Pipeline fuel	37	37	38	39	40	41	44	0.6%
Discrepancy[5]	-37	-33	-23	-14	-8	-5	-3	-7.3%
Total transportation	**1,864**	**1,866**	**1,794**	**1,711**	**1,687**	**1,717**	**1,849**	**0.0%**
Biogenic energy combustion[10]								
Biomass	194	174	192	197	196	202	216	0.6%
Electric power sector	20	9	16	22	22	24	30	3.6%
Other sectors	175	165	177	175	174	178	186	0.3%
Biogenic waste	22	24	26	25	25	26	28	0.5%
Biofuels heat and coproducts	80	84	81	80	78	79	75	-0.3%
Ethanol	79	80	77	74	73	73	83	0.1%
Biodiesel	16	20	13	7	7	7	7	-3.0%
Liquids from biomass	0	0	1	1	1	1	1	5.7%
Renewable diesel and gasoline	0	0	15	21	21	21	21	- -
Total	**392**	**383**	**405**	**404**	**401**	**409**	**431**	**0.3%**

[1]Does not include water heating portion of load.
[2]Includes televisions, set-top boxes, home theater systems, DVD players, and video game consoles.
[3]Includes desktop and laptop computers, monitors, and networking equipment.
[4]Includes small electric devices, heating elements, outdoor grills, exterior lights, pool heaters, spa heaters, backup electricity generators, and motors not listed above. Electric vehicles are included in the transportation sector.
[5]Represents differences between total emissions by end-use and total emissions by fuel as reported in Table A18. Emissions by fuel may reflect benchmarking and other modeling adjustments to energy use and the associated emissions that are not assigned to specific end uses.
[6]Includes emissions related to fuel consumption for district services.
[7]Includes emissions related to (but not limited to) miscellaneous uses such as transformers, medical imaging and other medical equipment, elevators, escalators, off-road electric vehicles, laboratory fume hoods, laundry equipment, coffee brewers, water services, emergency generators, combined heat and power in commercial buildings, manufacturing performed in commercial buildings, and cooking (distillate), plus residual fuel oil, propane, coal, motor gasoline, kerosene, and marketed renewable fuels (biomass).
[8]Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[9]Commercial trucks 8,501 to 10,000 pounds gross vehicle weight rating.
[10]By convention, the direct emissions from biogenic energy sources are excluded from energy-related carbon dioxide emissions. The release of carbon from these sources is assumed to be balanced by the uptake of carbon when the feedstock is grown, resulting in zero net emissions over some period of time. If, however, increased use of biomass energy results in a decline in terrestrial carbon stocks, a net positive release of carbon may occur. Accordingly, the emissions from biogenic energy sources are reported here as an indication of the potential net release of carbon dioxide in the absence of offsetting sequestration.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 emissions and emission factors: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, October 2016. 2016: EIA, *Short-Term Energy Outlook*, October 2016 and EIA, AEO2017 National Energy Modeling System run ref2017.d120816a. **Projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A20. Macroeconomic indicators
(billion 2009 chain-weighted dollars, unless otherwise noted)

Indicators	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Real gross domestic product	**16,397**	**16,652**	**20,558**	**22,585**	**25,054**	**27,852**	**33,653**	**2.1%**
Components of real gross domestic product								
Real consumption	11,215	11,522	14,402	15,952	17,759	19,851	24,332	2.2%
Real investment	2,869	2,816	3,913	4,319	4,886	5,477	6,806	2.6%
Real government spending	2,884	2,919	3,036	3,188	3,379	3,585	4,013	0.9%
Real exports	2,121	2,114	3,242	3,950	4,803	5,729	7,685	3.9%
Real imports	2,661	2,692	4,015	4,817	5,766	6,775	9,200	3.7%
Energy intensity (thousand Btu per 2009 dollar of GDP)								
Delivered energy	4.36	4.30	3.63	3.26	2.96	2.73	2.40	-1.7%
Total energy	5.91	5.79	4.88	4.37	3.96	3.64	3.17	-1.8%
Price indices								
GDP chain-type price index (2009=1.00)	1.10	1.12	1.35	1.51	1.67	1.83	2.26	2.1%
Consumer price index (1982-4=1.00)								
All-urban	2.37	2.40	3.00	3.40	3.82	4.26	5.40	2.4%
Energy commodities and services	2.03	1.87	2.84	3.29	3.74	4.23	5.46	3.2%
Wholesale price index (1982=1.00)								
All commodities	1.90	1.85	2.31	2.53	2.74	2.94	3.46	1.9%
Fuel and power	1.60	1.44	2.35	2.76	3.13	3.52	4.60	3.5%
Metals and metal products	2.00	1.93	2.26	2.30	2.38	2.46	2.66	0.9%
Industrial commodities excluding energy	1.94	1.93	2.26	2.44	2.60	2.76	3.15	1.4%
Interest rates (percent, nominal)								
Federal funds rate	0.13	0.42	3.07	2.93	2.98	2.99	2.96	- -
10-year treasury note	2.14	1.73	3.82	3.75	3.76	3.76	3.74	- -
AA utility bond rate	3.99	3.65	5.79	5.73	5.73	5.73	5.71	- -
Value of shipments (billion 2009 dollars)								
Non-industrial and service sectors	23,925	24,364	30,117	33,060	36,628	40,470	48,373	2.0%
Total industrial	7,374	7,453	9,147	9,655	10,476	11,491	13,836	1.8%
Agriculture, mining, and construction	2,049	2,079	2,545	2,639	2,802	2,978	3,395	1.5%
Manufacturing	5,325	5,374	6,602	7,016	7,674	8,512	10,441	2.0%
Energy-intensive	1,867	1,898	2,223	2,292	2,402	2,555	2,890	1.2%
Non-energy-intensive	3,458	3,476	4,378	4,725	5,272	5,958	7,552	2.3%
Total shipments	**31,298**	**31,817**	**39,264**	**42,715**	**47,104**	**51,961**	**62,209**	**2.0%**
Population and employment (millions)								
Population, with armed forces overseas	322	324	348	360	371	381	399	0.6%
Population, aged 16 and over	257	259	281	292	302	311	328	0.7%
Population, aged 65 and over	48	50	66	74	79	82	88	1.7%
Employment, nonfarm	142	144	158	163	167	173	181	0.7%
Employment, manufacturing	12.1	12.1	13.6	13.1	12.8	12.6	12.3	0.0%
Key labor indicators								
Labor force (millions)	157	159	171	177	182	188	198	0.6%
Nonfarm labor productivity (2009=1.00)	1.06	1.06	1.22	1.32	1.44	1.57	1.86	1.7%
Unemployment rate (percent)	5.28	4.88	4.52	4.55	4.40	4.42	4.68	- -
Key indicators for energy demand								
Real disposable personal income	12,343	12,663	16,041	17,848	19,717	21,866	26,219	2.2%
Housing starts (millions)	1.18	1.26	1.85	1.72	1.74	1.76	1.77	1.0%
Commercial floorspace (billion square feet)	89	90	99	105	110	116	127	1.0%
Unit sales of light-duty vehicles (millions)	17.4	17.5	17.6	17.8	18.4	18.7	19.8	0.4%

GDP = Gross domestic product.
Btu = British thermal unit.
- - = Not applicable.
Sources: 2015 and 2016: IHS Markit, Macroeconomic, Industry, and Employment models, August 2016. **Projections:** U.S. Energy Information Administration, AEO2017 National Energy Modeling System run ref2017.d120816a.

Table A21. International petroleum and other liquids supply, disposition, and prices
(million barrels per day, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Crude oil spot prices								
(2016 dollars per barrel)								
Brent	53	43	86	95	102	109	117	3.0%
West Texas Intermediate	49	43	80	88	96	103	110	2.8%
(nominal dollars per barrel)								
Brent	52	43	104	128	152	179	236	5.1%
West Texas Intermediate	49	43	97	118	143	169	223	5.0%
Petroleum and other liquids consumption[1]								
OECD								
United States (50 states)	19.55	19.59	19.77	19.13	19.00	19.34	20.57	0.1%
United States territories	0.26	0.27	0.30	0.31	0.32	0.34	- -	- -
Canada	2.39	2.39	2.38	2.39	2.44	2.51	- -	- -
Mexico and Chile	2.30	2.32	2.36	2.50	2.67	2.87	- -	- -
OECD Europe[2]	13.83	13.88	13.57	13.65	13.79	13.98	- -	- -
Japan	4.14	4.08	3.75	3.66	3.56	3.40	- -	- -
South Korea	2.38	2.43	2.42	2.44	2.48	2.55	- -	- -
Australia and New Zealand	1.28	1.31	1.39	1.41	1.45	1.53	- -	- -
Total OECD consumption	**46.13**	**46.26**	**45.92**	**45.49**	**45.71**	**46.51**	- -	- -
Non-OECD								
Russia	3.35	3.20	3.79	3.75	3.73	3.59	- -	- -
Other Europe and Eurasia[3]	2.07	2.15	2.34	2.43	2.48	2.53	- -	- -
China	11.18	11.52	13.81	14.81	15.65	16.36	- -	- -
India	3.97	4.18	5.19	5.94	6.97	8.26	- -	- -
Other Asia[4]	8.13	8.35	10.33	11.39	12.70	14.26	- -	- -
Middle East	8.29	8.58	10.42	11.28	12.31	13.23	- -	- -
Africa	3.86	4.02	5.06	5.50	6.08	6.93	- -	- -
Brazil	3.15	3.18	3.74	4.06	4.39	4.71	- -	- -
Other Central and South America	3.60	3.63	4.01	4.12	4.30	4.58	- -	- -
Total non-OECD consumption	**47.60**	**48.79**	**58.69**	**63.29**	**68.61**	**74.45**	- -	- -
Total consumption	**93.73**	**95.05**	**104.61**	**108.77**	**114.32**	**120.96**	- -	- -
Petroleum and other liquids production								
OPEC[5]								
Middle East	27.59	27.75	30.83	33.09	35.91	39.04	- -	- -
North Africa	2.15	2.07	2.74	2.96	3.18	3.42	- -	- -
West Africa	4.24	4.30	4.40	4.57	4.71	5.03	- -	- -
South America	3.25	3.17	3.15	3.38	3.65	3.93	- -	- -
Total OPEC production	**37.24**	**37.28**	**41.12**	**44.01**	**47.45**	**51.42**	- -	- -
Non-OPEC								
OECD								
United States (50 states)	14.99	14.64	17.61	17.72	17.34	17.47	16.90	0.4%
Canada	4.55	4.88	5.38	5.55	5.73	6.00	- -	- -
Mexico and Chile	2.66	2.62	2.44	2.49	2.80	3.26	- -	- -
OECD Europe[2]	3.52	3.38	3.25	2.99	2.86	2.74	- -	- -
Japan and South Korea	0.22	0.23	0.18	0.19	0.19	0.19	- -	- -
Australia and New Zealand	0.51	0.51	0.63	0.61	0.68	0.76	- -	- -
Total OECD production	**26.44**	**26.26**	**29.49**	**29.54**	**29.60**	**30.43**	- -	- -
Non-OECD								
Russia	10.87	10.67	10.84	11.04	11.52	12.22	- -	- -
Other Europe and Eurasia[3]	3.26	3.25	4.35	4.65	4.69	4.51	- -	- -
China	4.63	4.63	5.18	5.28	5.92	6.16	- -	- -
Other Asia[4]	4.07	4.15	3.82	3.71	3.66	3.66	- -	- -
Middle East	1.16	1.10	0.90	0.82	0.76	0.69	- -	- -
Africa	2.26	2.23	2.50	2.65	2.71	2.76	- -	- -
Brazil	3.13	3.18	4.30	4.87	5.43	6.12	- -	- -
Other Central and South America	2.22	2.24	2.11	2.21	2.59	3.01	- -	- -
Total non-OECD production	**31.60**	**31.45**	**34.00**	**35.23**	**37.27**	**39.12**	- -	- -
Total petroleum and other liquids production	**95.28**	**94.99**	**104.61**	**108.77**	**114.32**	**120.96**	- -	- -
OPEC market share (percent)	39.1	39.2	39.3	40.5	41.5	42.5	- -	- -

Table A21. International petroleum and other liquids supply, disposition, and prices (continued)
(million barrels per day, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2016-2050 (percent)
	2015	2016	2025	2030	2035	2040	2050	
Selected world production subtotals:								
Crude oil and equivalents[6]	79.67	78.88	85.26	88.54	93.21	98.92	- -	- -
Tight oil	5.33	5.10	6.25	6.89	7.80	9.57	- -	- -
Bitumen[7]	2.32	2.54	3.12	3.18	3.24	3.31	- -	- -
Refinery processing gain[8]	2.47	2.53	2.89	3.00	3.11	3.22	- -	- -
Natural gas plant liquids	10.41	10.76	12.82	13.04	13.28	13.55	- -	- -
Liquids from renewable sources[9]	2.32	2.38	2.96	3.37	3.74	4.11	- -	- -
Liquids from coal[10]	0.25	0.25	0.16	0.26	0.36	0.50	- -	- -
Liquids from natural gas[11]	0.29	0.30	0.52	0.57	0.62	0.65	- -	- -
Liquids from kerogen[12]	0.01	0.01	0.01	0.01	0.01	0.01	- -	- -
Crude oil production[6]								
OPEC[5]								
Middle East	24.22	24.30	26.99	29.07	31.63	34.55	- -	- -
North Africa	1.80	1.72	2.33	2.46	2.56	2.67	- -	- -
West Africa	4.22	4.28	4.34	4.51	4.64	4.95	- -	- -
South America	3.06	2.98	2.86	3.09	3.36	3.65	- -	- -
Total OPEC production	**33.31**	**33.27**	**36.51**	**39.13**	**42.19**	**45.80**	- -	- -
Non-OPEC								
OECD								
United States (50 states)	9.42	8.74	10.38	10.54	10.23	10.34	9.86	0.4%
Canada	3.72	4.05	4.42	4.53	4.69	4.96	- -	- -
Mexico and Chile	2.32	2.29	2.12	2.17	2.49	2.96	- -	- -
OECD Europe[2]	2.70	2.57	2.10	1.79	1.62	1.46	- -	- -
Japan and South Korea	0.00	0.00	0.00	0.00	0.00	0.00	- -	- -
Australia and New Zealand	0.39	0.38	0.50	0.48	0.56	0.64	- -	- -
Total OECD production	**18.54**	**18.04**	**19.53**	**19.52**	**19.60**	**20.36**	- -	- -
Non-OECD								
Russia	10.09	9.86	10.08	10.31	10.81	11.53	- -	- -
Other Europe and Eurasia[3]	3.04	3.02	4.10	4.39	4.43	4.25	- -	- -
China	4.25	4.23	4.40	4.23	4.63	4.58	- -	- -
Other Asia[4]	3.22	3.27	2.79	2.57	2.42	2.28	- -	- -
Middle East	1.13	1.07	0.87	0.80	0.73	0.67	- -	- -
Africa	1.86	1.83	2.01	2.15	2.21	2.26	- -	- -
Brazil	2.42	2.47	3.32	3.69	4.07	4.67	- -	- -
Other Central and South America	1.81	1.81	1.65	1.74	2.12	2.52	- -	- -
Total non-OECD production	**27.82**	**27.57**	**29.21**	**29.88**	**31.41**	**32.75**	- -	- -
Total crude oil production[6]	**79.67**	**78.88**	**85.26**	**88.54**	**93.21**	**98.92**	- -	- -
OPEC market share (percent)	41.8	42.2	42.8	44.2	45.3	46.3	- -	- -

[1]Estimated consumption. Includes both OPEC and non-OPEC consumers in the regional breakdown.
[2]OECD Europe = Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.
[3]Other Europe and Eurasia = Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Georgia, Kazakhstan, Kosovo, Kyrgyzstan, Latvia, Lithuania, Macedonia, Malta, Moldova, Montenegro, Romania, Serbia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.
[4]Other Asia = Afghanistan, Bangladesh, Bhutan, Brunei, Cambodia (Kampuchea), Fiji, French Polynesia, Guam, Hong Kong, India (for production), Indonesia, Kiribati, Laos, Malaysia, Macau, Maldives, Mongolia, Myanmar (Burma), Nauru, Nepal, New Caledonia, Niue, North Korea, Pakistan, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Taiwan, Thailand, Tonga, Vanuatu, and Vietnam.
[5]OPEC = Organization of the Petroleum Exporting Countries = Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela.
[6]Includes crude oil, lease condensate, tight oil (shale oil), extra-heavy oil, and bitumen (oil sands).
[7]Includes diluted and upgraded/synthetic bitumen (syncrude).
[8]The volumetric amount by which total output is greater than input due to the processing of crude oil into products which, in total, have a lower specific gravity than the crude oil processed.
[9]Includes liquids produced from energy crops.
[10]Includes liquids converted from coal via the Fischer-Tropsch coal-to-liquids process.
[11]Includes liquids converted from natural gas via the Fischer-Tropsch gas-to-liquids process.
[12]Includes liquids produced from kerogen (oil shale, not to be confused with tight oil (shale oil)).
OECD = Organization for Economic Cooperation and Development.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2015 are model results and may differ from official EIA data reports.
Sources: 2015 Brent and West Texas Intermediate crude oil spot prices: Thomson Reuters. **2015 quantities and projections:** EIA, AEO2017 National Energy Modeling System run ref2017.d120816a and EIA, Generate World Oil Balance application.

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This publication covers all companies which have common stock available for public trading with the exception of a few companies which are omitted because of the small percentage in the hands of the public or the small size of the company.

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ELECTRIC COMPANIES

		DIVIDEND YIELD	PRICE EARNINGS MULTIPLE
YEAR	2006	3.8	20.8
YEAR	2007	3.4	18.5
YEAR	2008	3.9	16.1
YEAR	2009	4.8	14.1
YEAR	2010	4.3	18.1
YEAR	2011	4.2	18.1
YEAR	2012	4.0	17.8
YEAR	2013	3.8	17.5
YEAR	2014	3.7	18.9
YEAR	2015	3.7	18.6
YEAR TO DATE	2016	3.7	19.6
OCTOBER	2015	3.8	17.7
NOVEMBER	2015	3.6	18.3
DECEMBER	2015	3.8	17.9
JANUARY	2016	3.8	18.1
FEBRUARY	2016	3.8	18.0
MARCH	2016	3.6	18.8
APRIL	2016	3.4	20.2
MAY	2016	3.5	20.1
JUNE	2016	3.5	20.3
JULY	2016	4.0	20.2
AUGUST	2016	3.9	20.9
SEPTEMBER	2016	4.0	20.1

COMBINED ELECTRIC & GAS DISTRIBUTION COMPANIES

		DIVIDEND YIELD	PRICE EARNINGS MULTIPLE
YEAR	2006	3.2	18.7
YEAR	2007	3.3	18.3
YEAR	2008	4.0	15.7
YEAR	2009	5.2	12.8
YEAR	2010	4.5	16.2
YEAR	2011	4.4	17.9
YEAR	2012	4.2	18.2
YEAR	2013	4.0	19.1
YEAR	2014	3.7	19.3
YEAR	2015	3.6	19.1
YEAR TO DATE	2016	3.5	21.8
OCTOBER	2015	3.9	17.0
NOVEMBER	2015	3.6	19.1
DECEMBER	2015	3.8	19.7
JANUARY	2016	3.7	19.9
FEBRUARY	2016	3.8	19.9
MARCH	2016	3.6	21.3
APRIL	2016	3.4	21.7
MAY	2016	3.4	21.4
JUNE	2016	3.4	22.2
JULY	2016	3.3	23.2
AUGUST	2016	3.2	23.6
SEPTEMBER	2016	3.3	22.7

2

NATURAL GAS DISTRIBUTION TRANSM. & INTEGRATED COMPANIES

		DIVIDEND YIELD	PRICE EARNINGS MULTIPLE
YEAR	2006	3.1	17.2
YEAR	2007	2.9	19.5
YEAR	2008	13.1	17.4
YEAR	2009	3.8	14.4
YEAR	2010	3.2	18.6
YEAR	2011	3.0	20.2
YEAR	2012	3.3	28.8
YEAR	2013	3.3	20.5
YEAR	2014	3.2	21.1
YEAR	2015	3.4	20.2
YEAR TO DATE	2016	3.2	23.6
OCTOBER	2015	3.7	19.5
NOVEMBER	2015	3.4	21.0
DECEMBER	2015	3.6	21.0
JANUARY	2016	3.7	20.1
FEBRUARY	2016	3.6	20.5
MARCH	2016	3.4	23.0
APRIL	2016	3.3	23.1
MAY	2016	2.9	23.7
JUNE	2016	3.1	24.4
JULY	2016	3.0	25.0
AUGUST	2016	2.9	26.6
SEPTEMBER	2016	3.0	25.6

WATER COMPANIES

		DIVIDEND YIELD	PRICE EARNINGS MULTIPLE
YEAR	2006	2.8	30.9
YEAR	2007	2.8	28.1
YEAR	2008	3.1	23.1
YEAR	2009	3.5	21.3
YEAR	2010	3.4	23.7
YEAR	2011	3.3	21.7
YEAR	2012	3.3	21.2
YEAR	2013	3.0	21.0
YEAR	2014	3.0	22.2
YEAR	2015	2.8	20.7
YEAR TO DATE	2016	2.4	25.5
OCTOBER	2015	2.9	20.0
NOVEMBER	2015	2.6	21.2
DECEMBER	2015	2.8	21.6
JANUARY	2016	2.7	22.3
FEBRUARY	2016	2.7	22.4
MARCH	2016	2.5	24.7
APRIL	2016	2.5	24.8
MAY	2016	2.4	26.0
JUNE	2016	2.4	25.6
JULY	2016	2.2	28.2
AUGUST	2016	2.1	29.3
SEPTEMBER	2016	2.3	26.4

ELECTRIC COMPANIES

COMPANY	LATEST 12 MONTHS EARNINGS AVAILABLE	PER SHARE EARNINGS	PER SHARE CURRENT ANNUAL DIVIDEND	DATA ($) BOOK VALUE (1)	DATA ($) STOCK PRICE 08/23/16	DATA ($) COMMON SHARES O/S MILL	PERCENT (2) DIV PAYOUT	PERCENT (2) DIV YIELD	PERCENT (2) MKT/ BOOK	DIV/ BOOK (2)	PRICE EARN MULT
ALLETE, Inc. (NYSE-ALE)	6/16	3.03	2.08	37.49	60.39	49.4	69	3.4	161.1	5.5	19.9
American Electric Power Co. (NYSE-AEP)	6/16	4.05	2.24	37.40	66.28	491.7	55	3.4	177.2	6.0	16.4
Edison International (NYSE-EIX)	6/16	2.70	1.92	35.47	73.97	325.8	71	2.6	208.5	5.4	27.4
El Paso Electric Company (NYSE-EE)	6/16	1.83	1.24	25.05	45.51	40.4	68	2.7	181.7	5.0	24.9
FirstEnergy Corporation (ASE-FE)	6/16	-1.39	1.44	26.83	32.92	425.2	NM	4.4	122.7	5.4	NM
Great Plains Energy Incorporated (NYSE-GXP)	6/16	1.34	1.04	23.56	28.10	154.8	78	3.7	119.3	4.4	21.0
Hawaiian Electric Industries, Inc. (NYSE-HE)	6/16	1.57	1.24	18.17	30.07	108.2	79	4.1	165.5	6.8	19.2
IDACORP, Inc. (NYSE-IDA)	6/16	3.72	2.04	41.46	77.30	50.4	55	2.6	186.4	4.9	20.8
Nextera Energy (NYSE-NEE)	6/16	5.55	3.48	50.16	25.86	462.0	63	13.5	51.5	6.9	4.7
OGE Energy Corp. (NYSE-OGE)	6/16	1.18	1.12	16.63	31.29	199.7	95	3.6	188.2	6.7	26.5
Otter Tail Corporation (NDQ-OTTR)	6/16	1.59	1.24	16.44	34.28	38.7	78	3.6	208.5	7.5	21.6
Pinnacle West Capital Corp. (NYSE-PNW)	6/16	3.79	2.48	41.24	76.85	111.2	65	3.2	186.3	6.0	20.3
PNM Resources, Inc. (NYSE-PNM)	6/16	0.09	0.88	42.62	33.11	39.1	NM	2.7	77.7	2.1	NM
Portland General Electric Company (NYSE-POR)	6/16	2.07	1.28	25.90	42.68	88.9	62	3.0	164.8	4.9	20.6
PPL Corporation (NYSE-PPL)	6/16	2.60	1.52	15.24	35.26	677.5	58	4.3	231.4	10.0	13.6
Southern Company (NYSE-SO)	6/16	2.52	2.24	24.04	51.71	941.2	89	4.3	215.1	9.3	20.5
Westar Energy, Inc. (NYSE-WR)	6/16	2.21	1.52	26.08	54.49	141.7	69	2.8	208.9	5.8	24.7
AVERAGE							70	4.0	167.9	6.0	20.1

ELECTRIC COMPANIES

COMPANY	TOTAL REV $ MILL (1)	% REG ELEC REV	NET PLANT $ MILL	NET PLANT PER $ REV (1)	S&P BOND RATING	MOODY'S BOND RATING	COMMON EQUITY RATIO (3)	%RETURN ON BOOK VALUE COMMON EQUITY (4)	%RETURN ON BOOK VALUE TOTAL CAPITAL	REGULATION ALLOWED ROE	REGULATION ORDER DATE
ALLETE, Inc. (NYSE-ALE)	1,491.7	66	3,631.3	2.43	A-	A3	54.2	8.2	6.6	10.64	1/1/2013
American Electric Power Co. (NYSE-AEP)	15,983.8	82	47,436.2	2.97	BBB/BBB-	Baa1	46.0	11.1	6.6	10.12	10/3/2013
Edison International (NYSE-EIX)	11,321.0	100	35,629.0	3.15	BBB+	A2/A3	44.3	7.8	5.8	10.82	5/9/2013
El Paso Electric Company (NYSE-EE)	842.3	100	2,752.2	3.27	BBB	Baa1	42.3	7.4	5.9	11.25	12/8/2001
FirstEnergy Corporation (ASE-FE)	14,934.0	71	37,461.0	2.51	BBB	Baa2	33.5	NM	1.5	10.45	3/2/2010
Great Plains Energy Incorporated (NYSE-GXP)	2,587.0	100	8,798.7	3.40	BBB	Baa2	46.5	5.7	6.3	9.50	7/1/2014
Hawaiian Electric Industries, Inc. (NYSE-HE)	2,458.4	89	4,483.0	1.82	BBB-	Baa2	49.5	8.8	6.3	9.67	5/31/2013
IDACORP, Inc. (NYSE-IDA)	1,251.0	100	4,045.3	3.23	A-	A3	54.1	9.2	7.3	NM	3/1/2012
Nextera Energy (NYSE-NEE)	16,675.0	67	64,157.0	3.85	A-/BBB+	A2/A3	41.2	11.5	8.0	10.50	1/1/2013
OGE Energy Corp. (NYSE-OGE)	2,151.4	100	7,469.9	3.47	BBB+	A3	53.3	7.2	6.3	9.98	6/17/2011
Otter Tail Corporation (NDQ-OTTR)	798.5	52	1,428.6	1.79	BBB-	Baa2	51.6	9.8	7.9	10.62	7/1/2016
Pinnacle West Capital Corp. (NYSE-PNW)	3,526.1	100	12,132.1	3.44	BBB	A3/Baa1	51.1	9.4	7.2	10.00	5/15/2012
PNM Resources, Inc. (NYSE-PNM)	1,379.7	100	4,790.2	3.47	BBB	Baa2	37.3	0.4	3.0	10.21	8/8/2011
Portland General Electric Company (NYSE-POR)	1,890.0	100	6,284.0	3.32	A-	A3	49.8	8.2	6.5	9.60	1/1/2016
PPL Corporation (NYSE-PPL)	7,454.0	60	30,794.0	4.13	A-	Baa1/Baa2	34.0	17.3	8.9	10.35	12/5/2012
Southern Company (NYSE-SO)	17,393.0	94	63,893.0	3.67	A	A3/Baa1	37.1	10.7	6.3	11.46	2/13/2013
Westar Energy, Inc. (NYSE-WR)	2,469.7	100	8,800.7	3.56	A-	A3/Baa1	49.0	8.7	6.6	10.15	3/1/2016
AVERAGE							45.6	8.8	6.3	10.33	

COMBINATION ELECTRIC & GAS COMPANIES

COMPANY	LATEST 12 MONTHS EARNINGS AVAILABLE	PER SHARE EARNINGS	PER SHARE CURRENT ANNUAL DIVIDEND	DATA ($) BOOK VALUE (1)	DATA ($) STOCK PRICE 08/23/16	DATA ($) COMMON SHARES O/S MILL	PERCENT (2) DIV PAYOUT	PERCENT (2) DIV YIELD	PERCENT (2) MKT/ BOOK	DIV/ BOOK (2)	PRICE EARN MULT
Alliant Energy Corporation (NYSE-LNT)	6/16	3.11	1.16	17.55	38.58	227.3	37	3.0	219.8	6.6	12.4
Ameren Corporation (NYSE-AEE)	6/16	2.54	1.72	28.53	50.42	242.6	68	3.4	176.7	6.0	19.9
Avista Corporation (NYSE-AVA)	6/16	2.11	1.36	25.38	41.63	63.7	64	3.3	164.0	5.4	19.7
Black Hills Corporation (NYSE-BKH)	6/16	0.25	1.68	29.89	59.94	52.3	NM	2.8	200.5	5.6	NM
CenterPoint Energy (NYSE-CNP)	6/16	-1.74	1.04	7.89	22.85	430.7	NM	4.6	289.6	13.2	NM
Chesapeake Utilities Corporation (NYSE-CPK)	6/16	2.74	1.24	24.78	65.55	15.3	45	1.9	264.5	5.0	23.9
CMS Energy Corporation (NYSE-CMS)	6/16	1.95	1.24	14.90	42.82	279.0	64	2.9	287.4	8.3	22.0
Consolidated Edison, Inc. (NYSE-ED)	6/16	3.86	2.68	45.89	76.46	304.0	69	3.5	166.6	5.8	19.8
Dominion Resources, Inc. (NYSE-D)	6/16	3.21	2.80	23.10	75.83	617.0	87	3.7	328.3	12.1	23.6
DTE Energy Company (NYSE-DTE)	6/16	4.12	3.08	48.92	94.61	179.4	75	3.3	193.4	6.3	23.0
Duke Energy Corporation (NYSE-DUK)	6/16	3.79	3.44	57.91	81.45	688.9	91	4.2	140.6	5.9	21.5
Empire District Electric Co. (NYSE-EDE)	6/16	1.33	1.04	18.36	33.90	44.0	78	3.1	184.6	5.7	25.5
Entergy Corporation (NYSE-ETR)	6/16	0.95	3.40	54.54	78.91	178.9	NM	4.3	144.7	6.2	NM
Eversource Energy (NYSE-ES)	6/16	2.72	1.76	33.13	55.28	317.2	65	3.2	166.9	5.3	20.3
Exelon Corporation (NYSE-EXC)	6/16	1.30	1.28	29.22	34.59	888.0	98	3.7	118.4	4.4	26.6
MDU Resources Group, Inc. (NYSE-MDU)	6/16	-0.88	0.76	11.38	23.55	195.3	NM	3.2	206.9	6.7	NM
MGE Energy, Inc. (NYSE-MGEE)	6/16	2.11	1.24	20.28	56.73	34.7	59	2.2	279.7	6.1	26.9
NiSource Inc. (NYSE-NI)	6/16	0.82	0.68	11.83	24.70	322.0	83	2.8	208.8	5.7	30.1
NorthWestern Corporation (NYSE-NWE)	6/16	2.95	2.00	31.33	59.19	52.0	68	3.4	188.9	6.4	20.1
PG&E Corporation (NYSE-PCG)	6/16	1.52	1.96	33.62	63.85	498.1	129	3.1	189.9	5.8	42.0
Public Service Enterprise Group (NYSE-PEG)	6/16	2.77	1.64	26.37	43.81	505.0	59	3.7	166.1	6.2	15.8
SCANA Corporation (NYSE-SCG)	6/16	3.70	2.28	0.00	72.50	142.9	62	3.1	Infinity	Infinity	19.6
Unitil Corporation (ASE-UTL)	6/16	1.75	1.40	20.49	39.72	14.1	80	3.5	193.9	6.8	22.7
Vectren Corporation (NYSE-VVC)	6/16	2.24	1.60	20.55	50.33	82.8	71	3.2	244.9	7.8	22.5
Wisconsin Energy Corporation (NYSE-WEC)	6/16	2.80	2.00	28.08	61.21	315.6	71	3.3	218.0	7.1	21.9
Xcel Energy Inc. (NYSE-XEL)	6/16	2.11	1.36	21.07	42.19	508.0	64	3.2	200.2	6.5	20.0
AVERAGE							72	3.3	Infinity	Infinity	22.7
COMBINED ELECTRIC/COMBINATION ELECTRIC & GAS AVERAGES							71	3.6	Infinity	Infinity	21.4

COMBINATION ELECTRIC & GAS COMPANIES

COMPANY	TOTAL REV $ MILL (1)	% REG ELEC REV	% REG GAS REV	NET PLANT $ MILL	NET PLANT PER $ REV (1)	S&P BOND RATING	MOODY'S BOND RATING	COMMON EQUITY RATIO (3)	%RETURN ON BOOK VALUE COMMON EQUITY (4)	%RETURN ON BOOK VALUE TOTAL CAPITAL	REGULATION ALLOWED ROE	REGULATION ORDER DATE
Alliant Energy Corporation (NYSE-LNT)	3,237.4	77	10	9,846.4	3.04	A-	A2/A3	48.0	10.1	7.4	10.31	6/6/2014
Ameren Corporation (NYSE-AEE)	6,002.0	86	19	19,324.0	3.22	BBB+/BBB	Baa1	46.5	9.2	6.9	10.50	1/1/2016
Avista Corporation (NYSE-AVA)	1,438.0	69	33	3,990.7	2.78	A-	Baa1	49.7	8.6	6.6	10.05	1/11/2016
Black Hills Corporation (NYSE-BKH)	1,365.8	50	45	4,389.9	3.21	BBB	A3/Baa1	31.8	1.2	3.2	10.53	6/10/2016
CenterPoint Energy (NYSE-CNP)	6,979.0	42	36	11,898.0	1.70	A-/BBB+	A3/Baa1	28.4	NM	NM	9.87	7/19/2016
Chesapeake Utilities Corporation (NYSE-CPK)	445.1	17	53	908.8	2.04	NR	NR	53.0	11.5	7.9	10.46	11/1/2014
CMS Energy Corporation (NYSE-CMS)	6,167.0	69	26	15,187.0	2.46	BBB+/BBB	A3/Baa1	30.3	13.6	7.3	10.50	11/1/2015
Consolidated Edison, Inc. (NYSE-ED)	12,100.0	71	14	32,600.0	2.69	A-/BBB+	A3	47.8	8.6	6.6	9.70	4/20/2015
Dominion Resources, Inc. (NYSE-D)	11,046.0	65	1	43,682.0	3.95	A-	A3/Baa1	31.7	14.4	6.7	9.88	7/1/2015
DTE Energy Company (NYSE-DTE)	9,913.0	50	13	18,295.0	1.85	A-/BBB+	A2/A3	47.5	8.6	6.6	10.65	10/20/2011
Duke Energy Corporation (NYSE-DUK)	22,911.0	91	2	77,329.0	3.38	BBB+	A3	47.2	6.6	5.4	10.17	5/1/2013
Empire District Electric Co. (NYSE-EDE)	597.1	93	6	2,048.6	3.43	A-	Baa1	47.7	7.3	6.1	NM	8/19/2008
Entergy Corporation (NYSE-ETR)	10,952.3	82	1	29,069.7	2.65	BBB+/BBB	Baa2/Baa3	39.2	1.7	3.6	10.25	9/13/2012
Eversource Energy (NYSE-ES)	7,447.2	89	11	20,448.5	2.75	A-	A3/Baa1	50.3	8.4	6.1	9.32	6/12/2010
Exelon Corporation (NYSE-EXC)	28,585.0	43	4	70,693.0	2.47	BBB+/BBB	Baa1	41.0	5.6	4.5	9.55	6/4/2016
MDU Resources Group, Inc. (NYSE-MDU)	4,292.1	7	20	3,974.6	0.93	BBB+	NR	52.6	NM	8.5	10.75	12/30/2013
MGE Energy, Inc. (NYSE-MGEE)	540.9	76	24	1,266.8	2.34	AA-	Aa2	64.4	10.6	8.6	10.30	7/26/2013
NiSource Inc. (NYSE-NI)	4,249.2	37	51	12,555.9	2.95	BBB-	Baa1/Baa2	34.4	5.1	4.7	10.61	2/28/2014
NorthWestern Corporation (NYSE-NWE)	1,223.4	80	20	4,109.7	3.36	NR	A3	44.2	9.1	6.7	10.00	12/1/2015
PG&E Corporation (NYSE-PCG)	16,860.0	82	18	48,597.0	2.88	BBB/BBB-	A3/Baa1	47.6	4.6	4.6	10.40	12/20/2012
Public Service Enterprise Group (NYSE-PEG)	9,487.0	36	17	28,014.0	2.95	A-/BBB+	A2	54.9	10.8	7.8	10.30	6/18/2010
SCANA Corporation (NYSE-SCG)	4,102.0	61	18	0.0	0.00	BBB+	Baa1/Baa2	NaN	19.7	14.7	10.49	10/15/2014
Unitil Corporation (ASE-UTL)	377.4	52	47	834.6	2.21	NR	NR	42.7	8.6	7.0	9.52	5/30/2014
Vectren Corporation (NYSE-VVC)	2,296.0	26	32	3,805.5	1.66	A/A-	A2	49.2	11.1	8.0	10.34	4/27/2011
Wisconsin Energy Corporation (NYSE-WEC)	7,343.8	62	28	19,398.9	2.64	A-/BBB+	A1/A2	47.1	10.2	7.0	9.82	1/1/2016
Xcel Energy Inc. (NYSE-XEL)	10,819.3	85	14	31,823.3	2.94	A-	A3	42.9	10.2	7.0	9.46	12/3/2015
AVERAGE								NaN	9.0	6.8	10.15	
COMBINED ELECTRIC/COMBINATION ELECTRIC & GAS AVERAGES								NaN	8.9	6.5	10.24	

NATURAL GAS DISTRIBUTION & INTEGRATED NAT. GAS COMPANIES

COMPANY	LATEST 12 MONTHS EARNINGS AVAILABLE	PER SHARE EARNINGS	PER SHARE CURRENT ANNUAL DIVIDEND	DATA ($) BOOK VALUE (1)	DATA ($) STOCK PRICE 08/23/16	DATA ($) COMMON SHARES O/S MILL	PERCENT (2) DIV PAYOUT	PERCENT (2) DIV YIELD	PERCENT (2) MKT/ BOOK	DIV/ BOOK (2)	PRICE EARN MULT
Atmos Energy Corporation (NYSE-ATO)	6/16	3.30	1.68	33.39	74.90	103.8	51	2.2	224.3	5.0	22.7
Delta Natural Gas Company (NDQ-DGAS)	3/16	0.73	0.84	11.11	25.51	7.1	115	3.3	229.6	7.6	34.9
Gas Natural, Inc. (NDQ-EGAS)	6/16	0.22	0.32	9.04	7.52	10.5	145	4.3	83.2	3.5	34.2
National Fuel Gas Company (NYSE-NFG)	6/16	-6.12	1.64	17.98	58.26	84.9	NM	2.8	324.0	9.1	NM
New Jersey Resources Corp. (NYSE-NJR)	6/16	1.25	0.96	13.60	34.27	86.1	77	2.8	252.0	7.1	27.4
Northwest Natural Gas Co. (NYSE-NWN)	6/16	2.24	1.88	29.04	61.52	27.6	84	3.1	211.8	6.5	27.5
Piedmont Natural Gas Co., Inc. (NYSE-PNY)	4/16	1.70	1.36	19.11	59.92	81.2	80	2.3	313.6	7.1	35.2
Questar Corporation (NYSE-STR)	6/16	1.11	0.88	7.75	24.99	175.4	79	3.5	322.5	11.4	22.5
RGC Resources, Inc. (NDQ-RGCO)	6/16	1.19	0.80	11.84	23.62	4.8	67	3.4	199.5	6.8	19.8
South Jersey Industries, Inc. (NYSE-SJI)	6/16	1.43	1.04	16.07	30.52	79.5	73	3.4	189.9	6.5	21.3
Southwest Gas Corporation (NYSE-SWX)	6/16	3.06	1.80	34.63	71.95	47.5	59	2.5	207.8	5.2	23.5
Spire, Inc. (NYSE-SR)	6/16	2.55	1.96	39.53	66.63	45.6	77	2.9	168.6	5.0	26.1
UGI Corporation (NYSE-UGI)	6/16	2.27	0.96	16.96	45.40	173.9	42	2.1	267.7	5.7	20.0
WGL Holdings, Inc. (NYSE-WGL)	6/16	3.54	1.96	1.21	64.09	1,162.3	55	3.1	5,296.7	162.0	18.1
AVERAGE							77	3.0	592.2	17.7	25.6

NATURAL GAS DISTRIBUTION & INTEGRATED NAT. GAS COMPANIES

COMPANY	TOTAL REV $ MILL (1)	% REG GAS REV	NET PLANT $ MILL	NET PLANT PER $ REV (1)	S&P BOND RATING	MOODY'S BOND RATING	COMMON EQUITY RATIO (3)	%RETURN ON BOOK VALUE		REGULATION	
								COMMON EQUITY (4)	TOTAL CAPITAL	ALLOWED ROE	ORDER DATE
Atmos Energy Corporation (NYSE-ATO)	3,328.3	72	8,053.5	2.42	A-	A2	52.6	10.1	7.3	9.81	9/9/2014
Delta Natural Gas Company (NDQ-DGAS)	65.2	63	137.8	2.11	NR	NR	60.2	6.7	5.9	10.40	10/1/2010
Gas Natural, Inc. (NDQ-EGAS)	97.9	89	140.5	1.44	NR	NR	63.5	2.4	1.9	12.63	NA
National Fuel Gas Company (NYSE-NFG)	1,461.0	47	4,447.8	3.04	BBB	Baa1	42.3	NM	NM	9.50	12/12/2007
New Jersey Resources Corp. (NYSE-NJR)	1,850.0	32	2,304.0	1.25	A+	Aa2	48.9	9.5	6.2	10.30	10/1/2008
Northwest Natural Gas Co. (NYSE-NWN)	678.6	97	2,214.5	3.26	AA-	A1	51.7	7.8	6.6	9.80	11/1/2012
Piedmont Natural Gas Co., Inc. (NYSE-PNY)	1,151.0	91	4,535.4	3.94	A	A2	44.3	9.3	6.6	10.33	11/1/2015
Questar Corporation (NYSE-STR)	1,137.4	98	3,889.2	3.42	A/A-	A2	48.2	14.6	9.6	9.68	3/1/2015
RGC Resources, Inc. (NDQ-RGCO)	58.8	98	127.9	2.17	NR	NR	58.0	10.2	7.9	9.75	5/9/2014
South Jersey Industries, Inc. (NYSE-SJI)	886.3	50	2,514.9	2.84	A	A2	51.1	9.0	5.6	9.75	10/1/2014
Southwest Gas Corporation (NYSE-SWX)	2,469.8	57	4,000.1	1.62	A-	A3	52.7	9.1	7.0	9.75	6/12/2014
Spire, Inc. (NYSE-SR)	858.6	101	3,028.0	3.53	NR	NR	48.0	12.4	8.0	0.00	-
UGI Corporation (NYSE-UGI)	5,792.3	13	5,108.2	0.88	NR	A2	36.2	14.0	8.0	11.60	8/11/2011
WGL Holdings, Inc. (NYSE-WGL)	2,357.3	45	3,950.2	1.68	A+	A1	47.2	13.3	8.5	9.58	11/22/2013
AVERAGE							50.4	9.9	6.9	9.49	

WATER COMPANIES

COMPANY	LATEST 12 MONTHS EARNINGS AVAILABLE	PER SHARE EARNINGS	PER SHARE CURRENT ANNUAL DIVIDEND	DATA ($) BOOK VALUE (1)	DATA ($) STOCK PRICE 08/23/16	COMMON SHARES O/S MILL	PERCENT (2) DIV PAYOUT	PERCENT (2) DIV YIELD	PERCENT (2) MKT/ BOOK	DIV/ BOOK (2)	PRICE EARN MULT
American States Water Co. (NYSE-AWR)	6/16	1.60	0.88	13.04	40.43	36.6	55	2.2	310.0	6.7	25.3
American Water Works Co., Inc. (NYSE-AWK)	6/16	2.74	1.52	28.37	76.49	181.6	55	2.0	269.6	5.4	27.9
Aqua America, Inc. (NYSE-WTR)	6/16	1.16	0.76	10.10	31.64	177.3	66	2.4	313.3	7.5	27.3
Artesian Resources Corp. (NDQ-ARTNA)	6/16	1.25	0.88	16.46	29.93	8.2	70	2.9	181.8	5.3	23.9
California Water Service Group (NYSE-CWT)	6/16	0.92	0.68	13.27	31.40	48.0	74	2.2	236.6	5.1	34.1
Connecticut Water Service, Inc. (NDQ-CTWS)	6/16	2.16	1.12	20.59	49.43	11.2	52	2.3	240.1	5.4	22.9
Middlesex Water Company (NDQ-MSEX)	6/16	1.33	0.80	13.03	35.61	16.3	60	2.2	273.3	6.1	26.8
SJW Corporation (NYSE-SJW)	6/16	2.23	0.80	19.37	42.83	20.4	36	1.9	221.1	4.1	19.2
York Water Company (NDQ-YORW)	6/16	0.97	0.64	8.70	29.02	12.9	66	2.2	333.6	7.4	29.9
AVERAGE							59	2.3	264.4	5.9	26.4

WATER COMPANIES

COMPANY	TOTAL REV $ MILL (1)	% REG WATER REV	NET PLANT $ MILL	NET PLANT PER $ REV (1)	S&P BOND RATING	MOODY'S BOND RATING	COMMON EQUITY RATIO (3)	% RETURN ON BOOK VALUE		REGULATION	
								COMMON EQUITY (4)	TOTAL CAPITAL	ALLOWED ROE	ORDER DATE
American States Water Co. (NYSE-AWR)	448.6	71	1,107.1	2.47	A+	A2	55.3	12.5	9.7	9.43	1/1/2013
American Water Works Co., Inc. (NYSE-AWK)	3,249.2	86	14,317.0	4.41	A+/A	A3/Baa1	42.9	9.6	6.9	9.75	12/12/2012
Aqua America, Inc. (NYSE-WTR)	814.6	97	4,823.5	5.92	AA-	NR	49.3	11.9	8.1	9.79	5/2/2014
Artesian Resources Corp. (NDQ-ARTNA)	77.4	94	413.6	5.35	NR	NR	55.2	8.7	7.4	10.00	5/2/2014
California Water Service Group (NYSE-CWT)	596.1	97	1,785.1	2.99	AA-	NR	50.0	7.0	6.0	9.43	1/1/2013
Connecticut Water Service, Inc. (NDQ-CTWS)	100.6	98	568.4	5.65	A/A-	NR	51.7	10.7	7.4	9.63	3/25/2014
Middlesex Water Company (NDQ-MSEX)	128.9	87	497.1	3.86	A	NR	58.6	10.6	7.6	9.75	8/19/2014
SJW Corporation (NYSE-SJW)	318.6	103	1,068.7	3.35	A	NR	47.8	12.1	8.5	9.43	1/1/2013
York Water Company (NDQ-YORW)	47.1	100	263.7	5.60	A-	NR	57.0	11.3	9.0	NM	2/28/2014
AVERAGE							52.0	10.5	7.8	9.65	

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AUS INDUSTRY RANKINGS

Dividend Yield
Market/Book Ratio
Price Earnings Multiple
Return on Book Value
of Common Equity

Industry rankings are based on the financial statistics reported in the preceding pages. These rankings are organized and presented for the reader's convenience. They do not represent a recommendation to buy or sell shares of common stock.

ELECTRIC COMPANIES

DIVIDEND YIELD

HIGH		LOW	
Nextera Energy (NYSE-NEE)	13.5	Edison International (NYSE-EIX)	2.6
FirstEnergy Corporation (ASE-FE)	4.4	IDACORP, Inc. (NYSE-IDA)	2.6
Southern Company (NYSE-SO)	4.3	PNM Resources, Inc. (NYSE-PNM)	2.7
PPL Corporation (NYSE-PPL)	4.3	El Paso Electric Company (NYSE-EE)	2.7
Hawaiian Electric Industries, Inc. (NYSE-HE)	4.1	Westar Energy, Inc. (NYSE-WR)	2.8
Great Plains Energy Incorporated (NYSE-GXP)	3.7	Portland General Electric Company (NYSE-POR)	3.0
Otter Tail Corporation (NDQ-OTTR)	3.6	Pinnacle West Capital Corp. (NYSE-PNW)	3.2
OGE Energy Corp. (NYSE-OGE)	3.6	American Electric Power Co. (NYSE-AEP)	3.4
ALLETE, Inc. (NYSE-ALE)	3.4	ALLETE, Inc. (NYSE-ALE)	3.4
American Electric Power Co. (NYSE-AEP)	3.4	OGE Energy Corp. (NYSE-OGE)	3.6

MARKET/BOOK RATIO

HIGH		LOW	
PPL Corporation (NYSE-PPL)	231.4	Nextera Energy (NYSE-NEE)	51.5
Southern Company (NYSE-SO)	215.1	PNM Resources, Inc. (NYSE-PNM)	77.7
Westar Energy, Inc. (NYSE-WR)	208.9	Great Plains Energy Incorporated (NYSE-GXP)	119.3
Edison International (NYSE-EIX)	208.5	FirstEnergy Corporation (ASE-FE)	122.7
Otter Tail Corporation (NDQ-OTTR)	208.5	ALLETE, Inc. (NYSE-ALE)	161.1
OGE Energy Corp. (NYSE-OGE)	188.2	Portland General Electric Company (NYSE-POR)	164.8
IDACORP, Inc. (NYSE-IDA)	186.4	Hawaiian Electric Industries, Inc. (NYSE-HE)	165.5
Pinnacle West Capital Corp. (NYSE-PNW)	186.3	American Electric Power Co. (NYSE-AEP)	177.2
El Paso Electric Company (NYSE-EE)	181.7	El Paso Electric Company (NYSE-EE)	181.7
American Electric Power Co. (NYSE-AEP)	177.2	Pinnacle West Capital Corp. (NYSE-PNW)	186.3

PRICE/EARNINGS MULTIPLE

HIGH		LOW	
Edison International (NYSE-EIX)	27.4	Nextera Energy (NYSE-NEE)	4.7
OGE Energy Corp. (NYSE-OGE)	26.5	PPL Corporation (NYSE-PPL)	13.6
El Paso Electric Company (NYSE-EE)	24.9	American Electric Power Co. (NYSE-AEP)	16.4
Westar Energy, Inc. (NYSE-WR)	24.7	Hawaiian Electric Industries, Inc. (NYSE-HE)	19.2
Otter Tail Corporation (NDQ-OTTR)	21.6	ALLETE, Inc. (NYSE-ALE)	19.9
Great Plains Energy Incorporated (NYSE-GXP)	21.0	Pinnacle West Capital Corp. (NYSE-PNW)	20.3
IDACORP, Inc. (NYSE-IDA)	20.8	Southern Company (NYSE-SO)	20.5
Portland General Electric Company (NYSE-POR)	20.6	Portland General Electric Company (NYSE-POR)	20.6
Southern Company (NYSE-SO)	20.5	IDACORP, Inc. (NYSE-IDA)	20.8
Pinnacle West Capital Corp. (NYSE-PNW)	20.3	Great Plains Energy Incorporated (NYSE-GXP)	21.0

RETURN ON BOOK VALUE OF COMMON EQUITY

HIGH		LOW	
PPL Corporation (NYSE-PPL)	17.3	PNM Resources, Inc. (NYSE-PNM)	0.4
Nextera Energy (NYSE-NEE)	11.5	Great Plains Energy Incorporated (NYSE-GXP)	5.7
American Electric Power Co. (NYSE-AEP)	11.1	OGE Energy Corp. (NYSE-OGE)	7.2
Southern Company (NYSE-SO)	10.7	El Paso Electric Company (NYSE-EE)	7.4
Otter Tail Corporation (NDQ-OTTR)	9.8	Edison International (NYSE-EIX)	7.8
Pinnacle West Capital Corp. (NYSE-PNW)	9.4	Portland General Electric Company (NYSE-POR)	8.2
IDACORP, Inc. (NYSE-IDA)	9.2	ALLETE, Inc. (NYSE-ALE)	8.2
Hawaiian Electric Industries, Inc. (NYSE-HE)	8.8	Westar Energy, Inc. (NYSE-WR)	8.7
Westar Energy, Inc. (NYSE-WR)	8.7	Hawaiian Electric Industries, Inc. (NYSE-HE)	8.8
ALLETE, Inc. (NYSE-ALE)	8.2	IDACORP, Inc. (NYSE-IDA)	9.2

COMBINATION ELECTRIC & GAS COMPANIES

DIVIDEND YIELD

HIGH		LOW	
CenterPoint Energy (NYSE-CNP)	4.6	Chesapeake Utilities Corporation (NYSE-CPK)	1.9
Entergy Corporation (NYSE-ETR)	4.3	MGE Energy, Inc. (NYSE-MGEE)	2.2
Duke Energy Corporation (NYSE-DUK)	4.2	NiSource Inc. (NYSE-NI)	2.8
Public Service Enterprise Group (NYSE-PEG)	3.7	Black Hills Corporation (NYSE-BKH)	2.8
Exelon Corporation (NYSE-EXC)	3.7	CMS Energy Corporation (NYSE-CMS)	2.9
Dominion Resources, Inc. (NYSE-D)	3.7	Alliant Energy Corporation (NYSE-LNT)	3.0
Unitil Corporation (ASE-UTL)	3.5	Empire District Electric Co. (NYSE-EDE)	3.1
Consolidated Edison, Inc. (NYSE-ED)	3.5	PG&E Corporation (NYSE-PCG)	3.1
Ameren Corporation (NYSE-AEE)	3.4	SCANA Corporation (NYSE-SCG)	3.1
NorthWestern Corporation (NYSE-NWE)	3.4	Vectren Corporation (NYSE-VVC)	3.2

MARKET/BOOK RATIO

HIGH		LOW	
SCANA Corporation (NYSE-SCG)	Infinity	Exelon Corporation (NYSE-EXC)	118.4
Dominion Resources, Inc. (NYSE-D)	328.3	Duke Energy Corporation (NYSE-DUK)	140.6
CenterPoint Energy (NYSE-CNP)	289.6	Entergy Corporation (NYSE-ETR)	144.7
CMS Energy Corporation (NYSE-CMS)	287.4	Avista Corporation (NYSE-AVA)	164.0
MGE Energy, Inc. (NYSE-MGEE)	279.7	Public Service Enterprise Group (NYSE-PEG)	166.1
Chesapeake Utilities Corporation (NYSE-CPK)	264.5	Consolidated Edison, Inc. (NYSE-ED)	166.6
Vectren Corporation (NYSE-VVC)	244.9	Eversource Energy (NYSE-ES)	166.9
Alliant Energy Corporation (NYSE-LNT)	219.8	Ameren Corporation (NYSE-AEE)	176.7
Wisconsin Energy Corporation (NYSE-WEC)	218.0	Empire District Electric Co. (NYSE-EDE)	184.6
NiSource Inc. (NYSE-NI)	208.8	NorthWestern Corporation (NYSE-NWE)	188.9

PRICE/EARNINGS MULTIPLE

HIGH		LOW	
PG&E Corporation (NYSE-PCG)	42.0	Alliant Energy Corporation (NYSE-LNT)	12.4
NiSource Inc. (NYSE-NI)	30.1	Public Service Enterprise Group (NYSE-PEG)	15.8
MGE Energy, Inc. (NYSE-MGEE)	26.9	SCANA Corporation (NYSE-SCG)	19.6
Exelon Corporation (NYSE-EXC)	26.6	Avista Corporation (NYSE-AVA)	19.7
Empire District Electric Co. (NYSE-EDE)	25.5	Consolidated Edison, Inc. (NYSE-ED)	19.8
Chesapeake Utilities Corporation (NYSE-CPK)	23.9	Ameren Corporation (NYSE-AEE)	19.9
Dominion Resources, Inc. (NYSE-D)	23.6	Xcel Energy Inc. (NYSE-XEL)	20.0
DTE Energy Company (NYSE-DTE)	23.0	NorthWestern Corporation (NYSE-NWE)	20.1
Unitil Corporation (ASE-UTL)	22.7	Eversource Energy (NYSE-ES)	20.3
Vectren Corporation (NYSE-VVC)	22.5	Duke Energy Corporation (NYSE-DUK)	21.5

RETURN ON BOOK VALUE OF COMMON EQUITY

HIGH		LOW	
SCANA Corporation (NYSE-SCG)	19.7	Black Hills Corporation (NYSE-BKH)	1.2
Dominion Resources, Inc. (NYSE-D)	14.4	Entergy Corporation (NYSE-ETR)	1.7
CMS Energy Corporation (NYSE-CMS)	13.6	PG&E Corporation (NYSE-PCG)	4.6
Chesapeake Utilities Corporation (NYSE-CPK)	11.5	NiSource Inc. (NYSE-NI)	5.1
Vectren Corporation (NYSE-VVC)	11.1	Exelon Corporation (NYSE-EXC)	5.6
Public Service Enterprise Group (NYSE-PEG)	10.8	Duke Energy Corporation (NYSE-DUK)	6.6
MGE Energy, Inc. (NYSE-MGEE)	10.6	Empire District Electric Co. (NYSE-EDE)	7.3
Xcel Energy Inc. (NYSE-XEL)	10.2	Eversource Energy (NYSE-ES)	8.4
Wisconsin Energy Corporation (NYSE-WEC)	10.2	Consolidated Edison, Inc. (NYSE-ED)	8.6
Alliant Energy Corporation (NYSE-LNT)	10.1	Unitil Corporation (ASE-UTL)	8.6

NATURAL GAS DIST. & INT GAS COMPANIES

DIVIDEND YIELD

HIGH		LOW	
Gas Natural, Inc. (NDQ-EGAS)	4.3	UGI Corporation (NYSE-UGI)	2.1
Questar Corporation (NYSE-STR)	3.5	Atmos Energy Corporation (NYSE-ATO)	2.2
South Jersey Industries, Inc. (NYSE-SJI)	3.4	Piedmont Natural Gas Co., Inc. (NYSE-PNY)	2.3
RGC Resources, Inc. (NDQ-RGCO)	3.4	Southwest Gas Corporation (NYSE-SWX)	2.5
Delta Natural Gas Company (NDQ-DGAS)	3.3	New Jersey Resources Corp. (NYSE-NJR)	2.8
WGL Holdings, Inc. (NYSE-WGL)	3.1	National Fuel Gas Company (NYSE-NFG)	2.8
Northwest Natural Gas Co. (NYSE-NWN)	3.1	Spire, Inc. (NYSE-SR)	2.9
Spire, Inc. (NYSE-SR)	2.9	Northwest Natural Gas Co. (NYSE-NWN)	3.1
National Fuel Gas Company (NYSE-NFG)	2.8	WGL Holdings, Inc. (NYSE-WGL)	3.1
New Jersey Resources Corp. (NYSE-NJR)	2.8	Delta Natural Gas Company (NDQ-DGAS)	3.3

MARKET/BOOK RATIO

HIGH		LOW	
WGL Holdings, Inc. (NYSE-WGL)	5296.7	Gas Natural, Inc. (NDQ-EGAS)	83.2
National Fuel Gas Company (NYSE-NFG)	324.0	Spire, Inc. (NYSE-SR)	168.6
Questar Corporation (NYSE-STR)	322.5	South Jersey Industries, Inc. (NYSE-SJI)	189.9
Piedmont Natural Gas Co., Inc. (NYSE-PNY)	313.6	RGC Resources, Inc. (NDQ-RGCO)	199.5
UGI Corporation (NYSE-UGI)	267.7	Southwest Gas Corporation (NYSE-SWX)	207.8
New Jersey Resources Corp. (NYSE-NJR)	252.0	Northwest Natural Gas Co. (NYSE-NWN)	211.8
Delta Natural Gas Company (NDQ-DGAS)	229.6	Atmos Energy Corporation (NYSE-ATO)	224.3
Atmos Energy Corporation (NYSE-ATO)	224.3	Delta Natural Gas Company (NDQ-DGAS)	229.6
Northwest Natural Gas Co. (NYSE-NWN)	211.8	New Jersey Resources Corp. (NYSE-NJR)	252.0
Southwest Gas Corporation (NYSE-SWX)	207.8	UGI Corporation (NYSE-UGI)	267.7

PRICE/EARNINGS MULTIPLE

HIGH		LOW	
Piedmont Natural Gas Co., Inc. (NYSE-PNY)	35.2	WGL Holdings, Inc. (NYSE-WGL)	18.1
Delta Natural Gas Company (NDQ-DGAS)	34.9	RGC Resources, Inc. (NDQ-RGCO)	19.8
Gas Natural, Inc. (NDQ-EGAS)	34.2	UGI Corporation (NYSE-UGI)	20.0
Northwest Natural Gas Co. (NYSE-NWN)	27.5	South Jersey Industries, Inc. (NYSE-SJI)	21.3
New Jersey Resources Corp. (NYSE-NJR)	27.4	Questar Corporation (NYSE-STR)	22.5
Spire, Inc. (NYSE-SR)	26.1	Atmos Energy Corporation (NYSE-ATO)	22.7
Southwest Gas Corporation (NYSE-SWX)	23.5	Southwest Gas Corporation (NYSE-SWX)	23.5
Atmos Energy Corporation (NYSE-ATO)	22.7	Spire, Inc. (NYSE-SR)	26.1
Questar Corporation (NYSE-STR)	22.5	New Jersey Resources Corp. (NYSE-NJR)	27.4
South Jersey Industries, Inc. (NYSE-SJI)	21.3	Northwest Natural Gas Co. (NYSE-NWN)	27.5

RETURN ON BOOK VALUE OF COMMON EQUITY

HIGH		LOW	
Questar Corporation (NYSE-STR)	14.6	Gas Natural, Inc. (NDQ-EGAS)	2.4
UGI Corporation (NYSE-UGI)	14.0	Delta Natural Gas Company (NDQ-DGAS)	6.7
WGL Holdings, Inc. (NYSE-WGL)	13.3	Northwest Natural Gas Co. (NYSE-NWN)	7.8
Spire, Inc. (NYSE-SR)	12.4	South Jersey Industries, Inc. (NYSE-SJI)	9.0
RGC Resources, Inc. (NDQ-RGCO)	10.2	Southwest Gas Corporation (NYSE-SWX)	9.1
Atmos Energy Corporation (NYSE-ATO)	10.1	Piedmont Natural Gas Co., Inc. (NYSE-PNY)	9.3
New Jersey Resources Corp. (NYSE-NJR)	9.5	New Jersey Resources Corp. (NYSE-NJR)	9.5
Piedmont Natural Gas Co., Inc. (NYSE-PNY)	9.3	Atmos Energy Corporation (NYSE-ATO)	10.1
Southwest Gas Corporation (NYSE-SWX)	9.1	RGC Resources, Inc. (NDQ-RGCO)	10.2
South Jersey Industries, Inc. (NYSE-SJI)	9.0	Spire, Inc. (NYSE-SR)	12.4

WATER COMPANIES

DIVIDEND YIELD

HIGH		LOW	
Artesian Resources Corp. (NDQ-ARTNA)	2.9	SJW Corporation (NYSE-SJW)	1.9
Aqua America, Inc. (NYSE-WTR)	2.4	American Water Works Co., Inc. (NYSE-AWK)	2.0
Connecticut Water Service, Inc. (NDQ-CTWS)	2.3	California Water Service Group (NYSE-CWT)	2.2
Middlesex Water Company (NDQ-MSEX)	2.2	American States Water Co. (NYSE-AWR)	2.2

MARKET/BOOK RATIO

HIGH		LOW	
York Water Company (NDQ-YORW)	333.6	Artesian Resources Corp. (NDQ-ARTNA)	181.8
Aqua America, Inc. (NYSE-WTR)	313.3	SJW Corporation (NYSE-SJW)	221.1
American States Water Co. (NYSE-AWR)	310.0	California Water Service Group (NYSE-CWT)	236.6
Middlesex Water Company (NDQ-MSEX)	273.3	Connecticut Water Service, Inc. (NDQ-CTWS)	240.1

PRICE/EARNINGS MULTIPLE

HIGH		LOW	
California Water Service Group (NYSE-CWT)	34.1	SJW Corporation (NYSE-SJW)	19.2
York Water Company (NDQ-YORW)	29.9	Connecticut Water Service, Inc. (NDQ-CTWS)	22.9
American Water Works Co., Inc. (NYSE-AWK)	27.9	Artesian Resources Corp. (NDQ-ARTNA)	23.9
Aqua America, Inc. (NYSE-WTR)	27.3	American States Water Co. (NYSE-AWR)	25.3

RETURN ON BOOK VALUE OF COMMON EQUITY

HIGH		LOW	
American States Water Co. (NYSE-AWR)	12.5	California Water Service Group (NYSE-CWT)	7.0
SJW Corporation (NYSE-SJW)	12.1	Artesian Resources Corp. (NDQ-ARTNA)	8.7
Aqua America, Inc. (NYSE-WTR)	11.9	American Water Works Co., Inc. (NYSE-AWK)	9.6
York Water Company (NDQ-YORW)	11.3	Middlesex Water Company (NDQ-MSEX)	10.6

GLOSSARY OF TERMS

Latest 12 Month Earnings Available -
Earnings per share as reported, based upon the latest 12 months ending as of the last day of the month reported in this column.

Earnings -
Earnings per share as reported before extraordinary items for the latest 12 months ending on the date reported.

Current Annual Dividend -
Latest quarterly dividend per share annualized.

Book Value -
Common equity divided by Common Shares Outstanding for the latest end figures available.

Price -
Closing market price per share of common stock on the date cited at the head of the column.

Common Shares Outstanding -
Common shares Outstanding for the latest quarter end figures available.

Dividend Payout -
Annualized Dividend per share divided by the reported Earnings per Share, multiplied by 100.

Dividend Yield -
Annualized Dividend per share divided by the market price per share of common stock reported, multiplied by 100.

Market/Book Ratio -
Market price per share of common stock reported, divided by the reported Book Value per share multiplied by 100.

Dividend/Book Ratio -
Annualized Dividend per share divided by the reported Book Value per share, multiplied by 100.

Price-Earnings Multiple Ratio -
Market price per share of common stock reported divided by the reported earnings per share.

Total Revenue - This is the total operating revenue for the latest 12 months as available. It includes regulated and non-regulated revenue.

% Electric / Gas / Water / Telephone Revenue -
Percentage of regulated revenues attributable to Elec./Gas/Water/Tele. operations relative to total Operating Revenue. Company groupings are based on revenue percentages and SIC classification criteria.

Net Plant -
Total Property, Plant and Equipment less Depreciation and Contributions in Aid of Construction for the latest quarter end figures available.

Net Plant Per Revenue -
Net Plant as reported divided by Operating Revenue as reported.

Standard & Poor's and Moody's Bond Ratings -
Ratings for each company's most senior long term debt security. For holding companies, ratings are based on an average of the bond ratings available for the regulated subsidiaries.

Common Equity Ratio -
Common Equity capital for the latest quarter divided by total capital as reported, multiplied by 100. Total capital is equal to the sum of long-term debt, current maturities, short-term debt, preferred stock and common equity for the latest quarter end figures available.

% Return on Book Value -- Common Equity -
Income Available for Common Equity divided by Average Common Equity, multiplied by 100. Average common equity based upon the most recent beginning and ending moving 12 month period available.

% Return on Book Value -- Total Capital From Continuing Operations -
Income before Interest Charges (inclusive of taxes) divided by Average Total Capitalization, multiplied by 100. Average total capitalization based upon the most recent beginning and ending four quarter values available.

Allowed R O E -
Most recent reported state-level allowed return rate on common equity (ROE). ROE for companies operating in multiple jurisdictions are averages. Various companies have received incentive-base ROE authorizations that are not reported upon in this report.

Order Date -
The date of the commission order authorizing reported ROE. For companies operating in multiple jurisdictions, no date is given because the reported ROE is an average derived from multiple commission orders issued at different times.

(NYSE) - New York Stock Exchange.

(ASE) - American Stock Exchange.

(NDQ) - NASDAQ.

NM - Not Meaningful.

NA - Not Available.

Additional Notes -

(1) Balance sheet values are the latest quarter end figures as available Income statement figures are for the latest 12 month available

(2) Based on per share value.

(3) Based on total capital. (The sum of long-term debt, current maturities, short term debt, preferred stock and common equity capital.)

(4) In many instances, available information require that Per Share and % Return on Book Value of Common Equity /Total Capital derived from figures that represent financial activity from different 12 month periods.

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IMPORTANT NUMBERS

GOVERNMENT AGENCIES

Federal Communications Commission (FCC)
445 12th Street S.W.
Washington D.C. 20554
(202) 418-0200
http://www.fcc.gov

Federal Energy Regulatory Commission (FERC)
888 First Street, N.E.
Washington D.C. 20426
(202) 208-0200
http://www.ferc.fed.us

Nuclear Regulatory Commission (NRC)
One White Flint North
11555 Rockville Pike
Rockville, MD 20852
(301) 415-7000
http://www.nrc.gov

Securities & Exchange Commission (SEC)
450 Fifth Street, N.W.
Washington D.C. 20549
(202) 942-7040
http://www.sec.gov

TRADE ASSOCIATIONS

American Gas Association (AGA)
400 N. Capitol Street, N.W.
Washington D.C. 20001
(202) 824-7000
http://www.aga.org

Edison Electric Institute (EEI)
701 Pennsylvania Ave., N.W.
Washington D.C. 20004
(202) 508-5000
http://www.eei.org

National Association of Water Companies (NAWC)
1725 K Street, N.W.
Suite 1212
Washington D.C. 20006
(202) 833-8383
http://www.nawc.org

United States Telecom Association (USTA)
1401 H. Street, N.W.
Suite 600
Washington D.C. 20005
(202) 326-7300
http://www.usta.org

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The Federal Reserve Board

Remarks by Governor Ben S. Bernanke

At the Sandridge Lecture, Virginia Association of Economists, Richmond, Virginia

Governor Bernanke presented similar remarks with updated data at the Homer Jones Lecture, St. Louis, Missouri, on April 14, 2005.

March 10, 2005

The Global Saving Glut and the U.S. Current Account Deficit

On most dimensions the U.S. economy appears to be performing well. Output growth has returned to healthy levels, the labor market is firming, and inflation appears to be well controlled. However, one aspect of U.S. economic performance still evokes concern among economists and policymakers: the nation's large and growing current account deficit. In the first three quarters of 2004, the U.S. external deficit stood at $635 billion at an annual rate, or about 5-1/2 percent of the U.S. gross domestic product (GDP). Corresponding to that deficit, U.S. citizens, businesses, and governments on net had to raise $635 billion on international capital markets.[1] The current account deficit has been on a steep upward trajectory in recent years, rising from a relatively modest $120 billion (1.5 percent of GDP) in 1996 to $414 billion (4.2 percent of GDP) in 2000 on its way to its current level. Most forecasters expect the nation's current account imbalance to decline slowly at best, implying a continued need for foreign credit and a concomitant decline in the U.S. net foreign asset position.

Why is the United States, with the world's largest economy, borrowing heavily on international capital markets--rather than

lending, as would seem more natural? What implications do the U.S. current account deficit and our consequent reliance on foreign credit have for economic performance in the United States and in our trading partners? What policies, if any, should be used to address this situation? In my remarks today I will offer some tentative answers to these questions. My answers will be somewhat unconventional in that I will take issue with the common view that the recent deterioration in the U.S. current account *primarily* reflects economic policies and other economic developments within the United States itself. Although domestic developments have certainly played a role, I will argue that a satisfying explanation of the recent upward climb of the U.S. current account deficit requires a global perspective that more fully takes into account events outside the United States. To be more specific, I will argue that over the past decade a combination of diverse forces has created a significant increase in the global supply of saving--a global saving glut--which helps to explain both the increase in the U.S. current account deficit and the relatively low level of long-term real interest rates in the world today. The prospect of dramatic increases in the ratio of retirees to workers in a number of major industrial economies is one important reason for the high level of global saving. However, as I will discuss, a particularly interesting aspect of the global saving glut has been a remarkable reversal in the flows of credit to developing and emerging-market economies, a shift that has transformed those economies from borrowers on international capital markets to large net lenders.

To be clear, in locating the principal causes of the U.S. current account deficit outside the country's borders, I am not making a value judgment about the behavior of either U.S. or foreign residents or their governments. Rather, I believe that understanding the influence of global factors on the U.S. current account deficit is essential for understanding the effects of the deficit and for devising policies to address it. Of course, as always, the views I express today are not necessarily shared by my colleagues at the Federal Reserve.[2]

The U.S. Current Account Deficit: Two Perspectives

We will find it helpful to consider, as background for the analysis of the U.S. current account deficit, two alternative ways of thinking about the phenomenon--one that relates the deficit to the patterns of U.S. trade and a second that focuses on saving, investment, and international financial flows. Although these two ways of viewing the current account derive from accounting identities and thus are ultimately two sides of the same coin, each provides a useful lens for examining the issue.

The first perspective on the current account focuses on patterns of international trade. You are probably aware that the United States has been experiencing a substantial trade imbalance in recent years, with U.S. imports of goods and services from abroad outstripping U.S. exports to other countries by a wide margin. According to preliminary data, in 2004 the United States imported $1.76 trillion worth of goods and services while exporting goods and services valued at only $1.15 trillion. Reflecting this imbalance in trade, current payments from U.S. residents to foreigners (consisting primarily of our spending on imports, but also including certain other types of payments, such as remittances, interest, and dividends) greatly exceed the analogous payments that U.S. residents receive from abroad. By definition, this excess of U.S. payments to foreigners over payments received in a given period equals the U.S. current account deficit, which, as I have already noted, was on track to equal $635 billion in 2004--close to the $618 billion by which the value of U.S. imports exceeded that of exports.

When U.S. receipts from its sales of exports and other current payments are insufficient to cover the cost of U.S. imports and other payments to foreigners, U.S. households, firms, and governments on net must borrow the difference on international capital markets.[3] Thus, essentially by definition, in each period U.S. net foreign borrowing equals the U.S. current account deficit, which in turn is closely linked to the imbalance in U.S. international trade.

That the nation's imports currently far exceed its exports is both widely understood and of concern to many Americans, particularly

those whose livelihoods depend on the viability of exporting and import-competing industries. The extensive attention paid to the trade imbalance in the media and elsewhere has tempted some observers to ascribe the growing current account deficit to factors such as changes in the quality or composition of U.S. and foreign-made products, changes in trade policy, or unfair foreign competition. However, I believe--and I suspect that most economists would agree--that specific trade-related factors cannot explain either the magnitude of the U.S. current account imbalance or its recent sharp rise. Rather, the U.S. trade balance is the tail of the dog; for the most part, it has been passively determined by foreign and domestic incomes, asset prices, interest rates, and exchange rates, which are themselves the products of more fundamental driving forces. Instead, an alternative perspective on the current account appears likely to be more useful for explaining recent developments. This second perspective focuses on international financial flows and the basic fact that, within each country, saving and investment need not be equal in each period.

In the United States, as in all countries, economic growth requires investment in new capital goods and the upgrading and replacement of older capital. Examples of capital investment include the construction of factories and office buildings and firms' acquisition of new equipment, ranging from drill presses to computers to airplanes. Residential construction--the building of new homes and apartment buildings--is also counted as part of capital investment.[4]

All investment in new capital goods must be financed in some manner. In a closed economy without trade or international capital flows, the funding for investment would be provided entirely by the country's national saving. By definition, national saving is the sum of saving done by households (for example, through contributions to employer-sponsored 401k accounts) and saving done by businesses (in the form of retained earnings) less any budget deficit run by the government (which is a use rather than a source of saving)[5].

As I say, in a closed economy investment would equal national saving in each period; but, in fact, virtually all economies today are open economies, and well-developed international capital markets allow savers to lend to those who wish to make capital investments in any country, not just their own. Because saving can cross international borders, a country's domestic investment in new capital and its domestic saving need not be equal in each period. If a country's saving exceeds its investment during a particular year, the difference represents excess saving that can be lent on international capital markets. By the same token, if a country's saving is less than the amount required to finance domestic investment, the country can close the gap by borrowing from abroad. In the United States, national saving is currently quite low and falls considerably short of U.S. capital investment. Of necessity, this shortfall is made up by net foreign borrowing--essentially, by making use of foreigners' saving to finance part of domestic investment. We saw earlier that the current account deficit equals the net amount that the United States borrows abroad in each period, and I have just shown that U.S. net foreign borrowing equals the excess of U.S. capital investment over U.S. national saving. It follows that the country's current account deficit equals the excess of its investment over its saving.

To summarize, I have described two equivalent ways of interpreting the current account deficit, one in terms of trade flows and related payments and one in terms of investment and national saving. In general, the perspective one takes depends on the particular analysis at hand.

As I have already suggested, most economists who have offered explanations of the high and rising level of the U.S. current account deficit and the country's foreign borrowing have emphasized investment-saving behavior rather than trade-related factors (and I will do the same today). Along these lines, one commonly hears that the U.S. current account deficit is the product of a precipitous decline in the U.S. national saving rate, which in recent years has fallen to a level that is far from adequate to fund domestic investment. For example, in 1985 U.S. gross national saving was 18 percent of GDP,

and in 1995 it was 16 percent of GDP; in 2004, by contrast, U.S. national saving was less than 14 percent of GDP. Those who emphasize the role of low U.S. saving often go on to conclude that, for the most part, the U.S. current account deficit is "made in the U.S.A." and is independent (to a first approximation) of developments in other parts of the globe.

That inadequate U.S. national saving is the source of the current account deficit must be true at some level; indeed, the statement is almost a tautology. However, linking current-account developments to the decline in saving begs the question of *why* U.S. saving has declined. In particular, although the decline in U.S. saving may reflect changes in household behavior or economic policy in the United States, it may also be in some part a reaction to events external to the United States--a hypothesis that I will propose and defend momentarily.

One popular argument for the "made in the U.S.A." explanation of declining national saving and the rising current account deficit focuses on the burgeoning U.S. federal budget deficit, which in 2004 drained more than $400 billion from the national saving pool. I will discuss the link between the budget deficit and the current account deficit in more detail later. Here I simply note that the so-called twin-deficits hypothesis, that government budget deficits cause current account deficits, does not account for the fact that the U.S. external deficit expanded by about $300 billion between 1996 and 2000, a period during which the federal budget was in surplus and projected to remain so. Nor, for that matter, does the twin-deficits hypothesis shed any light on why a number of major countries, including Germany and Japan, continue to run large current account *surpluses* despite government budget deficits that are similar in size (as a share of GDP) to that of the United States. It seems unlikely, therefore, that changes in the U.S. government budget position can entirely explain the behavior of the U.S. current account over the past decade.

The Changing Pattern of International Capital Flows and the Global Saving Glut

What then accounts for the rapid increase in the U.S. current account deficit? My own preferred explanation focuses on what I see as the emergence of a global saving glut in the past eight to ten years. This saving glut is the result of a number of developments. As I will discuss in more detail later, one well-understood source of the saving glut is the strong saving motive of rich countries with aging populations, which must make provision for an impending sharp increase in the number of retirees relative to the number of workers. With slowly growing or declining workforces, as well as high capital-labor ratios, many advanced economies outside the United States also face an apparent dearth of domestic investment opportunities. As a consequence of high desired saving and the low prospective returns to domestic investment, the mature industrial economies as a group seek to run current account surpluses and thus to lend abroad.[6]

Although strong saving motives on the part of many industrial economies contribute to the global saving glut, the saving behavior of these countries does not explain much of the *increase* in desired global saving in the past decade. Indeed, in a number of these countries--Japan is one example--household saving has declined recently. As we will see, a possibly more important source of the rise in the global supply of saving is the recent metamorphosis of the developing world from a net user to a net supplier of funds to international capital markets.

Table 1 provides a basis for a discussion of recent changes in global saving and financial flows by showing current account balances for different countries and regions, in billions of U.S. dollars, for the years 1996 (just before the U.S. current account deficit began to balloon) and 2003 (the most recent year for which complete data are available). I should note that these current account balances of necessity reflect realized patterns of investment and saving rather than changes in the rates of investment and saving desired from an *ex ante* perspective. Nevertheless, changes in the pattern of current account balances together with knowledge of changes in real interest

rates should provide useful clues about shifts in the global supply of and demand for saving.

The table confirms the sharp increase in the U.S. current account deficit, about $410 billion between 1996 and 2003. (Data from the first three quarters of 2004 imply that the current account deficit rose last year by an additional $140 billion at an annual rate.) In principle, the current account positions of the world's nations should sum to zero (although, in practice, data collection problems lead to a large statistical discrepancy, shown in the last row of table 1). The $410 billion increase in the U.S. current account deficit between 1996 and 2003 must therefore have been matched by a shift toward surplus of equal magnitude in other countries. Which countries experienced this change?

As we can infer from table 1, most of the swing toward surplus did not occur in the other industrial countries as a whole (although some individual industrial countries did experience large moves toward surplus, as we will see). The collective current account of the industrial countries declined more than $388 billion between 1996 and 2003, implying that, of the $410 billion increase in the U.S. current account deficit, only about $22 billion was offset by increased surpluses in other industrial countries. As table 1 shows, the bulk of the increase in the U.S. current account deficit was balanced by changes in the current account positions of developing countries, which moved from a collective deficit of $88 billion to a surplus of $205 billion--a net change of $293 billion-- between 1996 and 2003.[7] The available data suggest that the current accounts of developing and emerging-market economies swung a further $60 billion into surplus in 2004.

This remarkable change in the current account balances of developing countries raises at least three questions. First, what events or factors induced this change? Second, what causal relationship (if any) exists between this change and current-account developments in the United States and in other industrial countries? Third, to the extent that the movement toward surplus in developing-country

current accounts has had a differential impact on the United States relative to other industrial countries, what accounts for the difference?

In my view, a key reason for the change in the current account positions of developing countries is the series of financial crises those countries experienced in the past decade or so. In the mid-1990s, most developing countries were net importers of capital; as table 1 shows, in 1996 emerging Asia and Latin America borrowed about $80 billion on net on world capital markets. These capital inflows were not always productively used. In some cases, for example, developing-country governments borrowed to avoid necessary fiscal consolidation; in other cases, opaque and poorly governed banking systems failed to allocate those funds to the projects promising the highest returns. Loss of lender confidence, together with other factors such as overvalued fixed exchange rates and debt that was both short-term and denominated in foreign currencies, ultimately culminated in painful financial crises, including those in Mexico in 1994, in a number of East Asian countries in 1997-98, in Russia in 1998, in Brazil in 1999, and in Argentina in 2002. The effects of these crises included rapid capital outflows, currency depreciation, sharp declines in domestic asset prices, weakened banking systems, and recession.

In response to these crises, emerging-market nations either chose or were forced into new strategies for managing international capital flows. In general, these strategies involved shifting from being net importers of financial capital to being net exporters, in some cases very large net exporters. For example, in response to instability of capital flows and the exchange rate, some East Asian countries, such as Korea and Thailand, began to build up large quantities of foreign-exchange reserves and continued to do so even after the constraints imposed by the halt to capital inflows from global financial markets were relaxed. Increases in foreign-exchange reserves necessarily involve a shift toward surplus in the country's current account, increases in gross capital inflows, reductions in gross private capital outflows, or some combination of these elements. As table 1 shows,

current account surpluses have been an important source of reserve accumulation in East Asia.

Countries in the region that had escaped the worst effects of the crisis but remained concerned about future crises, notably China, also built up reserves. These "war chests" of foreign reserves have been used as a buffer against potential capital outflows. Additionally, reserves were accumulated in the context of foreign exchange interventions intended to promote export-led growth by preventing exchange-rate appreciation. Countries typically pursue export-led growth because domestic demand is thought to be insufficient to employ fully domestic resources. Following the 1997-98 financial crisis, many of the East Asian countries seeking to stimulate their exports had high domestic rates of saving and, relative to historical norms, depressed levels of domestic capital investment--also consistent, of course, with strengthened current accounts.

In practice, these countries increased reserves through the expedient of issuing debt to their citizens, thereby mobilizing domestic saving, and then using the proceeds to buy U.S. Treasury securities and other assets. Effectively, governments have acted as financial intermediaries, channeling domestic saving away from local uses and into international capital markets. A related strategy has focused on reducing the burden of external debt by attempting to pay down those obligations, with the funds coming from a combination of reduced fiscal deficits and increased domestic debt issuance. Of necessity, this strategy also pushed emerging-market economies toward current account surpluses. Again, the shifts in current accounts in East Asia and Latin America are evident in the data for the regions and for individual countries shown in table 1.

Another factor that has contributed to the swing toward current-account surplus among the non-industrialized nations in the past few years is the sharp rise in oil prices. The current account surpluses of oil exporters, notably in the Middle East but also in countries such as Russia, Nigeria, and Venezuela, have risen as oil revenues have surged. For example, as table 1 shows, the collective current account

surplus of the Middle East and Africa rose more than $40 billion between 1996 and 2003; it continued to swell in 2004 as oil prices increased yet further. In short, events since the mid-1990s have led to a large change in the collective current account position of the developing world, implying that many developing and emerging-market countries are now large net lenders rather than net borrowers on international financial markets.

Of course, developing countries as a group can increase their current account surpluses only if the industrial countries reduce their current accounts accordingly. How did this occur? Little evidence supports the view that the motivation to save has declined substantially in the industrial countries in recent years; indeed, as I have noted already, demographic factors should lead the industrial countries to try to save more, not less. Instead, the requisite shift in the collective external position of the industrial countries was facilitated by adjustments in asset prices and exchange rates, although the pattern of asset-price changes was somewhat different before and after 2000.

From about 1996 to early 2000, equity prices played a key equilibrating role in international financial markets. The development and adoption of new technologies and rising productivity in the United States--together with the country's long-standing advantages such as low political risk, strong property rights, and a good regulatory environment--made the U.S. economy exceptionally attractive to international investors during that period. Consequently, capital flowed rapidly into the United States, helping to fuel large appreciations in stock prices and in the value of the dollar. Stock indexes rose in other industrial countries as well, although stock-market capitalization per capita is significantly lower in those countries than in the United States.

The current account positions of the industrial countries adjusted endogenously to these changes in financial market conditions. I will focus here on the case of the United States, which bore the bulk of the adjustment. From the trade perspective, higher stock-market wealth increased the willingness of U.S. consumers to spend on

goods and services, including large quantities of imports, while the strong dollar made U.S. imports cheap (in terms of dollars) and exports expensive (in terms of foreign currencies), creating a rising trade imbalance. From the saving-investment perspective, the U.S. current account deficit rose as capital investment increased (spurred by perceived profit opportunities) at the same time that the rapid increase in household wealth and expectations of future income gains reduced U.S. residents' perceived need to save. Thus the rapid increase in the U.S. current account deficit between 1996 and 2000 was fueled to a significant extent both by increased global saving and the greater interest on the part of foreigners in investing in the United States.

After the stock-market decline that began in March 2000, new capital investment and thus the demand for financing waned around the world. Yet desired global saving remained strong. The textbook analysis suggests that, with desired saving outstripping desired investment, the real rate of interest should fall to equilibrate the market for global saving. Indeed, real interest rates have been relatively low in recent years, not only in the United States but also abroad. From a narrow U.S. perspective, these low long-term rates are puzzling; from a global perspective, they may be less so.[8]

The weakening of new capital investment after the drop in equity prices did not much change the net effect of the global saving glut on the U.S. current account. The transmission mechanism changed, however, as low real interest rates rather than high stock prices became a principal cause of lower U.S. saving. In particular, during the past few years, the key asset-price effects of the global saving glut appear to have occurred in the market for residential investment, as low mortgage rates have supported record levels of home construction and strong gains in housing prices. Indeed, increases in home values, together with a stock-market recovery that began in 2003, have recently returned the wealth-to-income ratio of U.S. households to 5.4, not far from its peak value of 6.2 in 1999 and above its long-run (1960-2003) average of 4.8. The expansion of U.S. housing wealth, much of it easily accessible to households

through cash-out refinancing and home equity lines of credit, has kept the U.S. national saving rate low--and indeed, together with the significant worsening of the federal budget outlook, helped to drive it lower. As U.S. business investment has recently begun a cyclical recovery while residential investment has remained strong, the domestic saving shortfall has continued to widen, implying a rise in the current account deficit and increasing dependence of the United States on capital inflows.[9]

According to the story I have sketched thus far, events outside U.S. borders--such as the financial crises that induced emerging-market countries to switch from being international borrowers to international lenders--have played an important role in the evolution of the U.S. current account deficit, with transmission occurring primarily through endogenous changes in equity values, house prices, real interest rates, and the exchange value of the dollar. One might ask why the current-account effects of the increase in desired global saving were felt disproportionately in the United States relative to other industrial countries. The attractiveness of the United States as an investment destination during the technology boom of the 1990s and the depth and sophistication of the country's financial markets (which, among other things, have allowed households easy access to housing wealth) have certainly been important. Another factor is the special international status of the U.S. dollar. Because the dollar is the leading international reserve currency, and because some emerging-market countries use the dollar as a reference point when managing the values of their own currencies, the saving flowing out of the developing world has been directed relatively more into dollar-denominated assets, such as U.S. Treasury securities. The effects of the saving outflow may thus have been felt disproportionately on U.S. interest rates and the dollar. For example, the dollar probably strengthened more in the latter 1990s than it would have if it had not been the principal reserve currency, enhancing the effect on the U.S. current account.

Most interesting, however, is that the experience of the United States in recent years is not so nearly unique among industrial countries as

one might think initially. As shown in table 1, a number of key industrial countries other than the United States have seen their current accounts move substantially toward deficit since 1996, including France, Italy, Spain, Australia, and the United Kingdom. The principal exceptions to this trend among the major industrial countries are Germany and Japan, both of which saw substantial increases in their current account balances between 1996 and 2003 (and significant further increases in 2004). A key difference between the two groups of countries is that the countries whose current accounts have moved toward deficit have generally experienced substantial housing appreciation and increases in household wealth, while Germany and Japan--whose economies have been growing slowly despite very low interest rates--have not. For example, wealth-to-income ratios have risen since 1996 by 14 percent in France, 12 percent in Italy, and 27 percent in the United Kingdom; each of these countries has seen their current account move toward deficit, as already noted. By contrast, wealth-to-income ratios in Germany and Japan have remained flat.[10] The evident link between rising household wealth and a tendency for the current account to shift toward deficit is consistent with the mechanism that I have described today.

Economic and Policy Implications

I have presented today a somewhat unconventional explanation of the high and rising U.S. current account deficit. That explanation holds that one of the factors driving recent developments in the U.S. current account has been the very substantial shift in the current accounts of developing and emerging-market nations, a shift that has transformed these countries from net borrowers on international capital markets to large net lenders. This shift by developing nations, together with the high saving propensities of Germany, Japan, and some other major industrial nations, has resulted in a global saving glut. This increased supply of saving boosted U.S. equity values during the period of the stock market boom and helped to increase U.S. home values during the more recent period, as a consequence

lowering U.S. national saving and contributing to the nation's rising current account deficit.

From a global perspective, are these developments economically beneficial or harmful? Certainly they have had some benefits. Most obviously, the developing and emerging-market countries that brought their current accounts into surplus did so to reduce their foreign debts, stabilize their currencies, and reduce the risk of financial crisis. Most countries have been largely successful in meeting each of these objectives. Thus, the shift of these economies from borrower to lender status has provided at least a short-term palliative for some of the problems they faced in the 1990s.

In the longer term, however, the current pattern of international capital flows--should it persist--could prove counterproductive. Most important, for the developing world to be lending large sums on net to the mature industrial economies is quite undesirable as a long-run proposition. Relative to their counterparts in the developing world, workers in industrial countries have large quantities of high-quality capital with which to work. Moreover, as I have already noted, the populations of most of these countries are both growing slowly and aging rapidly, implying that ratios of retirees to workers will rise sharply in coming decades. For example, in the United States, for every 100 people between the ages of 20 and 64, there are currently about 21 people aged 65 or older. According to United Nations projections, by 2030 the population of the United States will include about 34 people aged 65 or over for each 100 people in the 20-64 age range; for the Euro area and Japan, the analogous numbers in 2030 will be 46 and 57, respectively. Over the remainder of the century, the populations of other major industrial countries will age much more quickly than that of the United States. In 2050, for example, the number of retirees for each 100 working-age people in the United States should be about the same as in 2030, about 34, but the number of retirees per 100 working-age people is projected to increase to about 60 in the Euro area and about 78 in Japan.

We see that many of the major industrial countries--particularly Japan and some countries in Western Europe--have both strong reasons to save (to help support future retirees) and increasingly limited investment opportunities at home (because workforces are shrinking and capital-labor ratios are already high). In contrast, most developing countries have younger and more-rapidly growing workforces, as well as relatively low ratios of capital to labor, conditions that imply that the returns to capital in those countries may potentially be quite high.[11] Basic economic logic thus suggests that, in the longer term, the industrial countries as a group should be running current account surpluses and lending on net to the developing world, not the other way around. If financial capital were to flow in this "natural" direction, savers in the industrial countries would potentially earn higher returns and enjoy increased diversification, and borrowers in the developing world would have the funds to make the capital investments needed to promote growth and higher living standards. Of course, to ensure that capital flows to developing countries yield these benefits, the developing countries would need to make further progress toward improving conditions for investment, as I will discuss further in a bit.

A second issue concerns the uses of international credit in the United States and other industrial countries with external deficits. Because investment by businesses in equipment and structures has been relatively low in recent years (for cyclical and other reasons) and because the tax and financial systems in the United States and many other countries are designed to promote homeownership, much of the recent capital inflow into the developed world has shown up in higher rates of home construction and in higher home prices. Higher home prices in turn have encouraged households to increase their consumption. Of course, increased rates of homeownership and household consumption are both good things. However, in the long run, productivity gains are more likely to be driven by nonresidential investment, such as business purchases of new machines. The greater the extent to which capital inflows act to augment residential construction and especially current consumption spending, the

greater the future economic burden of repaying the foreign debt is likely to be.

A third concern with the pattern of capital flows arises from the indirect effects of those flows on the sectoral composition of the economies that receive them. In the United States, for example, the growth in export-oriented sectors such as manufacturing has been restrained by the U.S. trade imbalance (although the recent decline in the dollar has alleviated that pressure somewhat), while sectors producing nontraded goods and services, such as home construction, have grown rapidly. To repay foreign creditors, as it must someday, the United States will need large and healthy export industries. The relative shrinkage in those industries in the presence of current account deficits--a shrinkage that may well have to be reversed in the future--imposes real costs of adjustment on firms and workers in those industries.

Finally, the large current account deficit of the United States, in particular, requires substantial flows of foreign financing. As I have discussed today, the underlying sources of the U.S. current account deficit appear to be medium-term or even long-term in nature, suggesting that the situation will eventually begin to improve, although a return to approximate balance may take some time. Fundamentally, I see no reason why the whole process should not proceed smoothly. However, the risk of a disorderly adjustment in financial markets always exists, and the appropriately conservative approach for policymakers is to be on guard for any such developments.

What policy options exist to deal with the U.S. current account deficit? I have downplayed the role of the U.S. federal budget deficit today, and I disagree with the view, sometimes heard, that balancing the federal budget *by itself* would largely defuse the current account issue. In particular, to the extent that a reduction in the federal budget resulted in lower interest rates, the principal effects might be increased consumption and investment spending at home rather than a lower current account deficit. Indeed, a recent study suggests that a

one-dollar reduction in the federal budget deficit would cause the current account deficit to decline less than 20 cents (Erceg, Guerrieri, and Gust, 2005). These results imply that even if we could balance the federal budget tomorrow, the medium-term effect would likely be to reduce the current account deficit by less than one percentage point of GDP.

Although I do not believe that plausible near-term changes in the federal budget would eliminate the current account deficit, I should stress that reducing the federal budget deficit is still a good idea. Although the effects on the current account of reining in the budget deficit would likely be relatively modest, at least the direction is right. Moreover, there are other good reasons to bring down the federal budget deficit, including the reduction of the debt obligations that will have to be serviced by taxpayers in the future. Similar observations apply to policy recommendations to increase household saving in the United States, for example by creating tax-favored saving vehicles. Although the effect of saving-friendly policies on the U.S. current account deficit might not be dramatic, again the direction would be right. Moreover, increasing U.S. national saving from its current low level would support productivity and wealth creation and help our society make better provision for the future.

However, as I have argued today, some of the key reasons for the large U.S. current account deficit are external to the United States, implying that purely inward-looking policies are unlikely to resolve this issue. Thus a more direct approach is to help and encourage developing countries to re-enter international capital markets in their more natural role as borrowers, rather than as lenders. For example, developing countries could improve their investment climates by continuing to increase macroeconomic stability, strengthen property rights, reduce corruption, and remove barriers to the free flow of financial capital. Providing assistance to developing countries in strengthening their financial institutions--for example, by improving bank regulation and supervision and by increasing financial transparency--could lessen the risk of financial crises and thus increase both the willingness of those countries to accept capital

inflows and the willingness of foreigners to invest there. Financial liberalization is a particularly attractive option, as it would help both to permit capital inflows to find the highest-return uses and, by easing borrowing constraints, to spur domestic consumption. Other changes will occur naturally over time. For example, the pace at which emerging-market countries are accumulating international reserves should slow as they increasingly perceive their reserves to be adequate and as they move toward more flexible exchange rates. The factors underlying the U.S. current account deficit are likely to unwind only gradually, however. Thus, we probably have little choice except to be patient as we work to create the conditions in which a greater share of global saving can be redirected away from the United States and toward the rest of the world--particularly the developing nations.

Footnotes

1. As U.S. capital outflows in those three quarters totaled $728 billion at an annual rate, gross financing needs exceeded $1.3 trillion.Return to text

2. I thank David Bowman, Joseph Gagnon, Linda Kole, and Maria Perozek of the Board staff for excellent assistance.Return to text

3. For simplicity, I will use the term "net foreign borrowing" to refer to the financing of the current account deficit, though strictly speaking this financing involves the sale of foreign and domestic assets as well as the issuance of debt securities to foreigners. As illustrated by the data in footnote 1, U.S. gross foreign borrowing is much larger than net foreign borrowing, as gross borrowing must be sufficient to offset not only the deficit in current payments but also U.S. capital outflows.Return to text

4. This definition of capital investment ignores many less tangible forms of investment, such as research and development expenditures. It also ignores investment in human capital, such as educational expenses. Using a more inclusive definition of investment could well

change our perceptions of U.S. saving and investment trends quite substantially. I will leave that topic for another day. Return to text

5. The Bureau of Economic Analysis treats government investment--in roads or schools, for instance--as part of national saving in the national income accounts. Thus, strictly speaking, national saving is reduced by the government deficit net of government investment, not by the entire government deficit. The difference between domestic investment and national saving is not affected by this qualification, however, as government investment and the implied adjustment to national saving cancel each other out. Return to text

6. By "high desired saving" I mean a supply schedule for saving that is shifted far to the right. Actual or realized saving depends on the equilibrium values of the real interest rate and other economic variables. Return to text

7. The statistical discrepancy also increased substantially, by $96 billion on net. As asset accumulation in developing countries may be less completely measured than in industrial countries, a significant part of the change in the discrepancy may represent an additional movement toward surplus in developing-country current accounts. Return to text

8. In pointing out the possible effects of strong global saving on real interest rates, I do not mean to rule out other factors. For example, a lowering of risk premiums resulting from increased macroeconomic and monetary stability has likely played some role. Return to text

9. Greenspan (2005) notes a strong correlation between U.S. mortgage debt and the U.S. current account deficit. Return to text

10. These data are from Annex Table 58, OECD Economic Outlook, vol. 76, 2004, p. 226. The latest year for which data are available is 2003 for Germany and the United Kingdom, 2002 for France, Italy, and Japan. Return to text

11. China is an important exception to the generalization that developing countries have young populations. The country's fertility rate has declined since the 1970s, and its elderly dependency ratio is expected to exceed that of the United States by midcentury. Return to text

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References

Erceg, Christopher, Luca Guerrieri, and Christopher Gust (2005)."Expansionary Fiscal Shocks and the Trade Deficit." International Finance Discussion Paper 2005-825. Washington: Board of Governors of the Federal Reserve System (January).

Greenspan, Alan (2005). "Current account." Speech at Advancing Enterprise 2005 Conference, London, February 4.

Table 1. Global Current Account Balances, 1996 and 2003 (Billions of U.S. dollars)

Countries	1996	2003
Industrial	**46.2**	**-342.3**
United States	-120.2	-530.7
Japan	65.4	138.2
Euro Area	88.5	24.9
France	20.8	4.5
Germany	-13.4	55.1
Italy	39.6	-20.7
Spain	0.4	-23.6
Other	12.5	25.3
Australia	-15.8	-30.4
Canada	3.4	17.1

Switzerland	21.3	42.2
United Kingdom	-10.9	-30.5
Developing	**-87.5**	**205.0**
Asia	-40.8	148.3
China	7.2	45.9
Hong Kong	-2.6	17.0
Korea	-23.1	11.9
Taiwan	10.9	29.3
Thailand	-14.4	8.0
Latin America	-39.1	3.8
Argentina	-6.8	7.4
Brazil	-23.2	4.0
Mexico	-2.5	-8.7
Middle East and Africa	5.9	47.8
E. Europe and the former Soviet Union	-13.5	5.1
Statistical discrepancy	**41.3**	**137.2**

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BROOKINGS

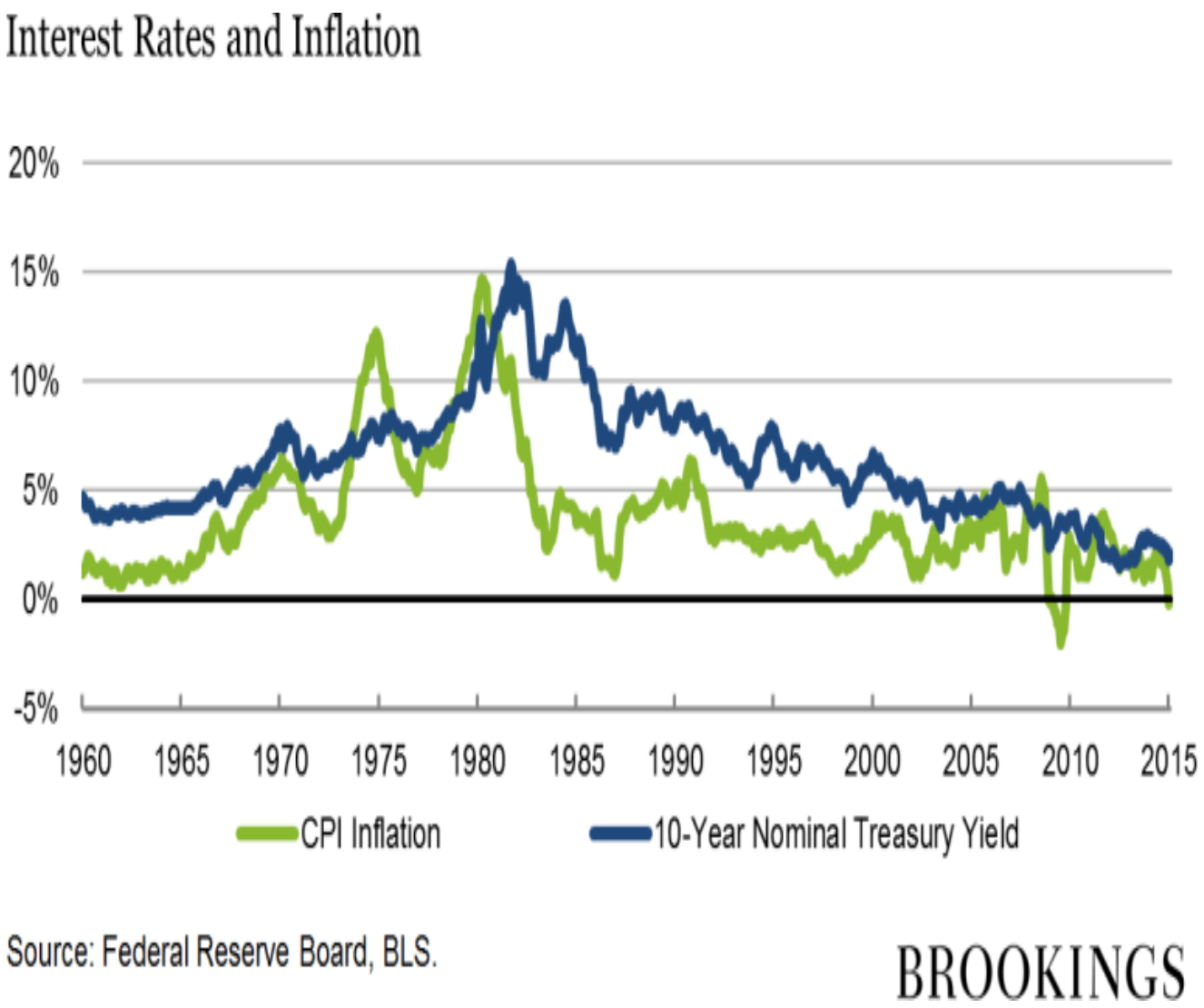
Ben Bernanke

Why are interest rates so low?

Ben S. BernankeMonday, March 30, 2015

Interest rates around the world, both short-term and long-term, are exceptionally low these days. The U.S. government can borrow for ten years at a rate of about 1.9 percent, and for thirty years at about 2.5 percent. Rates in other industrial countries are even lower: For example, the yield on ten-year government bonds is now around 0.2 percent in Germany, 0.3 percent in Japan, and 1.6 percent in the United Kingdom. In Switzerland, the ten-year yield is currently slightly negative, meaning that lenders must pay the Swiss government to hold their money! The interest rates paid by businesses and households are relatively higher, primarily because of credit risk, but are still very low on an historical basis.

Low interest rates are not a short-term aberration, but part of a long-term trend. As the figure below shows, ten-year government bond yields in the United States were relatively low in the 1960s, rose to a peak above 15 percent in 1981, and have been declining ever since. That pattern is partly explained by the rise and fall of inflation, also shown in the figure. All else equal, investors demand higher yields when inflation is high to compensate them for the declining purchasing power of the dollars with which they expect to be repaid. But yields on inflation-protected bonds are also very low today; the real or inflation-adjusted return on lending to the U.S. government for five years is currently about *minus* 0.1 percent.



Why are interest rates so low? Will they remain low? What are the implications for the economy of low interest rates?

If you asked the person in the street, "Why are interest rates so low?", he or she would likely answer that the Fed is keeping them low. That's true only in a very narrow sense. The Fed does, of course, set the benchmark nominal short-term interest rate. The Fed's policies are also the primary determinant of inflation and inflation expectations over the longer term, and inflation trends affect interest rates, as the figure above shows. But what matters most for the economy is the real, or inflation-adjusted, interest rate (the market, or nominal, interest rate minus the inflation rate). The real interest rate is most relevant for capital investment decisions, for example. The Fed's ability to affect real rates of return,

especially longer-term real rates, is transitory and limited. Except in the short run, real interest rates are determined by a wide range of economic factors, including prospects for economic growth—not by the Fed.

To understand why this is so, it helps to introduce the concept of the *equilibrium real interest rate* (sometimes called the Wicksellian interest rate, after the late-nineteenth- and early twentieth-century Swedish economist Knut Wicksell). The equilibrium interest rate is the real interest rate consistent with full employment of labor and capital resources, perhaps after some period of adjustment. Many factors affect the equilibrium rate, which can and does change over time. In a rapidly growing, dynamic economy, we would expect the equilibrium interest rate to be high, all else equal, reflecting the high prospective return on capital investments. In a slowly growing or recessionary economy, the equilibrium real rate is likely to be low, since investment opportunities are limited and relatively unprofitable. Government spending and taxation policies also affect the equilibrium real rate: Large deficits will tend to increase the equilibrium real rate (again, all else equal), because government borrowing diverts savings away from private investment.

If the Fed wants to see full employment of capital and labor resources (which, of course, it does), then its task amounts to using its influence over market interest rates to push those rates toward levels consistent with the equilibrium rate, or—more realistically—its best estimate of the equilibrium rate, which is not directly observable. If the Fed were to try to keep market rates persistently too high, relative to the equilibrium rate, the economy would slow (perhaps falling into recession), because capital investments (and other long-lived purchases, like consumer durables) are unattractive when the cost of borrowing set by the Fed exceeds the potential return on those investments. Similarly, if the Fed were to push market rates too low, below the levels consistent with the equilibrium rate, the economy would eventually overheat, leading to inflation—also an unsustainable and undesirable situation. The bottom line is that the state of the

economy, not the Fed, ultimately determines the real rate of return attainable by savers and investors. The Fed influences market rates but not in an unconstrained way; if it seeks a healthy economy, then it must try to push market rates toward levels consistent with the underlying equilibrium rate.

This sounds very textbook-y, but failure to understand this point has led to some confused critiques of Fed policy. When I was chairman, more than one legislator accused me and my colleagues on the Fed's policy-setting Federal Open Market Committee of "throwing seniors under the bus" (to use the words of one senator) by keeping interest rates low. The legislators were concerned about retirees living off their savings and able to obtain only very low rates of return on those savings.

I was concerned about those seniors as well. But if the goal was for retirees to enjoy sustainably higher real returns, then the Fed's raising interest rates prematurely would have been exactly the wrong thing to do. In the weak (but recovering) economy of the past few years, all indications are that the equilibrium real interest rate has been exceptionally low, probably negative. A premature increase in interest rates engineered by the Fed would therefore have likely led after a short time to an economic slowdown and, consequently, lower returns on capital investments. The slowing economy in turn would have forced the Fed to capitulate and reduce market interest rates again. This is hardly a hypothetical scenario: In recent years, several major central banks have prematurely raised interest rates, only to be forced by a worsening economy to backpedal and retract the increases. Ultimately, the best way to improve the returns attainable by savers was to do what the Fed actually did: keep rates low (closer to the low equilibrium rate), so that the economy could recover and more quickly reach the point of producing healthier investment returns.

A similarly confused criticism often heard is that the Fed is somehow distorting financial markets and investment decisions by keeping interest rates "artificially low." Contrary to what sometimes seems to be alleged, the Fed cannot somehow

withdraw and leave interest rates to be determined by "the markets." The Fed's actions determine the money supply and thus short-term interest rates; it has no choice but to set the short-term interest rate *somewhere*. So where should that be? The best strategy for the Fed I can think of is to set rates at a level consistent with the healthy operation of the economy over the medium term, that is, at the (today, low) equilibrium rate. There is absolutely nothing artificial about that! Of course, it's legitimate to argue about where the equilibrium rate actually is at a given time, a debate that Fed policymakers engage in at their every meeting. But that doesn't seem to be the source of the criticism.

The state of the economy, not the Fed, is the ultimate determinant of the sustainable level of real returns. This helps explain why real interest rates are low throughout the industrialized world, not just in the United States. What features of the economic landscape are the ultimate sources of today's low real rates? I'll tackle that in later posts.

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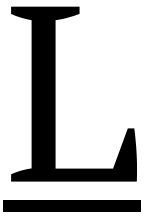
- 

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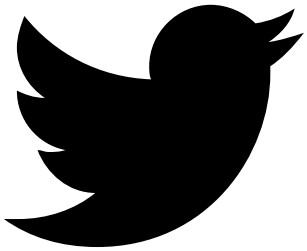

BenBernanke

Ben Bernanke

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The Hutchins Center on Fiscal and Monetary Policy provides independent, non-partisan analysis of fiscal and monetary policy issues in order to improve the quality and effectiveness of those policies and public understanding of them.

Bloomberg

Unstoppable $100 Trillion Bond Market Renders Models Useless

By Susanne Walker and Liz Capo McCormick - Jun 2, 2014

If the insatiable demand for bonds has upended the models you use to value them, you're not alone.

Just last month, researchers at the Federal Reserve Bank of New York retooled a gauge of relative yields on Treasuries, casting aside three decades of data that incorporated estimates for market rates from professional forecasters. Priya Misra, the head of U.S. rates strategy at Bank of America Corp., says a risk metric she's relied on hasn't worked since March.

After unprecedented stimulus by the Fed and other central banks made many traditional models useless, investors and analysts alike are having to reshape their understanding of cheap and expensive as the global market for bonds balloons to $100 trillion. With the world's biggest economies struggling to grow and inflation nowhere in sight, catchphrases such as "new neutral" and "no normal" are gaining currency to describe a reality where bonds are rallying the most in a decade.

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"The world's gotten more complicated and it's a little different," James Evans, a New York-based money manager at Brown Brothers Harriman & Co., which oversees $30 billion, said in a telephone interview on May 30. "As far as predicting direction up and down, I don't think they have much value," referring to bond-market models used by forecasters.

Flawed Consensus

With the Fed paring its $85 billion-a-month bond buying program this year and economists calling for the five-year-long U.S. expansion to finally take off, Wall Street prognosticators said at the start

of the year that yields were bound to rise as central banks began employing tighter monetary policies.

Instead, investors poured into bonds of all types as global growth weakened, disinflation emerged in Europe and tensions between Ukraine and Russia intensified.

Globally, bonds have returned an average 3.89 percent this year for the biggest year-to-date gain since 2003, index data compiled by Bank of America Merrill Lynch show. The advance decreased yields on 10-year Treasuries by more than a half percentage point to 2.48 percent, the fastest pace over the same span since 1995, while borrowing costs for the riskiest U.S. companies tumbled to a record 5.94 percent last week.

Benchmark Treasury 10-year note yields rose six basis points, or 0.06 percentage point, to 2.53 percent as of 3:36 p.m. in New York.

In developed countries, benchmark yields in 24 of 25 nations tracked by Bloomberg have fallen this year, with those in Italy and Spain closing below 3 percent for the first time.

'How Wrong'

"I don't expect the consensus to be right, I'm just surprised by how wrong it has been," Jim Bianco, president of Chicago-based Bianco Research LLC, said by telephone on May 28.

The seemingly unstoppable rally has caused bond-market professionals to reassess whether they're using the right tools.

At the New York Fed, researchers Tobias Adrian, Richard Crump, Benjamin Mills and Emanuel Moench on May 12 released an updated methodology for a metric known as the term premium, which can be used to determine whether 10-year Treasuries are cheap or expensive relative to short-term rates.

After stripping out all human predictions and using only market prices to calculate future expectations, the researchers found the extra yield longer-term Treasuries offered has been "considerably higher since the onset of the financial crisis" than previous models, according to their blog post that included the data. That may be because the metric now suggests the Fed's short-term interest rate may not rise as high as survey-based results predicted, wrote the economists.

Old Model

Based on the old model, last updated on March 31, the term premium on 10-year notes was 0.25 percentage point, versus 0.96 percentage point on the same day using the current methodology. The reading was at 0.67 percentage point last week.

The researchers declined to comment beyond the blog post, according to Eric Pajonk, a spokesman at the New York Fed.

Bank of America's Misra says she stopped looking at the gap between the rate on 10-year interest-rate swaps and yields on benchmark government debt as a measure of risk.

The gauge, which usually widens as investors seek out haven assets in times of stress, is being distorted as those betting on losses in Treasuries have unwound their trades, she said.

Hedge funds and other large speculators cut their net short positions in 10-year note futures by the most since February as of May 27, according to data from the U.S. Commodity Futures Trading Commission. Primary dealers, which had net short positions in March for the first time since 2011, have since reversed those wagers, data compiled by Bloomberg show.

Forced Buying

"Everyone is short and they are forced to cover," Misra said by telephone on May 28.

While economists and strategists have reduced their yield forecasts, they're still sticking to the view borrowing costs will end the year higher as the economy gains momentum.

They now see yields on 10-year Treasuries rising to 3.25 percent by year-end as the economy accelerates 3.1 percent in 2015, estimates compiled by Bloomberg show. At the start of the year, the median yield forecast was 3.44 percent.

Investors risk becoming lulled into complacency by six years of near-zero U.S. interest rates at a time when yields are so low, according to Zach Pandl, the Minneapolis-based senior interest-rate strategist at Columbia Management Investment Advisers, which oversees $340 billion.

Pandl, who developed his own version of the term premium, maintains that U.S. government bonds are too expensive.

"The Treasury market is overvalued," he said by telephone on May 28. "The funds rate has been at zero for so long so it becomes difficult to envision it being higher at all. Monetary policy is closer to exit."

Biggest Mistake

Traditional models are failing to explain the resilience of fixed-income assets as central banks led by the Fed pump trillions of dollars into their economies and suppress short-term rates at historical lows, according to Bianco.

The Fed, Bank of Japan and Bank of England all have quantitative-easing programs in place, while at least two dozen nations have dropped benchmark rates to 1 percent or less.

"The biggest mistake for people is they think interest rates are merely a projection of where the economy is supposed to go," Bianco said. "It's the Fed and the way they have changed the marketplace." He foresees that yields on 10-year notes will end the year at 2 percent to 2.5 percent.

Fed Chair Janet Yellen said on May 7 there will be "considerable time" before the central bank raises its benchmark rate as slack in the jobs market keeps inflation below its 2 percent target.

Household spending declined in April, while the world's largest economy contracted in the first quarter for the first time since 2011, government reports showed last week.

"Given the outlook for the global economy and inflation, bonds are not a bad place to be," Gary Pollack, the New York-based head of fixed-income trading at Deutsche Bank AG's private-wealth management unit, which oversees $12 billion, said in a telephone interview on May 28.

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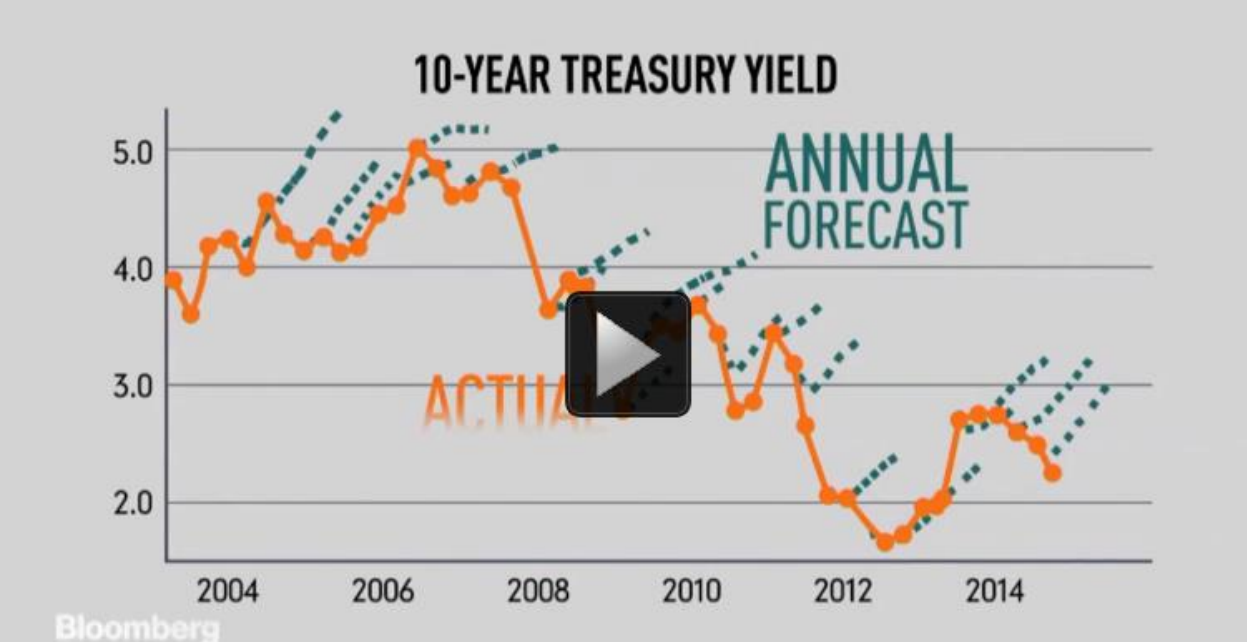
http://www.bloomberg.com/news/articles/2015-03-16/how-interest-rates-keep-making-people-on-wall-street-look-like-fools

How Interest Rates Keep Making People on Wall Street Look Like Fools

Will this be the year they get it right?



If there's one call that investors and economists almost always seem to get wrong, it's the direction of long-term interest rates. For years economists have been predicting that rates would rise, yet rates have been on a downtrend for ages.

Over the years, a variety of reasons have been given for the forecasted rise. Inflation and the amount of government spending have often been cited. You also frequently hear that "rates have nowhere to go but up," yet it turns out that yes, they can keep getting lower.

The ongoing decline in interest rates isn't just a U.S. phenomenon, either. In Europe, many government bonds now carry negative interest rates—a decline some wouldn't have thought possible. In Japan, the term "the widowmaker" has been used to describe the perpetually losing trade of betting on higher government rates.

So why have rates declined so intensely over the years? Inflation has been on a steady downtrend in most places. And as societies get older, the demand for ultra-safe assets, such as government bonds, gets bigger.

And yes, in 2015, analysts are once again predicting higher rates.

BUSINESS INSIDER

Interest rate forecasters are shockingly wrong almost all of the time

AKIN OYEDELE
JUL. 8, 2015, 8:25 AM

Most interest rate forecasters are wrong most of the time.

Very wrong.

The chart below is from Jeff Gundlach's presentation on Tuesday, comparing the US 10-year yield to median economist forecasts over the past five years.

Wikimedia Commons

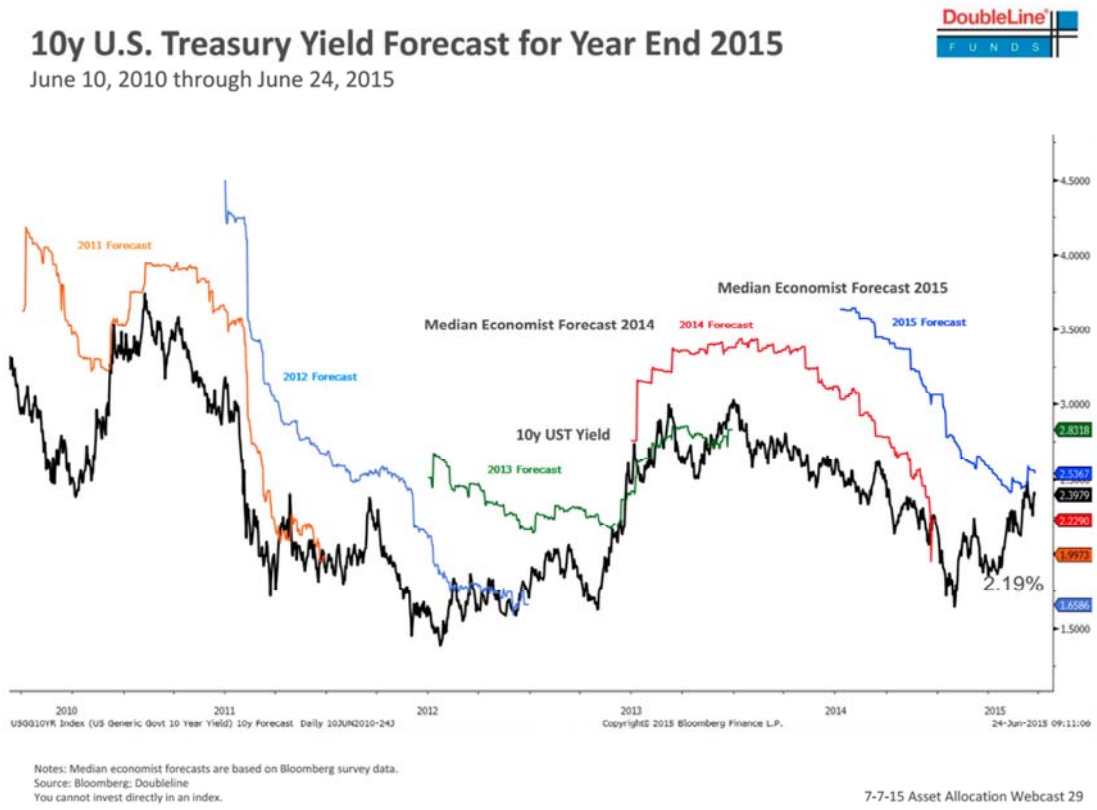
The black line is the 10-year yield, and the colored lines are the paths that economists thought rates would take.

Clearly, these forecasters were wrong most of the time, as there were only a few instances of convergence between both lines.

In 2012, forecasters were hugely bleak about the economy, and thought that interest rates would collapse the whole year. Rates ended the year higher than where they started.

Last year was particularly bad, when strategists became too optimistic that the Federal Reserve would hike rates.

This year, forecasters again thought rates would rise and as rates fell, so did those forecasts, which have now converged with interest rates.



Doubleline Funds

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More: Interest Rates Jeff Gundlach Forecasting

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Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

1a. Are you more or less optimistic about your country's economy compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	216	64.1 %	± 5.1 %
0=No change	66	19.6 %	± 4.3 %
-1=Less optimistic	55	16.3 %	± 4.0 %
Total	337	100.0 %	

Mean = 0.5
SD = 0.8

Missing Cases = 0
Response Percent = 100.0 %

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1b. Rate your optimism about your country's economy on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 7.5

Maximum = 100

Mean = 66.5

Median = 70

Standard Deviation (Unbiased Estimate) = 16.9

95 Percent Confidence Interval Around The Mean = 64.6 - 68.5

Quartiles

1 = 56
2 = 70
3 = 78

Valid Cases =286
Missing Cases =51
Response Percent = 84.9%

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

2a. Are you more or less optimistic about the financial prospects for your own company compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	170	51.1 %	± 5.4 %
0=No change	102	30.6 %	± 4.9 %
-1=Less optimistic	61	18.3 %	± 4.1 %
Total	333	100.0 %	

Mean = 0.3
SD = 0.8

Missing Cases = 4
Response Percent = 98.8 %

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2b. Rate your optimism about the financial prospects for your own company on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 0

Maximum = 100

Mean = 67.4

Median = 70

Standard Deviation (Unbiased Estimate) = 19.5

95 Percent Confidence Interval Around The Mean = 65.2 - 69.7

Quartiles

1 = 50
2 = 70
3 = 80

Valid Cases =288
Missing Cases =49
Response Percent = 85.5%

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

3a. During the past quarter, which items have been the most pressing concerns for your company's top management team?

	Number	Percent	95% CI
Economic uncertainty	144	43.0 %	± 5.3 %
Cost of benefits	140	41.8 %	± 5.3 %
Regulatory requirements	137	40.9 %	± 5.3 %
Government policies	126	37.6 %	± 5.2 %
Difficulty attracting / retaining qualified employees	112	33.4 %	± 5.1 %
Weak demand for your products/services	72	21.5 %	± 4.4 %
Data security	70	20.9 %	± 4.4 %
Access to capital	59	17.6 %	± 4.1 %
Rising wages and salaries	42	12.5 %	± 3.6 %
Employee morale	42	12.5 %	± 3.6 %
Employee productivity	41	12.2 %	± 3.5 %
Currency risk	30	9.0 %	± 3.1 %
Corporate tax code	29	8.7 %	± 3.0 %
Geopolitical / health crises	26	7.8 %	± 2.9 %
Cost of borrowing	25	7.5 %	± 2.8 %
Rising input or commodity costs	19	5.7 %	± 2.5 %
Other	17	5.1 %	± 2.4 %
Deflation	9	2.7 %	± 1.7 %
Inflation	5	1.5 %	± 1.3 %
Total	1145		

Number of Cases = 335
Number of Responses = 1145
Average Number Of Responses Per Case = 3.4
Number Of Cases With At Least One Response = 335
Response Percent = 100.0 %

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3a. During the past quarter, which items have been the most pressing concerns for your company's top management team? - Other specified

Bank/Fin/Insur/Real Est	US election
Communication/Media	adapting to a changing millennial market
Communication/Media	Sales
Energy	General commodity price levels
Manufacturing	China influencing lower prices in the market
Manufacturing	Effect of election
Manufacturing	Healthcare
Other	FLSA adoption
Other	HB2 Impact
Other	Introducing new product line
Other	Location
Other	TRUMP!
Retail/Wholesale	Election of Trump
Retail/Wholesale	FYI. Health costs are and have been a constant concern throughout my career of 30+.
Retail/Wholesale	Industry over-supply
Services, Consulting	DOL Overtime Ruling
Transp, Public Util	presidential election uncertainty

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Agr, Forestry, Fishing	Strong Dollar
Bank/Fin/Insur/Real Est	allowing new administration to pursue policy changes/directives that were discussed during the campaign
Bank/Fin/Insur/Real Est	Baseline growth (GDP)
Bank/Fin/Insur/Real Est	HEALTH INSURANCE
Bank/Fin/Insur/Real Est	Healthcare costs
Bank/Fin/Insur/Real Est	Higher interest rates.
Bank/Fin/Insur/Real Est	keeping qualified employees
Bank/Fin/Insur/Real Est	NA
Bank/Fin/Insur/Real Est	Production requirements with insurance companies, less commission, more work on our end
Bank/Fin/Insur/Real Est	reputation of bank
Bank/Fin/Insur/Real Est	Rising interest rate environment
Bank/Fin/Insur/Real Est	Rising interest rates and the impact on our balance sheet
Bank/Fin/Insur/Real Est	Rising interest rates.
Bank/Fin/Insur/Real Est	rising interest rates
Bank/Fin/Insur/Real Est	The challenge of rebuilding our reputation in the market looms large for our firm.
Bank/Fin/Insur/Real Est	Trump presidency is a big risk. Also interest rates staying flat are a risk.
Bank/Fin/Insur/Real Est	Uncertainty on the regulatory front with the new President
Bank/Fin/Insur/Real Est	Volatility as the country transitions in Washington
Bank/Fin/Insur/Real Est	Ziki virus threat to Florida.
Communication/Media	Dollar devaluation
Communication/Media	Successfully tapping global markets.
Communication/Media	Uncertainity in the economy.
Energy	competition
Energy	Government transition
Energy	Transfer management to the next generation
Healthcare/Pharm	Changes in the government's position on healthcare expenditures (CMS, ACA, etc.)
Healthcare/Pharm	Corporate tax
Healthcare/Pharm	Electronic records
Healthcare/Pharm	New administration
Healthcare/Pharm	New government
Healthcare/Pharm	Political uncertainty.
Healthcare/Pharm	Rising wages and salaries
Healthcare/Pharm	The continuing complexity and requirements for healthcare organizations that do not seem to be having any positive impact on cost or patient care but do have a very negative effect on Doctor productiv
Healthcare/Pharm	Trump may renegotiate trade agreements, this will cause issues with our foreign sales.
Healthcare/Pharm	Uncertainty driven by presidential election as relates to trade agreements and import / export especially with China.
Manufacturing	Aerospace industrial base shrinking.
Manufacturing	Aging workforce
Manufacturing	breakup of the company into 1) a merged company with another and then 2) breakup of the combined company into 3 separately traded companies
Manufacturing	Central Bank policies
Manufacturing	China over investing and over capitalizing our industry.
Manufacturing	Continued low crude oil costs, reducing 15% market demand for our products, uncertain environmental regulation affecting demand, and precipitation in the Western US affecting another market niche
Manufacturing	Continued weak demand for capital goods, increased price pressure for goods and services.
Manufacturing	Customers' uncertainty with their revenue projections
Manufacturing	Figuring out the direction of policies by new presidential administration
Manufacturing	Getting elected officials to listen to us.

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Manufacturing	government rules and regulations. Health Care costs rising double digits
Manufacturing	International sales demand
Manufacturing	Isolationism - Risk and Opportunity.
Manufacturing	Leadership transition
Manufacturing	NA
Manufacturing	political uncertainty
Manufacturing	Post election Mexican peso collapse has cause immediate receivable concern.
Manufacturing	Rising raw material input costs is not a current problem, but will be in the future. Hedged short-term risk. Turnover at all levels has accelerated in 2016 and is a major issue quality and cost issue
Manufacturing	Running out of space in our current location
Manufacturing	Streamlining processes through efficient use of our time. The increase in steel prices.
Manufacturing	The strength of the dollar and changing regulatory environment in Europe due to Brexit.
Manufacturing	trump presidency
Manufacturing	Turning business away due to high demand in some areas of my business
Manufacturing	Undetermined government policy on infrastructure spending.
Manufacturing	US Presidential change, France looking the same way, BREXIT still working it's way through, Russia and China looking like they will take more prominent positions on world stage
Manufacturing	Water challenges in California, lack of high speed broadband (5 to 10 gigs) compared to South Korea and other countries, since manufacturing machines can 'talk' to each other no mfg invesment without
Mining/Construction	Iflation of goods & services as well as the cost of building code changes.
Mining/Construction	More competition coming into market
Mining/Construction	New firms moving in to our area. Stronger competition
Other	Access to IPO/M&A markets
Other	Competition created by new legislation.
Other	continued industry consolidation
Other	Economic uncertainty with new administration
Other	Federal Government uncertainity, Trump
Other	Housing shortage in our area
Other	inflation - Fed reaction by increasing borrowing rates
Other	lack of civility and divided country after election campaign
Other	n/a
Other	Rising Health Insurance Costs
Other	Slow growth
Other	The effect of changes in Government policies including the projected increase in the cost of capital
Other	The negative impacts from HB2
Other	The regulations involved and unnecessary government involvement.
Other	Timing of political transition and subsequent changes
Other	What changes to Obamacare are coming.
Pub Admin	All are listed above.
Pub Admin	costs of medical care and prescriptions are sky rocketing.
Retail/Wholesale	Government regulations
Retail/Wholesale	No new challenges
Retail/Wholesale	Political uncertainty given the Trump Presidency
Retail/Wholesale	Pricing pressure from customers
Retail/Wholesale	Stock market uncertainty given Donald Trump's election will affect the confidence of our higher net worth customers.
Retail/Wholesale	Threat to free trade agreements
Retail/Wholesale	We are just opening a company in Mexico. Very concerned with rhetoric surrounding trade policies.
Retail/Wholesale	Weakness of the Mexican peso. Gap between food at home inflation and food a

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Services, Consulting	as listed
Services, Consulting	Capricious executive orders between now and 1/20/17.
Services, Consulting	Change in the Presidency and the election results
Services, Consulting	Consolidation among potential client/prospect base
Services, Consulting	Customer/partners wishing to have signed work agreements that basically absolve them from anything and try to put all responsibility for everything onto the vendor/ partner. Too much CYA and litigation
Services, Consulting	Employee Training and retention
Services, Consulting	Finding senior engineers capable of both managing other engineers in their work and making the necessary steps to develop new business
Services, Consulting	General uncertainty that the presidential election has brought.
Services, Consulting	global economic instability
Services, Consulting	global instability
Services, Consulting	Impact of HB2 in NC
Services, Consulting	Increased government regulation
Services, Consulting	Leadership transition, and then ownership transition (cultural and financial)
Services, Consulting	Political uncertainties caused by US elections
Services, Consulting	Political uncertainty
Services, Consulting	President Trump
Services, Consulting	retaining qualified employees
Services, Consulting	The change going on in my profession of accounting and taxes. As well as all the new technology and the ability yo acquire such technology.
Services, Consulting	The receptivity of traditional businesses to new groundbreaking technologies.
Services, Consulting	Trump Presidency...good or bad an international reaction
Services, Consulting	Uncertain political climate, in the US and abroad.
Services, Consulting	Uncertainty related to new administration
Tech [Soft/Hard/Bio]	Across the globe we are seeing increasing patterns of instability, economic and political. Politics around the globe show an increasing impact on business and how business is conducted.
Tech [Soft/Hard/Bio]	How US election results will impact economy and our company's ability to grow; and how it will impact our company's ability to hire the best talent from around the world (immigration policy)
Tech [Soft/Hard/Bio]	Shrinking market for our product
Tech [Soft/Hard/Bio]	The economy in general direct affects our business.
Tech [Soft/Hard/Bio]	The global impact from any policy shift related to trade from the new administration.
Tech [Soft/Hard/Bio]	Turmoil related to change.
Tech [Soft/Hard/Bio]	Uncertainty resulting from changes in political office holders.
Transp, Public Util	America needs infrastructure investment from the new administration and congress.
Transp, Public Util	Competition
Transp, Public Util	industry oversupply
Transp, Public Util	Rising wages and salaries with a tightening labor market.
Transp, Public Util	We and the rest of the trucking industry continue to face a growing shortage of qualified drivers. Demographics are not in our favor and regulations continue to chip away at productivity.

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Unweighted - Winsorized]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Earnings	10.0	16.2	8.1 - 11.9	5	-30.7	53.2	257
Revenue	9.7	15.0	8.0 - 11.4	5	-34.8	58.5	276
Health care costs	8.1	7.4	7.3 - 9.0	7	-9.9	27	293
Technology spending	5.0	8.2	4.0 - 6.0	3	-18.3	29	251
Marketing/advertising spending	5.0	10.4	3.7 - 6.3	2	-23.8	35.9	274
Capital spending	4.0	18.4	1.7 - 6.2	2	-42.4	51.6	262
Wages/Salaries	3.7	3.8	3.3 - 4.2	3	-7.6	15.5	209
Number of domestic full-time employees	3.1	8.3	2.2 - 4.1	2	-29.8	38	293
Prices of your products	2.1	3.5	1.7 - 2.6	2	-7.2	11.1	248
Research and development spending	1.5	5.7	0.8 - 2.3	0	-15.6	17.7	290

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months for: [Unweighted - Sorted]

(N=337)

	Mean & SD	Positive 1	Zero 0	Negative -1	Total
	0.9	262	20	8	290
Wages/Salaries	0.4	90.3%	6.9%	2.8%	100.0%
	0.8	253	27	13	293
Health care costs	0.5	86.3%	9.2%	4.4%	100.0%
	0.7	241	20	32	293
Revenue	0.7	82.3%	6.8%	10.9%	100.0%
	0.6	214	27	35	276
Earnings	0.7	77.5%	9.8%	12.7%	100.0%
	0.6	175	57	16	248
Technology spending	0.6	70.6%	23.0%	6.5%	100.0%
	0.5	157	86	19	262
Prices of your products	0.6	59.9%	32.8%	7.3%	100.0%
	0.5	140	96	15	251
Marketing/advertising spending	0.6	55.8%	38.2%	6.0%	100.0%
	0.4	159	75	40	274
Number of domestic full-time employees	0.7	58.0%	27.4%	14.6%	100.0%
	0.4	134	79	44	257
Capital spending	0.8	52.1%	30.7%	17.1%	100.0%
	0.3	71	124	14	209
Research and development spending	0.6	34.0%	59.3%	6.7%	100.0%

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Revenue Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Earnings	6.7	10.5	5.5 - 8.0	5	-30.7	53.2	260
Revenue	4.4	8.5	3.4 - 5.4	5	-34.8	58.5	233
Technology spending	3.5	6.4	2.7 - 4.3	3	-18.3	29	281
Marketing/advertising spending	1.9	6.8	1.0 - 2.7	1	-23.8	35.9	248
Prices of your products	1.7	3.4	1.3 - 2.1	2	-7.2	11.1	247
Capital spending	1.4	16.8	-0.7 - 3.5	2	-42.4	51.6	272
Research and development spending	0.9	2.7	0.6 - 1.3	0	-15.6	17.7	251

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Employee Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Health care costs	6.8	6.8	6.1 - 7.6	5	-9.9	27	261
Wages/Salaries	3.2	3.3	2.9 - 3.6	3	-7.6	15.5	286
Number of domestic full-time employees	2.2	7.7	1.3 - 3.1	1	-29.8	38	285

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Public Companies - Winsorized - Revenue Weighted]

	Mean	SD	95% CI	Median	Minimum	Maximum
Earnings	8.4	11.0	6.5 - 10.3	5	-5	50
Revenue	3.9	9.2	2.4 - 5.4	4	-34.8	35

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Q5. Do you support the Fed raising interest rates in mid-December 2016?

	Number	Percent	95% CI
No	98	29.4 %	± 4.9 %
Yes	200	60.1 %	± 5.3 %
Don't Know	35	10.5 %	± 3.3 %
Total	333	100.0 %	

Missing Cases = 4
Response Percent = 98.8 %

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Q6a. Does your company's planning anticipate a change in your borrowing costs from today through the end of 2017?

	Number	Percent	95% CI
Reduction in borrowing costs	12	3.6 %	± 2.0 %
No change	174	52.4 %	± 5.4 %
Increase in borrowing costs	146	44.0 %	± 5.3 %
Total	332	100.0 %	

Missing Cases = 5
Response Percent = 98.5 %

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Q6b. Increase of: in your borrowing costs from today through the end of 2017?

	Number	Percent	95% CI
0.25%	27	19.7 %	± 6.4 %
0.50%	58	42.3 %	± 8.0 %
0.75%	22	16.1 %	± 5.9 %
1%	19	13.9 %	± 5.5 %
1.25%	4	2.9 %	± 2.7 %
1.50%	6	4.4 %	± 3.3 %
2%	1	0.7 %	± 1.4 %
>2%	0	0.0 %	± 0.0 %
Total	137	100.0 %	

Missing Cases = 9
Response Percent = 93.8 %

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	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Q6B. Increase of: in your borrowing costs from today through the end of 2017? - Summary of Descriptives	0.6	0.3	0.6 - 0.7	0.5	0.3	2	137

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Q7. We'd like to learn about any effects of the election on your company's plans. Have your company's 2017 plans changed because of likely changes to US....

(N=337)

	Decrease	No change	Increase	Wait and see mode	Total
	5	294	4	28	331
Immigration Policy (Hiring)	1.5%	88.8%	1.2%	8.5%	100.0%
	4	278	12	24	318
Immigration Policy (Spending)	1.3%	87.4%	3.8%	7.5%	100.0%
	10	256	14	47	327
Trade Policy (Hiring)	3.1%	78.3%	4.3%	14.4%	100.0%
	6	255	12	43	316
Trade Policy (Spending)	1.9%	80.7%	3.8%	13.6%	100.0%
	7	214	31	78	330
Corporate Tax Policy (Hiring)	2.1%	64.8%	9.4%	23.6%	100.0%
Corporate Tax Policy	7	198	39	75	319
(Spending)	2.2%	62.1%	12.2%	23.5%	100.0%
	20	175	45	90	330
Regulatory Policy (Hiring)	6.1%	53.0%	13.6%	27.3%	100.0%
	12	188	39	76	315
Regulatory Policy (Spending)	3.8%	59.7%	12.4%	24.1%	100.0%
	3	48	1	8	60
Other (Hiring)	5.0%	80.0%	1.7%	13.3%	100.0%
	1	41	3	9	54
Other (Spending)	1.9%	75.9%	5.6%	16.7%	100.0%

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Q7. We'd like to learn about any effects of the election on your company's plans. Have your company's 2017 plans changed because of likely changes to US.... (Excludes Wait and see mode - shows average scores)

(N=337)

	Mean	Decrease	No change	Increase	Total
Immigration Policy (Hiring)	2.0	5 1.7%	294 97.0%	4 1.3%	303 100.0%
Immigration Policy (Spending)	2.0	4 1.4%	278 94.6%	12 4.1%	294 100.0%
Trade Policy (Hiring)	2.0	10 3.6%	256 91.4%	14 5.0%	280 100.0%
Trade Policy (Spending)	2.0	6 2.2%	255 93.4%	12 4.4%	273 100.0%
Corporate Tax Policy (Hiring)	2.1	7 2.8%	214 84.9%	31 12.3%	252 100.0%
Corporate Tax Policy (Spending)	2.1	7 2.9%	198 81.1%	39 16.0%	244 100.0%
Regulatory Policy (Hiring)	2.1	20 8.3%	175 72.9%	45 18.8%	240 100.0%
Regulatory Policy (Spending)	2.1	12 5.0%	188 78.7%	39 16.3%	239 100.0%
Other (Hiring)	2.0	3 5.8%	48 92.3%	1 1.9%	52 100.0%
Other (Spending)	2.0	1 2.2%	41 91.1%	3 6.7%	45 100.0%

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Q7. Other hiring/spending changes:

Manufacturing	Export Revenue
Manufacturing	Uncertain regulation
Other	Advocacy
Other	Health Insurance
Other	reduced taxes & regulations
Other	Trump
Services, Consulting	N/A

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Q7. Have your hiring plans decreased because of:

	Number	Percent	95% CI
uncertainty about which policies might be implemented	20	5.9 %	± 2.6 %
the policies you expect to be implemented	9	2.7 %	± 1.8 %
other	5	1.5 %	± 1.4 %
Total	34		

Number of Cases = 337
Number of Responses = 34
Average Number Of Responses Per Case = 0.1
Number Of Cases With At Least One Response = 29
Response Percent = 8.6 %

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Q7. Other hiring plans decreased:

Bank/Fin/Insur/Real Est	Policies implemented
Bank/Fin/Insur/Real Est	Reduced regulation
Energy	No Change
Manufacturing	restructure of the company
Other	Rising Health Insurance costs

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Q7. Have your spending plans decreased because of:

	Number	Percent	95% CI
uncertainty about which policies might be implemented	16	4.7 %	± 2.4 %
the policies you expect to be implemented	6	1.8 %	± 1.5 %
other	4	1.2 %	± 1.2 %
Total	26		

Number of Cases = 337
Number of Responses = 26
Average Number Of Responses Per Case = 0.1
Number Of Cases With At Least One Response = 23
Response Percent = 6.8 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Q7. Other spending plans decreased:

Energy	No Change
Manufacturing	Less Demand for products
Other	Rising Health Insurance costs
Retail/Wholesale	change in needs

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Q8a. Please consider the amount of debt taken on by other firms in your industry over the past three years:

Has their borrowing exposed these firms to greater financial risk?	Number	Percent	95% CI
Less financial risk than normal	19	5.7 %	± 2.5 %
About normal financial risk	136	40.8 %	± 5.3 %
More financial risk than normal	98	29.4 %	± 4.9 %
Don't know	80	24.0 %	± 4.6 %
Total	333	100.0 %	

Missing Cases = 4
Response Percent = 98.8 %

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(Excludes Don't Know) Q8a. Please consider the amount of debt taken on by other firms in your industry over the past three years:

Has their borrowing exposed these firms to greater financial risk?	Number	Percent	95% CI
Less financial risk than normal	19	7.5 %	± 2.5 %
About normal financial risk	136	53.8 %	± 5.3 %
More financial risk than normal	98	38.7 %	± 4.9 %
Total	253	100.0 %	

Missing Cases = 84
Response Percent = 75.1 %

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Q8b. Please consider the amount of debt taken on by other firms in your industry over the past three years: How have these firms used the debt proceed:

How have these firms used the debt proceeds?	Number	Percent	95% CI
For 'real' activities like hiring, capital spending, or acquisitions	175	51.9 %	± 5.4 %
Don't Know	108	32.0 %	± 5.0 %
For 'financial' activities like paying dividends or share repurchases	59	17.5 %	± 4.1 %
To build up a cash reserve	33	9.8 %	± 3.2 %
Other	8	2.4 %	± 1.6 %
Issued debt to avoid repatriating foreign profits	6	1.8 %	± 1.4 %
Total	389		

Number of Cases = 337
Number of Responses = 389
Average Number Of Responses Per Case = 1.2
Number Of Cases With At Least One Response = 335
Response Percent = 99.4 %

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Q8b. Other uses of debt proceeds:

Energy	to stay alive
Healthcare/Pharm	Product Innnovation
Manufacturing	mergers and acquistions
Manufacturing	refinancing
Other	Capital Projects
Services, Consulting	Buy out retiring owners, purchase other companies
Transp, Public Util	refunding at lower interest rates for savings

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Q8c. Will the debt burden of these firms limit their ability to pursue future investment opportunities?

Will the debt burden of these firms limit their ability to pursue future investment opportunities?	Number	Percent	95% CI
No	81	24.4 %	± 4.6 %
Yes, will limit investment moderately	126	38.0 %	± 5.2 %
Yes, will limit investment significantly	19	5.7 %	± 2.5 %
Don't know	106	31.9 %	± 5.0 %
Total	332	100.0 %	

Missing Cases = 5
Response Percent = 98.5 %

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(Excludes Don't Know) Q8c. Will the debt burden of these firms limit their ability to pursue future investment opportunities?

Will the debt burden of these firms limit their ability to pursue future investment opportunities?	Number	Percent	95% CI
No	81	35.8 %	± 4.6 %
Yes, will limit investment moderately	126	55.8 %	± 5.2 %
Yes, will limit investment significantly	19	8.4 %	± 2.5 %
Total	226	100.0 %	

Missing Cases = 111
Response Percent = 67.1 %

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Q8d. Do these firms have the correct mix between floating and fixed rate debt?

Do these firms have the correct mix between floating and fixed rate debt?	Number	Percent	95% CI
Too little floating/too much fixed	7	2.1 %	± 1.5 %
Correct floating vs. fixed mix.	57	17.3 %	± 4.0 %
Too much floating/too little fixed (why too much floating?	18	5.5 %	± 2.4 %
Don't know	248	75.2 %	± 4.7 %
Total	330	100.0 %	

Missing Cases = 7
Response Percent = 97.9 %

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Q8e. Why do these firms have too little floating debt?

Bank/Fin/Insur/Real Est	because we are in a rising rate environment
Bank/Fin/Insur/Real Est	Inability to borrow
Communication/Media	Past interest rate history
Manufacturing	Because bank financing is not available to them (3.5x + leverage)
Mining/Construction	low interest rates
Services, Consulting	Floating debt is a bad way to go with the low rates at this time.
Transp, Public Util	use all asset-backed financing and no sophisticated (e.g. fixed to floating swaps) instruments

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Q8e. Why do these firms have too much floating debt?

Bank/Fin/Insur/Real Est	It has been cheaper borrowing for the past 10 years or so
Bank/Fin/Insur/Real Est	it is too cheap
Energy	no expectation of rate increases
Manufacturing	Bank's will not go out past three years. Everything is short term.
Manufacturing	Unable to access capital markets
Mining/Construction	HIGHLY LEVERAGED INDUSTRY
Other	High cost of weekly, fluctuating payroll financing.
Other	it is the only debt available
Services, Consulting	Higher risks involved
Services, Consulting	history of floating being the lowest cost
Transp, Public Util	Money is cheaper

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Q9. Have the amount of share repurchases by other firms in your industry over the past three years limited their ability to spend on capital expenditures or R&D?

	Number	Percent	95% CI
No	77	23.3 %	± 4.5 %
Yes, a little	72	21.8 %	± 4.4 %
Yes, a lot	11	3.3 %	± 1.9 %
NA	171	51.7 %	± 5.4 %
Total	331	100.0 %	

Missing Cases = 6
Response Percent = 98.2 %

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On November 14, 2016 the annual yield on 10-yr treasury bonds was 2.23%. Please complete the following: (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	1.3	4.0	0.8 - 1.8	2	-9.5	12.1	293
Over the next 10 years, I expect the average annual S&P 500 return will be: Expected return:	5.7	2.6	5.4 - 6.0	5	-1	13	309
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	8.8	4.1	8.4 - 9.3	8	0	21.6	292
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	-1.5	6.9	-2.3 - -0.7	0	-17.9	14.9	292
Over the next year, I expect the average annual S&P 500 return will be: Expected return:	5.0	3.2	4.6 - 5.3	5	-2.9	12.8	306
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	9.0	4.5	8.5 - 9.5	9	-0.5	19.1	291

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Return on assets (ROA=operating earnings/assets) (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% Approximate ROA in 2016	7.9	10.8	6.6 - 9.2	5	-17.7	35.9	259
% Expected ROA in 2017	10.0	10.4	8.8 - 11.3	6.5	-15.5	38.5	259

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Manufacturing capacity utilized (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% of capacity utilized in first half of 2016	66.2	19.6	61.6 - 70.8	66	30.3	100	70
% of capacity utilization planned for the second half of 2016	68.3	18.8	63.9 - 72.8	70	33.6	101	70

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Industry

	Number	Percent	95% CI
Manufacturing	70	20.8 %	± 4.4 %
Services, Consulting	57	16.9 %	± 4.0 %
Banking/Finance/Insurance/Real Estate	46	13.6 %	± 3.7 %
Retail/Wholesale	32	9.5 %	± 3.1 %
Healthcare/Pharmaceutical	26	7.7 %	± 2.9 %
Technology [Software/Hardware/Biotech]	16	4.7 %	± 2.3 %
Transportation & Public Utilities	12	3.6 %	± 2.0 %
Communication/Media	10	3.0 %	± 1.8 %
Mining/Construction	8	2.4 %	± 1.6 %
Energy	7	2.1 %	± 1.5 %
Agriculture, Forestry, & Fishing	7	2.1 %	± 1.5 %
Public Administration	5	1.5 %	± 1.3 %
Other Industry	41	12.2 %	± 3.5 %
Total	337	100.0 %	

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Industry (Other specified)

Accounting
Chamber
Charity
Commercial Aircraft Leasing
commercial real estate
community development
defense contractor
Distribution
Education
Education
Entertainment Attraction
entertainment/leisure
Government
Higher Education
Hospitality
Hospitality
Hotels
indoor recreation
Legal
Local Government
Local Government
Manufacturing / Wholesale distribution to retailers
Medical devices
non profit
Nonprofit
Nonprofit
Nonprofit Foundation
Nonprofit social services
nonprofit education
Not for Profit
Not for profit higher ed foundation
Performing Arts Center
Private Education
Private Foundation
Renewable Energy
Rental-Equip Maintenance
Staffing/Recruiting
Telecommunications
telecommunications
Tourism

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Sales Revenue

	Number	Percent	95% CI
Less than $25 million	124	36.9 %	± 5.2 %
$25-$99 million	83	24.7 %	± 4.6 %
$100-$499 million	65	19.3 %	± 4.2 %
$500-$999 million	13	3.9 %	± 2.1 %
$1-$4.9 billion	29	8.6 %	± 3.0 %
$5-$9.9 billion	7	2.1 %	± 1.5 %
More than $10 billion	15	4.5 %	± 2.2 %
Total	336	100.0 %	

Missing Cases = 1
Response Percent = 99.7 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Statistics - Sales Revenue (Millions)

Minimum = 25

Maximum = 11000

Mean = 1017.8

Median = 62

Variance (Unbiased Estimate) = 6373761.3

Standard Deviation (Unbiased Estimate) = 2524.6

Standard Error Of The Mean = 137.7

95 Percent Confidence Interval Around The Mean = 747.9 - 1287.8

99 Percent Confidence Interval Around The Mean = 663.2 - 1372.5

Skewness = 3.1

Kolmogorov-Smirnov Statistic For Normality = 32.1

Quartiles

1 = 25
2 = 62
3 = 300

Valid Cases =336
Missing Cases =1
Response Percent = 99.7%

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Number of Employees

	Number	Percent	95% CI
Fewer than 100	119	40.8 %	± 5.1 %
100-499	87	29.8 %	± 4.7 %
500-999	22	7.5 %	± 2.7 %
1,000-2,499	18	6.2 %	± 2.4 %
2,500-4,999	18	6.2 %	± 2.4 %
5,000-9,999	8	2.7 %	± 1.6 %
Over 10,000	20	6.8 %	± 2.5 %
Total	292	100.0 %	

Missing Cases = 45
Response Percent = 86.6 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Statistics - Number of Employees

Minimum = 100

Maximum = 12000

Mean = 1553.1

Median = 300

Variance (Unbiased Estimate) = 10155746.5

Standard Deviation (Unbiased Estimate) = 3186.8

Standard Error Of The Mean = 186.5

95 Percent Confidence Interval Around The Mean = 1187.6 - 1918.6

99 Percent Confidence Interval Around The Mean = 1072.9 - 2033.3

Skewness = 2.6

Kolmogorov-Smirnov Statistic For Normality = 28.1

Quartiles

1 = 100
2 = 300
3 = 750

Valid Cases =292
Missing Cases =45
Response Percent = 86.6%

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Where are you personally located?

	Number	Percent	95% CI
Midwest U.S.	90	26.8 %	± 4.7 %
Northeast U.S.	66	19.6 %	± 4.3 %
North Carolina	61	18.2 %	± 4.1 %
South Central U.S.	42	12.5 %	± 3.5 %
Pacific US	30	8.9 %	± 3.1 %
South Atlantic U.S. (Not NC)	28	8.3 %	± 3.0 %
Mountain U.S.	19	5.7 %	± 2.5 %
Total	336	100.0 %	

Missing Cases = 1
Response Percent = 99.7 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Where are you personally located? - Other specified

--- No Response ---

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Ownership

	Number	Percent	95% CI
Private	235	73.0 %	± 4.9 %
Public, NYSE	37	11.5 %	± 3.4 %
Nonprofit	28	8.7 %	± 3.0 %
Public, NASDAQ-AMEX	11	3.4 %	± 1.9 %
Government	11	3.4 %	± 1.9 %
Total	322	100.0 %	

Missing Cases = 15
Response Percent = 95.5 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Foreign Sales

	Number	Percent	95% CI
0%	162	49.5 %	± 5.4 %
1-24%	127	38.8 %	± 5.2 %
25-50%	24	7.3 %	± 2.8 %
More than 50%	14	4.3 %	± 2.1 %
Total	327	100.0 %	

Missing Cases = 10
Response Percent = 97.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

In what region of the world are most of your foreign sales?

	Number	Percent	95% CI
Europe	56	38.4 %	± 7.3 %
Canada	43	29.5 %	± 6.8 %
Asia/Pacific Basin	31	21.2 %	± 6.0 %
Latin America	15	10.3 %	± 4.4 %
Africa	1	0.7 %	± 1.2 %
Total	146	100.0 %	

Missing Cases = 19
Response Percent = 88.5 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

What is your company's credit rating?

	Number	Percent	Cumulative
AAA	45	18.8 %	18.8 %
AA+	23	9.6 %	28.5 %
AA	31	13.0 %	41.4 %
AA-	13	5.4 %	46.9 %
A+	17	7.1 %	54.0 %
A	18	7.5 %	61.5 %
A-	14	5.9 %	67.4 %
BBB+	22	9.2 %	76.6 %
BBB	13	5.4 %	82.0 %
BBB-	6	2.5 %	84.5 %
BB+	8	3.3 %	87.9 %
BB	7	2.9 %	90.8 %
BB-	3	1.3 %	92.1 %
B+	2	0.8 %	92.9 %
B	3	1.3 %	94.1 %
B-	5	2.1 %	96.2 %
CCC	6	2.5 %	98.7 %
CC	2	0.8 %	99.6 %
D	1	0.4 %	100.0 %
Total	239	100.0 %	100.0 %

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

What is your company's credit rating?

N=239	Total	Credit Rating	
		Actual A	Estimate B
Total	239	98	141
	100.0%	41.0%	59.0%
AAA	45	25	20
	18.8%	25.5%	14.2%
		b	a
AA+	23	13	10
	9.6%	13.3%	7.1%
AA	31	10	21
	13.0%	10.2%	14.9%
AA-	13	7	6
	5.4%	7.1%	4.3%
A+	17	3	14
	7.1%	3.1%	9.9%
		b	a
A	18	6	12
	7.5%	6.1%	8.5%
A-	14	8	6
	5.9%	8.2%	4.3%
BBB+	22	6	16
	9.2%	6.1%	11.3%
BBB	13	4	9
	5.4%	4.1%	6.4%
BBB-	6	4	2
	2.5%	4.1%	1.4%
BB+	8	6	2
	3.3%	6.1%	1.4%
		b	a
BB	7	1	6
	2.9%	1.0%	4.3%
BB-	3	0	3
	1.3%	0.0%	2.1%
B+	2	1	1
	0.8%	1.0%	0.7%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

What is your company's credit rating?

N=239	Total	Credit Rating	
		Actual A	Estimate B
B	3	1	2
	1.3%	1.0%	1.4%
B-	5	0	5
	2.1%	0.0%	3.5%
CCC	6	3	3
	2.5%	3.1%	2.1%
CC	2	0	2
	0.8%	0.0%	1.4%
D	1	0	1
	0.4%	0.0%	0.7%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Your job title (e.g., CFO, Asst. Treasurer, etc):

	Number	Percent
CFO	166	49.6 %
Other	77	23.0 %
CEO	48	14.3 %
Controller	38	11.3 %
Treasurer	6	1.8 %
Total	335	100.0 %

Missing Cases = 2
Response Percent = 99.4 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Other job title:

Chief Accounting Officer
Owner
analyst
Finance Manager
Sr Director
Finance Director
Consultant
Senior Director of Finance
EVP
VP Finance
VP Finance, Global Sales
President
VP-Finance
Director Treasury Risk Management
VP Business Planning
CFO / COO
partner
CPA
Managing Director
SVP
COO
Partner
COO
Interim CFO
Finance Manager
Director
trustee
Finance Director
Director, Finance
Strategic Advisor
Managing Director
CFO Consultant, CFO Roundtable Facilitator
COO
SVP FINANCE
Procurement & Supply Chain Director
President
Sr VP Finance
Chief Acctng Officer & Treasurer.
Sr. Director of Finance & Admin
General partner
Program Director
President
Principal
Division Manager
Director
Compliance Consultant
GM
vice president
Principal
Chairman of Board
Private Banking
Deputy CEO
Sr. Dir. of Business Development
VP Operations
VP Finance

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Other job title:

SVP
Chairman & President
Managing Director
SVP
Director
Global Strategic Leader
Manager FP&A

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

What is the probability that you will be a CEO in 5 years?

	Number	Percent	95% CI
0%	117	42.9 %	± 5.7 %
1-20%	74	27.1 %	± 5.1 %
21-40%	28	10.3 %	± 3.4 %
41-60%	25	9.2 %	± 3.3 %
61-80%	17	6.2 %	± 2.7 %
81-100%	12	4.4 %	± 2.3 %
Total	273	100.0 %	

Missing Cases = 15
Response Percent = 94.8 %

Only asked of those respondents who are not currently a CEO

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

What is the probability that you will be a CEO in 5 years? - Descriptive Summary

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
What is the probability that you will be a CEO in 5 years?	18.5	27.3	15.3 - 21.8	5	0	100	273

Only asked of those respondents who are not currently a CEO

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Do your current job tasks adequately prepare you to be a CEO at some point in the future?

	Number	Percent	95% CI
No	74	26.9 %	± 5.1 %
Yes	178	64.7 %	± 5.6 %
Don't Know	23	8.4 %	± 3.2 %
Total	275	100.0 %	

Missing Cases = 13
Response Percent = 95.5 %

Only asked of those respondents who are not currently a CEO

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Besides current job tasks, what skills must the CFO of your company develop to become a CEO?

Agr, Forestry, Fishing	Be a member of the controlling shareholder family.
Agr, Forestry, Fishing	Cannot. CEO will be family member.
Agr, Forestry, Fishing	Customer Profitability.
Agr, Forestry, Fishing	Operational experience.
Bank/Fin/Insur/Real Est	already have the needed skills
Bank/Fin/Insur/Real Est	Become more operationally oriented and understand better the back-office processes that drive revenue on the front-office side.
Bank/Fin/Insur/Real Est	being involved all departments and staying on top of all issues being informed on the good and bad issues,
Bank/Fin/Insur/Real Est	Communication skills; Strategic thinking
Bank/Fin/Insur/Real Est	Do you have a less conservative you with respect to finances and to take more of a few from the sales and marketing approach.
Bank/Fin/Insur/Real Est	Figure out how to get the President/Director/Shareholder to leave the company. Strategic planning, monitor and adjust to industry regulatory changes.
Bank/Fin/Insur/Real Est	Knowledge of operations, leadership skills
Bank/Fin/Insur/Real Est	Knowledge of the front side of the business
Bank/Fin/Insur/Real Est	Leadership skills
Bank/Fin/Insur/Real Est	LEGAL AND REAL ESTATE KNOWLEDGE
Bank/Fin/Insur/Real Est	marketer
Bank/Fin/Insur/Real Est	Marketing and Leadership skills
Bank/Fin/Insur/Real Est	Marketing and Technology
Bank/Fin/Insur/Real Est	Master IT and Big Data Analytics, and how to mesh that with marketing. Better Understand how social media drives business. Better Understand millennials as employees and customers.
Bank/Fin/Insur/Real Est	Master political currents coming out of Washington DC
Bank/Fin/Insur/Real Est	personality, business development
Bank/Fin/Insur/Real Est	personnel leadership and vision for the company.
Bank/Fin/Insur/Real Est	sales ability and industry knowledge
Bank/Fin/Insur/Real Est	Strong sales and marketing skills.
Bank/Fin/Insur/Real Est	Understand employees and customers - desires & motivation, and true measures of profitability
Bank/Fin/Insur/Real Est	Underwriter
Communication/Media	MBA education, understanding of macroeconomomics, BigData, Business Intelligence, EPM, Accounting.
Communication/Media	Savy in politics and entrepreneurship.
Communication/Media	Telecommunications networking
Energy	leadership and communication
Energy	Manufacturing, oil and gas experience
Energy	none
Energy	Sales skills, communications and in-depth understanding of the operating portion of the business
Energy	Salesmanship, Industry knowledge, Manufacturing and engineering process familiarity
Healthcare/Pharm	Being the face of the Company.
Healthcare/Pharm	Business development and promotions of our services and products, but not just a 'sales & marketing' person.
Healthcare/Pharm	CEO is owner so not applicable
Healthcare/Pharm	Customer facing, operations responsibility
Healthcare/Pharm	Customer intimacy skills and understanding of healthcare trends globally.
Healthcare/Pharm	High level industry contacts.
Healthcare/Pharm	Keeping my up to date with latest trends in health care.

Only asked of those respondents who are not currently a CEO

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Besides current job tasks, what skills must the CFO of your company develop to become a CEO?

Healthcare/Pharm	Knowledge as a CIO and a Chief Administrative Officer.
Healthcare/Pharm	Licensure
Healthcare/Pharm	Manufacturing experience
Healthcare/Pharm	Needs to manage his time better. Needs to delegate more effectively.
Healthcare/Pharm	Operational experience
Healthcare/Pharm	operational understanding
Healthcare/Pharm	Strategic planning skills and internal and external politics
Healthcare/Pharm	To take a more analytic approach to information available.
Manufacturing	A strategist for the future in both human capital, production efficiencies and technology. A CFO needs to be the main project manager of the company goals to move things forward.
Manufacturing	become fully conversant with all aspects of the business, i.e. operations and markets / competitors.
Manufacturing	Better product knowledge
Manufacturing	Better understanding of Operations and Sales and Marketing
Manufacturing	Commercial understanding, visible leadership
Manufacturing	culture leadership and industry contacts
Manufacturing	Deeper interaction with Board members. Close involvement with operations and operating decisions.
Manufacturing	Develop a salesperson perspective
Manufacturing	Front office know-how
Manufacturing	Human capital management, market knowledge, & a strategic vision.
Manufacturing	Increased understanding of market segments and customers to better set strategic initiatives for the company.
Manufacturing	Investor relations
Manufacturing	Leadership Skills across disciplines inside and outside the company.
Manufacturing	Managing People
Manufacturing	Marketing
Manufacturing	Master the strategy
Manufacturing	More customer focus experience
Manufacturing	More personal interaction with dealers and customers in order to build credibility in the marker.
Manufacturing	More sales organization/customer engagement
Manufacturing	Motivational
Manufacturing	operating and marketing leadership for a period
Manufacturing	Operational skills
Manufacturing	Sales and Marketing, New product development and voice of customer
Manufacturing	Sales development
Manufacturing	Sales skills
Manufacturing	Strategic Sales, Operations, Heavier Investor Relations
Manufacturing	Strategic Thinker
Manufacturing	Strategic thinker, customer interface and relationship building
Manufacturing	Strategic vision, ability to manage multiple teams. Leadership skills
Manufacturing	Strategist
Manufacturing	Strong leadership; Strong communication, Strong understanding of markets (Micro & Macro); Strong overall management skills, etc.
Manufacturing	Team building, leadership and customer development
Manufacturing	Technical knowledge of operations across employee functions and equipment at the shop floor level.

Only asked of those respondents who are not currently a CEO

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Besides current job tasks, what skills must the CFO of your company develop to become a CEO?

Manufacturing	The CFO needs to understand the non-financial metrics that drive the business. Also, communication is always a necessary skill set.
Manufacturing	Understand the business process, our products/markets and culture.
Manufacturing	Understanding of people: Feeling vs. Facts or financials.
Mining/Construction	market knowledge, pricing knowledge, marketing knowledge
Mining/Construction	More operational experience
Mining/Construction	none
Mining/Construction	Sales
Other	Ability to obtain buy in from staff and stakeholders for the agency's mission.
Other	Customer focused thinking about the value proposition
Other	Deep knowledge of government policies and effect on various stakeholder groups
Other	Diplomacy, Communication, and Strategic Thinking
Other	Engineering license
Other	Governance, strategy, leadership, people skills to include communications3.6
Other	Knowledge of social work type issues
Other	Learning additional operational skills
Other	Managing people, future planning
Other	Marketing acumen, identifying executive level talent
Other	Marketing and Business Development
Other	marketing/BD
Other	More strategic thinking tasks
Other	Must be an educator
Other	No CFO on staff. VP and owner is a former CPA, so she oversees many of the CFO functions.
Other	Philanthropic solicitation skills
Other	Relationship throughout the company that are positive
Other	Sales building, Organizational development, and Operational experience
Other	Specialized experience in the educational field.
Other	Specific content knowledge in the areas of developmental and educational psychology
Other	Understanding of sales, business development and operations.
Other	verbal communication, drive and passion, organizational knowledge/competency, ethics
Pub Admin	Leadership and better social & communication skills
Pub Admin	leadership, visionary, strategic planning
Pub Admin	Use of technology and analytics
Retail/Wholesale	adjusting to changes that affect business activities
Retail/Wholesale	Ambition to be one, develop the 'often wrong but never in doubt' mentality, and more marketing expertise.
Retail/Wholesale	Be a family member of the controlling family.
Retail/Wholesale	be younger
Retail/Wholesale	customer relations
Retail/Wholesale	Deep knowledge of industry
Retail/Wholesale	Expand experience to include sales and operations
Retail/Wholesale	Further knowledge of the customers and the industry.
Retail/Wholesale	I think the CFO of the company has adequate skill set to be CEO
Retail/Wholesale	Internally at my company I could be CEO in 5 years with more marketing experience/ digital experience to transition the company dominant sales channel to digital.
Retail/Wholesale	Leadership
Retail/Wholesale	Leadership, motifation and people skils
Retail/Wholesale	learn intimate operations of restaurants.

Only asked of those respondents who are not currently a CEO

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Besides current job tasks, what skills must the CFO of your company develop to become a CEO?

Retail/Wholesale	Marketing, product development and interdepartmental integration
Retail/Wholesale	More external orientated e.g. customer intimacy and relationship with vendors
Retail/Wholesale	Operations
Retail/Wholesale	Operations, change management, cyber, technology, recruitment, development of employee's, tools for employee's to be successful and give them the ability and environment to succeed.
Retail/Wholesale	SALES & OPERATIONS
Retail/Wholesale	Understand and drive revenue.
Services, Consulting	Ability to present facts in a way that motivates people to action
Services, Consulting	All CEO's of our company have been Professional Engineers with experience as a practitioner in an Engineering field
Services, Consulting	board and customer management
Services, Consulting	Business Development acumen
Services, Consulting	CEO is always an attorney
Services, Consulting	Communication and persistence
Services, Consulting	Communication, Business Development
Services, Consulting	Defining risks accurately.
Services, Consulting	i have no desire to be ceo
Services, Consulting	International Business Experience
Services, Consulting	It's a service based business. No one not involved in the consulting has ever been named CEO in the 50 year history of this firm
Services, Consulting	Know about operations and Administration
Services, Consulting	Knowledge of government contract vehicles and budgets
Services, Consulting	Marketing, evaluating risk and knowing when to take risks.
Services, Consulting	Operational experience
Services, Consulting	People management, board relationships, an understating of company Operations.
Services, Consulting	People skills.
Services, Consulting	Skill to persuade potential clients to use our services. Increase parntering.
Services, Consulting	Soft skills, leadership, strategic thinking, people development
Services, Consulting	Thorough knowledge of accounting system, ESOP guidelines and requirements, 401K Guidelines and requirements, tax consequences of distributions and bonuses, submittal dates required by local, State and
Services, Consulting	Understanding of: the markets, the operations, valuing talent
Services, Consulting	Vision
Services, Consulting	Vision, business development
Services, Consulting	Vision, Leadership, Political Power (external), communications, Law Degree
Tech [Soft/Hard/Bio]	Analytics, over the horizon planning has become increasingly volatile and unpredictable affecting working capital commitments adversely.
Tech [Soft/Hard/Bio]	better communication of the 'story'
Tech [Soft/Hard/Bio]	Broad Company experience and understanding, including marketing, IT and working on the revenue side - sales, acquisitions, etc.
Tech [Soft/Hard/Bio]	Customer facing
Tech [Soft/Hard/Bio]	Increased technical skills.
Tech [Soft/Hard/Bio]	Market knowledge
Tech [Soft/Hard/Bio]	Marketing / Sales / Operations
Tech [Soft/Hard/Bio]	Oversight of operations/operational areas.
Tech [Soft/Hard/Bio]	Sales, Human Resource Mgmt, Legal, Software Development Methodolgy
Tech [Soft/Hard/Bio]	Sales experience
Tech [Soft/Hard/Bio]	Sales skills. Cross-functional management.
Tech [Soft/Hard/Bio]	Sales understanding

Only asked of those respondents who are not currently a CEO

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2016

Besides current job tasks, what skills must the CFO of your company develop to become a CEO?

Tech [Soft/Hard/Bio]	Team building, effective writing, public speaking
Transp, Public Util	Already the CFO. The CFO need a broad background in finance, operations and strategic planning background so that they can be a trusted advisor to the CEO. Strong Finance skills are not enough.
Transp, Public Util	Board savvy, business experience beyond finance and accounting, being seen as strategic in vision.
Transp, Public Util	Global operational knowledge that comes from decades of direct operational leadership roles in multiple national and, preferably, international locations.
Transp, Public Util	Knowledge of overseeing other departments such as Engineering and Operations.
Transp, Public Util	More sales skills
Transp, Public Util	More well rounded in greater aspects of whatever the particular business is.
Transp, Public Util	OUTGOING PERSONALITY, PRESENTATION SKILLS, DESIRE TO SPEAK CONTINUALLY
Transp, Public Util	Play golf.
Transp, Public Util	Revenue generation and Energy procurement.
Transp, Public Util	Talking to the press, speeches to employees

Only asked of those respondents who are not currently a CEO

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Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

1a. Are you more or less optimistic about your country's economy compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	148	41.8 %	± 5.1 %
0=No change	123	34.7 %	± 5.0 %
-1=Less optimistic	83	23.4 %	± 4.4 %
Total	354	100.0 %	

Mean = 0.18
SD = 0.79

Missing Cases = 3
Response Percent = 99.2 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

1b. Rate your optimism about your country's economy on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 10

Maximum = 100

Mean = 67.41

Median = 70

Standard Deviation (Unbiased Estimate) = 15.15

95 Percent Confidence Interval Around The Mean = 65.74 - 69.08

Quartiles

1 = 60
2 = 70
3 = 76.50

Valid Cases = 317
Missing Cases = 40
Response Percent = 88.8%

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

2a. Are you more or less optimistic about the financial prospects for your own company compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	177	49.6 %	± 5.2 %
0=No change	106	29.7 %	± 4.8 %
-1=Less optimistic	74	20.7 %	± 4.2 %
Total	357	100.0 %	

Mean = 0.29
SD = 0.79

Missing Cases = 0
Response Percent = 100.0 %

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2b. Rate your optimism about the financial prospects for your own company on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 5

Maximum = 100

Mean = 69.15

Median = 75

Standard Deviation (Unbiased Estimate) = 19.00

95 Percent Confidence Interval Around The Mean = 67.05 - 71.24

Quartiles

1 = 56.25
2 = 75
3 = 80

Valid Cases = 317
Missing Cases = 40
Response Percent = 88.8%

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3a. During the past quarter, which items have been the most pressing concerns for your company's top management team?

	Number	Percent	95% CI
Difficulty attracting / retaining qualified employees	146	41.0 %	± 5.1 %
Government policies	129	36.2 %	± 5.0 %
Cost of benefits	128	36.0 %	± 5.0 %
Economic uncertainty	113	31.7 %	± 4.9 %
Data security	111	31.2 %	± 4.8 %
Regulatory requirements	108	30.3 %	± 4.8 %
Employee productivity	72	20.2 %	± 4.2 %
Weak demand for your products/services	70	19.7 %	± 4.2 %
Corporate tax code	57	16.0 %	± 3.8 %
Rising wages and salaries	53	14.9 %	± 3.7 %
Access to capital	42	11.8 %	± 3.4 %
Employee morale	42	11.8 %	± 3.4 %
Geopolitical / health crises	29	8.1 %	± 2.9 %
Rising input or commodity costs	27	7.6 %	± 2.8 %
Cost of borrowing	23	6.5 %	± 2.6 %
Other	23	6.5 %	± 2.6 %
Currency risk	15	4.2 %	± 2.1 %
Inflation	7	2.0 %	± 1.5 %
Deflation	3	0.8 %	± 1.0 %
Total	1198		

Number of Cases = 356
Number of Responses = 1198
Average Number Of Responses Per Case = 3.4
Number Of Cases With At Least One Response = 356
Response Percent = 100.0 %

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3a. During the past quarter, which items have been the most pressing concerns for your company's top management team? - Other specified

Bank/Fin/Insur/Real Est	level of US Stock Trading Activity
Energy	presidential appointments picking winners (Big Oil, Coal, poluters, etc.) who don't put Country firs
Healthcare/Pharm	Healthcare bill
Healthcare/Pharm	new product launch
Healthcare/Pharm	Pricing pressures
Manufacturing	Acquisitions
Manufacturing	Contract labor rising costs
Manufacturing	Marketing
Manufacturing	Presidential Miscues
Manufacturing	Reduction in customer demand
Manufacturing	System Conversion
Manufacturing	Tax incentive changes in China for our products. China is our third largest sales demographic,.
Other	Annual DoD Budget
Other	health ins
Other	inability to raise prices / deteriorating margins
Other	Labor Shortage
Other	lack of cohesive leadership/divided country
Other	New Sales
Other	None of the above.
Retail/Wholesale	Bricks and mortar problems
Services, Consulting	Mentally Ill US President
Services, Consulting	Sales
Services, Consulting	Trump
Tech [Soft/Hard/Bio]	Product Development

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Agr, Forestry, Fishing	World trade
Bank/Fin/Insur/Real Est	Competition
Bank/Fin/Insur/Real Est	Complying with Department of Labor Fiduciary Rule
Bank/Fin/Insur/Real Est	Current political environment. Lot's of talk, no action.
Bank/Fin/Insur/Real Est	Domestic political uncertainty and impact on capital markets
Bank/Fin/Insur/Real Est	Finding experienced, qualified account managers to service our customers. We are an insurance agency and there is not enough young people entering the industry for service and sales positions.
Bank/Fin/Insur/Real Est	Finding quality credit risks
Bank/Fin/Insur/Real Est	Geo-political issues
Bank/Fin/Insur/Real Est	Interest Rate Risk, Stalemate in Washington DC
Bank/Fin/Insur/Real Est	No
Bank/Fin/Insur/Real Est	None
Bank/Fin/Insur/Real Est	none
Bank/Fin/Insur/Real Est	North korea
Bank/Fin/Insur/Real Est	Our greatest challenge in keeping up with and proactively exceeding the speed of change in the technology adaptations in our banking industry.
Bank/Fin/Insur/Real Est	Political environment
Bank/Fin/Insur/Real Est	Regulators C & D order
Communication/Media	Attracting new clients.
Communication/Media	retraction of venture capital
Communication/Media	terrorism
Energy	Cost of Health Care
Energy	Domestic competition
Energy	New Presidential advisors' self-interests influencing policy that negatively effects the-greater-good of the USofA.
Energy	same as above
Energy	Technology changes in the industry.
Healthcare/Pharm	Changes in healthcare put forth by Trump administration & effect on healthcare industry and the millions employed in that industry, not to mention the negative impact on the health of a major portion
Healthcare/Pharm	Dealing with healthcare-costs, uncertaiity
Healthcare/Pharm	Government oversight
Healthcare/Pharm	Government program change not meeting expectations on taxes, regulations and the economy overall. If some level of reform are not executed there will be a large economic backlash.
Healthcare/Pharm	Growing our programs and having the talent we need to attract to a rural area.
Healthcare/Pharm	None
Healthcare/Pharm	None
Healthcare/Pharm	Political uncertainty regarding key legislation which needs to be passed (Healthcare, Dodd-Frank repeal, Tax reform, the Federal Budget)
Healthcare/Pharm	Speed of competition
Healthcare/Pharm	Start-up company so everything is at risk, attain funding, launch production and generate sales
Healthcare/Pharm	Terrorism and wanton killings of innocent people.
Healthcare/Pharm	The amount of disposable income for clients is a challenge. People have or seem to have lower expectations on the economy in future quarters.They are limiting their spending on items.
Healthcare/Pharm	Those capture it.
Healthcare/Pharm	Uncertainty of Federal changes to health care regulations and tax code changes.
Manufacturing	availability of workers
Manufacturing	competition from suppliers
Manufacturing	Congressional turmoil and stalemate
Manufacturing	Continued competitive intensity in a slow growth world.

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Manufacturing	Data security
Manufacturing	Donald Trump..donald Trump..Donald Trump...Massive uncertainty about what he will do next....
Manufacturing	Economic impact on demand for our products
Manufacturing	Employee turnover, particularly at high / executive level
Manufacturing	Foreign competition
Manufacturing	GAAP changes and impact on reported revenue/op
Manufacturing	Gridlock in Congress inhibiting healthcare and tax reform
Manufacturing	Immigration policy impact on household formation
Manufacturing	Import tax on items we buy from Asia.
Manufacturing	Increased costs of dealing internationally.
Manufacturing	Insurance costs on all fronts are becoming bigger and bigger % of fixed overhead. Cyber insurance, environmental insurance, liability insurances, litigation has become a intermural sport in CA.
Manufacturing	Issues with import taxes due to changes that could be made by our fearless presidential leader!
Manufacturing	Labor market getting very tight-hard to find good people.
Manufacturing	Liberals blocking President Trump's AHC and tax iniatives.
Manufacturing	Management transition and market focus.
Manufacturing	None
Manufacturing	Off shore dumping of products continues
Manufacturing	Political and regulatory uncertainty
Manufacturing	Political floundering, obnoxious partisan rhetoric, indecisiveness, and incompetence in the government is extremely disconcerting!
Manufacturing	potential slowdown in commercial construction
Manufacturing	Pressure on customers from private equity firms.
Manufacturing	Prospecting for new Customers
Manufacturing	Reduction of technological research programs due to increased immigration restrictions
Manufacturing	Regulatory requirements for the shipment of dangerous goods is an emerging risk for us.
Manufacturing	Regulatory uncertainty
Manufacturing	Revenue Recognition accounting standard
Manufacturing	specifically, cost of healthcare provided employees
Manufacturing	The healthcare bill passed by congress could cause costs to begin rising at the previous +-8% each year. The ACA effectively stopped this annual healthcare inflation.
Manufacturing	The risk of economic protectionism rhetoric in developed countries is increasingly becoming more concerning, coupled with the uncertainty regarding the potential outcomes of renegotiated trade agreeme
Manufacturing	Uncertainty around cost of employee benefits, particularly healthcare
Mining/Construction	Governments continue to take longer to process permits review plans or do inspections. They are unmotivated to be efficient and this continues to crush small business and benefits large business.
Mining/Construction	Growth that cannot be performed by the work force skills available
Mining/Construction	Health care
Mining/Construction	North Korea
Mining/Construction	political uncertainties impacting offshore business
Mining/Construction	uncertainty regarding employee health benefits and their cost
Other	Anticipated lower investment returns due to current full valuations and unclear growth prospects.
Other	decrease in college attendance due to new administration which would decrease the need for student housing
Other	Executive side of US
Other	Growth and the ability to complete work with existing staff levels
Other	How will new health care affect my operational budget?

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Other	I am in debtor's prison and see no emerging from it.
Other	increased competition for acquisitions in a low rate environment
Other	New health care law
Other	Other companies not cutting back on basic services to maintain the upkeep of their buildings.
Other	Retiring of senior employees with institutional knowledge.
Other	Rising inequality, immigration uncertanties
Other	Rising input / commodity costs.
Other	State tax proposal on gross sales,
Other	Strong Dollar encourages exports which negatively impacts our business
Other	The 'Liberal' problem is becoming more serious, as they are trying to take down this President. We, Americans, need to stand together united, but liberals are trying to undermine our country everyday.
Other	The increasingly unpredictable and erratic actions of the President and both the uncertainties and the risks that result.
Other	The International presence of the US Gov't is unpredictable and creates lack of confidence our international policy. At the same time, China is taking a proactive approach instead of us.
Other	The Labor shortage in Rochester Minnesota and perhaps all of Minnesota is pressing current staff to work far more hours than usual. Employee morale is down and turnover could accelerate next year.
Other	The lack of leadership out of the White House is appalling. The lack of backbone in Congress is distressing as they pander , along with the insensitivity to all but the 'insiders' and the 'haves'
Other	The proposed Trump budget reduces payments to the poor and student loans, which we predict will take more cash out of our customers hands. Also, federal research is proposed to be cut.
Other	The trump administration is a trainwreck, and as a result it is clear that business decision makers in the US are distracted by the uncertainty of U.S. policy and the self-dealing of the new admin.
Other	Top line growth
Other	transfer of wealth to a younger generation
Other	We are a non-profit, so changes to the charitable deduction could affect us in a big way.
Other	We specifically offer a product that will lose it's luster as technology takes over
Other	World security/safety issues.
Pub Admin	Health insurance costs increasing at a rate that we cannot sustain current benefits
Pub Admin	Wildly unpredictable and incompetent president.
Retail/Wholesale	Combination of a conversion to SAP and a change in our distribution model using a 3PL.
Retail/Wholesale	Compliance with lending covenants
Retail/Wholesale	Impact of interest rates on housing market
Retail/Wholesale	Industry consolidations
Retail/Wholesale	Lack of cooperation in Washington. Congress not helping president
Retail/Wholesale	Political uncertainty vis a vis offshoring
Retail/Wholesale	Product supply
Retail/Wholesale	uncertain tax and government policy.
Retail/Wholesale	wage inflation
Services, Consulting	Ability to retain core clients
Services, Consulting	Attracting qualified New employees
Services, Consulting	Building competition.
Services, Consulting	Completing the process to get my corporation incorporated
Services, Consulting	Concerned about Europe and the future of the Euro
Services, Consulting	congress gridlock
Services, Consulting	Democrats promoting political uncertainty
Services, Consulting	Developing volatility in trade realtionships.

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Services, Consulting	Digital Disruption
Services, Consulting	Employee compensation increase.
Services, Consulting	Employee turn over.
Services, Consulting	engaging and maintaining clients
Services, Consulting	Government policies are an important factor for us as well.
Services, Consulting	Governments immigration polices
Services, Consulting	NA
Services, Consulting	None
Services, Consulting	None
Services, Consulting	None
Services, Consulting	not sure
Services, Consulting	Payout of retiring partners.
Services, Consulting	Political fall out from a Presidential regime that is about to crumble and has no idea what they are doing.
Services, Consulting	Possible new laws under Trump Administration
Services, Consulting	Progress on tax reform is crucial to continued capital investment from our clients.
Services, Consulting	Talent and wage inflation
Services, Consulting	The economic future direction is totally dependent upon the Administration's success in policy and legislative implementation. So far, not so great; but it's too soon to draw longer term inferences.
Services, Consulting	The very wide political split in the US.
Services, Consulting	TRUMP
Services, Consulting	Trump total unpredictability
Services, Consulting	Uncertainty about US economic policy and budge.
Services, Consulting	Work ethics of the work force
Tech [Soft/Hard/Bio]	Changes in government policy may impact market for product / services.
Tech [Soft/Hard/Bio]	changing marketplace
Tech [Soft/Hard/Bio]	Cost of providing heathcare, data intrusion
Tech [Soft/Hard/Bio]	Just in time resourcing, Cash Flow
Tech [Soft/Hard/Bio]	Managing growth
Tech [Soft/Hard/Bio]	N/A
Tech [Soft/Hard/Bio]	Non-defense spending
Tech [Soft/Hard/Bio]	Roll out of new product; completing round b funding
Tech [Soft/Hard/Bio]	Tax risks for software sales.
Tech [Soft/Hard/Bio]	Volitility caused by uncertainty due to policy tweets and fake news.
Transp, Public Util	Merger / shareholder activism threats
Transp, Public Util	Privatization of air traffic controllers
Transp, Public Util	We need for the President and the US Congress to highly prioritize Infrastructure investments to drive US economic growth.
Unspecified Industry	Unpredictability and irrationality of Trump administraton
Unspecified Industry	US Government uncertainty.

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Unweighted - Winsorized]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Health care costs	8.23	6.54	7.50 - 8.96	7	-9.26	27.05	309
Earnings	8.15	16.96	6.22 - 10.08	5	-36.50	57.61	297
Revenue	7.95	15.06	6.29 - 9.62	5	-44.90	68.34	314
Technology spending	5.70	10.63	4.43 - 6.97	3	-26.20	39.94	270
Wages/Salaries	4.25	4.67	3.73 - 4.77	3	-13	23.32	312
Number of domestic full-time employees	3.96	12.01	2.55 - 5.36	2	-49.60	62.22	281
Capital spending	3.88	19.49	1.57 - 6.19	2	-60.20	76.24	273
Marketing/advertising spending	3.76	8.81	2.68 - 4.84	2	-29.40	39.30	256
Research and development spending	2.74	6.73	1.85 - 3.62	0	-17.50	24.79	222
Prices of your products	2.47	4.54	1.93 - 3.02	2	-10.90	16.69	266

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months for: [Unweighted - Sorted]

(N=357)

	Mean & SD	Positive 1	Zero 0	Negative -1	Total
	0.89	285	21	6	312
Wages/Salaries	0.37	91.35%	6.73%	1.92%	100.00%
	0.89	278	27	4	309
Health care costs	0.36	89.97%	8.74%	1.29%	100.00%
	0.70	261	13	40	314
Revenue	0.68	83.12%	4.14%	12.74%	100.00%
	0.62	183	72	15	270
Technology spending	0.59	67.78%	26.67%	5.56%	100.00%
	0.57	218	30	49	297
Earnings	0.76	73.40%	10.10%	16.50%	100.00%
	0.53	158	91	17	266
Prices of your products	0.62	59.40%	34.21%	6.39%	100.00%
	0.47	139	99	18	256
Marketing/advertising spending	0.63	54.30%	38.67%	7.03%	100.00%
	0.42	168	62	51	281
Number of domestic full-time employees	0.78	59.79%	22.06%	18.15%	100.00%
	0.35	143	82	48	273
Capital spending	0.76	52.38%	30.04%	17.58%	100.00%
	0.33	83	130	9	222
Research and development spending	0.55	37.39%	58.56%	4.05%	100.00%

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Revenue Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Earnings	7.22	11.09	5.94 - 8.49	5	-36.50	57.61	291
Revenue	6.20	8.72	5.22 - 7.18	5	-44.90	68.34	304
Technology spending	4.14	9.31	3.05 - 5.24	2	-26.20	39.94	277
Prices of your products	2.53	4.24	2.02 - 3.03	2	-10.90	16.69	273
Research and development spending	2.28	4.85	1.67 - 2.90	0	-17.50	24.79	238
Capital spending	2.24	13.09	0.74 - 3.74	3	-60.20	76.24	293
Marketing/advertising spending	1.77	3.65	1.32 - 2.21	0	-29.40	39.30	255

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Employee Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Health care costs	7.83	6.64	6.97 - 8.70	7	-9.26	27.05	228
Wages/Salaries	4.07	4.09	3.54 - 4.60	3	-13	23.32	226
Number of domestic full-time employees	3.84	11.35	2.29 - 5.38	2	-49.60	62.22	208

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Public Companies - Winsorized - Revenue Weighted]

	Mean	SD	95% CI	Median	Minimum	Maximum
Earnings	8.17	9.52	6.70 - 9.64	7.38	-5	57.61
Revenue	6.40	9.60	4.95 - 7.85	5	-10	50

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Q5a. Compared to the typical amount of uncertainty that your company faces, how would you rank the current level of uncertainty facing your firm?

Compared to the typical amount of uncertainty that your company faces, how would you rank the current level of uncertainty facing your firm?	Number	Percent	95% CI
below average	22	6.3 %	± 2.5 %
average	201	57.4 %	± 5.2 %
above average	125	35.7 %	± 5.0 %
DK	2	0.6 %	± 0.8 %
Total	350	100.0 %	

Missing Cases = 7
Response Percent = 98.0 %

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Q5a. Compared to the typical amount of uncertainty that your company faces, how would you rank the current level of uncertainty facing your firm? (DK excluded - Shows average scores)

Compared to the typical amount of uncertainty that your company faces, how would you rank the current level of uncertainty facing your firm?	Number	Percent	95% CI
-1=below average	22	6.3 %	± 2.5 %
0=average	201	57.8 %	± 5.2 %
1=above average	125	35.9 %	± 5.0 %
Total	348	100.0 %	

Mean = 0.30

Missing Cases = 9
Response Percent = 97.5 %

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Q5b. Compared to an average or normal amount of uncertainty, has the current amount of uncertainty about governmental policies and/or economic conditions led your firm to?

N=147	Total	Compared to the typical amount of uncertainty that your company faces, how would you rank the current level of uncertainty facing your firm?	
		below average	above average
Total	147	22	125
	100.0%	15.0%	85.0%
Compared to an average or normal amount of uncertainty, has the current amount of uncertainty about governmental policies and/or economic conditions led your firm to (select one)			
proceed more aggressively	25	8	17
	17.1%	36.4%	13.7%
proceed at a normal pace	37	8	29
	25.3%	36.4%	23.4%
proceed at a slower pace	47	2	45
	32.2%	9.1%	36.3%
delay expansion / new projects	23	3	20
	15.8%	13.6%	16.1%
cancel expansion / new projects	2	0	2
	1.4%	0.0%	1.6%
Don't know, does not apply	12	1	11
	8.2%	4.5%	8.9%

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Q5b. Compared to an average or normal amount of uncertainty, has the current amount of uncertainty about governmental policies and/or economic conditions led your firm to? (DK excluded - Shows average scores)

N=147	Total	Compared to the typical amount of uncertainty that your company faces, how would you rank the current level of uncertainty facing your firm?	
		below average	above average
		1	3
Total	147	22	125
	100.0%	15.0%	85.0%
Compared to an average or normal amount of uncertainty, has the current amount of uncertainty about governmental policies and/or economic conditions led your firm to (select one)			
-1=proceed more aggressively	25	8	17
	18.7%	38.1%	15.0%
0=proceed at a normal pace	37	8	29
	27.6%	38.1%	25.7%
1=proceed at a slower pace	47	2	45
	35.1%	9.5%	39.8%
2=delay expansion / new projects	23	3	20
	17.2%	14.3%	17.7%
3=cancel expansion / new projects	2	0	2
	1.5%	0.0%	1.8%
Mean	0.55	0.00	0.65

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Q5b. Compared to an average or normal amount of uncertainty, has the current amount of uncertainty about governmental policies and/or economic conditions led your firm to? (DK excluded - Additional analysis)

N=147	Total	Compared to the typical amount of uncertainty that your company faces, how would you rank the current level of uncertainty facing your firm?	
		below average	above average
Total	147	22	125
	100.0%	15.0%	85.0%
Compared to an average or normal amount of uncertainty, has the current amount of uncertainty about governmental policies and/or economic conditions led your firm to (select one)			
proceed more aggressively	25	8	17
	18.7%	38.1%	15.0%
proceed at a normal pace	37	8	29
	27.6%	38.1%	25.7%
proceed at a slower pace /delay expansion / new projects	70	5	65
	52.2%	23.8%	57.5%
cancel expansion / new projects	2	0	2
	1.5%	0.0%	1.8%

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Agr, Forestry, Fishing	Active involvement in policy. Adjust to the uncertainty or just keep running the business
Agr, Forestry, Fishing	Use outside legal counsel for labor policy/practices and mitigating risk. Lock-in interest rates by converting short term to long term debt.
Bank/Fin/Insur/Real Est	Adhere to and incur costs associated with regulatory requirements.
Bank/Fin/Insur/Real Est	Be aware but continue to work on the tasks and goals that you can influance or control.
Bank/Fin/Insur/Real Est	Be cautious and stay true to your primary values and practices that have worked well in the past.
Bank/Fin/Insur/Real Est	Be conservative in regards to expansion andhiring
Bank/Fin/Insur/Real Est	Be flexible and stay short term thinking
Bank/Fin/Insur/Real Est	be vigilant
Bank/Fin/Insur/Real Est	Conduct scenario planning and be ready to be flexible.
Bank/Fin/Insur/Real Est	Conservatism
Bank/Fin/Insur/Real Est	Contingency/scenario planning, government and regulatory communication
Bank/Fin/Insur/Real Est	Determine customer problems and find creative solutions to solve them
Bank/Fin/Insur/Real Est	effectively managing our major cost - people resources - don't hire too fast
Bank/Fin/Insur/Real Est	Erring on the side of conservatism
Bank/Fin/Insur/Real Est	find a niche
Bank/Fin/Insur/Real Est	Focus on things within your control - service your clients.
Bank/Fin/Insur/Real Est	Focus on your business
Bank/Fin/Insur/Real Est	Go slowly
Bank/Fin/Insur/Real Est	Have a good enough understanding of your organization and your markets that you can make quick course corrections if necessary
Bank/Fin/Insur/Real Est	Ignore Washington and double focus on customer.
Bank/Fin/Insur/Real Est	It depends on the industry
Bank/Fin/Insur/Real Est	keep focused on what you can control yourself.

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Bank/Fin/Insur/Real Est	Limit new products and services
Bank/Fin/Insur/Real Est	moderate plans and develop contingency steps
Bank/Fin/Insur/Real Est	Monitor the risk and mitigate as you can but don't stop with indecision
Bank/Fin/Insur/Real Est	more review and analysis before embarking on new products
Bank/Fin/Insur/Real Est	Narrow your focus to your core competencies.
Bank/Fin/Insur/Real Est	Prepare in advance for the potential outcome.
Bank/Fin/Insur/Real Est	Review short and long term debt
Bank/Fin/Insur/Real Est	ROI analysis, scenario analysis, ROTCE analysis
Bank/Fin/Insur/Real Est	Slow and steady pace. Monitor changes but be quick to react.
Bank/Fin/Insur/Real Est	Stay conservative.
Bank/Fin/Insur/Real Est	Stay focused
Bank/Fin/Insur/Real Est	Stay liquid, hold off on large, costly projects
Bank/Fin/Insur/Real Est	Stay the course on core businesses. Proceed cautiously with new business ideas. Continue to focus on technological improvements in operations and customer service.
Bank/Fin/Insur/Real Est	Stronger Risk Analysis
Bank/Fin/Insur/Real Est	Take a 'don't be the farm' approach.
Bank/Fin/Insur/Real Est	Tighten spending. Search for new revenue opportunities.
Bank/Fin/Insur/Real Est	Use of subject matter experts and consultants
Bank/Fin/Insur/Real Est	Watch costs
Communication/Media	assume not going to control everything. try to accelerate less risky paths but have multi faceted plan.
Communication/Media	retain high amount of liquid assets
Communication/Media	Slow to hire. Stay on budget. Invest in new business opportunities.
Energy	Add revenue stream(s)within framework of company's infrastructurem
Energy	Execute on the opportunities and think long term, but staying strong in cash

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Energy	Find alternative sales channels for products currently supported by government regulation
Energy	hedge more, spend less
Energy	Increasing degree of accuracy in forecasts
Energy	Keeping adequate cash reserves and shortening the procurement cycle to keep inventory turns high
Energy	Looking at the long term goals and strategies.
Energy	scenario analysis; preparedness
Energy	The uncertainty this time is whether conditions improve
Energy	Unless the change is concrete or certain, then you must plan with the laws and policies in place currently.
Energy	wait and see, but invest based on long-term prudent business practices
Energy	we've pulled back and waited for the economic indications to change
Healthcare/Pharm	Attention to detail & flexibility
Healthcare/Pharm	Be cautious.
Healthcare/Pharm	Caution.
Healthcare/Pharm	caution
Healthcare/Pharm	Control costs, grow revenue
Healthcare/Pharm	Do the best to remain flexible
Healthcare/Pharm	Engage with the government stakeholders as directly and often as possible
Healthcare/Pharm	focus on improving core business - efficiency, for ex. Look for ways to spread the risk (new markets, for ex)
Healthcare/Pharm	Gather data from financial, industry & academic resources; analyze & then make best possible decisions
Healthcare/Pharm	Have multiple scenario's and action plan's. Stay on top of trends with accurate and timely (weekly) Key Performance Indicators
Healthcare/Pharm	Having multiple strategies to address uncertainties and a decision process evaluating likelihood of the various scenarios.

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Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Healthcare/Pharm	Invest in great talent, invest in new technology that gives us an edge over others. Cut those who are not productive.
Healthcare/Pharm	Keep to the basics and focus on your core business functions. New ideas and innovations will be slowed to going into production or deferred.
Healthcare/Pharm	limit high levels of cash flow out.
Healthcare/Pharm	move forward with caution
Healthcare/Pharm	Move swiftly, don't overanalyze, don't worry about issues outside ones control
Healthcare/Pharm	Stash cash to a 360 day reserve. Trend major services to pull from the market if reimbursement collapses.
Healthcare/Pharm	stay within your budget
Healthcare/Pharm	Steady as she goes...
Healthcare/Pharm	Stick to the basics; run the company in an efficient manner and use sound business practices.
Healthcare/Pharm	take calculated risks
Healthcare/Pharm	Wait out what the policies are going to be coming out of Washington
Manufacturing	Accumulate cash, pay back debt. Wait for certainty. Proceed cautiously
Manufacturing	Active involvement in advocacy work in DC. Scenario planning under different environments.
Manufacturing	Avoid over-leveraging
Manufacturing	Be very cautious about spending and hiring
Manufacturing	Best practice for us is to diversify our product mix, and take strides to develop new marketable items.
Manufacturing	Cash is King
Manufacturing	Cash is king. Keep employees informed.
Manufacturing	Caution feels appropriate. Washington always difficult to predict, but volatility of new President taking uncertainty to a new level.
Manufacturing	Closely monitor changes and proactively plan for changes
Manufacturing	conservative approach

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Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Manufacturing	Continue to focus on customer needs and relationships. No matter what -customer dialogue about your issues is #1 best practice. Size up all platforms for potential cash conversion improvement.
Manufacturing	Control spending both on expense items as well as capital acquisitions. Ensure that debt is not out of hand. Focus on productivity and efficient operations.
Manufacturing	Cost and productivity management. aligned incentives. Focus to advance competitive position. Customer services and relationships
Manufacturing	delay until we have more certainty
Manufacturing	Do not undertake any new projects, conserve cash and look after customer base more diligently
Manufacturing	Do your job properly daily
Manufacturing	don't ignore long term needs
Manufacturing	Double check every project and take calculated risks that can be changed or unwound in short order
Manufacturing	flexibility and nimbleness
Manufacturing	Focus on core competencies, and invest wisely. Do not burden the company with fixed costs that can be avoided.
Manufacturing	Focus on leveraging the core strengths of the business
Manufacturing	Focus on long-term goals. Open and frequent communication. Stay the course. Improve relationships with customers.
Manufacturing	Focus on what your company does best.
Manufacturing	focus on what you can do
Manufacturing	Focused market strategies and operations improvement and excellence.
Manufacturing	Further develop capability to flex cost structure to match changing conditions
Manufacturing	Govt policies are not major factors. Marketplace is primary.
Manufacturing	Hold the line.
Manufacturing	Increase understanding of options available.
Manufacturing	It depends on how the company is directly impacted. Our company is not anticipated to be directly impacted by any of the current regulatory uncertainty.

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Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Manufacturing	Learn all you can and use the assets available such as banks and trade associations
Manufacturing	Listen carefully and be part of the conversation
Manufacturing	Maintain as much flexibility/optionality as possible
Manufacturing	Maintain flexibility
Manufacturing	Maintaining contingencies across different markets that are not public spend dependent
Manufacturing	Manage risk from uncertainty with conservative policies
Manufacturing	match internal costs to market reality
Manufacturing	Minimize any speculative growth investments or hiring. Tight cost control.
Manufacturing	NA
Manufacturing	Plow ahead
Manufacturing	Proceed cautiously
Manufacturing	Pull back, go slowly, proceed with caution, be flexible enough to change quickly.
Manufacturing	Stay close to your customer and understand the drivers of their decision making process. Stay nimble and recalibrate areas of investment and reconfirm ROI. Don't let sunk costs cloud your decision.
Manufacturing	Stay the course
Manufacturing	Stay the course. Doing the right thing for customers and the regulation will be what it will be.
Manufacturing	Stick to what you know best and do it very well. Focus on long-term metrics such as return on capital to ensure success over the longer term.
Manufacturing	This information is proprietary so unfortunately I can't disclose
Manufacturing	Uncertainty creates opportunity and risk, so the best practice will generally be to assess the risk-reward and continue to take appropriate risks.
Manufacturing	Understand the sensitivity for each of your core segments to changing government policy and/or economic conditions. Acquire businesses that are less sensitive to government policy and elastic demand.

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Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Manufacturing	understand leading market indicators and adjust spending accordingly on a timely basis
Mining/Construction	Add the price of the risk perceived to the product.
Mining/Construction	Add to liquidity position
Mining/Construction	Best time to move forward. Uncertainity from FAKE News does not create uncertainity in business. Uncertainity from US Media is marginal at best at all times as they are more a sensationalist TV show
Mining/Construction	Build a fortress balance sheet, operate as lean as possible, and become risk averse.
Mining/Construction	Focus on what matters
Mining/Construction	Keep Cash reserves high. Don't hire. Do not take on Debt
Mining/Construction	minimize spending and diversify to limit exposure.
Mining/Construction	Spread risk among as many different projects as possible
Mining/Construction	Stay focus and take care of your people and customers
Mining/Construction	try to influence upcoming policy decisions
Mining/Construction	Wish I knew
Other	act conservatively until a clear path emerges
Other	Aggressive conservatism
Other	be cautious, look at long term trends,
Other	Caution
Other	cautious capital spending; slower staffing
Other	Companies need to have reliable economic indicators to gauge where they are in the economic marketplace. We have had much success with developing our own leading, coincidental and lacking indicators.
Other	Consider downside scenarios
Other	Cut on spending, increase reserves.
Other	Don't make large bets....
Other	Focus on Cost reduction, affordability and limit new spending.

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Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Other	focus on what you can control ; govt policies and economic conditions are not something you can control
Other	Hedging.
Other	Help customers with country risk assessments, and provide them ways to manage their risk by using Master Data and our Global Data capabilities
Other	Hunker down with current strategy. Work with group on other options, looking at extremes and working backwards.
Other	Innovate new ways to excel in the changing context.
Other	keep challenging yourself, keep looking for new opportunities, continue to improve processes and productivity
Other	lower your risk factors
Other	Maintaining or reducing costs related to your business.
Other	Maximize revenue, tight expense control, long-term capital expense planning
Other	Not sure
Other	Opportunity for growth when we are the best at what we do
Other	Pay more attention to various controllable costs and hiring of FT staff.
Other	Remember mission but require a higher degree of certainly before embarking on new or expanding existing programs and initiatives.
Other	Scenario planning, scalability, cash flow, financing and community relationships.
Other	Stay the course
Other	stay the course
Other	Steady course.
Other	strong leadership response
Other	Take a deep breath and analyze the 'big picture' and assess risk long term.
Other	Take a long term approach.

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Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Other	Take care of employees! The current climate is very volatile, and companies are firing people because they don't seem to know how to manage through uncertainty. Firing doesn't solve problems
Other	Taking tolerable risk with sufficient safety caution to stay alert in the market, keep up with major players and competitors, and move ahead.
Other	Two choices: hunker down and ride it out, or move forward in creative ways. We use both depending on the project/line item
Other	Uncertainty is not about government policies, but more importantly about staff shortages. The question that needs to be answered ..'when should risk down-sizing Operations to match our labor force'.
Pub Admin	Budget conservatively
Pub Admin	Don't market to sensitive sectors
Pub Admin	move slowly and carefully into new things while taking excellent care of customers. Increase customer service performance
Pub Admin	Plan for all possible scenarios as far in advance as possible and be prepared to act as quickly as possible.
Retail/Wholesale	Always be assessing ways to cut back your expenses and continue to work to expand and improve your existing product lines
Retail/Wholesale	build cash and accelerate debt payoff.
Retail/Wholesale	Conservative investment and spending
Retail/Wholesale	Focus on profitable sales
Retail/Wholesale	Have the business goal in mind and keep working towards it, adjusting along the way when the economics are unclear. Imperative to be able to pivot quickly
Retail/Wholesale	Hold
Retail/Wholesale	Our company is cautious on its inventory levels and marketing spending.
Retail/Wholesale	planning, communication (frequent), realistic outlook
Retail/Wholesale	Predicting the future
Retail/Wholesale	Proceed with caution if those uncertainties could translate to higher risk.
Retail/Wholesale	Scrutinize plans for spend.

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Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Retail/Wholesale	Select the course of action that makes the most sense for stakeholders while trying to leave flexibility for the possible outcomes of policy changes.
Retail/Wholesale	Stay conservative on budgets/forecasts, along with being conservative on new investments or increased spending.
Retail/Wholesale	stay focused on our core structure
Retail/Wholesale	Take a conservative approach and plan for the worst possible outcome.
Retail/Wholesale	wait until enough data is available to make a reasonable decision
Retail/Wholesale	We don't spend on expansion or capex or hire additional employees until there is greater certainty.
Retail/Wholesale	We make decisions based on current policies. We do not try to guess what will happen.
Services, Consulting	Act upon metrics sooner rather than wait and see approach.
Services, Consulting	Adopt next generation of digital assets. Inorganic growth to accelerate revenue.
Services, Consulting	Being conservative in your decisin making processes. Figure income low and expenses high.
Services, Consulting	Being very conservative in your approach
Services, Consulting	caution
Services, Consulting	Communication and education
Services, Consulting	Conservation of capital and reduction in expenses
Services, Consulting	cooperation among producers
Services, Consulting	Cost mabagement and strategic capital allocation
Services, Consulting	Create a environment that values cash and reduces risk and investment until issues are resolved
Services, Consulting	Develop a strategy/plan, have contingencies but stick to the strategy/ plan.
Services, Consulting	Diversification, agility and responsiveness. Using predictive analytics but also being prepared to change course if warranted. Efficiencies and versatility
Services, Consulting	DO WHAT IS BEST FOR YOUR COMPANY

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Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Services, Consulting	Don't guess
Services, Consulting	Educate about impact of Government policies to proceed cautiously
Services, Consulting	expand marketing efforts
Services, Consulting	Focus on bottom line vs top line and invest back into the company
Services, Consulting	Focus on execution of key strategies
Services, Consulting	Focus on stable demand services
Services, Consulting	Focus on the basics
Services, Consulting	For us, it is wait and see.
Services, Consulting	Increase marketing to obtain new business to offset losses elsewhere. Look to expand in foreign markets.
Services, Consulting	Keep cost to a minimum and look for other financial resources.
Services, Consulting	Keep focusing on growing revenues and trying to reach higher revenue pricing
Services, Consulting	Maintain flexibility, write contracts cancellable with 60-days advance notice, and partner with strategic vendors/suppliers.
Services, Consulting	maintain focus on serving the clients as best we can
Services, Consulting	maintain status quo of no new investment
Services, Consulting	Manager for internal stability and new, equally stable customers. Grow market share aggressively.
Services, Consulting	Must use the best risk analysis that is available. This would likely be a more conservative position.
Services, Consulting	plan for change
Services, Consulting	Plan for the worst-case scenario
Services, Consulting	plan for the future- increase cash reserves
Services, Consulting	Positive change is coming- capitalize on it
Services, Consulting	Protect cash flow.
Services, Consulting	reducing speculative investment, maintain strong balance sheet,
Services, Consulting	slow and steady

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Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Services, Consulting	Staying focused on core competencies and delivering value
Services, Consulting	steady conservative policies that have led the company through the last 8 miserable years.
Services, Consulting	Stick to strategy.
Services, Consulting	Stockpile cash so that you can survive an economic downturn.
Services, Consulting	Take a second look and or get a second opinion on spending. Validate government policies related to your business.
Services, Consulting	Wait and see
Services, Consulting	Wait for signals before investing
Services, Consulting	We need to be cautious to manage our employment levels judiciously and be prepared to respond appropriately when the uncertainty conditions become clearer.
Services, Consulting	Weight the risk more carefully and maintain continous improvement strageties
Tech [Soft/Hard/Bio]	Careful Spending. Avoid risky ventures. Focus on getting more revenue from current product lines, and existing clients.
Tech [Soft/Hard/Bio]	Develop a model that projects the outcomes for various policy changes and conditions.
Tech [Soft/Hard/Bio]	Develop channels to gather information, gauge temperature around pending legislation, prepare alternatives in as much detail as possible. Prepare the organization to pivot to viable alternatives.
Tech [Soft/Hard/Bio]	Follow the news carefully
Tech [Soft/Hard/Bio]	hold cash for emergency
Tech [Soft/Hard/Bio]	In Chaos there is both danger and opportunity.
Tech [Soft/Hard/Bio]	Keep expenses under control, focus on key investments only and exploit every revenue opportunity (faster if possible)
Tech [Soft/Hard/Bio]	Monitor cash flow and manage customer accounts receivables. Reduce travel expenses and cap employee numbers.
Tech [Soft/Hard/Bio]	Multiple scenarios and flexibility in changing courseTi
Tech [Soft/Hard/Bio]	prepare, stay informed, have back up
Tech [Soft/Hard/Bio]	Proactively plan and be flexible

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Q6. What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?

IN	What are the best practices for running a company when uncertainty is high about governmental policies and/or economic conditions?
Tech [Soft/Hard/Bio]	Understand the marketplace today and how quickly it is moving. Start the changes early and modify if assumptions change.
Tech [Soft/Hard/Bio]	We view it as an opportunity - we try to be aggressive in times of uncertainty, figuring that those that are reluctant will stay on the sidelines and lessen our competition.
Transp, Public Util	1) Judicious capital spending. Pick the projects with the best ROI, 2) Devote some time and resources to influencing government policies/ decisions.3)Good spending control/managerial accounting.
Transp, Public Util	Care
Transp, Public Util	Do not become paralyzed with fear about the uncertainty
Transp, Public Util	Keep informed and have plans for however it goes
Transp, Public Util	Stick with your strengths, don't watch TV.
Unspecified Industry	Conserve cash
Unspecified Industry	Focus on adding value in everything we do and change things that don't.

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Q7. About which if any of the following items is uncertainty (about policy details or timing, etc.) holding back your company's plans for expansion and new projects?

About which if any of the following items is uncertainty (about policy details or timing, etc.) holding back your company's plans for expansion and new projects?	Number	Percent	95% CI
Health Care policy	117	32.8 %	± 4.9 %
Regulatory policy	116	32.5 %	± 4.9 %
Economic growth	105	29.4 %	± 4.8 %
Tax policy	99	27.7 %	± 4.7 %
Trade policy	49	13.7 %	± 3.6 %
Interest rates	40	11.2 %	± 3.3 %
Immigration Policy	38	10.6 %	± 3.2 %
Other	27	7.6 %	± 2.8 %
Total	591		

Number of Cases = 357
Number of Responses = 591
Average Number Of Responses Per Case = 1.7
Number Of Cases With At Least One Response = 316
Response Percent = 88.5 %

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Q7. About which if any of the following items is uncertainty (about policy details or timing, etc.) holding back your company's plans for expansion and new projects? OTHERS

IN	About which if any of the following items is uncertainty (about policy details or timing, etc.) holding back your company's plans for expansion and new projects? OTHERS
Agr, Forestry, Fishing	Access to capital
Bank/Fin/Insur/Real Est	Insurtech
Communication/Media	none
Energy	reversal of government policies.
Healthcare/Pharm	CMS Reimbursement
Healthcare/Pharm	oversight
Manufacturing	Long term federal deficits and outlook on capital returns
Manufacturing	No public policy issues.
Manufacturing	none
Manufacturing	None directly right now.
Other	Available Workforce
Other	Labor Force
Other	Labor requirements
Other	Legislative action on programs
Other	None
Other	none of these
Pub Admin	Government funding
Retail/Wholesale	Infrastructure spending
Services, Consulting	Government spending
Services, Consulting	None of these
Services, Consulting	public educati0n spending

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? TRADE POLICY

IN	Trade policy
Transp, Public Util	Cautious about increase staff numbers
Manufacturing	Creates uncertainty with our international partners. Reducing pricing to cope with strong dollar.
Bank/Fin/Insur/Real Est	Cut back on products for Chinese investors
Manufacturing	Delay investment in US or OUS facilities until long-term solution is more clear
Unspecified Industry	Didn't pursue international expansion
Manufacturing	expanding into Mexico
Manufacturing	Expansion. N
Manufacturing	expansion plans in various parts of the world due to trade uncertainty
Mining/Construction	Hand holding with foreign partners
Retail/Wholesale	High level of communications with import resources
Agr, Forestry, Fishing	Impact of export business
Manufacturing	import tax on items we buy from Asia
Manufacturing	Improved domestic production actually resulting in increased capex investments
Services, Consulting	less mfg investment
Manufacturing	Limiting expansion in Mexican operations
Services, Consulting	Look to foreign expansion
Manufacturing	Mexico plans on hold
Retail/Wholesale	New policy expectations
Healthcare/Pharm	None
Manufacturing	Potential for BATand/or uncompetitive tariff structures that could impact trade flows or strength of the US dollar; hard to assess strategic choices in this situation
Other	Potential impact on International sales
Services, Consulting	Proceeding as planned, but with caution.
Manufacturing	sold division
Retail/Wholesale	Still waiting for decisions to be made on aluminum tariffs to see if we need to find new source of supply

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? TRADE POLICY

IN	Trade policy
Services, Consulting	Trump is killing us
Other	uncertainty about its development
Manufacturing	We were actively pursuing new business in Canada--with NAFTA on the line, now what?
Manufacturing	Were looking to increase outsourcing of certain products -- slowed plans.

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? TAX POLICY

IN	Tax policy
Services, Consulting	Be conservative
Retail/Wholesale	buy vs lease equipment
Bank/Fin/Insur/Real Est	capital repatriation
Other	Charitable Deduction changes could drastically affect our business model
Bank/Fin/Insur/Real Est	Conservative capital spending (impacts nearly all capex decisions)
Retail/Wholesale	delay capital expenditures
Bank/Fin/Insur/Real Est	delay capital projects, hoping new reules will allow expensing
Services, Consulting	Delay Captial projects & new hires
Bank/Fin/Insur/Real Est	delay on plans for capital spending
Tech [Soft/Hard/Bio]	Delaying decisions on global Tax structure
Tech [Soft/Hard/Bio]	Difficulty with transfer pricing
Retail/Wholesale	estate planning, worldwide tax planning
Bank/Fin/Insur/Real Est	Expanding slower, lower wage increases
Tech [Soft/Hard/Bio]	held back transformation to different entity
Tech [Soft/Hard/Bio]	Higher hurdle rate for investment
Other	hired a more seasoned CPA firm
Manufacturing	Holding back on capex investment
Services, Consulting	Holding off / pursing sale of business
Other	holding off on long-term plans
Other	holding pattern on investment/expansion
Services, Consulting	if current proposals will be approved- please yes
Manufacturing	Infrastructure modernization
Energy	investment in Mexico
Healthcare/Pharm	Limited capital investments
Manufacturing	Limiting dividends
Services, Consulting	lobbied the new administration

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? TAX POLICY

IN	Tax policy
Energy	may require reorganization
Other	Monitoring
Manufacturing	More conservative growth and investment
Other	Moving corp office for billing only to another state,
Pub Admin	need significant reduction in corporate and personal tax rates
Retail/Wholesale	New policy expectations
Other	No change, steady course.
Healthcare/Pharm	None
Bank/Fin/Insur/Real Est	Not as aggressive on investments in infrastructure to support client growth
Retail/Wholesale	NOT DEFINITIVE PLAN, TOO MUCH POLITICKING IMPACTING LOCAL, NATIONAL, INTERNATIONAL
Services, Consulting	Not hired
Other	Potential loss of 1031 Exchange with new tax policy uncertain
Other	rate
Manufacturing	Reduced spending.
Manufacturing	Reduced Working Capital
Bank/Fin/Insur/Real Est	Reorganize to transfer revenue streams out of the US
Bank/Fin/Insur/Real Est	review tax benefits for clients
Bank/Fin/Insur/Real Est	Tax policies will affect out clients willingness to invest for future growth
Transp, Public Util	Tax structure and change for small business
Retail/Wholesale	Too soon to know what to do
Services, Consulting	Trump proposal will never fly
Manufacturing	Uncertainty in trade-offs for lower tax rate including bonus depreciation and mandatory repatriation impacting capital investment choices
Mining/Construction	Wait and see, working closely with accounting team
Services, Consulting	Waiting
Bank/Fin/Insur/Real Est	We are not spending more on capital

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? TAX POLICY

IN	Tax policy
Retail/Wholesale	We believe a simplified and perhaps more favorable tax environment would increase economic activity. Without certainty, we defer spending on non-essential capex.
Tech [Soft/Hard/Bio]	We have issues with international taxation, for certain countries we are adding a surcharge to our pricing to cover the additional international tax withholdings.
Other	We haven't taken specific action yet, just trying to get our donations to the level we budgeted for. We are tracking under.
Healthcare/Pharm	What are the limitations going to be.

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? REGULATORY POLICY

IN	Regulatory policy
Energy	accelerated acquisition due to better regulatory environment
Bank/Fin/Insur/Real Est	Adjust to new landscape
Healthcare/Pharm	Attitude toward aging population & employment
Energy	Back of purchase of competitor
Bank/Fin/Insur/Real Est	Banking is a heavily regulated industry and we encountered a greater demand for resources that keep us from hiring for other needs.
Bank/Fin/Insur/Real Est	capital planning
Bank/Fin/Insur/Real Est	Cease & Desist Order
Bank/Fin/Insur/Real Est	Changing products and sources of distribution of products
Bank/Fin/Insur/Real Est	compliance issues
Manufacturing	creating new products
Bank/Fin/Insur/Real Est	currently 50 state rules for insurance hoping for 1 national set of rules
Bank/Fin/Insur/Real Est	dealing with increased burden
Manufacturing	Delay decisions
Energy	Delay in infrastructure projects due to regulatory delays
Bank/Fin/Insur/Real Est	delayed expansion
Bank/Fin/Insur/Real Est	DLOL Regulations
Services, Consulting	DOL Fiduciary Rule
Bank/Fin/Insur/Real Est	Elimination of services
Manufacturing	Expanding sales force
Bank/Fin/Insur/Real Est	Expanding slower, lower wage increases
Healthcare/Pharm	fight over medicare and medicaid
Bank/Fin/Insur/Real Est	Go slow on any new product
Manufacturing	Have to plan for higher level of regulations from prior administration
Bank/Fin/Insur/Real Est	Health Care legislation potential changes
Bank/Fin/Insur/Real Est	hired further compliance personnel
Healthcare/Pharm	hiring freeze

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? REGULATORY POLICY

IN	Regulatory policy
Services, Consulting	hold steady until more clear
Tech [Soft/Hard/Bio]	Increased Lobbyist and Research Outreach
Bank/Fin/Insur/Real Est	lack of action on regs scheduled for 2019
Bank/Fin/Insur/Real Est	Lending is more muted than otherwise would be
Tech [Soft/Hard/Bio]	Less investment
Other	Limits on smaller, regional banks lending ability
Services, Consulting	lobbied the new administration
Energy	Located alternative sales channels
Manufacturing	Looking for ways to avoid triggering additional regulation. OSHA is a real issue.
Manufacturing	Lower investment in US Govt Mkt
Services, Consulting	Monitor and react
Healthcare/Pharm	monitor impact of changes on product launch
Other	Monitoring
Retail/Wholesale	NEEDS MORE CUTTING, THROW THE NAYSAYERS OUT AND CUT BUREAUCRACY THAT IS HOLDING UP IMPLEMENTATION OR FUDGING NUMBERS
Services, Consulting	new capital reuirements on banks are requiring outside PE funding for projects
Other	New Data regulations overseas are creating challenges for a more transparent and open data insight
Other	No 24/7 Waiver care expansion allowed by Department of Human Services.
Services, Consulting	no action taken
Services, Consulting	none
Services, Consulting	Not hired
Other	Not hiring
Services, Consulting	not investing capital for new projects
Pub Admin	Not moving as fast on certain projects until some of the uncertainty is reduced.

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? REGULATORY POLICY

IN	Regulatory policy
Retail/Wholesale	Not sure how import taxes will impact us so not looking at as many sources
Retail/Wholesale	Obama's added female wage information for DOL is useless without context.
Services, Consulting	Ovaerall uncertainty
Retail/Wholesale	Pending global merger
Tech [Soft/Hard/Bio]	Personal identity information in EU
Services, Consulting	PLAN FOR LEGISLATIVE INIATIVES
Bank/Fin/Insur/Real Est	product development has been put on hold due to DOL fiduciary reg
Manufacturing	Pushing the sale of current dangerous goods shipping solutions and the development of new products are slow-going when regulatory changes are currently being written.
Manufacturing	Review of policies and procedures impacted by new regulations
Other	Sadly, none
Bank/Fin/Insur/Real Est	slower expansion
Energy	slowing spending
Transp, Public Util	Some capital plans/projects are delayed until certainty is reached on policies
Healthcare/Pharm	The government over-reach has slowed us down, hoping for relief
Services, Consulting	Trump is all over the map
Services, Consulting	Uncertain position with foreign country relations.
Other	uncertainty about its development
Manufacturing	uncertainty causing our customers to withhold investments, thus resulting in our reduction of capex and hiring
Energy	wait to see what regulations will be finalized
Other	waiting to see what's blowing in the wind
Bank/Fin/Insur/Real Est	We have slowed down our expansion
Energy	will brief on legislative reg changes this evening through middle of next week
Bank/Fin/Insur/Real Est	will rules actually be loosened, if not then plans will be scaled back

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? HEALTH CARE POLICY

IN	Health Care policy
Bank/Fin/Insur/Real Est	2018 benefits changes
Retail/Wholesale	add full or part timer employee
Manufacturing	Adding additional staff
Services, Consulting	Aggresively looking at coverages that will protect the company and employees
Other	budgeting as usual and hoping ACA doesn't change and medical bens are not taxable
Other	carefully evaluate new policies
Manufacturing	Choosing Health Insurance plan very difficult
Services, Consulting	Consulting service offerings
Bank/Fin/Insur/Real Est	cost
Services, Consulting	Couldn't afforf to hire
Other	coverage mandates
Manufacturing	Decrease quality of coverage becasue of cost.
Services, Consulting	Delay new hires
Manufacturing	Delay staffing additions
Services, Consulting	delayed hiring
Bank/Fin/Insur/Real Est	delayed introduction of new products
Tech [Soft/Hard/Bio]	Difficulty with LT budgeting
Other	Employer reporting forms
Bank/Fin/Insur/Real Est	Expanding slower, lower wage increases
Bank/Fin/Insur/Real Est	extend current policy for as long as possible 18 months
Manufacturing	Future of ACA related reforms
Healthcare/Pharm	Governmental treatment of Medicare, Medicaid + attitude of government toward the baby boomer generation who has lost savings as a result of the Great Recession
Tech [Soft/Hard/Bio]	has affected sales opportunities
Bank/Fin/Insur/Real Est	Health Care legislation potential changes

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? HEALTH CARE POLICY

IN	Health Care policy
Other	held back on setting up employee health insurance
Tech [Soft/Hard/Bio]	Hiring reduction
Energy	Holding back hiring
Services, Consulting	if changes will be approved- please yes
Retail/Wholesale	increase co-pays, deductibles and employee contributions
Other	Increase in costs and employee demands for increasing benefits.
Manufacturing	increased employee contribution toward health insurance - employees covered increase for current year premiums
Manufacturing	Increases employee cost sharing
Services, Consulting	labbied the new administration
Unspecified Industry	Link benefits strategy to human capital strategy
Services, Consulting	Looking for less expensive opportunities
Healthcare/Pharm	May change policies
Energy	may impact employees, so wait & see attitude will respond later
Manufacturing	Minimal changes to benefits
Services, Consulting	Monitor. The ACA has been extremely beneficial so it going away will harm us. California changes on the face of it will be very beneficial.
Healthcare/Pharm	monitor impact of legislation on product launch
Manufacturing	Movement toward High Deductible HSA type plans
Pub Admin	need affordable options for medical and control of pharmacy cost increases
Services, Consulting	no changein coverage
Manufacturing	no design changes for healthcare pending future outcome of ACA
Other	Not being able to budget appropriately
Retail/Wholesale	Obama care
Manufacturing	Our health care costs are through the roof and outlook is grim for next year.
Tech [Soft/Hard/Bio]	Out of healthcare causes direct budget impact on total personnel costs.

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? HEALTH CARE POLICY

IN	Health Care policy
Energy	Partial self insurance
Retail/Wholesale	Plan cost
Healthcare/Pharm	Product development
Healthcare/Pharm	Re-evaluation of current benefits plans and companies
Other	reduce other spending
Manufacturing	reduced hiring of full time employees
Manufacturing	Reducing benefits of health care offered.
Healthcare/Pharm	Reimbursements and market forces will determine our budget.
Mining/Construction	Review with brokers
Manufacturing	Riising rates reduces Working Capital
Bank/Fin/Insur/Real Est	Self insurance6.25
Retail/Wholesale	Shop around for the best rates
Services, Consulting	shopping around but to no avail as there are only so many companies to choose from.
Communication/Media	Slow to hire new staff.
Services, Consulting	unable to project costs, resulting spending holds
Healthcare/Pharm	Uncertainity of future healthcare
Healthcare/Pharm	uncertainity of government payments
Bank/Fin/Insur/Real Est	Uncertainty and change creates additional consulting opportunities for us
Other	uncertainty about its implications
Mining/Construction	wait and see, set funds aside in case of increased expenses
Healthcare/Pharm	waiting to see how the new health care law irons out
Bank/Fin/Insur/Real Est	We are reducing benefits due to the higher healthcare costs
Retail/Wholesale	We have passed on the increase in costs to employees for past 2 years
Bank/Fin/Insur/Real Est	We will be exploring alternative plans and funding by company
Healthcare/Pharm	Who is covered and the cost

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? IMMIGRATION POLICY

IN	Immigration policy
Tech [Soft/Hard/Bio]	Access to qualified tech workers
Manufacturing	Capital spending is modestly less aggressive
Other	encourage legislators to be more open to immigrants
Mining/Construction	Explore hiring options to encourage non-citizens to apply
Manufacturing	government visa regulations
Mining/Construction	Had to withdraw from some projects. Ecause this labor force was not available
Other	Haven't changed anything at this point,
Services, Consulting	hiring
Tech [Soft/Hard/Bio]	hold back on hiring graduates
Other	Hurts our many int'l students
Services, Consulting	Immigration restrictions & Visa policies
Other	Less customers for our products, & Less workers for our vendors
Manufacturing	limited engineering talent
Manufacturing	Modify succession planning where immigrants were considered successors
Manufacturing	need more workers
Pub Admin	no refuges that are not 100% safe.
Healthcare/Pharm	None
Services, Consulting	none
Tech [Soft/Hard/Bio]	On ern over H1 visa hiring and employee turnover.
Services, Consulting	Outreach to immigrant populations
Mining/Construction	policies to retain current workers
Bank/Fin/Insur/Real Est	potential impact on revenues
Healthcare/Pharm	recruiting staff, especially the J-1 visa status
Manufacturing	Reducing # of expatriates
Other	refrain from plant expansion and acquistions due to limited labor availability

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? IMMIGRATION POLICY

IN	Immigration policy
Unspecified Industry	Slowed hiring of immigrations
Communication/Media	slowed hiring and number of projects.
Services, Consulting	The indirect costs are hidden and. in most cases, uncontrollable for private enterprise.

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? INTEREST RATES

IN	Interest rates
Manufacturing	Be cognizant of leverage -- use interest rate hedge products to limit exposure
Other	borrow less
Retail/Wholesale	Borrowing
Bank/Fin/Insur/Real Est	continous monitoring what is appearing to become a flat yield curve
Services, Consulting	feds are anti trump
Bank/Fin/Insur/Real Est	it has been great paying less for loans outstanding. this will affect our bottom line if interest rates rise
Communication/Media	Keep borrowing to a minimum
Services, Consulting	LDI in DB plans
Bank/Fin/Insur/Real Est	Limiting exposure to interest sensitive liabilities
Other	No clear picture on the strategy of the govt long term is an issue for investments.
Energy	perform more important cap ex projects sooner than later.
Services, Consulting	Plan not to borrow as much and use reserves if necessary.
Bank/Fin/Insur/Real Est	Raised mortgage rates as general rates go up.
Bank/Fin/Insur/Real Est	Reducing interest rate sensitivity
Services, Consulting	Reviewing lines of credit etc.
Bank/Fin/Insur/Real Est	risk
Bank/Fin/Insur/Real Est	Scaled back lending activity
Bank/Fin/Insur/Real Est	structure credit markets accordingly
Other	We constantly move our funds to higher yield accounts when possible.
Services, Consulting	won't borrow
Healthcare/Pharm	Working to internally generate working capital

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? ECONOMIC GROWTH

IN	Economic growth
Retail/Wholesale	1-2% GDP growth is weak. Need 4% to lift all companies.
Unspecified Industry	Accelerated spending
Other	Annual Govt funding cycle has been limited to Continuing Resolutions - no growth, no new programs
Services, Consulting	Asset valuations are getting stretched in equities
Services, Consulting	Attempting to expand our customer base beyond our historical target comapnies
Manufacturing	Be cognizant of leverage -- ability to pay down debt
Tech [Soft/Hard/Bio]	Become more aggresive in selling effort in order to overcome customers' economic uncertainty.
Manufacturing	Buffered with other customers
Manufacturing	CAPITAL SPENDING
Manufacturing	Capital spending is modestly less aggressive
Manufacturing	capital spend slower
Retail/Wholesale	Cautious about hiring and expansion
Retail/Wholesale	Congress not helping president
Healthcare/Pharm	continue to wait on increasing housing supply
Manufacturing	Continued slow growth US and Europe economies is minimizing faster growth in emerging regions
Bank/Fin/Insur/Real Est	Creating more prospective leads
Services, Consulting	Current regime has no clue on economic growth.
Manufacturing	Cutback on investment in people, marketing and capital.
Other	Delay in M&A activity
Retail/Wholesale	demand more risky to assess
Manufacturing	Evaluating acquisitions and expansion into adjacent markets
Services, Consulting	have postponed hiring more staff
Other	High investor net income expectations limit growth opportunities n certain geographical markets we have considered

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? ECONOMIC GROWTH

IN	Economic growth
Retail/Wholesale	Holding off on spending initiatives until sales growth projections come true.
Services, Consulting	Identify new markets
Manufacturing	impact on comsumer demand
Bank/Fin/Insur/Real Est	Increased govt spending has a positive impact on our top line growth
Bank/Fin/Insur/Real Est	Increased marketing
Manufacturing	Industrial Production soft globally - reducing capex spend and hiring
Services, Consulting	Investing in capital equipment
Communication/Media	investing in sales force to combat overall minimal growth
Manufacturing	Lack thereof has reduced employment.
Services, Consulting	Limited growth of personnel ranks
Services, Consulting	Looking at acquistion and merger.
Manufacturing	Lower investment in Biz Jet market
Services, Consulting	More emphasis on maximizing sales... new and existing
Retail/Wholesale	MUST GET PAST THIS SOCIALISTIC 1.9% LEVEL AND BACK INTO THE 3-5% RANGE.
Retail/Wholesale	Needs for products or service
Bank/Fin/Insur/Real Est	Not as aggressive on investments in infrastructure to support client growth
Manufacturing	not pursuing acquisitions for growth.
Bank/Fin/Insur/Real Est	Not seeking to add outside of core businesses
Communication/Media	Operate conservatively
Healthcare/Pharm	Our business is dependent on economic stability due to our clients spending decisions
Other	Placed a hold on expansion
Healthcare/Pharm	preparing for growth due to aging population
Energy	price of oil
Other	question medicare changes

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? ECONOMIC GROWTH

IN	Economic growth
Services, Consulting	Reduce current spending
Tech [Soft/Hard/Bio]	Reduced headcount
Energy	Reduced M&A
Healthcare/Pharm	Refocus on more domestic manufacturing
Manufacturing	restructured manufacturing footprint (downsized)
Services, Consulting	Slow growth plans
Manufacturing	slower capital expenditures
Energy	slowing spending
Services, Consulting	stopped hiring
Other	Tighter hiring controls, shorter new employee training periods.
Manufacturing	tightly controlling investments in capital equipment
Retail/Wholesale	Uncertainity of current economic climate is tempering consumer spending
Mining/Construction	Unwilling to expand our geographic footprint
Bank/Fin/Insur/Real Est	waiting for growth
Services, Consulting	we are countercyclical, so we have to plan for headwinds.
Other	We are firing employees. It's easier that coming up with a good idea. Short term foolishness seems to prevail
Other	We aren't able to increase prices as much as we should to cover costs, affecting bottom line
Services, Consulting	We expect growth to collapse under federal policies. While the great recession was very beneficial to us we do not know whether that was just unique and we may be harmed.
Healthcare/Pharm	Where is the economy going.
Manufacturing	Will growth be there to justify expansion into new product lines.

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Q7. Please list a specific action or lack of action your firm has taken because of uncertainty about this item? OTHER

IN	Other
Services, Consulting	Activity in Russia has stopped because of current government relations.
Services, Consulting	broader marketing
Other	Have not changed employee statuses, but would if FLSA goes into effect
Pub Admin	Increased lobbying
Manufacturing	Internal focus and leadership.
Bank/Fin/Insur/Real Est	Investigate and invest in insurtech areas
Tech [Soft/Hard/Bio]	Marketplace changes
Retail/Wholesale	No h
Services, Consulting	None
Other	None
Manufacturing	Outlook for growth in GDP. Deflation vs inflation.
Bank/Fin/Insur/Real Est	Product losses.
Healthcare/Pharm	See above. We are engaging with Congress and CMS
Services, Consulting	significantly cut staff
Other	The ability to find qualified employees
Mining/Construction	This is an assumption question and shows your trying to make a political statement
Other	We need additional 40 Full time employees and the problem is growing.
Other	With low unemployment, need to be more creative in attracting new / retaining existing staff. Incentives, better explanation of benefits, etc.

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Q7b. About which if any of the following specific trade and tax policies is uncertainty (about policy details or timing, etc.) holding back your company's plans for expansion and new projects? Select up to three

About which if any of the following specific trade and tax policies is uncertainty (about policy details or timing, etc.) holding back your company's plans for expansion and new projects? Select up to three	Number	Percent	95% CI
Trade Deals (e.g., NAFTA)	37	27.6 %	± 7.7 %
Income Tax Rate for C-corporations	36	26.9 %	± 7.6 %
Income Tax Rate for pass-through businesses	36	26.9 %	± 7.6 %
Border Tax	34	25.4 %	± 7.5 %
Individual Tax Rates	31	23.1 %	± 7.2 %
Tariffs	30	22.4 %	± 7.2 %
Expensing vs. Deductibility of Investment	23	17.2 %	± 6.5 %
R&D tax incentives	16	11.9 %	± 5.6 %
Debt Interest Deductibility	15	11.2 %	± 5.4 %
Repatriation Tax Rules	15	11.2 %	± 5.4 %
Other	6	4.5 %	± 3.6 %
Estate Tax	5	3.7 %	± 3.3 %
Total	284		

Number of Cases = 134
Number of Responses = 284
Average Number Of Responses Per Case = 2.1
Number Of Cases With At Least One Response = 119
Response Percent = 88.8 %

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Q7b. About which if any of the following specific trade and tax policies is uncertainty (about policy details or timing, etc.) holding back your company's plans for expansion and new projects? OTHERS

IN	About which if any of the following specific trade and tax policies is uncertainty (about policy details or timing, etc.) holding back your company's plans for expansion and new projects? OTHERS
Other	1031 Exchange
Other	BREXIT may impact us as we have operations in the UK.
Other	Minimum wage raises in states like NY
Retail/Wholesale	All of these
Tech [Soft/Hard/Bio]	Sales tax
Transp, Public Util	Tax credits

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Q8a. What is the hurdle rate that your company uses to evaluate investment projects?

What is the hurdle rate that your company uses to evaluate investment projects? (The "hurdle rate" is typically the minimum rate of return a project is required to earn in order for a company to pursue the project.)

Minimum = 3

Maximum = 100

Mean = 13.60

Median = 12

Standard Deviation (Unbiased Estimate) = 9.67

95 Percent Confidence Interval Around The Mean = 12.51 - 14.68

Quartiles

1 = 10
2 = 12
3 = 15

Valid Cases = 306
Missing Cases = 51
Response Percent = 85.7%

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Q8b. Does your company pursue all projects that are expected to earn a return higher than the hurdle rate?

Does your company pursue all projects that are expected to earn a return higher than the hurdle rate? (e.g., if your overall hurdle rate is 15%, among projects with similar risk to your company's overall risk, would you pursue all projects that are expected to return 16% or higher?)	Number	Percent	95% CI
Yes	71	20.6 %	± 4.2 %
No	232	67.2 %	± 5.0 %
Don't Know	42	12.2 %	± 3.4 %
Total	345	100.0 %	

Missing Cases = 12
Response Percent = 96.6 %

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Q8c. What prevents you from pursuing all projects that are expected to earn a return higher than the hurdle rate?

What prevents you from pursuing all projects that are expected to earn a return higher than the hurdle rate?	Number	Percent	95% CI
Shortage of management time and expertise	118	50.9 %	± 6.5 %
Project is not consistent with company's core strategy	96	41.4 %	± 6.4 %
The risk of the project is too high	90	38.8 %	± 6.3 %
Shortage of funding	87	37.5 %	± 6.3 %
There is too much uncertainty about some projects	78	33.6 %	± 6.1 %
Shortage of employees	74	31.9 %	± 6.0 %
Some projects only appear to be attractive due to optimistic projections but may not be successful	66	28.4 %	± 5.9 %
Pressure to cut expenses	30	12.9 %	± 4.4 %
Shortage of production capacity	26	11.2 %	± 4.1 %
Better projects might come along in the future	22	9.5 %	± 3.8 %
Other	22	9.5 %	± 3.8 %
Project might reduce earnings per share	5	2.2 %	± 1.9 %
Total	714		

Number of Cases = 232
Number of Responses = 714
Average Number Of Responses Per Case = 3.1
Number Of Cases With At Least One Response = 228
Response Percent = 98.3 %

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Q8c. What prevents you from pursuing all projects that are expected to earn a return higher than the hurdle rate? OTHERS

IN	What prevents you from pursuing all projects that are expected to earn a return higher than the hurdle rate? OTHER
Bank/Fin/Insur/Real Est	Parent company approval (final say)
Bank/Fin/Insur/Real Est	We do not want to be distracted by on-core projects
Energy	Prioritization with other more important projects
Healthcare/Pharm	Balance between the need to provide short term results along with longer term investments
Healthcare/Pharm	Break even project that servie the community are OK, we are a community hospital.
Healthcare/Pharm	changes going on in company
Healthcare/Pharm	Ever changing consumer demand & Gov regulations
Manufacturing	Activism's influence on capital allocation
Manufacturing	Conservative investment stance
Manufacturing	Extneded payback period
Manufacturing	Lack of management direction
Manufacturing	uncertainty regarding future demand
Other	Contract Type - FFP
Other	Future needs and projects
Other	general conservative nature of executive management
Other	Government Regulations
Other	Projects chosen according to value provided not necessarily for a return.
Pub Admin	we are a municipality
Retail/Wholesale	shortage of physical space
Retail/Wholesale	Too many years to recover investment
Transp, Public Util	Cost of the project is too high

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j. Weighted Average Cost of Capital

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
What is your company's overall weighted average cost of capital (WACC) for 2017?	10.55	9.84	9.23 - 11.88	9.80	3	100	212
What cost of debt do you use in your WACC calculation?	7.10	13.80	5.32 - 8.88	4.50	0	100	230
Cost of equity?	11.79	12.07	10.19 - 13.40	10	0	100	217
Approximately what proportion of debt financing do you use in your WACC calculation?	36.36	33.43	32.01 - 40.71	27	0	100	227

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k1. Why is your hurdle rate (to evaluate investment projects) GREATER than your cost of capital?

IN	What is the hurdle rate that your company uses to evaluate	What is your company's overall weighted average	Why is your hurdle rate (to evaluate investment projects) greater than your cost of capital?
Agr, Forestry, Fishing	12.0	9.5	Achieve higher returns and due to no return replacement capital
Bank/Fin/Insur/Real Est	8.0	3.5	10
Bank/Fin/Insur/Real Est	5.0	1.8	As a financial institution, we operate on very slim margins
Bank/Fin/Insur/Real Est	15.0	11.0	Because we look to invest in high return projects
Bank/Fin/Insur/Real Est	13.5	12.0	Conservative view reflects imprecision in a number of variables.
Bank/Fin/Insur/Real Est	20.0	1.0	costs more to close
Bank/Fin/Insur/Real Est	10.0	7.0	Expect cost of capital to increase
Bank/Fin/Insur/Real Est	10.0	9.0	I have trouble with this since the firm is a Bank
Bank/Fin/Insur/Real Est	10.0	6.0	It's equal to our cost of equity, which ensures we keep our eye towards making a good return to our shareholders. There's enough projects to ensure we execute on those that exceed 10%.
Bank/Fin/Insur/Real Est	15.0	6.0	Looking to dedicate personnel resources to most productive opportunities. Don't have sufficient personnel to pursue all projects
Bank/Fin/Insur/Real Est	15.0	7.0	need greater returns if I am to expand
Bank/Fin/Insur/Real Est	15.0	6.0	Risk adjustment
Bank/Fin/Insur/Real Est	20.0	8.0	Risk associated with projects/M&A
Bank/Fin/Insur/Real Est	5.0	1.5	to provide some margin of error for inevitable project shortcomings.
Bank/Fin/Insur/Real Est	12.0	7.0	Uncertainty
Bank/Fin/Insur/Real Est	4.0	1.0	We have sufficient capital to finance most projects.
Bank/Fin/Insur/Real Est	20.0	9.0	We're a smaller company that takes on projects in proportion to our size.

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k1. Why is your hurdle rate (to evaluate investment projects) GREATER than your cost of capital?

IN	What is the hurdle rate that your company uses to evaluate	What is your company's overall weighted average	Why is your hurdle rate (to evaluate investment projects) greater than your cost of capital?
Bank/Fin/Insur/Real Est	8.0	5.0	We want projects to exceed our equity costs, not overall cost of capital
Communication/Media	16.0	5.0	Certain projects are selected for strategic reasons that may result in the hurdle rated being greater that the cost of capital.
Communication/Media	12.0	10.0	Large number of competing projects
Energy	25.0	10.0	15%
Energy	10.0	5.4	allowed ROE from utility regulators
Energy	20.0	10.5	commodity price risk
Energy	15.0	10.0	In this private setting, with no debt load, the 'cost of capital' is not directly tied to hurdle rate. There are enough projects out there with high returns, that 15% is a reasonable number.
Energy	15.0	10.0	Most of new investment is made with equity
Energy	20.0	10.0	Really? You are finance people, right?
Energy	12.0	6.5	Risk premium compared to existing portfolio
Energy	25.0	15.0	to accommodate for assumption errors and market changes
Healthcare/Pharm	10.0	4.5	10
Healthcare/Pharm	15.0	13.0	Being a small company we need to be able to turn positive cash flow on all projects above our hurdle rate in order to re-invest
Healthcare/Pharm	10.0	5.0	Desire to improve total net assets of organization
Healthcare/Pharm	15.0	11.0	need to be profitable....finance 101
Healthcare/Pharm	10.0	1.0	Start-up; no debt, raising capital with no intent to incur debt based on funding model

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k1. Why is your hurdle rate (to evaluate investment projects) GREATER than your cost of capital?

IN	What is the hurdle rate that your company uses to evaluate	What is your company's overall weighted average	Why is your hurdle rate (to evaluate investment projects) greater than your cost of capital?
Healthcare/Pharm	9.0	6.5	To provide a risk premium
Healthcare/Pharm	25.0	8.0	We are mostly funded by the owners with the exception of real estate, where we use high leverage.
Healthcare/Pharm	80.0	10.0	We generally want to get back almost all of our investment into a project. Sometimes we want a 100% ROI on a project in order for it to get approved. The ROI may be over 2+ years
Manufacturing	25.0	14.0	25%
Manufacturing	15.0	4.0	8.0
Manufacturing	8.0	1.4	As a small company with limited resources, seek significantly greater returns on projects.
Manufacturing	20.0	8.5	Availability of Competing/Alternative projects and investment constraints
Manufacturing	11.0	7.4	Because we try to create value rather than destroy it. WACC is fairly known, but investments have many forms of risk. An excessive premium is needed given the fundamental flaws in the calculations.
Manufacturing	12.0	9.0	Compensating for risk and trying to create 'excess' returns
Manufacturing	10.0	2.5	Cost of capital is very low and does not meet the expectations of return expected by our parent companies
Manufacturing	25.0	13.0	debt financing limits
Manufacturing	6.0	2.0	Expect a better return than could be obtained by investing idle capital in stock market investments.
Manufacturing	15.0	4.0	Has to have positive cash flow and realization of regular revenue
Manufacturing	25.0	15.0	Improve free cash flow to retire debt

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k1. Why is your hurdle rate (to evaluate investment projects) GREATER than your cost of capital?

IN	What is the hurdle rate that your company uses to evaluate	What is your company's overall weighted average	Why is your hurdle rate (to evaluate investment projects) greater than your cost of capital?
Manufacturing	18.0	17.3	Minor difference. I see rates moving up beyond our 3% in the current model. Moving rates to 5% basically equates the cost of capital equal to hurdle rate.
Manufacturing	10.0	4.8	Need to drive improved cash flow and earnings.
Manufacturing	15.0	10.0	owners want some 'slop' in the calculation
Manufacturing	10.0	3.9	Return on top of WACC is how we evaluate it, as we don't use cost of equity in WACC
Manufacturing	10.0	7.0	Risk
Manufacturing	25.0	7.6	risk
Manufacturing	15.0	11.0	Risk adjusted hurdle rate
Manufacturing	15.0	12.0	Risk in projects
Manufacturing	20.0	10.0	Risk of failure and excessive optimism
Manufacturing	10.0	7.0	Risk profile.
Manufacturing	12.0	8.0	Secure best project IRR
Manufacturing	11.0	10.5	They are approximately the same and we adjust for specific risk, plus adjust upward for many specific projects to accommodate risk not properly incorporated in projections.
Manufacturing	33.0	16.7	We have an adequate number of projects to exhaust our internal capabilities for capital projects.
Manufacturing	15.0	10.0	We have no debt
Manufacturing	12.0	5.0	we use a range depending on the project relationship to core business
Manufacturing	15.0	12.0	we would likely have to borrow add'l funds to do further investments. the return has to make sense and at least cover the cost of capital.
Manufacturing	8.0	7.2	You need to factor in setbacks.

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

k1. Why is your hurdle rate (to evaluate investment projects) GREATER than your cost of capital?

IN	What is the hurdle rate that your company uses to evaluate	What is your company's overall weighted average	Why is your hurdle rate (to evaluate investment projects) greater than your cost of capital?
Mining/Construction	13.0	5.0	10
Mining/Construction	10.0	5.0	For risk in performing the work
Mining/Construction	15.0	6.8	If the hurdle rate is greater than the amount of the project's capital investment, the project would generate positive returns after covering the financing cost of the investment capital.
Mining/Construction	15.0	12.0	Margin of error for risk beta due to government policy shifting and harm caused to foreign partner relationships
Mining/Construction	15.0	8.4	Market
Mining/Construction	30.0	10.0	There are increased risks of taking on new projects. Example: the policy uncertainties affecting hiring construction workers, employee health care, etc. We have no debt at all.
Other	15.0	6.2	Borrowing from myself.
Other	33.0	5.0	n/a
Other	15.0	8.3	note: cost of debt above is after tax rate; debt ratio above is debt/equity ratio. we risk adjust our WACC to achieve hurdle rate
Other	18.0	6.1	Overall risk of projects. Approximately 1 in 5 will loose money.
Other	25.0	9.0	Premium for uncertainty.
Other	10.0	9.0	Risk factors, including contract type, stability of funding, etc.
Other	12.0	7.5	to reflect expectation of higher borrowing costs over time as opposed to the low rate environment we are in now and we want to ensure to the extent est are missed we still exceed coc
Other	9.0	8.5	Uncertainty about assumptions

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

k1. Why is your hurdle rate (to evaluate investment projects) GREATER than your cost of capital?

IN	What is the hurdle rate that your company uses to evaluate	What is your company's overall weighted average	Why is your hurdle rate (to evaluate investment projects) greater than your cost of capital?
Other	12.0	10.0	We add an approximate 200bp spread to growth projects to account for incremental project risk and execution risk
Other	10.0	2.0	We are capitalized by our employees.
Other	17.0	8.1	We are that good! Sorry NDA would be needed to discuss further
Other	10.0	7.5	We want increasing margins and profitability
Pub Admin	10.0	2.0	expect to make money
Retail/Wholesale	15.0	8.0	10
Retail/Wholesale	20.0	10.8	Account for risk; provide for contingency
Retail/Wholesale	15.0	8.0	higher sensitivity to cost of equity capital
Retail/Wholesale	20.0	5.0	If your wrong and the capital is gone you either have to personally put money in or earn enough to recover it. Both are risky and the hurdle rate reflects the risk.
Retail/Wholesale	15.0	8.0	Political and regulatory risk
Retail/Wholesale	7.0	4.6	The cost of retained earnings is only an opportunity cost. There are no dividends with my company. Debt is very cheap now.
Services, Consulting	15.0	12.0	25
Services, Consulting	10.0	6.0	always calculated it in this manner.
Services, Consulting	10.0	5.0	BEST USE OF TIME AND TALENT
Services, Consulting	12.0	8.0	capital stack & risk profile
Services, Consulting	30.0	17.0	Corp Finance 101 - A return on investment projects that is lower than the WACC will destroy shareholder wealth. A higher return will create wealth.
Services, Consulting	15.0	8.0	cost of capital heavily weighted on debt
Services, Consulting	10.2	7.2	Looking at uncertainty and only looking at high quality investments.

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

k1. Why is your hurdle rate (to evaluate investment projects) GREATER than your cost of capital?

IN	What is the hurdle rate that your company uses to evaluate	What is your company's overall weighted average	Why is your hurdle rate (to evaluate investment projects) greater than your cost of capital?
Services, Consulting	14.0	11.0	NA
Services, Consulting	10.0	6.0	Need higher returns to keep up with industry changes in Tech needs etc.
Services, Consulting	18.0	12.0	Our owners expect a high long term gain, in addition to annual returns.
Services, Consulting	10.0	8.0	Risk
Services, Consulting	15.0	10.0	ROI
Services, Consulting	10.0	5.0	Survival
Services, Consulting	9.0	4.0	The hurdle rate is conservative t account for costs/revenue uncertainty.
Services, Consulting	8.0	5.5	To ensure positive ROI
Services, Consulting	15.0	8.0	To only pursue the stars among the potential projects....
Services, Consulting	15.0	1.0	Truly not applicable to my business.
Services, Consulting	25.0	8.5	uncertainy
Tech [Soft/Hard/Bio]	15.0	14.0	Investments need to be accretive to equity position.
Tech [Soft/Hard/Bio]	30.0	3.0	Limited by experienced management and engineering employees
Tech [Soft/Hard/Bio]	10.0	2.0	more costs mot related to interest rate
Tech [Soft/Hard/Bio]	15.0	9.3	Need to justify the soft costs - management & Board time and attention.
Tech [Soft/Hard/Bio]	30.0	15.0	Prioritization of resources in small cap stock with 50% volitility.
Tech [Soft/Hard/Bio]	15.0	8.0	Risk return
Tech [Soft/Hard/Bio]	10.0	5.0	We don't invest outside of our core business. There are limited opportunities within this line of business for investment. Few viable purchase opportunities. Working on Partnerships only.

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

k1. Why is your hurdle rate (to evaluate investment projects) GREATER than your cost of capital?

IN	What is the hurdle rate that your company uses to evaluate	What is your company's overall weighted average	Why is your hurdle rate (to evaluate investment projects) greater than your cost of capital?
Transp, Public Util	12.0	10.0	Not the greatest business for investment. Other options probably and clearly better.
Transp, Public Util	12.0	5.6	To take into account risk
Transp, Public Util	9.0	6.4	We have little debt now but may borrow for certain projects, thereby adding to the overall WACC. Our hurdle rate is also only a guide as we are gov't owned and may consider motives other than profit.

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

k2. Why is your hurdle rate (to evaluate investment projects) LESS than your cost of capital?

IN	What is the hurdle rate that your company uses to evaluate	What is your company's overall weighted average	Why is your hurdle rate (to evaluate investment projects) less than your cost of capital?
Bank/Fin/Insur/Real Est	5.0	40.0	Effective personal income tax rate.
Bank/Fin/Insur/Real Est	15.0	25.0	the capital costs are fixed and do not increase each year. since these are sunk costs i look at the incremental increase in revenue as flowing down with no capital costs.
Healthcare/Pharm	8.0	16.0	Investor's requirements.
Healthcare/Pharm	15.0	20.0	We do not issue new equity capital very often.
Manufacturing	10.0	20.0	Board requires above a maximum return. So we use a much higher rate
Manufacturing	14.6	15.4	It's pretty close in our case and financial return is not top evaluation of a new project. Ability to execute/implement and availability of human capital are much more important these days.
Manufacturing	11.0	11.8	risk
Mining/Construction	10.0	12.5	Focus more on debt cost. Equity cost is based on theoretical calculations.
Other	2.0	10.0	Do not know if my book is being read or not and how the ideas and ideals are being measured.
Pub Admin	5.0	10.0	Will the program be sustainable? Can we do it successfully? Does it fit with our mission?
Services, Consulting	95.0	100.0	Because with improved skills I can create a better capital outlook through future investments
Services, Consulting	7.0	11.0	it depends
Services, Consulting	5.0	10.8	No Comment
Services, Consulting	15.0	17.4	We are privately held, with no debt. We must look at our hurdle rate as an opportunity rate, and not compare it to our equity return.

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

k2. Why is your hurdle rate (to evaluate investment projects) LESS than your cost of capital?

IN	What is the hurdle rate that your company uses to evaluate	What is your company's overall weighted average	Why is your hurdle rate (to evaluate investment projects) less than your cost of capital?
Tech [Soft/Hard/Bio]	8.0	10.0	Our investment projects are relatively small and are simply financed out of existing working capital so there is no real opportunity cost to factor in.

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

On May 22, 2017 the annual yield on 10-yr treasury bonds was 2.25%. Please complete the following: (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	1.58	3.78	1.17 - 1.99	2	-8.22	10.91	326
Over the next 10 years, I expect the average annual S&P 500 return will be: Expected return:	6.10	2.39	5.84 - 6.36	6	1.17	11.37	332
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	9.52	4.25	9.06 - 9.99	10	2	20.51	322
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	-1.43	7.44	-2.24 - -0.62	1	-18.40	14.27	324
Over the next year, I expect the average annual S&P 500 return will be: Expected return:	5.65	3.51	5.27 - 6.03	5	-2.31	13.45	328
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	10.20	5.08	9.64 - 10.76	10	0	22.18	319

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Return on assets (ROA=operating earnings/assets) (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% Approximate ROA in 2016	7.41	7.67	6.49 - 8.32	6.40	-12.20	28	271
% Expected ROA in 2017	8.77	7.75	7.84 - 9.69	7	-9.80	29.10	271

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Manufacturing capacity utilized (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% of capacity utilized in first half of 2017	72.06	13.98	68.72 - 75.41	75	43.68	98.42	67
% of capacity utilization planned for the second half of 2017	75.70	14.58	72.20 - 79.19	80	44.91	103.91	67

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Industry

	Number	Percent	95% CI
Manufac- turing	69	19.5 %	± 4.1 %
Service Consult- ing	60	16.9 %	± 3.9 %
Bank/Fin Insur Real Estate	49	13.8 %	± 3.6 %
Health- care Pharm	27	7.6 %	± 2.8 %
Retail/Whole- sale	27	7.6 %	± 2.8 %
Tech Soft- Hardware Bio	21	5.9 %	± 2.5 %
Energy	15	4.2 %	± 2.1 %
Mining Construc- tion	12	3.4 %	± 1.9 %
Trans- portation Pub. Util	8	2.3 %	± 1.5 %
Agr, Pub Admin	8	2.3 %	± 1.5 %
Commun- ications Media	6	1.7 %	± 1.3 %
Other Industry	52	14.7 %	± 3.7 %
Total	354	100.0 %	

Missing Cases = 3
Response Percent = 99.2 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Industry (Other specified)

Accounting
adult beverages
Aerospace & Defense
Aerospace/Defense
Apparel Manufacturer (CMT)
commodity chemicals
Construction
consulting
country club
Data & Information
Data Analytics & benchmarks
Education
Education
Education
Education
education
education
education
elementary education
entertainment
Foundation
government
Group Home Care for Disabled
Higher Ed
Home builder, Developer
Hospitality
Hospitality
Hotels & hotel management
Janitorial
launderer
leisure
Local Government
media
multi industry
Non Profit
non-profit religious
Nonprofit - charity
Nonprofit Foundation
nonprofit
nonprofit
Not-for profit
not for profit (services)
print distribution
Real Estate
Religious/Charitable
School district
social services
student rental property
Telecommunications
Textile Rental
training
Travel/Hospitality

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Sales Revenue

	Number	Percent	95% CI
Less than $25 million	137	38.9 %	± 5.1 %
$25-99 million	81	23.0 %	± 4.4 %
$100-499 million	53	15.1 %	± 3.7 %
$500-999 million	19	5.4 %	± 2.3 %
$1-4.9 billion	28	8.0 %	± 2.8 %
$5-9.9 billion	20	5.7 %	± 2.4 %
More than $10 billion	14	4.0 %	± 2.0 %
Total	352	100.0 %	

Missing Cases = 5
Response Percent = 98.6 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Statistics - Sales Revenue (Millions)

Minimum = 25

Maximum = 11000

Mean = 1211.92

Median = 62

Variance (Unbiased Estimate) = 7321514.66

Standard Deviation (Unbiased Estimate) = 2705.83

Standard Error Of The Mean = 144.22

95 Percent Confidence Interval Around The Mean = 929.25 - 1494.60

99 Percent Confidence Interval Around The Mean = 840.55 - 1583.29

Skewness = 2.57

Kolmogorov-Smirnov Statistic For Normality = 7.56

Quartiles

1 = 25
2 = 62
3 = 300

Valid Cases = 352
Missing Cases = 5
Response Percent = 98.6%

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Number of Employees

	Number	Percent	95% CI
Fewer than 100	101	38.3 %	± 4.7 %
100-499	72	27.3 %	± 4.2 %
500-999	17	6.4 %	± 2.2 %
1,000-2,499	28	10.6 %	± 2.8 %
2,500-4,999	10	3.8 %	± 1.7 %
5,000-9,999	10	3.8 %	± 1.7 %
Over 10,000	26	9.8 %	± 2.7 %
Total	264	100.0 %	

Missing Cases = 93
Response Percent = 73.9 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Statistics - Number of Employees

Minimum = 100

Maximum = 12000

Mean = 1961.93

Median = 300

Variance (Unbiased Estimate) = 13436292.45

Standard Deviation (Unbiased Estimate) = 3665.55

Standard Error Of The Mean = 225.60

95 Percent Confidence Interval Around The Mean = 1519.76 - 2404.11

99 Percent Confidence Interval Around The Mean = 1381.01 - 2542.85

Skewness = 2.09

Kolmogorov-Smirnov Statistic For Normality = 5.69

Quartiles

1 = 100
2 = 300
3 = 1750

Valid Cases = 264
Missing Cases = 93
Response Percent = 73.9%

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Where are you personally located?

	Number	Percent	95% CI
Midwest U.S.	93	26.3 %	± 4.6 %
Northeast U.S.	74	21.0 %	± 4.2 %
South Central U.S.	67	19.0 %	± 4.1 %
Pacific US	51	14.4 %	± 3.6 %
South Atlantic U.S. (Not NC)	29	8.2 %	± 2.8 %
Mountain U.S.	25	7.1 %	± 2.7 %
North Carolina	14	4.0 %	± 2.0 %
Total	353	100.0 %	

Missing Cases = 4
Response Percent = 98.9 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Where are you personally located? - Other specified

--- No Response ---

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

NC Only - What are the effects of HB2 on the 2017 economic prospects of firms in your industry?

	Number	Percent	95% CI
Very negative	0	0.0 %	± 0.0 %
Negative	4	28.6 %	± 27.1 %
Neutral	7	50.0 %	± 30.0 %
Positive	1	7.1 %	± 15.5 %
Very postive	0	0.0 %	± 0.0 %
DK	2	14.3 %	± 21.0 %
Total	14	100.0 %	

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

NC Only / Excludes DK - What are the effects of HB2 on the 2017 economic prospects of firms in your industry?

	Number	Percent	95% CI
-2=Very Negative	0	0.0 %	± 0.0 %
-1=-Negative	4	33.3 %	± 27.6 %
0=Neutral	7	58.3 %	± 30.6 %
1=Positive	1	8.3 %	± 15.8 %
2=Very Positive	0	0.0 %	± 0.0 %
Total	12	100.0 %	

Mean = -0.25

Missing Cases = 2
Response Percent = 85.7 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Ownership

	Number	Percent	95% CI
Private	218	68.3 %	± 5.1 %
Public, NYSE	41	12.9 %	± 3.3 %
Nonprofit	34	10.7 %	± 3.1 %
Public, Nasdaq/AMEX	16	5.0 %	± 2.2 %
Govern-ment	10	3.1 %	± 1.7 %
Total	319	100.0 %	

Missing Cases = 38
Response Percent = 89.4 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Foreign Sales

	Number	Percent	95% CI
0%	175	49.7 %	± 5.2 %
1-24%	130	36.9 %	± 5.0 %
25-50%	27	7.7 %	± 2.8 %
More than 50%	20	5.7 %	± 2.4 %
Total	352	100.0 %	

Missing Cases = 5
Response Percent = 98.6 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

In what region of the world are most of your foreign sales?

	Number	Percent	95% CI
Europe	65	40.9 %	± 7.2 %
Canada	42	26.4 %	± 6.3 %
Asia/Pacific Basin	27	17.0 %	± 5.4 %
Latin America	24	15.1 %	± 5.1 %
Africa	1	0.6 %	± 1.1 %
Total	159	100.0 %	

Missing Cases = 18
Response Percent = 89.8 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

What is your company's credit rating?

	Number	Percent	Cumulative
AAA	32	13.0 %	13.0 %
AA+	22	8.9 %	21.9 %
AA	26	10.5 %	32.4 %
AA-	10	4.0 %	36.4 %
A+	14	5.7 %	42.1 %
A	25	10.1 %	52.2 %
A-	14	5.7 %	57.9 %
BBB+	22	8.9 %	66.8 %
BBB	19	7.7 %	74.5 %
BBB-	10	4.0 %	78.5 %
BB+	8	3.2 %	81.8 %
BB	13	5.3 %	87.0 %
BB-	5	2.0 %	89.1 %
B+	5	2.0 %	91.1 %
B	6	2.4 %	93.5 %
B-	7	2.8 %	96.4 %
CCC	5	2.0 %	98.4 %
CC	0	0.0 %	98.4 %
D	4	1.6 %	100.0 %
Total	247	100.0 %	100.0 %

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

What is your company's credit rating?

N=247	Total	Credit Rating	
		Actual A	Estimate B
Total	247	99	148
	100.0%	40.1%	59.9%
AAA	32	17	15
	13.0%	17.2%	10.1%
AA+	22	8	14
	8.9%	8.1%	9.5%
AA	26	11	15
	10.5%	11.1%	10.1%
AA-	10	3	7
	4.0%	3.0%	4.7%
A+	14	5	9
	5.7%	5.1%	6.1%
A	25	8	17
	10.1%	8.1%	11.5%
A-	14	6	8
	5.7%	6.1%	5.4%
BBB+	22	10	12
	8.9%	10.1%	8.1%
BBB	19	6	13
	7.7%	6.1%	8.8%
BBB-	10	4	6
	4.0%	4.0%	4.1%
BB+	8	5	3
	3.2%	5.1%	2.0%
BB	13	5	8
	5.3%	5.1%	5.4%
BB-	5	0	5
	2.0%	0.0%	3.4%
B+	5	3	2
	2.0%	3.0%	1.4%
B	6	4	2
	2.4%	4.0%	1.4%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

What is your company's credit rating?

N=247	Total	Credit Rating	
		Actual	Estimate
		A	B
B-	7	2	5
	2.8%	2.0%	3.4%
CCC	5	2	3
	2.0%	2.0%	2.0%
CC	0	0	0
	0.0%	0.0%	0.0%
D	4	0	4
	1.6%	0.0%	2.7%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Your job title (e.g., CFO, Asst. Treasurer, etc):

	Number	Percent
CFO	188	53.9 %
Other	48	13.8 %
Controller	40	11.5 %
CEO	39	11.2 %
VP of Finance	27	7.7 %
Treasurer	7	2.0 %
Total	349	100.0 %

Missing Cases = 8
Response Percent = 97.8 %

Duke CFO magazine Global Business Outlook survey - U.S. - Second Quarter, 2017

Other job title:

Global ERP Senior PM
Md Investments
Ex VP
Managing Director
Principal
President Asia
Senior Accountant
President
Sr. Managing Director
Utilities Financial Manager
CFO Consultant
Owner
VP of Corporate Strategy
Proprietor
President
VP
SVP Business Development
Strategic advisor
Program Director
& Chairman
Managing Director/ President
Manager, Global GL Controls
VP Risk Management
director
Owner
Managing director
Owner
Ceif Credit Officer
Trustee
Managing Partner
Senior Manager
Owner/Principal
Audit Manager
COO
VP of Transformation
Board
Consultant
Associate Professor of Finance
FVP
VP Finance
Much of the requested financial and investment info is proprietary. I answered those permissible
Retired but consulting
Area Senior Vice President
EVP business development
Managing Director
Director of Supply Chain Management
President

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Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

1a. Are you more or less optimistic about your country's economy compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	224	62.0 %	± 5.0 %
0=No change	83	23.0 %	± 4.3 %
-1=Less optimistic	54	15.0 %	± 3.7 %
Total	361	100.0 %	

Mean = 0.5
SD = 0.7

Missing Cases = 2
Response Percent = 99.4 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

1b. Rate your optimism about your country's economy on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 8

Maximum = 100

Mean = 68.5

Median = 70

Standard Deviation (Unbiased Estimate) = 16.0

95 Percent Confidence Interval Around The Mean = 66.7 - 70.2

Quartiles

1 = 60
2 = 70
3 = 80

Valid Cases = 328
Missing Cases = 35
Response Percent = 90.4%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

2a. Are you more or less optimistic about the financial prospects for your own company compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	208	58.1 %	± 5.1 %
0=No change	86	24.0 %	± 4.4 %
-1=Less optimistic	64	17.9 %	± 3.9 %
Total	358	100.0 %	

Mean = 0.4
SD = 0.8

Missing Cases = 5
Response Percent = 98.6 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

2b. Rate your optimism about the financial prospects for your own company on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 8

Maximum = 100

Mean = 69.0

Median = 75

Standard Deviation (Unbiased Estimate) = 17.6

95 Percent Confidence Interval Around The Mean = 67.1 - 70.9

Quartiles

1 = 60
2 = 75
3 = 80

Valid Cases = 322
Missing Cases = 41
Response Percent = 88.7%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

3a. During the past quarter, which items have been the most pressing concerns for your company's top management team?

	Number	Percent	95% CI
Government policies	141	38.8 %	± 5.0 %
Economic uncertainty	128	35.3 %	± 4.9 %
Difficulty attracting / retaining qualified employees	121	33.3 %	± 4.9 %
Cost of benefits	119	32.8 %	± 4.9 %
Regulatory requirements	119	32.8 %	± 4.9 %
Data security	78	21.5 %	± 4.2 %
Weak demand for your products/services	78	21.5 %	± 4.2 %
Employee productivity	75	20.7 %	± 4.2 %
Corporate tax code	67	18.5 %	± 4.0 %
Rising wages and salaries	65	17.9 %	± 4.0 %
Access to capital	52	14.3 %	± 3.6 %
Employee morale	52	14.3 %	± 3.6 %
Other	31	8.5 %	± 2.9 %
Cost of borrowing	28	7.7 %	± 2.8 %
Geopolitical / health crises	26	7.2 %	± 2.7 %
Rising input or commodity costs	25	6.9 %	± 2.6 %
Currency risk	24	6.6 %	± 2.6 %
Inflation	11	3.0 %	± 1.8 %
Deflation	5	1.4 %	± 1.2 %
Total	1245		

Number of Cases = 363
Number of Responses = 1245
Average Number Of Responses Per Case = 3.4
Number Of Cases With At Least One Response = 363
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

3a. During the past quarter, which items have been the most pressing concerns for your company's top management team? - Other specified

Agr, Forestry, Fishing	Disease affecting citrus production
Healthcare/Pharm	ACA repeal
Healthcare/Pharm	Marketing and promotion
Manufacturing	attracting new employees
Manufacturing	craft labor and college tech level labor
Manufacturing	Donald Trump
Manufacturing	frivolous litigation
Manufacturing	higher medical
Manufacturing	On-Time Delivery with Quality Product
Manufacturing	Product Strategy and Development
Manufacturing	Slip in product quality and delivery
Manufacturing	Supply chain, parts shortages
Other	Activist Investor/ Acquisition
Other	getting books correct
Other	Mostly internal; No clear plan for business direction, causing poor execution in marketing and
Other	Refinancing (regulations)
Retail/Wholesale	Industry Over-Supply
Retail/Wholesale	INTERNET SALES
Services, Consulting	accelerating collections
Services, Consulting	attracting new business
Services, Consulting	competition
Services, Consulting	Integration of acquisitions
Services, Consulting	not enough licensed engineers--civil, structural, soils, etc.
Services, Consulting	Rising healthcare/ insurance costs
Tech [Soft/Hard/Bio]	adding customers
Tech [Soft/Hard/Bio]	Finding talent (electrical engineering/software engineering)
Tech [Soft/Hard/Bio]	increased competition
Tech [Soft/Hard/Bio]	uncertain political environment
Transp, Public Util	UNION

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Agr, Forestry, Fishing	good
Agr, Forestry, Fishing	Political uncertainty.
Bank/Fin/Insur/Real Est	ACA!!!!
Bank/Fin/Insur/Real Est	Continued pressure in intellectual property and cyber.
Bank/Fin/Insur/Real Est	Developing a new line of business
Bank/Fin/Insur/Real Est	Increasing incursion by the Federal Government in micromanaging business.
Bank/Fin/Insur/Real Est	Inflation
Bank/Fin/Insur/Real Est	Losses or reduced collections on certain assets.
Bank/Fin/Insur/Real Est	New government policies
Bank/Fin/Insur/Real Est	none
Bank/Fin/Insur/Real Est	Quality ,commoditising business finance, Optimistic financial forecasts and estimates preferred over negatives but corrections and adjustments. Nerves crushed by the bears.
Bank/Fin/Insur/Real Est	The uncertain political environment and erratic behavior of our newly elected President.
Bank/Fin/Insur/Real Est	Uncertainty with regards to changing government policy and positions under the new administration. Increased international tension both trade and non-trade related.
Bank/Fin/Insur/Real Est	US - China relations
Communication/Media	Terrorism and cyber security
Healthcare/Pharm	ACA and where it is going
Healthcare/Pharm	Aging ownership
Healthcare/Pharm	Border Tax
Healthcare/Pharm	Constricting budgets of possible new clients, specifically healthcare clients
Healthcare/Pharm	Disruption of trade agreements by the Trump Administration. 30% of our business is overseas.
Healthcare/Pharm	Government Grants being held up in 'red tape'. Cash flow is an issue.
Healthcare/Pharm	Health care policy changes
Healthcare/Pharm	Healthcare changes, tax code changes, global political uncertainty
Healthcare/Pharm	N/A
Healthcare/Pharm	Replacement to the ACA
Healthcare/Pharm	Tax complexities, Insurance change
Healthcare/Pharm	Technological advancement
Healthcare/Pharm	uncertainty of national health care as designed by legislative bodies.
Manufacturing	achieving ROI on new technologies
Manufacturing	Attracting additional strong sales personnel
Manufacturing	Business model and cost structure that yields annual operating plan profit and cash with continuing flatness/fall off of sales in some markets.
Manufacturing	Significant regulatory compliance data requirements
Manufacturing	Continuing consolidation of industrial base, especially for Aerospace components.
Manufacturing	Currency Risk, China and Wall Street Bubbles
Manufacturing	Effect of current politics on our ability to export to Middle East and Mexico.
Manufacturing	Effectively marketing.
Manufacturing	I have concern as to whether the Democrats in Congress will block substantial progress the president wants to make.
Manufacturing	Impact of surging nationalism
Manufacturing	Integrating new technologies into our business processes and transforming technology investments into revenue.
Manufacturing	Low cost Chinese imports entering under the anti-dumping import fees imposed for steel
Manufacturing	Ownership transition.
Manufacturing	Political volatility.
Manufacturing	Sales Growth from New Customers
Manufacturing	Strong dollar continues to depress exports. Any retaliation for import tariffs will make this concern worse.

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Manufacturing	Tax reform and/or a border tax or Tariff with mexico and possibly drastic changes to NAFTA
Manufacturing	the confusing and protectionist messages coming from the white house are terrible for our long term economic prospects.
Manufacturing	The lack of suitable qualified labor is a serious threat.
Manufacturing	Trade policies
Manufacturing	Transition to younger management team.
Manufacturing	Trump administration actions.
Manufacturing	Trump's tariff policies will hurt us economically...on import duties, manufacturing in Mexico and ultimately, we will have to raise prices to our customers.
Manufacturing	Uncertainty of what the new President is going to do.
Manufacturing	US/NAFTA and Global trade policies.Corporate tax policy changes and the Border Tax ridiculousness.
Mining/Construction	Employee retention
Mining/Construction	None
Mining/Construction	Productivity from the workforce. We seem to have hit a plateau and quality issues have arisen causing production issues.
Mining/Construction	Skilled labor shortages
Other	Changing Technology / Business models.
Other	counting on financial deregulation to boost finance sector clients
Other	Current interest in manufacturing 'on shoring' creates ostensible opportunity but also potential for greater competition as certain states create more beneficial tax and regulatory environments
Other	Domestic and Global uncertainty associated with the New Administration in the US.
Other	General uncertainty in US due to change in administration.
Other	government regulations/federal and state
Other	Healthcare reform impact
Other	High Cost of rent
Other	increased competition
Other	Inflation and not being able to pass on these costs to our members.
Other	Introducing a new line of business
Other	maintaining gross margins and converting to newer enterprise type software
Other	Political uncertainty effecting the economy, prices, and labor availability
Other	Slashing government funding for research (esp. humanities).
Other	Trump based changes to the regulatory environment
Other	Unaffordable health care plan costs; software subscription costs
Other	We are a member based non-profit who is worried our state's economy will hurt our members ability to participate in our professional development opportunities
Other	WE are waiting for the Trump administration to reduce regulations and reduce corporate taxes.
Other	We will have a hard time obtaining raw materials.
Pub Admin	cost of Health Care biggest concern, dominates the other issues
Pub Admin	Large turnover at top due to retirements
Pub Admin	Trump's trade policies
Retail/Wholesale	Destination based cash flow tax / border tax would have a significant negative impact on our company.
Retail/Wholesale	Determining the correct balance between bricks and mortar and digital sales.
Retail/Wholesale	Difficulty attracting and retaining qualified sales personnel.
Retail/Wholesale	environmental restrictions and policies are too extreme and costly but no real environmental benefits....
Retail/Wholesale	Global Trade Competitiveness with the stronger US Dollar
Retail/Wholesale	Immigration policy impact on homebuilder labor availability
Retail/Wholesale	leadership succession planning

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Retail/Wholesale	Potential Tax on Imported goods
Retail/Wholesale	Prolonged industry over-supply and restricted ability to raise prices
Retail/Wholesale	same
Retail/Wholesale	taxes
Retail/Wholesale	The unknown effect of the Trump administration on the non-profit sector of the economy
Retail/Wholesale	There is a strong need to eliminate government regulation of business. The country needs some strong tort reform.
Retail/Wholesale	Trade agreement impacts
Retail/Wholesale	Trump Administration
Retail/Wholesale	Uber, Lyft, autonomous driving vehicles; some initial impact with more expected.
Retail/Wholesale	Uncertainty about import costs & regulation
Retail/Wholesale	Uncertainty in the direction of our policy makers in Washington.
Services, Consulting	A federal government that cannot accomplish anything due to the great divide in our country.
Services, Consulting	Ability to remain relevant in a changing world economy and be able to provide value-added services.
Services, Consulting	accounting changes- 606, 842...
Services, Consulting	California continues to require small businesses to pay employees for NOT working. The looming increase to $15 minimum wage will be impossible to meet without significant fee increases to our clients
Services, Consulting	Change in how our clients aquire technology
Services, Consulting	Client in-action
Services, Consulting	Continued growth
Services, Consulting	continuing unstable government in the US
Services, Consulting	general market uncertainty
Services, Consulting	Global instability
Services, Consulting	I am planning to reach out to clients who may feel that their needs are not being met. I am going after LGTBQ clients and immigrants who are small business owners and need business assistance.
Services, Consulting	Increased competition, Price deflation, Mergers of competitors
Services, Consulting	Market correction due to the current, overly bullish sentiment that new administration will be successful in garnering regulatory and tax change.
Services, Consulting	My major area is consulting about financing options for clients - there are many players without experience who attempt to provide these services
Services, Consulting	None
Services, Consulting	other countries' reactions to new or changing US policies
Services, Consulting	Ownership and Leadership transition
Services, Consulting	Potential for weakening of demand for products/services as companies bring in house our services vs contract or vendors due to having improved cash flow allowing them to invest internally.
Services, Consulting	Regulatory uncertainty--distractions from the new presidential administration.
Services, Consulting	seCURITY
Services, Consulting	states broadening their Nexus definition.
Services, Consulting	THOSE HAVE BEEN MINIMIZED BY THE NEW ADMINISTRATION IN WASHINGTON. WE ARE TAKING IT AS AN ARTICLE OF FAITH THE NEW POLITICAL CLIMATE WILL BEAR POSITIVE FRUIT FOR THE BUSINESS COMMUNITY.
Services, Consulting	Trade Agreements being changed for taxation.
Services, Consulting	Uncertainty as to regulatory changes including individual taxes
Services, Consulting	Uncertainty regarding new healthcare policies, and the impacts associated with the overturn of Obamacare.
Services, Consulting	uncertainty with layoffs
Services, Consulting	Understanding of the USA position in its attempt to regain geopolitical stature as a leader and not as a determent to world affairs.

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Services, Consulting	We are concerned that the salary levels are not going to keep up with the increase in consumer prices and rise of real estate costs and services.
Services, Consulting	With he election of Trump, the future looks more unpredictable and volatile. I guess is is doing what he said he would do and no one believed him.
Tech [Soft/Hard/Bio]	Challenges to prior immigration policies disrupting access to talented tech workforce
Tech [Soft/Hard/Bio]	competition
Tech [Soft/Hard/Bio]	Failure to reform the tax system
Tech [Soft/Hard/Bio]	increased competition
Tech [Soft/Hard/Bio]	meeting rising market expectations
Tech [Soft/Hard/Bio]	Potential limitations on H1B visa applications would further exasperate the engineering talent shortage.
Tech [Soft/Hard/Bio]	Slower growth
Tech [Soft/Hard/Bio]	UK/EMEA privacy issues
Tech [Soft/Hard/Bio]	Uncertainty with new president and his protectionist policies
Tech [Soft/Hard/Bio]	Very strong competitive pressure on price
Transp, Public Util	Aging out of a generation.
Transp, Public Util	congressional impass to reducing regulation/tax chnges
Transp, Public Util	Continued funding mechanisms to pay for infrastructure improvements.
Transp, Public Util	New Technologies
Transp, Public Util	none
Transp, Public Util	Pilot shortage increases cost which then will raise the cost of charter. Capacity concerns. We need more space.
Unspecified Industry	Current political environment.

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Unweighted - Winsorized]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Earnings	8.3	18.6	6.2 - 10.4	5	-45.4	69	291
Revenue	8.1	11.0	6.9 - 9.3	6	-22.4	41.9	308
Health care costs	7.4	6.4	6.7 - 8.1	6	-7.3	22.7	315
Marketing/advertising spending	6.3	10.2	5.1 - 7.5	3	-20	38.6	263
Technology spending	5.8	9.3	4.6 - 6.9	3	-24.5	38.7	263
Number of domestic full-time employees	4.4	7.5	3.6 - 5.3	2	-14.4	25	272
Wages/Salaries	4.4	4.6	3.9 - 4.9	3	-10	22.8	318
Capital spending	3.9	16.4	1.9 - 5.8	2	-40.2	50.1	274
Research and development spending	3.6	7.2	2.7 - 4.6	0	-15.9	24.9	217
Prices of your products	2.6	3.9	2.1 - 3.1	2	-6.5	12	270

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months for: [Unweighted - Sorted]

(N=363)

	Mean & SD	Positive 1	Zero 0	Negative -1	Total
	0.9	298	17	3	318
Wages/Salaries	0.3	93.7%	5.3%	0.9%	100.0%
	0.8	276	24	15	315
Health care costs	0.5	87.6%	7.6%	4.8%	100.0%
	0.7	260	14	34	308
Revenue	0.6	84.4%	4.5%	11.0%	100.0%
	0.7	193	56	14	263
Technology spending	0.6	73.4%	21.3%	5.3%	100.0%
	0.6	173	74	16	263
Marketing/advertising spending	0.6	65.8%	28.1%	6.1%	100.0%
	0.6	182	65	23	270
Prices of your products	0.6	67.4%	24.1%	8.5%	100.0%
	0.6	219	24	48	291
Earnings	0.8	75.3%	8.2%	16.5%	100.0%
	0.5	167	81	24	272
Number of domestic full-time employees	0.7	61.4%	29.8%	8.8%	100.0%
	0.4	97	112	8	217
Research and development spending	0.6	44.7%	51.6%	3.7%	100.0%
	0.4	149	79	46	274
Capital spending	0.8	54.4%	28.8%	16.8%	100.0%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Revenue Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Earnings	8.7	10.6	7.4 - 9.9	7	-45.4	69	297
Revenue	8.1	6.0	7.4 - 8.7	6	-22.4	41.9	305
Capital spending	5.8	14.8	4.1 - 7.5	3	-40.2	50.1	290
Technology spending	5.3	8.4	4.3 - 6.3	5	-24.5	38.7	268
Research and development spending	4.0	5.7	3.3 - 4.7	2	-15.9	24.9	249
Marketing/advertising spending	3.8	7.8	2.8 - 4.7	2	-20	38.6	261
Prices of your products	3.0	4.2	2.6 - 3.5	2	-6.5	12	282

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Employee Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Health care costs	6.8	5.9	6.1 - 7.5	5	-7.3	22.7	269
Wages/Salaries	3.9	3.8	3.5 - 4.4	3	-10	22.8	265
Number of domestic full-time employees	3.5	7.1	2.6 - 4.4	1	-14.4	25	231

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Public Companies - Winsorized - Revenue Weighted]

	Mean	SD	95% CI	Median	Minimum	Maximum
Earnings	8.6	10.0	6.9 - 10.2	7.4	-9	50
Revenue	8.4	5.7	7.4 - 9.3	6	-10	25

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Q5. For the good of the U.S. business community, should President Trump:

(N=363)

	Yes	No	Total
Stick to prepared remarks during public speeches	247 70.2%	105 29.8%	352 100.0%
Stop using Twitter	234 66.7%	117 33.3%	351 100.0%
Continue seeking to restrict immigration from certain foreign nations	205 58.1%	148 41.9%	353 100.0%
Build a wall along the Mexican border	126 36.1%	223 63.9%	349 100.0%
Replace the leadership at the Federal Reserve	112 31.8%	240 68.2%	352 100.0%
Reduce H1-B visas (highly skilled worker) visas	53 15.2%	296 84.8%	349 100.0%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Explanation of items President Trump should do for the good of the U.S. business community:

IN	Explanation:
Agr, Forestry, Fishing	none
Bank/Fin/Insur/Real Est	Explain use of twitter ??? Lol
Bank/Fin/Insur/Real Est	He needs to project professionalism and leadership, not pettiness and vindictiveness.
Bank/Fin/Insur/Real Est	His policies are highly insular and would ultimately harm the long term prospects for our country and the world. His policies if carried out could lead to retaliation by other countries and lead to a worldwide depression.
Bank/Fin/Insur/Real Est	The noise of wall building is a waste of energy, time, and resources. Focus on employment/employers of illegals. Deport illegals. Provide an opportunity for presently illegals to achieve 'green card status.'
Bank/Fin/Insur/Real Est	I wish he would talk less and do more. Quit responding to every criticism (i.e. Meryl Streep)....be more presidential
Bank/Fin/Insur/Real Est	Immigration needs to be reduced dramatically so that we can employ Americans first
Bank/Fin/Insur/Real Est	Protectionism and nationalism are inconsistent with the realities of a global economy. Restricting immigration overall is counterproductive to additional economic expansion in general. Reduced H1-B visas restrict access to critical skill sets.
Communication/Media	He should keep using twitter, just not the way he has used it lately. Positive messaging and not attack, hit back messaging
Energy	He campaigned and won with certain promises. Whether I like him or not, he is delivering to his campaign promises, and that brings consistency and predictability to the markets.
Energy	The Presidency is a symbol, not about a personality. He needs real advisers who understand the position and its limitations.

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Explanation of items President Trump should do for the good of the U.S. business community:

IN	Explanation:
Healthcare/Pharm	He needs to act like a President. I struggle with the lack of respect he has for the institution and the many people he continues to insult. He has some great ideas but they are getting lost in all the noise he is creating.
Healthcare/Pharm	He should Focus on positive actions.
Healthcare/Pharm	I am concerned about his lack of Presidential behavior and the direction he wants to take the economy.
Healthcare/Pharm	no
Healthcare/Pharm	Public discourse and debate through the use of Twitter is unprofessional and a negative stimulus on wanting to support those who use this social media outlet excessively.News media needs to stop being part of the problem and get engaged for solutions
Healthcare/Pharm	Think ahead what you are saying.
Healthcare/Pharm	We all want what's best for our country and as the figurehead, he should act more informed and professional.
Manufacturing	(1)H1-B visas put downward pressure on compensation for highly-skilled workers, which is not good for our citizens. We must reduce the actual costs of higher education & not by shifting it to the taxpayers.(2) Trump makes exaggerated stmts off script
Manufacturing	Asking Trump to alter his speaking style or twitter use won't alter his behavior. Best to look at what is 'done' vs what is 'said'
Manufacturing	Be presidential
Manufacturing	Has to accept facts that don't align with world view.
Manufacturing	He is following through on his promises made during the campaign but needs to keep acting Presidential like his speech to Congress. Stop the rants. Big turn off! Stop the TSA from profiling American Citizens with legit passports.
Manufacturing	high skilled immigration preferable to low skilled

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Explanation of items President Trump should do for the good of the U.S. business community:

IN	Explanation:
Manufacturing	I can't believe these are questions that even need to be asked...but unfortunately they are.
Manufacturing	Immediate focus should be on economic issues
Manufacturing	Inconsistent messaging undermines credibility
Manufacturing	Need to concentrate on US investment and research. Example: NIH and other US Grant funding - Foreign PHD's get grants then bring foreign (China) post doc's to work on them. After grant completion take results out of country to manufacture or use.
Manufacturing	No
Manufacturing	Off the cuff remarks remind me of barbershop conversation when I was a kid, except twitter goes world wide and risks international stability. The economy of that era is not coming back and we need immigrants to refresh our population.
Manufacturing	Rather than restrict I would use the term 'thoroughly screen'.
Manufacturing	Replace the far left Liberals in Govermment and Civil Srvice
Manufacturing	So called 'proper statesmanship' has gotten us into a terrible mess. It takes a change in leadership style to right the ship. We need to listen to content rather than polemics.
Manufacturing	Trump should not stop using Twitter, but be more careful in its use.
Manufacturing	Walls can be penetrated, tunneled. A 'cyber wall' using technology (including satellites) could be more interesting and effective
Manufacturing	We need a govt that enforces laws and protects americans first
Mining/Construction	His twitters are off the top of the head thoughts and effect too many people before they are 'explained' or clarified by the staff.
Mining/Construction	Introducing too much uncertainty and confusion. Difficult to make business plans. It wastes valuable business time and resources when we constantly have to change plans. We have to plan for change anyway, but this is getting out of hand.
Mining/Construction	This country was made great by immigrants. Make America great again by designing policies which give undocumented a path to citizenship and new immigrants an efficient and systematic way to earn citizenship.
Other	His pathological lying makes the government look unstable, especially when he sends out cronies to try to support the lies. His dishonesty over trivial matters only discredits him.

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Explanation of items President Trump should do for the good of the U.S. business community:

IN	Explanation:
Other	I do not believe the president should stop using twitter but I do believe he has to watch what he says on twitter. Needs some self-control.
Other	Most of your items really don't matter in the big scheme of things.
Other	Oh boy would I.
Other	Our President doesn't seem willing to work on compromising and making things better by evaluating current practices. He only wants to change things to change things.
Other	POTUS is busy running pep rallies instead of doing POTUS work. What kind of President goes to a rally in Florida & leaves the VP to carry important messages to Europe? We should be worried. He needs to think instead of react with EGO.
Other	secure the border
Other	Stop with all the grandstanding and focus on implementing your policies. I don't agree with some of the stated policies, but would rather see them thoughtfully debated rather than yelling at each other on the news programs and firing potshots on web
Other	The building of the border wall is going to be a waste of money
Other	The first 4 are policies that have not been thought through that, as the President has now discovered with healthcare, it much more complex than he thought. The last two address the stream of confusing/ contradictory remarks that create uncertainty.
Other	The president may be the US' greatest risk to economic stability
Other	Trump needs to realized he is the leader of the free world economy and we cant file BK if he gets it wrong.
Other	Until the media reports the news accurately, POTUS should continue to use Twitter to communicate with the people. We need to work together not against each other.
Other	vet immigrants yes, bias toward immigrants with desired skills yes,
Pub Admin	He adds to uncertainty, not good for markets or national mood.
Pub Admin	Trade is not the bull in the china closet as far as employment is concerned. It is technology.
Retail/Wholesale	Good to hear a politician speak bluntly. Need a better solution than a wall. US is a nation of immigrants and law - need to balance the two.

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Explanation of items President Trump should do for the good of the U.S. business community:

IN	Explanation:
Retail/Wholesale	In my opinion, the business community will be best served on a long-term basis if Trump can find a way to govern successfully from the center.
Retail/Wholesale	Let the Donald be the Donald. That is why he was elected
Retail/Wholesale	self explanatory
Retail/Wholesale	The news media for years has failed to represent the 'people' and many of us have discussed this problem. We do not trust it. When Trump Twitts we get his message.
Retail/Wholesale	THIS COUNTRY NEEDS A 'DOER' AND WE NOW HAVE ONE. FOR THE LAST 8 YEARS THIS COUNTRY WHO WAS A VERY POLISHED, ARTICULATE SPEAKER AND VERY LITTLE WAS ACCOMPLISHED - HOWEVER, WHAT WAS ACCOMPLISHED WAS NOT HELPFUL TO THIS COUNTRY.
Retail/Wholesale	Tougher immigration restrictions to protect against terrorism. More economic methods than a wall. Federal Reserve leadership needed to promote growth. We need highly skilled workers to come to the US. Trump has the right to promote his agenda.
Retail/Wholesale	Trump is breathing some new life into Washington politics. The media is not reporting the news it is manufacturing the news for its own agenda.
Retail/Wholesale	Unsure how to answer H1B or Fed Reserve...don't have enough insight, so I answered no.
Retail/Wholesale	Using Twitter seems liek a waste of time for a President. However, he is using it within a broader communication strategy to inform and mislead.
Services, Consulting	Because Free Speech. President should focus on expanding employment opportunities for Americans.
Services, Consulting	he does need to learn to be quiet sometimes.
Services, Consulting	He is what a President and Congress should do, fight for the American People. Plus cut cost and improve performance by automation under budget in time and costs.
Services, Consulting	I, personally, am in favor of some of Trump's stances (restricting immigration from Mexico and other countries), as I believe they will help the American worker, but at the expense of U.S. business profits.
Services, Consulting	I appreciate the full-disclosure of the president as long as it's is honest and considerate. I believe in building a better nation to educate, rehabilitate and put more US citizens back to work, however, I believe it's the people that have the power

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Explanation of items President Trump should do for the good of the U.S. business community:

IN	Explanation:
Services, Consulting	My optimism in economy is due to the President's effort in keeping american jobs within america. Other than that, i don't think the above actions from Trump will help the economy. On the contrary, they may be just distractions.
Services, Consulting	No
Services, Consulting	no
Services, Consulting	no
Services, Consulting	On immigration we need a comprehensive policy but we should enforce it.
Services, Consulting	President 45 needs to act like a leader, and not run the country like a reality show. His tweets are hilarious, but not becoming of a president.
Services, Consulting	SELECT COMEPETENT PEOPLE FOR ADVISORS
Services, Consulting	The wall is a waste of time and of taxpayers' monies. While the existing walls may have deterred some from entering, they have not completely stopped illegal entry. There is still a border with Canada, and there's no talk of building a wall there.
Services, Consulting	Things change day to day so what was said yesterday may not be on target for tommorow
Services, Consulting	Too many arguments FOR allowing immigrants, especially highly skilled ones, to enter into the country to enumerate. Prohibitions are short-sighted and wrong-headed
Services, Consulting	Trump is creating chaos and distraction with his seat-of-the-pants approach to many complex issues. It is impacting the construction arena by affecting access to capital, inability to anticipate possible regulatory changes, etc.
Services, Consulting	Trump needs to be closely monitored.
Services, Consulting	Trumps use of Twitter allows us inside the President's psyche, for better or worse
Services, Consulting	Twitter should be far, far below his level

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Explanation of items President Trump should do for the good of the U.S. business community:

IN	Explanation:
Services, Consulting	Twitter should be used judiciously. The mainstream press is not friendly/fair to him.
Services, Consulting	Twitter usage is a real problem.
Services, Consulting	Twitter would not have to stop, just be more careful of what is stated and understand ramifications.
Services, Consulting	we are on the fence about the fed...we believe that normalized interest rates will provide fuel for GDP growth, but could also stall the housing recovery.
Services, Consulting	WE UNDERSTAND THAT THE NEW STYLE OF LEADERSHIP STEMS FROM MR TRUMPS BUSINESS SUCCESS AND SETS THE STAGE FOR A MORE ATTENTIVE AUDIENCE N THE OTHER SIDE OF THE NEGOTIATING TABLE. ALL TO THE BENEFIT OF OUR COUNTRY,
Services, Consulting	while I disagree with some of his policies there is a need to protect and build up American industry; have our allies devote more of their GNP to defense; and eliminate laws, regulations and paper work hampering /American Business.
Services, Consulting	Yes, build a wall including electronic surveillance in the south and north. Federal Reserve is a tough question. I think we need a deep look and clean up regulations and restrictions. Immigration total revision adding an entrepreneurial visa.
Tech [Soft/Hard/Bio]	Erratic behavior by the President makes business planning difficult.
Tech [Soft/Hard/Bio]	Focus attention on things that matter like fixing the tax code, especially corporate tax rates.
Tech [Soft/Hard/Bio]	H1B visas need a massive increase, every person who comes to the USA and receives a college degree should immediately be issued a 10 year work permit.
Tech [Soft/Hard/Bio]	Illegal immigration is the issue. Legal immigration should be encouraged and made easier. Businesses care about high taxes, too many regulations, and foreign relations. Twitter and sarcastic comments do not concern me.
Tech [Soft/Hard/Bio]	Irrationality at the Presidential level does not inspire confidence
Tech [Soft/Hard/Bio]	The President should move beyond his election campaign snark and start acting presidential for ALL Americans.

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Explanation of items President Trump should do for the good of the U.S. business community:

IN	Explanation:
Tech [Soft/Hard/Bio]	The wall is a huge waste of money. Restricting immigration is discriminatory and short sighted.
Tech [Soft/Hard/Bio]	Very apprehensive from tech sector what he do with highly skilled international workers as we are a multinational technology company. Rest of world question what our president stands for and what he will do.
Transp, Public Util	communication focused on key elements of the agenda and results achieved
Transp, Public Util	New administration has opportunity to establish more rational policies across the entire scope of public policy. Unreasonable pursuit of marginal goals and poor communication are strong obstacles do achieving the changes that are desperately needed.
Transp, Public Util	None of these are particularly troubling as long as he works with legislators in a compromise fashion.
Transp, Public Util	Please STOP using Twitter. Nobody cares what you think at that precise moment. Just concentrate on the people of the USA.
Transp, Public Util	The big question to me with immigration is illegal vs legal.
Transp, Public Util	The President should remain genuine, should be himself, and should strive to keep the campaign promises for which he was elected. Tax reform, energy independence, and repeal of Obamacare will do the most good for the business community.
Transp, Public Util	Washington needed a jolt in order to get out of the rut that they have entrenched for the past decade. Washington needed to be shaken up in order to start solving the issues of this country and the world.
Transp, Public Util	We cannot let people pour into our borders. We don't have the capacity or the money.
Unspecified Industry	Although I state No to some of the above, for most I believe he should go ahead, although there can be some negative impacts to business.
Unspecified Industry	Protectionism and closing immigration is bad policy.

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Q6. How would the following proposed tax reforms affect the business community?

(N=363)

	Very bad	Bad	Neutral	Good	Very good	DK	Total
Reduce corporate income tax rate to 20%	2 0.6%	7 2.0%	35 9.8%	95 26.5%	213 59.5%	6 1.7%	358 100.0%
Ease repatriation of foreign profits	2 0.6%	14 3.9%	60 16.8%	98 27.4%	170 47.5%	14 3.9%	358 100.0%
Immediate deduction for new investment	3 0.8%	13 3.7%	66 18.6%	130 36.6%	136 38.3%	7 2.0%	355 100.0%
Elimination of debt interest deduction	49 13.7%	158 44.1%	93 26.0%	28 7.8%	15 4.2%	15 4.2%	358 100.0%
Border tax (imported inputs not deductible)	79 22.3%	115 32.4%	83 23.4%	41 11.5%	19 5.4%	18 5.1%	355 100.0%
Substantial tariff on Mexican and Chinese goods	87 24.9%	113 32.3%	80 22.9%	42 12.0%	15 4.3%	13 3.7%	350 100.0%
Reduce personal income tax rate to 30% maximum	4 1.1%	20 5.6%	65 18.3%	124 34.9%	137 38.6%	5 1.4%	355 100.0%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Q6. How would the following proposed tax reforms affect the business community? (DK excluded - Shows average scores)

(N=363)

	Mean	Very bad -2	Bad -1	Neutral 0	Good 1	Very good 2	Total
Reduce corporate income tax rate to 20%	1.4	2 0.6%	7 2.0%	35 9.9%	95 27.0%	213 60.5%	352 100.0%
Ease repatriation of foreign profits	1.2	2 0.6%	14 4.1%	60 17.4%	98 28.5%	170 49.4%	344 100.0%
Immediate deduction for new investment	1.1	3 0.9%	13 3.7%	66 19.0%	130 37.4%	136 39.1%	348 100.0%
Elimination of debt interest deduction	-0.6	49 14.3%	158 46.1%	93 27.1%	28 8.2%	15 4.4%	343 100.0%
Border tax (imported inputs not deductible)	-0.6	79 23.4%	115 34.1%	83 24.6%	41 12.2%	19 5.6%	337 100.0%
Substantial tariff on Mexican and Chinese goods	-0.6	87 25.8%	113 33.5%	80 23.7%	42 12.5%	15 4.5%	337 100.0%
Reduce personal income tax rate to 30% maximum	1.1	4 1.1%	20 5.7%	65 18.6%	124 35.4%	137 39.1%	350 100.0%

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Q7. Would your company be directly affected by a border tax (imported inputs not a deductible expense, domestic inputs deductible)?

	Number	Percent	95% CI
No	234	65.0 %	± 4.9 %
Yes	99	27.5 %	± 4.6 %
Don't Know	27	7.5 %	± 2.7 %
Total	360	100.0 %	

Missing Cases = 3
Response Percent = 99.2 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Q7a/b. If company would be directly affected by a border tax

(N=99)

	Large decrease in profit	Small decrease in profit	No change	Small increase in profit	Large increase in profit	DK	Total
Q7a. Assuming no change in the exchange rate, how would a border tax impact your bottom line?	30	49	4	8	2	6	99
	30.3%	49.5%	4.0%	8.1%	2.0%	6.1%	100.0%
Q7b. Assuming the US dollar appreciates by 20% as a result of the border tax, how would the combination of the border tax and the dollar appreciation impact your bottom line?	31	35	13	10	1	8	98
	31.6%	35.7%	13.3%	10.2%	1.0%	8.2%	100.0%

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Q7a/b. If company would be directly affected by a border tax - Excludes DK (Shows average scores)

(N=99)

	Mean	Large decrease in profit -2	Small decrease in profit -1	No change 0	Small increase in profit 1	Large increase in profit 2	Total
Q7a. Assuming no change in the exchange rate, how would a border tax impact your bottom line?	-1.0	30	49	4	8	2	93
		32.3%	52.7%	4.3%	8.6%	2.2%	100.0%
Q7b. Assuming the US dollar appreciates by 20% as a result of the border tax, how would the combination of the border tax and the dollar appreciation impact your bottom line?	-0.9	31	35	13	10	1	90
		34.4%	38.9%	14.4%	11.1%	1.1%	100.0%

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Q8. How much do you expect real GDP to grow in 2017

	Number	Percent	95% CI
0-0.9	15	4.1 %	± 2.1 %
1-1.9%	89	24.6 %	± 4.4 %
2-2.9%	180	49.7 %	± 5.2 %
3-3.9%	54	14.9 %	± 3.7 %
>4	7	1.9 %	± 1.4 %
Don't Know	17	4.7 %	± 2.2 %
Total	362	100.0 %	

Missing Cases = 1
Response Percent = 99.7 %

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Q9. Recent data from the Edelman Trust Barometer shows public trust continues to decline in business and government leadership. To what degree, if any, has a lack of public trust in business and government affected…

(N=363)

	Not at all	Very little	Moderately	A great deal	N/A	Total
	96	149	85	22	8	360
Your company:	26.7%	41.4%	23.6%	6.1%	2.2%	100.0%
Your business	47	139	120	47	5	358
environment:	13.1%	38.8%	33.5%	13.1%	1.4%	100.0%

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Q9. Recent data from the Edelman Trust Barometer shows public trust continues to decline in business and government leadership. To what degree, if any, has a lack of public trust in business and government affected… (DK Excluded - Shows average scores)

(N=363)

	Mean	Not at all 0	Very little 1	Moderately 2	A great deal 3	Total
	1.1	96	149	85	22	352
Your company:		27.3%	42.3%	24.1%	6.3%	100.0%
Your business	1.5	47	139	120	47	353
environment:		13.3%	39.4%	34.0%	13.3%	100.0%

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Q10. How much do you agree or disagree with the following statements in relation to public concerns about business trust?

(N=363)

	Mean	Strongly Disagree -2	Disagree -1	Neutral 0	Agree 1	Strongly Agree 2	Total
We have emphasized increased transparency in our business dealings and reporting	0.3	22 6.2%	42 11.8%	118 33.1%	142 39.9%	32 9.0%	356 100.0%
We have strengthened our governance policies and procedures	0.2	25 7.0%	52 14.5%	122 34.1%	139 38.8%	20 5.6%	358 100.0%
Public perceptions and trust considerations affect my company's business decisions	0.2	27 7.5%	71 19.8%	105 29.2%	128 35.7%	28 7.8%	359 100.0%
Other	0.0	1 3.4%	1 3.4%	26 89.7%	0 0.0%	1 3.4%	29 100.0%
We use marketing and public relations to counteract the lack of public trust	-0.4	61 17.1%	101 28.4%	113 31.7%	68 19.1%	13 3.7%	356 100.0%
We have made organizational changes in response to the lack of public trust	-0.6	69 19.3%	130 36.3%	115 32.1%	37 10.3%	7 2.0%	358 100.0%
Our CEO has chosen to speak out on controversial issues in an effort to regain public trust	-0.6	81 22.7%	120 33.6%	104 29.1%	39 10.9%	13 3.6%	357 100.0%
Our revenues are lower because of a lack of public trust	-0.7	62 17.3%	166 46.2%	85 23.7%	37 10.3%	9 2.5%	359 100.0%

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Other public concerns about business trust:

IN	Global_BizTrust_8_Other
Bank/Fin/Insur/Real Est	Donate at http://viflys.blogspot.com optimistic estimate
Communication/Media	none
Manufacturing	In 1950's if a newspaper reported it...it was true. This is not the case today. Public trust is damaged by the media
Retail/Wholesale	Businesses should stay neutral on controversial policies.
Retail/Wholesale	Small private B2B company
Services, Consulting	democratic discrimination against republican and independent businesses
Services, Consulting	W express confidence and share little outside
Tech [Soft/Hard/Bio]	For our type of business, public trust is not a factor since we sell to other businesses.
Tech [Soft/Hard/Bio]	none

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On February 20, 2017 the annual yield on 10-yr treasury bonds was 2.41%. Please complete the following: (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	2.0	4.0	1.6 - 2.4	2	-9.5	13.5	322
Over the next 10 years, I expect the average annual S&P 500 return will be: Expected return:	6.6	4.2	6.1 - 7.1	6	-5	21.3	327
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	9.8	5.8	9.2 - 10.4	9	-7	28.7	326
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	-0.5	7.1	-1.3 - 0.2	1	-17.3	15.5	324
Over the next year, I expect the average annual S&P 500 return will be: Expected return:	6.1	4.3	5.7 - 6.6	5	-6.1	19.2	330
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	10.8	5.9	10.2 - 11.4	10	-2.5	25	328

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Return on assets (ROA=operating earnings/assets) (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% Approximate ROA in 2016	7.2	8.8	6.2 - 8.2	5	-14.1	30.4	279
% Expected ROA in 2017	8.9	9.4	7.8 - 10.0	6	-14.1	34.1	279

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Manufacturing capacity utilized (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% of capacity utilized in first half of 2017	71.7	15.3	67.9 - 75.5	75	41.8	99.5	62
% of capacity utilization planned for the second half of 2017	76.0	14.2	72.4 - 79.5	80	49.6	100.4	62

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Industry

	Number	Percent	95% CI
Services, Consulting	71	19.8 %	± 4.1 %
Manufacturing	64	17.8 %	± 3.9 %
Banking/Finance/Insurance/Real Estate	47	13.1 %	± 3.5 %
Retail/Wholesale	37	10.3 %	± 3.1 %
Technology [Software/Hardware/Biotech]	28	7.8 %	± 2.8 %
Healthcare/Pharmaceutical	27	7.5 %	± 2.7 %
Transportation & Public Utilities	14	3.9 %	± 2.0 %
Mining/Construction	11	3.1 %	± 1.8 %
Agriculture, Forestry, & Fishing	6	1.7 %	± 1.3 %
Public Administration	5	1.4 %	± 1.2 %
Energy	4	1.1 %	± 1.1 %
Communication/Media	4	1.1 %	± 1.1 %
Other Industry	41	11.4 %	± 3.3 %
Total	359	100.0 %	

Missing Cases = 4
Response Percent = 98.9 %

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Industry (Other specified)

Accounting and Tax Preparation
Aerospace/defense
Architecture/Engineering
Aviation
charity
childcare/school
Commerical Aircraft Leasing
CPG
Distribution -- Specialty Chemicals
Education
Education
Education
Education
education
education
Educational Foundation
Entertainment
Environmental Consulting / Regulatory Compliance
Equipment Rental & Maintenance
FIRE
Healthcare Finance
hospitality
Hotel management
industrial and medical equipment mfg
Logistics and distribution
non profit education association
Nonprofit
Nonprofit services
nonprofit
nonprofit foundation
Not for Profit
Not for profit Education
not for profit
Seafood processing & distribution
Senior Living
Social sector
Social Services
Travel and Hospitality
Wholesale Distribution
wine production and sales

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Sales Revenue

	Number	Percent	95% CI
Less than $25 million	142	40.0 %	± 5.0 %
$25-99 million	75	21.1 %	± 4.2 %
$100-499 million	70	19.7 %	± 4.1 %
$500-999 million	21	5.9 %	± 2.4 %
$1-4.9 billion	25	7.0 %	± 2.6 %
$5-9.9 billion	8	2.3 %	± 1.5 %
More than $10 billion	14	3.9 %	± 2.0 %
Total	355	100.0 %	

Missing Cases = 8
Response Percent = 97.8 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Statistics - Sales Revenue (Millions)

Minimum = 25

Maximum = 11000

Mean = 940.7

Median = 62

Variance (Unbiased Estimate) = 5856896.5

Standard Deviation (Unbiased Estimate) = 2420.1

Standard Error Of The Mean = 128.4

95 Percent Confidence Interval Around The Mean = 689.0 - 1192.5

99 Percent Confidence Interval Around The Mean = 610.0 - 1271.5

Skewness = 3.3

Kolmogorov-Smirnov Statistic For Normality = 7.8

Quartiles

1 = 25
2 = 62
3 = 300

Valid Cases = 355
Missing Cases = 8
Response Percent = 97.8%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Number of Employees

	Number	Percent	95% CI
Fewer than 100	128	42.4 %	± 4.9 %
100-499	80	26.5 %	± 4.3 %
500-999	26	8.6 %	± 2.7 %
1,000-2,499	34	11.3 %	± 3.0 %
2,500-4,999	7	2.3 %	± 1.4 %
5,000-9,999	13	4.3 %	± 1.9 %
Over 10,000	14	4.6 %	± 2.0 %
Total	302	100.0 %	

Missing Cases = 61
Response Percent = 83.2 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Statistics - Number of Employees

Minimum = 100

Maximum = 12000

Mean = 1349.5

Median = 300

Variance (Unbiased Estimate) = 8049592.8

Standard Deviation (Unbiased Estimate) = 2837.2

Standard Error Of The Mean = 163.3

95 Percent Confidence Interval Around The Mean = 1029.5 - 1669.5

99 Percent Confidence Interval Around The Mean = 929.1 - 1769.9

Skewness = 2.9

Kolmogorov-Smirnov Statistic For Normality = 6.2

Quartiles

1 = 100
2 = 300
3 = 750

Valid Cases = 302
Missing Cases = 61
Response Percent = 83.2%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Where are you personally located?

	Number	Percent	95% CI
Midwest U.S.	104	28.9 %	± 4.7 %
Northeast U.S.	76	21.1 %	± 4.2 %
South Central U.S.	56	15.6 %	± 3.7 %
Pacific US	49	13.6 %	± 3.5 %
South Atlantic U.S. (Not NC)	36	10.0 %	± 3.1 %
Mountain U.S.	27	7.5 %	± 2.7 %
North Carolina	12	3.3 %	± 1.8 %
Total	360	100.0 %	

Missing Cases = 3
Response Percent = 99.2 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Where are you personally located? - Other specified

--- No Response ---

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NC Only - What are the effects of HB2 on the 2017 economic prospects of firms in your industry?

	Number	Percent	95% CI
Very negative	2	16.7 %	± 24.8 %
Negative	3	25.0 %	± 28.8 %
Neutral	6	50.0 %	± 33.2 %
Positive	1	8.3 %	± 18.4 %
Very postive	0	0.0 %	± 0.0 %
DK	0	0.0 %	± 0.0 %
Total	12	100.0 %	

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

NC Only / Excludes DK - What are the effects of HB2 on the 2017 economic prospects of firms in your industry?

	Number	Percent	95% CI
-2=Very Negative	2	16.7 %	± 24.8 %
-1=-Negative	3	25.0 %	± 28.8 %
0=Neutral	6	50.0 %	± 33.2 %
1=Positive	1	8.3 %	± 18.4 %
2=Very Positive	0	0.0 %	± 0.0 %
Total	12	100.0 %	

Mean = -0.5

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Ownership

	Number	Percent	95% CI
Private	257	76.0 %	± 4.7 %
Nonprofit	32	9.5 %	± 2.9 %
Public, NYSE	31	9.2 %	± 2.9 %
Govern-ment	10	3.0 %	± 1.7 %
Public, Nasdaq/AMEX	8	2.4 %	± 1.5 %
Total	338	100.0 %	

Missing Cases = 25
Response Percent = 93.1 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Foreign Sales

	Number	Percent	95% CI
0%	173	48.7 %	± 5.2 %
1-24%	135	38.0 %	± 5.0 %
25-50%	35	9.9 %	± 3.1 %
More than 50%	12	3.4 %	± 1.8 %
Total	355	100.0 %	

Missing Cases = 8
Response Percent = 97.8 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

In what region of the world are most of your foreign sales?

	Number	Percent	95% CI
Europe	64	38.6 %	± 7.0 %
Canada	46	27.7 %	± 6.4 %
Asia/Pacific Basin	35	21.1 %	± 5.8 %
Latin America	19	11.4 %	± 4.5 %
Africa	2	1.2 %	± 1.5 %
Total	166	100.0 %	

Missing Cases = 16
Response Percent = 91.2 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

What is your company's credit rating?

	Number	Percent	Cumulative
AAA	37	15.4 %	15.4 %
AA+	35	14.5 %	29.9 %
AA	28	11.6 %	41.5 %
AA-	8	3.3 %	44.8 %
A+	16	6.6 %	51.5 %
A	22	9.1 %	60.6 %
A-	18	7.5 %	68.0 %
BBB+	17	7.1 %	75.1 %
BBB	15	6.2 %	81.3 %
BBB-	7	2.9 %	84.2 %
BB+	7	2.9 %	87.1 %
BB	7	2.9 %	90.0 %
BB-	4	1.7 %	91.7 %
B+	3	1.2 %	92.9 %
B	5	2.1 %	95.0 %
B-	6	2.5 %	97.5 %
CCC	4	1.7 %	99.2 %
CC	1	0.4 %	99.6 %
D	1	0.4 %	100.0 %
Total	241	100.0 %	100.0 %

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

What is your company's credit rating?

N=241	Total	Credit Rating	
		Actual A	Estimate B
Total	241	103	138
	100.0%	42.7%	57.3%
AAA	37	18	19
	15.4%	17.5%	13.8%
AA+	35	17	18
	14.5%	16.5%	13.0%
AA	28	11	17
	11.6%	10.7%	12.3%
AA-	8	1	7
	3.3%	1.0%	5.1%
A+	16	7	9
	6.6%	6.8%	6.5%
A	22	11	11
	9.1%	10.7%	8.0%
A-	18	10	8
	7.5%	9.7%	5.8%
BBB+	17	7	10
	7.1%	6.8%	7.2%
BBB	15	3	12
	6.2%	2.9%	8.7%
BBB-	7	4	3
	2.9%	3.9%	2.2%
BB+	7	3	4
	2.9%	2.9%	2.9%
BB	7	3	4
	2.9%	2.9%	2.9%
BB-	4	1	3
	1.7%	1.0%	2.2%
B+	3	1	2
	1.2%	1.0%	1.4%
B	5	3	2
	2.1%	2.9%	1.4%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

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What is your company's credit rating?

N=241	Total	Credit Rating	
		Actual A	Estimate B
B-	6	3	3
	2.5%	2.9%	2.2%
CCC	4	0	4
	1.7%	0.0%	2.9%
CC	1	0	1
	0.4%	0.0%	0.7%
D	1	0	1
	0.4%	0.0%	0.7%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Your job title (e.g., CFO, Asst. Treasurer, etc):

	Number	Percent
CFO	177	49.4 %
CEO	47	13.1 %
Other	44	12.3 %
Controller	41	11.5 %
VP of Finance	41	11.5 %
Treasurer	8	2.2 %
Total	358	100.0 %

Missing Cases = 5
Response Percent = 98.6 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2017

Other job title:

owner/cfo
Consultant & Former Treasurer
VP Product
Partner
Managing Director
Acting CFO
Senior Vice President
Partner
SVP Divisional Credit Officer
Operations
Managing Director
Board member
President
Corporate strategist
President
Strategic advisor
Consultant
VP Strategy
Deputy CEO
Managing Director
Assoc Prof Finance
Partner / CFO
VP
Managing Partner
President
DIRECTOR
Managing Director
Director, Supply Chain Management
Partner
VP
Managing Director
President
managing director
Managing Member
HR Manager
Owner
owner

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Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

1a. Are you more or less optimistic about your country's economy compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	121	32.7 %	± 4.8 %
0=No change	141	38.1 %	± 5.0 %
-1=Less optimistic	108	29.2 %	± 4.6 %
Total	370	100.0 %	

Mean = 0.04
SD = 0.79

Missing Cases = 1
Response Percent = 99.7 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

1b. Rate your optimism about your country's economy on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 0

Maximum = 100

Mean = 65.87

Median = 70

Standard Deviation (Unbiased Estimate) = 16.18

95 Percent Confidence Interval Around The Mean = 64.12 - 67.62

Quartiles

1 = 55
2 = 70
3 = 76.75

Valid Cases = 329
Missing Cases = 42
Response Percent = 88.7%

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

2a. Are you more or less optimistic about the financial prospects for your own company compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	174	47.7 %	± 5.1 %
0=No change	110	30.1 %	± 4.7 %
-1=Less optimistic	81	22.2 %	± 4.2 %
Total	365	100.0 %	

Mean = 0.25
SD = 0.80

Missing Cases = 6
Response Percent = 98.4 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

2b. Rate your optimism about the financial prospects for your own company on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 5

Maximum = 100

Mean = 70.19

Median = 75

Standard Deviation (Unbiased Estimate) = 17.89

95 Percent Confidence Interval Around The Mean = 68.25 - 72.12

Quartiles

1 = 60
2 = 75
3 = 84.25

Valid Cases = 329
Missing Cases = 42
Response Percent = 88.7%

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

3a. During the past quarter, which items have been the most pressing concerns for your company's top management team?

	Number	Percent	95% CI
Difficulty attracting / retaining qualified employees	153	41.4 %	± 5.0 %
Cost of benefits	128	34.6 %	± 4.9 %
Government policies	117	31.6 %	± 4.8 %
Regulatory requirements	111	30.0 %	± 4.7 %
Economic uncertainty	110	29.7 %	± 4.7 %
Data security	100	27.0 %	± 4.5 %
Employee productivity	87	23.5 %	± 4.3 %
Weak demand for your products/services	80	21.6 %	± 4.2 %
Rising wages and salaries	65	17.6 %	± 3.9 %
Access to capital	52	14.1 %	± 3.6 %
Corporate tax code	49	13.2 %	± 3.5 %
Employee morale	48	13.0 %	± 3.4 %
Geopolitical / health crises	35	9.5 %	± 3.0 %
Other	30	8.1 %	± 2.8 %
Cost of borrowing	28	7.6 %	± 2.7 %
Rising input or commodity costs	28	7.6 %	± 2.7 %
Currency risk	15	4.1 %	± 2.0 %
Deflation	4	1.1 %	± 1.1 %
Inflation	2	0.5 %	± 0.8 %
Total	1242		

Number of Cases = 370
Number of Responses = 1242
Average Number Of Responses Per Case = 3.4
Number Of Cases With At Least One Response = 370
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

3a. During the past quarter, which items have been the most pressing concerns for your company's top management team? - Other specified

Bank/Fin/Insur/Real Est	Competition
Bank/Fin/Insur/Real Est	High tech partially collasping in No. Ca.
Bank/Fin/Insur/Real Est	Legal environment - need tort reform badly!
Bank/Fin/Insur/Real Est	tax reform
Healthcare/Pharm	Controlled growth
Healthcare/Pharm	Government/State Reimbursement
Healthcare/Pharm	poor government leadership
Manufacturing	launch of new software
Manufacturing	organic revenue growth
Mining/Construction	Congress' ineptitude
Mining/Construction	LAbor Shortage
Mining/Construction	President's ability to lead and make good decisions
Mining/Construction	Succession plannng
Other	Confusion/uncertainty caused by Trump administration
Other	Increasing clients
Other	operating systems to be more efficient
Other	Republican house and senate not acting on President Trumps Agenda.
Other	Weather
Retail/Wholesale	bricks and mortar problems
Retail/Wholesale	Market penetration
Services, Consulting	Consolidations
Services, Consulting	The flood in Houston where I am located
Services, Consulting	Weak governmental leadership
Tech [Soft/Hard/Bio]	foreign country tax policies
Tech [Soft/Hard/Bio]	New clients
Tech [Soft/Hard/Bio]	Price compression/low revenue growth
Tech [Soft/Hard/Bio]	Revenue growth
Tech [Soft/Hard/Bio]	Sales / revenue growth
Transp, Public Util	competition
Transp, Public Util	Weather- extreme hot summer

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Agr, Forestry, Fishing	Access to capital related to movable structures, i.e. Greenhouses
Agr, Forestry, Fishing	Access to seasonal workforce considering unclear Federal policy.
Agr, Forestry, Fishing	I never see any indication that my brain children are coming to life.
Bank/Fin/Insur/Real Est	China stumbles -- b/c internal issue like debt constipation or bank problem. or external issue with Taiwan, N. Korea or reckless U.S. -- and the world economy goes into another four-year dimming.
Bank/Fin/Insur/Real Est	Competition in our industry is fierce. Customers now look at our product as a commodity.
Bank/Fin/Insur/Real Est	Consolidating movement triggered by mediocre and changing demand for services.
Bank/Fin/Insur/Real Est	Consumer demand
Bank/Fin/Insur/Real Est	Corporate tax rates not changing
Bank/Fin/Insur/Real Est	Cost of benefits and excessive taxes--local, state and national.
Bank/Fin/Insur/Real Est	Credit worthiness of customers
Bank/Fin/Insur/Real Est	Donald Trumps policies will negatively impact our future economy (but benefit him and his family personally), the stock market will have a significant crash and it will ripple through the economy.
Bank/Fin/Insur/Real Est	Interest rate level - need to see gradual increases in rates
Bank/Fin/Insur/Real Est	N/A
Bank/Fin/Insur/Real Est	N/A
Bank/Fin/Insur/Real Est	none
Bank/Fin/Insur/Real Est	Regulatory and compliance concerns continue to consume more time and resources
Bank/Fin/Insur/Real Est	Supply/Demand imbalance in Housing market. High tech partial collapse in northern California
Bank/Fin/Insur/Real Est	Technology
Bank/Fin/Insur/Real Est	Terror attacks in high traffic vacation destinations.
Bank/Fin/Insur/Real Est	The uncertainty and gridlock in Congress needs to unwind at some point. There is a level of anxiety as we wait for some shoe to drop.
Bank/Fin/Insur/Real Est	Uncertainty over health care market and impact on cost of benefits.
Bank/Fin/Insur/Real Est	We are related to a membership organization with declining menbership so our chief challenge is developing new markets for our insurance products.
Communication/Media	Continued demand from clients for longer payment terms, forcing us to utilize additional capital with low ROI
Communication/Media	Ensuring that the business model is correct.
Communication/Media	Global terrorism
Communication/Media	Government policies interfering with productivity and client retention.
Communication/Media	Opening new revenue streams
Energy	Fossil fuel/Big Oil back in control of Washington!
Healthcare/Pharm	Affordable Care Act
Healthcare/Pharm	As a nonprofit, competition for donor dollars is high. There will be more expenses for marketing in order to attract donors to us and or cause.
Healthcare/Pharm	Changes in healthcare and tax codes.
Healthcare/Pharm	Collection of accounts receivables, how the new franchisees will perform and staff.
Healthcare/Pharm	Continuing uncertainty concerning healthcare costs and how possible changes by Trump administration could affect our business...sales to hospitals as well as cost of healthcare insurance for employees
Healthcare/Pharm	Electronic medical records
Healthcare/Pharm	Healthcare reform not getting done in 2017
Healthcare/Pharm	Industry consolidation.
Healthcare/Pharm	Presidential uncertainty; external events such as terrorism.
Healthcare/Pharm	uncertainty about repeal and replace the ACA
Healthcare/Pharm	US tax code reform, US medical policy uncertainty, US geopolitical status
Healthcare/Pharm	Worker training; Opioid Crisis; Legal Environment
Manufacturing	Being able to keep up with customer demand
Manufacturing	Degrading reputation of the U.S. in the world due to Trump.

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Manufacturing	deterioration of market growth
Manufacturing	Difficulty growing
Manufacturing	DONALD TRUMP..who knows what happens with him. totally unstable
Manufacturing	Findinng New Customers
Manufacturing	Foreign exchange exposure
Manufacturing	general economic conditions may restrict growth in our served markets
Manufacturing	global enterprise complexity for a SBE
Manufacturing	hedge fund activity
Manufacturing	Identifying and mitigating risk around global expansion
Manufacturing	Industry consolidation, regulations, health care reform
Manufacturing	instability internationally can affect our business
Manufacturing	Lack of bipartisan action at both the Federal and State levels
Manufacturing	Lack of control of China and her unfair business practices
Manufacturing	Lack of growth in revenue. Continuing decline in distribution channel used to move product
Manufacturing	Lack of skilled labor - specifically in the housing industry.
Manufacturing	none
Manufacturing	Organizational change required to address changing economy
Manufacturing	Overall spending of customers due to market pressure.
Manufacturing	Political instability in Washington
Manufacturing	Political unrest
Manufacturing	political uncertainty
Manufacturing	recent increases in commodity prices may have an adverse effect later in the year.
Manufacturing	Rising political uncertainty in the US.
Manufacturing	Shifting consumer patterns, driven by e-commerce and especially Amazon
Manufacturing	Significant need to increase manufacturing process efficiency.
Manufacturing	Supply Chain Management with China
Manufacturing	Supply chain risk
Manufacturing	The ability to meet our customers demands under our current business model.
Manufacturing	US government instability. Republicans and Democrats refusing to work together. In addition alt left and right groups trying to grab center stage ahead of the issues that 'actually' need to be address
Manufacturing	Water limitations in California (becoming a National issue that is not really discussed for Business)
Mining/Construction	corporate mentoring for management as revenues grows
Mining/Construction	disruption in the business climate due to major political infighting and severe lack of leadership in the President and in Congress
Mining/Construction	Inability of the current President to do anything and the lack of any Republican congressional leadership
Mining/Construction	Litigation/liability
Mining/Construction	NA
Mining/Construction	The media's constant campaign to impeach our president.
Other	A general sense that the economy will turn bad.
Other	Ability to finance growing needs
Other	Ability to secure competent engineering and fabrication talent and services.
Other	along with Ee retention, lack of vocational education / training for repair technicians
Other	Barriers against free global trade
Other	Cash flow and levelof contributions
Other	Changing face of higher education
Other	collection of a bad debt (vendor in bankruptcy)
Other	Congress not allowing any tax or infrastructure policies to get passed.
Other	Equity acquisitions of our clients. The margin requirements on Equity investment lower overall margins for our company.

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Other	government is getting bigger and putting more barriers in place with little accountability on their side. This will cause small business owners to have more obstacles or barriers to entry
Other	Increasing competition, efficacy of back office function consolidation
Other	Increasing minimum wage with minimal probability that revenue rates will increase at the same pace.
Other	Increasing polarization, angry rhetoric and growing political unrest and violence on both sides.
Other	Integration of acquisitions
Other	Minimum wage increases greatly affect our profitability in NY, may have to cut employment there to compensate.
Other	none
Other	Office relocation
Other	Rising wages to be able to attract and retain employees and the clients budget cuts for janitorial services. We want to make sure our employees can make a fair wage.
Other	Uncertainty regarding the current Administration.
Pub Admin	cost of health insurance
Pub Admin	Funding
Pub Admin	Geopolitical uncertainty
Pub Admin	Geopolitics.
Retail/Wholesale	Border tax, trade war, import duties,
Retail/Wholesale	China's on going factory closures for environmental and financial viability audits
Retail/Wholesale	Clinical trial development
Retail/Wholesale	Finding sufficient employees
Retail/Wholesale	Hiring & retaining qualified people
Retail/Wholesale	Impact of weather events....Harvey Irma.
Retail/Wholesale	Industry consolidation
Retail/Wholesale	More companies have available products for our products sold. More competition due to manufacturers opening more companies to sell their products
Retail/Wholesale	N/A
Retail/Wholesale	Providing competitive benefits for our employees
Retail/Wholesale	Rising wages and salaries, data security
Retail/Wholesale	Stealing. CA has had major changes for leniency regarding prisoners and is allowing out of jail. Many of drug problems and they now steal to serve their addiction. Also, marijuana becomes legal.
Retail/Wholesale	Talent pool, unrest in the radical left, Government failure to reform healthcare
Retail/Wholesale	Trying to do everything right, but getting an unforseen lawsuit.
Services, Consulting	business outlook unless the USA government gets to correct the current ineffectiveness.
Services, Consulting	Changes that might be made in Free Trade Agreements; NAFTA,CAFTA, AGOA,
Services, Consulting	Client interest in Risk Management Consulting Services.
Services, Consulting	Competition from online startups
Services, Consulting	Cybersecurity
Services, Consulting	dysfunctional government
Services, Consulting	Emergence of Artificial Intelligence and the affect it will have on the profession.
Services, Consulting	European regulations
Services, Consulting	Facility and data security
Services, Consulting	government polices
Services, Consulting	Increased competition from large firms who need more business.
Services, Consulting	Increasing commodity costs.
Services, Consulting	Lack of confidence in the US economy and US leadership on the part of allies.
Services, Consulting	NLRB Joint Employer standard, Franchise legislation
Services, Consulting	none
Services, Consulting	Retaining top talent
Services, Consulting	Terrorism

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Services, Consulting	The recovery of Houston and its impact on refinery prices for gasoline and heating oil for the winter....
Services, Consulting	The total uncertainty surrounding any policy out of Washington DC. From health care implications, to tax uncertainty (tariffs etc) to lack of respect for the office of the President.
Services, Consulting	We have lost two significant client relationships this year -- both due to merger / acquisition of our clients by much larger entities.
Tech [Soft/Hard/Bio]	1. Credit risks for our larger customers 2. Continued consolidation in the IOT whereby lage companies are buying up smaller firms.
Tech [Soft/Hard/Bio]	Changing immigration policies
Tech [Soft/Hard/Bio]	Geopolitical crises--we do a lot of business in China
Tech [Soft/Hard/Bio]	H1B Visas
Tech [Soft/Hard/Bio]	Lack of growth in Telecom industry
Tech [Soft/Hard/Bio]	relationships with customer's home countries- our country's leaders doing stupid things
Transp, Public Util	Changes in the commodity markets, particular the electric market.
Transp, Public Util	Economic slowdown
Transp, Public Util	Increase ordering of new vessels destabilizing the shipping industry
Transp, Public Util	Managing growth in cap ex
Transp, Public Util	The healthcare issue in America must be addressed and improved by Congress.
Unspecified Industry	California specific labor laws regulations
Unspecified Industry	California specific regulatory and labor laws

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Unweighted - Winsorized]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Earnings	9.11	23.24	6.52 - 11.70	5	-60	87.28	309
Health care costs	8.58	6.11	7.92 - 9.25	8	-6.69	24.91	322
Revenue	8.28	14.63	6.69 - 9.88	5	-36.10	58.17	324
Technology spending	5.95	11.69	4.60 - 7.30	5	-45.60	62.01	288
Capital spending	5.69	16.34	3.81 - 7.57	3	-34.80	46.29	291
Marketing/advertising spending	4.50	9.49	3.40 - 5.61	1.50	-23.90	36.06	282
Wages/Salaries	4.42	4.75	3.91 - 4.94	3	-12.50	22.42	327
Number of domestic full-time employees	4.11	8.37	3.17 - 5.05	2	-18.10	26.70	303
Research and development spending	2.21	5.26	1.55 - 2.88	0	-12.80	17.59	239
Prices of your products	2.07	3.81	1.63 - 2.52	2	-11.70	16.40	280

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months for: [Unweighted - Sorted]

(N=371)

	Mean & SD	Positive 1	Zero 0	Negative -1	Total
	0.92	305	17	5	327
Wages/Salaries	0.33	93.27%	5.20%	1.53%	100.00%
	0.89	292	24	6	322
Health care costs	0.37	90.68%	7.45%	1.86%	100.00%
	0.69	266	16	42	324
Revenue	0.69	82.10%	4.94%	12.96%	100.00%
	0.64	200	71	17	288
Technology spending	0.59	69.44%	24.65%	5.90%	100.00%
	0.53	221	32	56	309
Earnings	0.78	71.52%	10.36%	18.12%	100.00%
	0.53	163	102	15	280
Prices of your products	0.60	58.21%	36.43%	5.36%	100.00%
	0.46	147	117	18	282
Marketing/advertising spending	0.61	52.13%	41.49%	6.38%	100.00%
	0.45	183	73	47	303
Number of domestic full-time employees	0.75	60.40%	24.09%	15.51%	100.00%
	0.42	165	83	43	291
Capital spending	0.74	56.70%	28.52%	14.78%	100.00%
	0.31	85	144	10	239
Research and development spending	0.55	35.56%	60.25%	4.18%	100.00%

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Revenue Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Technology spending	5.23	8.56	4.26 - 6.20	5	-45.60	62.01	298
Earnings	4.71	12.23	3.35 - 6.08	5	-60	87.28	309
Revenue	4.30	8.54	3.36 - 5.24	4	-36.10	58.17	317
Capital spending	4.24	12.34	2.89 - 5.60	2	-34.80	46.29	320
Marketing/advertising spending	1.68	5.96	0.94 - 2.41	0	-23.90	36.06	253
Research and development spending	1.30	4.66	0.72 - 1.88	0	-12.80	17.59	247
Prices of your products	1.23	3.60	0.81 - 1.66	1.46	-11.70	16.40	278

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Employee Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Health care costs	8.56	5.96	7.85 - 9.27	8	-6.69	24.91	270
Wages/Salaries	3.93	4.20	3.43 - 4.43	3	-12.50	22.42	267
Number of domestic full-time employees	3.37	7.50	2.45 - 4.30	2	-18.10	26.70	253

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Public Companies - Winsorized - Revenue Weighted]

	Mean	SD	95% CI	Median	Minimum	Maximum
Earnings	4.62	9.43	3.28 - 5.95	8.11	-25	20
Revenue	3.01	6.71	2.10 - 3.93	4	-20	20

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Q5. What is the hurdle rate that your company uses to evaluate investment projects?

What is the hurdle rate that your company uses to evaluate investment projects?

Minimum = 3

Maximum = 100

Mean = 13.50

Median = 12

Standard Deviation (Unbiased Estimate) = 8.50

95 Percent Confidence Interval Around The Mean = 12.56 - 14.43

Quartiles

1 = 9.35
2 = 12
3 = 15

Valid Cases = 317
Missing Cases = 54
Response Percent = 85.4%

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q6a. Does your company pursue all NPV>0 projects?

	Number	Percent	95% CI
Yes	35	9.6 %	± 3.0 %
No	299	81.7 %	± 4.0 %
Don't Know	32	8.7 %	± 2.9 %
Total	366	100.0 %	

Missing Cases = 5
Response Percent = 98.7 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q6b. Does a shortage of management time or expertise prevent your firm from pursuing some NPV>0 projects that you would otherwise pursue?

	Number	Percent	95% CI
Yes	144	39.3 %	± 5.0 %
No	191	52.2 %	± 5.1 %
Don't Know	31	8.5 %	± 2.8 %
Total	366	100.0 %	

Missing Cases = 5
Response Percent = 98.7 %

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Why doesn't your firm hire more managers to reduce the shortage?

	Number	Percent	95% CI
Financial constraints	69	47.9 %	± 8.3 %
Our top management team does not have enough bandwidth to oversee an expanded organization and expanded managerial workforce	63	43.8 %	± 8.2 %
It is difficult to hire potential managers that possess the specific hard skills that we need	42	29.2 %	± 7.5 %
It's difficult to quickly get new managers up to speed and fully productive	37	25.7 %	± 7.2 %
It is difficult to hire potential managers that possess the intangible skills that we need	28	19.4 %	± 6.5 %
It's difficult to find new managers who mesh with our work culture	25	17.4 %	± 6.3 %
Hiring more managers would reduce organizational focus	19	13.2 %	± 5.6 %
Other	14	9.7 %	± 4.9 %
Even if more managers were hired, some tasks and responsibilities could not delegated to new managerial hires	13	9.0 %	± 4.7 %
Total	310		

Number of Cases = 144
Number of Responses = 310
Average Number Of Responses Per Case = 2.2
Number Of Cases With At Least One Response = 144
Response Percent = 100.0 %

Asked of those who indicated a shortage of management time or expertise prevented their firm from pursuing some NPV>0 projects that they would otherwise pursue

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Why doesn't your firm hire more managers to reduce the shortage? - OTHERS

IN	Why doesn't your firm hire more managers to reduce the shortage? - Others
Agr, Forestry, Fishing	lack of further vision
Bank/Fin/Insur/Real Est	Cyclical nature of projects make fulltime hires difficult to justify
Healthcare/Pharm	Lack of decisiveness at BOD level
Healthcare/Pharm	Too much already on our plate to effectively execute
Manufacturing	Ownership restricts expansion
Manufacturing	We do not have enough projects to cost justify the addition of a manager
Manufacturing	We run a lean organization that focuses on the most substantive opportunities
Other	Scale of many projects is require only fractional FTE staffing components but would require the hiring of full time staff, part of whose costs would have to be covered from other sources.
Other	Some projects create disruption to our customers and they must be sequenced due to compounding costs
Retail/Wholesale	Hiring quality staff for the manager to use to complete production
Services, Consulting	Have not exhausted opportunities in core business - FOCUS
Services, Consulting	We are a 'project' entity. Hiring and then terminating is very difficult.
Tech [Soft/Hard/Bio]	startup funding
Tech [Soft/Hard/Bio]	We need to stay focused on core objectives

Asked of those who indicated a shortage of management time or expertise prevented their firm from pursuing some NPV>0 projects that they would otherwise pursue

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

What managerial hard skills are most scarce?

IN	What managerial hard skills are most scarce?
Bank/Fin/Insur/Real Est	Accounting, other technical skills
Bank/Fin/Insur/Real Est	Experienced decision makers that can perform automonously
Bank/Fin/Insur/Real Est	industry experience
Healthcare/Pharm	Ability to understand future costs
Healthcare/Pharm	evaluate risk, manage complex organizations
Healthcare/Pharm	home health care experience
Healthcare/Pharm	resource management
Manufacturing	Engineering and supervision
Manufacturing	General Management breadth
Manufacturing	Industry specific knowledge
Manufacturing	INJECTION MOLDING
Manufacturing	Problem Solving
Manufacturing	pure experience in manufacturing
Manufacturing	Sales, IT savvy, decision-making/judgment
Manufacturing	technical/engineering
Manufacturing	understanding all the variables in the business
Mining/Construction	sub contractor in construction and the legal experience, contract exp
Other	entreprenurial experience
Other	quantitative analysis
Other	sales/engineer type
Pub Admin	common sense
Retail/Wholesale	Flooring knowledge
Retail/Wholesale	Industry specific knowledge
Retail/Wholesale	Productive discipline

Asked of those who indicated a shortage of management time or expertise prevented their firm from pursuing some NPV>0 projects that they would otherwise pursue

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

What managerial hard skills are most scarce?

IN	What managerial hard skills are most scarce?
Services, Consulting	Experience in finances, technical skills
Services, Consulting	Industry expertise
Services, Consulting	leadership
Services, Consulting	technical regulatory knowledge
Services, Consulting	valuation expertise
Tech [Soft/Hard/Bio]	Technical
Transp, Public Util	Subject Matter Expertise

Asked of those who indicated a shortage of management time or expertise prevented their firm from pursuing some NPV>0 projects that they would otherwise pursue

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

What managerial intangible skills are most scarce?

IN	What managerial intangible skills are most scarce?
Bank/Fin/Insur/Real Est	coordination, team skills
Energy	judgment
Healthcare/Pharm	Ability to deal with Regulatory changes and Forecasts
Healthcare/Pharm	Communication; Listening
Healthcare/Pharm	leadership & strategic thinking
Manufacturing	Building a Team
Manufacturing	communication, depth perception
Manufacturing	discernment
Manufacturing	Iron fist in velvet glove
Manufacturing	WORK ETHIC
Mining/Construction	soft skills, people skills
Other	entrepreneurial experience
Other	Leadership and drive for results
Retail/Wholesale	Personal drive and time commitment
Services, Consulting	communication skills
Services, Consulting	Delegation
Services, Consulting	integration, critical thinking
Services, Consulting	Strategic thinking and thought leadership
Tech [Soft/Hard/Bio]	Passion, Inquisitiveness
Transp, Public Util	creative problem solving...consensus building

Asked of those who indicated a shortage of management time or expertise prevented their firm from pursuing some NPV>0 projects that they would otherwise pursue

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

What tasks and responsibilities cannot be delegated to new managers?

IN	What tasks and responsibilities cannot be delegated to new managers?
Bank/Fin/Insur/Real Est	Decisions
Healthcare/Pharm	Contract negotiation; Hiring
Manufacturing	big new projects, i.e. acquisitions
Other	Contracts/Financial Committments
Retail/Wholesale	Industry specific
Services, Consulting	industry knowledge
Services, Consulting	Many
Tech [Soft/Hard/Bio]	Experienced judgment and decision making
Transp, Public Util	MOST ALL

Asked of those who indicated a shortage of management time or expertise prevented their firm from pursuing some NPV>0 projects that they would otherwise pursue

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q6c. Does your firm require that proposed projects earn a higher expected return because of a shortage of management time or expertise? ALL Respondents

Does your firm require that proposed projects earn a higher expected return (e.g., set a higher hurdle rate) because of a shortage of management time or expertise?	Number	Percent	95% CI
Yes	73	20.0 %	± 4.1 %
No	272	74.5 %	± 4.5 %
Don't Know	20	5.5 %	± 2.3 %
Total	365	100.0 %	

Missing Cases = 6
Response Percent = 98.4 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q6c. Does your firm require that proposed projects earn a higher expected return because of a shortage of management time or expertise? Shows responses of those who indicated a shortage of management time or expertise prevent their firm from pursuing some NPV>0 projects that you would otherwise pursue?

Does your firm require that proposed projects earn a higher expected return (e.g., set a higher hurdle rate) because of a shortage of management time or expertise?	Number	Percent	95% CI
Yes	46	32.2 %	± 7.7 %
No	90	62.9 %	± 8.0 %
Don't Know	7	4.9 %	± 3.6 %
Total	143	100.0 %	

Missing Cases = 1
Response Percent = 99.3 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q6d. Does a shortage of non-management labor prevent your firm from pursuing some NPV>0 projects that you would otherwise pursue?

	Number	Percent	95% CI
Yes	88	23.9 %	± 4.4 %
No	256	69.6 %	± 4.7 %
Don't Know	24	6.5 %	± 2.5 %
Total	368	100.0 %	

Missing Cases = 3
Response Percent = 99.2 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q6b d. Shows how many pass up NPV>0 due to a managerial or non-managerial labor shortage (Excludes Don't Know's)

Q6b d	Number	Percent	95% CI
Yes, pass up NPV>0	186	55.0 %	± 5.1 %
No	152	45.0 %	± 5.0 %
Total	338	100.0 %	

Missing Cases = 33
Response Percent = 91.1 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Why doesn't your firm hire more labor to reduce the shortage?

	Number	Percent	95% CI
It is difficult to find potential hires that possess the specific skills we need	46	52.3 %	± 10.7 %
It is difficult to find potential hires that possess intangibles such as always being reliable and working a full day	25	28.4 %	± 9.6 %
It's difficult to quickly get new employees up to speed and fully productive	24	27.3 %	± 9.5 %
We don't know how long we'll need the expanded workforce, and it's costly to cut back later	24	27.3 %	± 9.5 %
Current workers don't want to expand their hours	16	18.2 %	± 8.2 %
Applicants don't pass background and related checks	13	14.8 %	± 7.6 %
Benefits are too expensive	13	14.8 %	± 7.6 %
Training new workers is too expensive or time-consuming	13	14.8 %	± 7.6 %
Potential employees are hesitant to leave their current jobs (and give up benefits/tenure in their current organization)	10	11.4 %	± 6.8 %
Potential employees don't want to relocate (move homes) to work here	8	9.1 %	± 6.1 %
Other	6	6.8 %	± 5.4 %
Potential employees are hesitant to work here because they are worried about job security	3	3.4 %	± 3.9 %
Potential employees don't know about our job opportunities	2	2.3 %	± 3.2 %
Total	203		

Number of Cases = 88
Number of Responses = 203
Average Number Of Responses Per Case = 2.3
Number Of Cases With At Least One Response = 86
Response Percent = 97.7 %

Ask of respondents who indicated a shortage of non-management labor prevent their firm from pursuing some NPV>0 projects that they would otherwise pursue?

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Why doesn't your firm hire more labor to reduce the shortage? - OTHER

IN	Why doesn't your firm hire more labor to reduce the shortage? - OTHER
Manufacturing	Lack of certainty of project payback.
Other	Financial constraints
Other	High Costs
Other	Same concern as described about concerning factiional FTEs.
Retail/Wholesale	Ca minimum wage
Transp, Public Util	There is a shortage of pilots and they don't stay in one place

Ask of respondents who indicated a shortage of non-management labor prevent their firm from pursuing some NPV>0 projects that they would otherwise pursue?

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Which skills are most scarce among potential hires?

IN	Which skills are most scarce among potential hires?
Bank/Fin/Insur/Real Est	Ability to withstand failure and endure through learning process
Bank/Fin/Insur/Real Est	Basic skill set and a willingness to learn and work
Bank/Fin/Insur/Real Est	insurance licensing
Communication/Media	Research and communcations
Energy	Commercial Driver's License
Healthcare/Pharm	healthcare skills
Manufacturing	basic - show up on time, absenteeism
Manufacturing	Coherent writing skills. Basic knowledge of physics and accounting.
Manufacturing	ELECTRICAL / MECHANICAL
Manufacturing	engineering
Manufacturing	machine and equipment operators
Manufacturing	Math & machining/(grinding) skills.
Mining/Construction	Constrcution Project Management/Supervision
Mining/Construction	Construction labor pool
Mining/Construction	good work ethic, and the technical skills in our trade
Mining/Construction	Problem solving and common sense
Mining/Construction	Qualified Electricians, including those with supervisory skills
Other	database management
Other	Janitorial
Other	operators of heavy equipment amd paving employees
Other	personal care skills
Other	truck / engine service technicians
Retail/Wholesale	Basic math, basic work ethics
Retail/Wholesale	commercial drivers license

Ask of respondents who indicated a shortage of non-management labor prevent their firm from pursuing some NPV>0 projects that they would otherwise pursue?

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Which skills are most scarce among potential hires?

IN	Which skills are most scarce among potential hires?
Retail/Wholesale	Customer service, selling
Retail/Wholesale	Irrigation experience
Retail/Wholesale	Sales skills and self motivation
Services, Consulting	Deep understanding of the industry we serve and the ability to comfortably communicate at the senior executive level.
Services, Consulting	engineering
Services, Consulting	Experience
Services, Consulting	Hvac tech, plumbing
Services, Consulting	Industry expertise
Tech [Soft/Hard/Bio]	Developers, coders, QA, Systems
Tech [Soft/Hard/Bio]	Electrical and software engineering.
Tech [Soft/Hard/Bio]	IT Tech and Engineering
Tech [Soft/Hard/Bio]	SW developer skills
Tech [Soft/Hard/Bio]	technology
Transp, Public Util	specific training and hours
Transp, Public Util	Type ratings for the planes we have

Ask of respondents who indicated a shortage of non-management labor prevent their firm from pursuing some NPV>0 projects that they would otherwise pursue?

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q6e. Does your firm require that proposed projects earn a higher expected return because of a shortage of non-management labor? ALL RESPONDENTS

Does your firm require that proposed projects earn a higher expected return (e.g., set a higher hurdle rate) because of a shortage of non-management labor?	Number	Percent	95% CI
Yes	34	9.2 %	± 3.0 %
No	310	83.8 %	± 3.8 %
Don't Know	26	7.0 %	± 2.6 %
Total	370	100.0 %	

Missing Cases = 1
Response Percent = 99.7 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q6e. Does your firm require that proposed projects earn a higher expected return because of a shortage of non-management labor? Shows responses of those who indicated a shortage of non-management labor prevent their firm from pursuing some NPV>0 projects that they would otherwise pursue?

Does your firm require that proposed projects earn a higher expected return (e.g., set a higher hurdle rate) because of a shortage of non-management labor?	Number	Percent	95% CI
Yes	20	22.7 %	± 8.9 %
No	60	68.2 %	± 9.9 %
Don't Know	8	9.1 %	± 6.1 %
Total	88	100.0 %	

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q7. Compared to 3 years ago, has the number of NPV>0 projects that your firm has 'back-logged' changed?

	Number	Percent	95% CI
We have more back-logged projects	73	20.2 %	± 4.1 %
The number of back-logged projects is about the same	163	45.0 %	± 5.1 %
We have fewer back-logged projects	67	18.5 %	± 3.9 %
Don't Know	59	16.3 %	± 3.7 %
Total	362	100.0 %	

Missing Cases = 9
Response Percent = 97.6 %

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Q8a. Does your company have difficulty attracting and retaining qualified technology employees?

	Number	Percent	95% CI
Yes, causing substantial adverse impacts to the organization	20	5.4 %	± 2.3 %
Yes, causing moderate adverse impacts to the organization	127	34.4 %	± 4.9 %
Yes, but causing little or no adverse impacts to the organization	90	24.4 %	± 4.4 %
No, we have no difficulties	132	35.8 %	± 4.9 %
Total	369	100.0 %	

Missing Cases = 2
Response Percent = 99.5 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q8b. Which areas/aspects of your organization are currently adversely impacted by a technology talent shortage? ALL RESPONDENTS

	Number	Percent	95% CI
Operations support	128	34.5 %	± 4.9 %
Innovation/product development support	112	30.2 %	± 4.7 %
IT core functions effectiveness	97	26.1 %	± 4.5 %
Analysis of big data	89	24.0 %	± 4.4 %
Sales and marketing support	72	19.4 %	± 4.0 %
Finance function effectiveness	71	19.1 %	± 4.0 %
Customer service levels	70	18.9 %	± 4.0 %
Strategic decision support	63	17.0 %	± 3.8 %
Competitive intelligence	62	16.7 %	± 3.8 %
Other	23	6.2 %	± 2.5 %
Total	787		

Number of Cases = 371
Number of Responses = 787
Average Number Of Responses Per Case = 2.1
Number Of Cases With At Least One Response = 308
Response Percent = 83.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Q8b. Which areas/aspects of your organization are currently adversely impacted by a technology talent shortage? Shows just responses if company has difficulty attracting and retaining qualified technology employees

	Number	Percent	95% CI
Operations support	112	46.9 %	± 6.4 %
Innovation/product development support	99	41.4 %	± 6.3 %
IT core functions effectiveness	84	35.1 %	± 6.1 %
Analysis of big data	72	30.1 %	± 5.9 %
Customer service levels	62	25.9 %	± 5.6 %
Finance function effectiveness	57	23.8 %	± 5.4 %
Sales and marketing support	54	22.6 %	± 5.3 %
Competitive intelligence	53	22.2 %	± 5.3 %
Strategic decision support	51	21.3 %	± 5.2 %
Other	7	2.9 %	± 2.2 %
Total	651		

Number of Cases = 239
Number of Responses = 651
Average Number Of Responses Per Case = 2.7
Number Of Cases With At Least One Response = 229
Response Percent = 95.8 %

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Which areas/aspects of your organization are currently adversely impacted by a technology talent shortage? - OTHERS

IN	Which areas/aspects of your organization are currently adversely impacted by a technology talent shortage? - OTHERS
Bank/Fin/Insur/Real Est	None
Bank/Fin/Insur/Real Est	none
Communication/Media	Data security & Privacy
Healthcare/Pharm	not needed currently
Manufacturing	N/A
Manufacturing	none
Manufacturing	none
Manufacturing	none
Manufacturing	Supply Chain support
Mining/Construction	data security
Mining/Construction	None
Other	None, plethora of IT talent available
Other	Operations
Other	We don't have technology talent
Retail/Wholesale	Warehousing and factory/production
Services, Consulting	Information Security
Services, Consulting	None
Services, Consulting	None
Services, Consulting	None
Services, Consulting	none
Services, Consulting	none
Services, Consulting	security
Transp, Public Util	N/A

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j. Weighted Average Cost of Capital

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
What is your company's overall weighted average cost of capital (WACC) for 2017?	9.20	4.42	8.68 - 9.72	9	3	33	276

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k. Workforce

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
What percentage of your workforce has a college degree?	50.10	33.14	46.64 - 53.56	50	0	100	353
What percentage of your workforce is unionized?	5.72	17.85	3.87 - 7.57	0	0	100	358
How many years has the average employee worked at your firm?	8.27	5.69	7.67 - 8.86	7	0.80	50	351

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On August 21, 2017 the annual yield on 10-yr treasury bonds was 2.18%. Please complete the following: (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	1.33	4.90	0.80 - 1.86	2	-11.50	14.10	330
Over the next 10 years, I expect the average annual S&P 500 return will be: Expected return:	6.50	3.06	6.18 - 6.83	6	0	17.60	343
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	10.29	5.15	9.74 - 10.84	10	2	28.21	332
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	-1.65	7.57	-2.47 - -0.83	0.15	-18	14.18	327
Over the next year, I expect the average annual S&P 500 return will be: Expected return:	5.47	3.68	5.08 - 5.86	5	-3.17	14.19	341
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	10.05	4.45	9.57 - 10.53	10	1.20	19.47	328

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Return on assets (ROA=operating earnings/assets) (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% Approximate ROA in 2016	9.55	11.82	8.18 - 10.92	7	-19.60	42.40	285
% Expected ROA in 2017	10.14	11.53	8.80 - 11.48	7.55	-19.40	43.60	285

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Manufacturing capacity utilized (Winsorized)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% of capacity utilized in first half of 2017	70.74	13.33	67.70 - 73.78	75	42.21	96.54	74
% of capacity utilization planned for the second half of 2017	73.89	15.28	70.40 - 77.37	75	41.92	100	74

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Industry

	Number	Percent	95% CI
Manufacturing	78	21.1 %	± 4.2 %
Services, Consulting	55	14.9 %	± 3.6 %
Banking/Finance/Insurance/Real Estate	41	11.1 %	± 3.2 %
Retail/Wholesale	37	10.0 %	± 3.1 %
Technology [Software/Hardware/Biotech]	30	8.1 %	± 2.8 %
Healthcare/Pharmaceutical	30	8.1 %	± 2.8 %
Transportation & Public Utilities	15	4.1 %	± 2.0 %
Mining/Construction	15	4.1 %	± 2.0 %
Energy	8	2.2 %	± 1.5 %
Public Administration	6	1.6 %	± 1.3 %
Communication/Media	6	1.6 %	± 1.3 %
Agriculture, Forestry, & Fishing	5	1.4 %	± 1.2 %
Other Industry	43	11.7 %	± 3.3 %
Total	369	100.0 %	

Missing Cases = 2
Response Percent = 99.5 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Industry (Other specified)

Accounting
Advertising Agency
Aerospace
Aerospace/Defense
Bulk liquid storage
Chemicals
Construction
Construction
Construction
Consumer goods
Design Build Commercial Construction
Diversified
Education
education
Entertainment
Higher Education
holding company across various fields
Hospitality
hospitality
Hotel & hotel management
Human Services
Janitorial
LOGISTICS
Media/Entertainment
NFP Higher Education
Non Profit
non-profit trade association
Nonprofit
Nonprofit - charity
nonprofit
nonprofit education
Not For Profit
Not for Profit - Religious
Not for profit
Not-for-Profit
online marketplace
private preschool and afterschool care
Professional Sales
Public Education
Telecommunications
Trade association for manufacturers
Truck Dealership

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Sales Revenue

	Number	Percent	95% CI
Less than $25 million	147	40.2 %	± 5.0 %
$25-99 million	100	27.3 %	± 4.5 %
$100-499 million	55	15.0 %	± 3.6 %
$500-999 million	15	4.1 %	± 2.0 %
$1-4.9 billion	26	7.1 %	± 2.6 %
$5-9.9 billion	8	2.2 %	± 1.5 %
More than $10 billion	15	4.1 %	± 2.0 %
Total	366	100.0 %	

Missing Cases = 5
Response Percent = 98.7 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Statistics - Sales Revenue (Millions)

Minimum = 25

Maximum = 11000

Mean = 930.67

Median = 62

Variance (Unbiased Estimate) = 6016039.76

Standard Deviation (Unbiased Estimate) = 2452.76

Standard Error Of The Mean = 128.21

95 Percent Confidence Interval Around The Mean = 679.38 - 1181.96

99 Percent Confidence Interval Around The Mean = 600.53 - 1260.80

Skewness = 3.28

Kolmogorov-Smirnov Statistic For Normality = 8.18

Quartiles

1 = 25
2 = 62
3 = 300

Valid Cases = 366
Missing Cases = 5
Response Percent = 98.7%

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Number of Employees

	Number	Percent	95% CI
Fewer than 100	118	38.8 %	± 4.8 %
100-499	88	28.9 %	± 4.4 %
500-999	24	7.9 %	± 2.5 %
1,000-2,499	29	9.5 %	± 2.7 %
2,500-4,999	11	3.6 %	± 1.7 %
5,000-9,999	13	4.3 %	± 1.9 %
Over 10,000	21	6.9 %	± 2.4 %
Total	304	100.0 %	

Missing Cases = 67
Response Percent = 81.9 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Statistics - Number of Employees

Minimum = 100

Maximum = 12000

Mean = 1637.17

Median = 300

Variance (Unbiased Estimate) = 10582607.15

Standard Deviation (Unbiased Estimate) = 3253.09

Standard Error Of The Mean = 186.58

95 Percent Confidence Interval Around The Mean = 1271.48 - 2002.86

99 Percent Confidence Interval Around The Mean = 1156.73 - 2117.61

Skewness = 2.44

Kolmogorov-Smirnov Statistic For Normality = 6.36

Quartiles

1 = 100
2 = 300
3 = 750

Valid Cases = 304
Missing Cases = 67
Response Percent = 81.9%

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Where are you personally located?

	Number	Percent	95% CI
Midwest U.S.	107	29.3 %	± 4.6 %
South Central U.S.	68	18.6 %	± 4.0 %
Northeast U.S.	65	17.8 %	± 3.9 %
South Atlantic U.S.	51	14.0 %	± 3.5 %
Pacific US	47	12.9 %	± 3.4 %
Mountain U.S.	26	7.1 %	± 2.6 %
Other	1	0.3 %	± 0.5 %
Total	365	100.0 %	

Missing Cases = 6
Response Percent = 98.4 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Where are you personally located? - Other specified

Southwest UIS

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Ownership

	Number	Percent	95% CI
Private	242	72.7 %	± 4.9 %
Public, NYSE	40	12.0 %	± 3.2 %
Nonprofit	30	9.0 %	± 2.8 %
Public, Nasdaq/AMEX	14	4.2 %	± 2.0 %
Govern-ment	7	2.1 %	± 1.4 %
Total	333	100.0 %	

Missing Cases = 38
Response Percent = 89.8 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

Foreign Sales

	Number	Percent	95% CI
0%	172	47.4 %	± 5.1 %
1-24%	135	37.2 %	± 4.9 %
25-50%	43	11.8 %	± 3.3 %
More than 50%	13	3.6 %	± 1.9 %
Total	363	100.0 %	

Missing Cases = 8
Response Percent = 97.8 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

In what region of the world are most of your foreign sales?

	Number	Percent	95% CI
Europe	65	37.8 %	± 6.8 %
Canada	51	29.7 %	± 6.3 %
Asia/Pacific Basin	33	19.2 %	± 5.4 %
Latin America	20	11.6 %	± 4.4 %
Africa	3	1.7 %	± 1.8 %
Total	172	100.0 %	

Missing Cases = 19
Response Percent = 90.1 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

What is your company's credit rating?

	Number	Percent	Cumulative
AAA	42	16.0 %	16.0 %
AA+	27	10.3 %	26.3 %
AA	33	12.6 %	38.9 %
AA-	11	4.2 %	43.1 %
A+	22	8.4 %	51.5 %
A	21	8.0 %	59.5 %
A-	20	7.6 %	67.2 %
BBB+	17	6.5 %	73.7 %
BBB	15	5.7 %	79.4 %
BBB-	4	1.5 %	80.9 %
BB+	7	2.7 %	83.6 %
BB	12	4.6 %	88.2 %
BB-	6	2.3 %	90.5 %
B+	7	2.7 %	93.1 %
B	6	2.3 %	95.4 %
B-	4	1.5 %	96.9 %
CCC	3	1.1 %	98.1 %
CC	0	0.0 %	98.1 %
D	5	1.9 %	100.0 %
Total	262	100.0 %	100.0 %

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

What is your company's credit rating?

N=262	Total	Credit Rating	
		Actual A	Estimate B
Total	262	90	172
	100.0%	34.4%	65.6%
AAA	42	20	22
	16.0%	22.2%	12.8%
		b	a
AA+	27	11	16
	10.3%	12.2%	9.3%
AA	33	10	23
	12.6%	11.1%	13.4%
AA-	11	3	8
	4.2%	3.3%	4.7%
A+	22	6	16
	8.4%	6.7%	9.3%
A	21	6	15
	8.0%	6.7%	8.7%
A-	20	6	14
	7.6%	6.7%	8.1%
BBB+	17	5	12
	6.5%	5.6%	7.0%
BBB	15	5	10
	5.7%	5.6%	5.8%
BBB-	4	3	1
	1.5%	3.3%	0.6%
BB+	7	2	5
	2.7%	2.2%	2.9%
BB	12	7	5
	4.6%	7.8%	2.9%
BB-	6	1	5
	2.3%	1.1%	2.9%
B+	7	3	4
	2.7%	3.3%	2.3%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

Duke CFO magazine Global Business Outlook survey - U.S. - Third Quarter, 2017

What is your company's credit rating?

N=262	Total	Credit Rating	
		Actual A	Estimate B
B	6	0	6
	2.3%	0.0%	3.5%
B-	4	1	3
	1.5%	1.1%	1.7%
CCC	3	1	2
	1.1%	1.1%	1.2%
CC	0	0	0
	0.0%	0.0%	0.0%
D	5	0	5
	1.9%	0.0%	2.9%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

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	Number	Percent
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VP of Finance	35	9.6 %
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Total	364	100.0 %

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The Level and Persistence of Growth Rates

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ABSTRACT

Expectations about long-term earnings growth are crucial to valuation models and cost of capital estimates. We analyze historical long-term growth rates across a broad cross section of stocks using several indicators of operating performance. We test for persistence and predictability in growth. While some firms have grown at high rates historically, they are relatively rare instances. There is no persistence in long-term earnings growth beyond chance, and there is low predictability even with a wide variety of predictor variables. Specifically, IBES growth forecasts are overly optimistic and add little predictive power. Valuation ratios also have limited ability to predict future growth.

THE EXPECTED RATE of growth in future cash flows (usually proxied by accounting earnings) plays a pivotal role in financial management and investment analysis. In the context of aggregate market valuation, for example, projections about future growth are instrumental in predicting the equity risk premium. Much current controversy surrounds the appropriate level of the equity risk premium, as well as whether recent market valuation levels (at least as of year-end 1999) can be justified (Asness (2000), Welch (2000), Fama and French (2002)). Debate also revolves around how much of the performance of equity asset classes, such as large glamour stocks, can be attributed to changes in profitability growth (Fama and French (1995), Chan, Karceski, and Lakonishok (2000)). When applied to the valuation of individual stocks, projected growth rates have implications for the cross-sectional distribution of cost of capital estimates (Fama and French (1997), Claus and Thomas (2001), Gebhardt, Lee, and Swaminathan (2001)), as well as widely followed valuation ratios like price-to-earnings and price-to-book ratios.

Common measures of expected growth in future earnings, such as valuation ratios and analysts' growth forecasts, vary greatly across stocks. In the case of price-to-earnings multiples for the IBES universe of U.S. firms, for example, at

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year-end 1999, the distribution of the stock price relative to the consensus forecast of the following year's earnings has a 90th percentile of 53.9, while the 10th percentile is 7.4, yielding a difference of 46.5. Firms with a record of sustained, strong past growth in earnings are heavily represented among those trading at high multiples. Security analysts issue positive recommendations for these stocks and forecast buoyant future prospects. Other stocks with a history of disappointing past growth are shunned by the investment community. They are priced at low multiples and analysts are unexcited about their outlook. Putting aside the possibility of mispricing, one reason for the disparity in multiples is differences in risk. At the level of individual stocks, however, the relation between risk and expected return is weak (Fama and French (1992)). It is thus unlikely that the large dispersion is driven primarily by risk (the evidence in Beaver and Morse (1978) also supports this view). Rather, if the pricing is rational, most of the cross-sectional variation reflects differences in expected growth rates. A more direct measure of the market's expectations, security analysts' forecasts of long-term growth in earnings, also displays large differences across stocks. For example, the 90th percentile of the distribution of IBES five-year forecasts is 40 percent as of year-end 1999, compared to the 10th percentile of 8.9 percent. If analysts and investors do not believe that future earnings growth is forecastable, they would predict the same growth rate (the unconditional mean of the distribution) for all companies, and it is unlikely that the dispersion in forecasts or price–earnings ratios would be as large as it actually is.

Based on market valuations and analysts' forecasts, then, there is a widespread belief among market participants that future earnings growth is highly predictable. However, economic intuition suggests that there should not be much consistency in a firm's profitability growth. Following superior growth in profits, competitive pressures should ultimately tend to dilute future growth. Exit from an unprofitable line of business should tend to raise the remaining firms' future growth rates. Some support for this logic comes from Fama and French (2002). Their evidence for the aggregate market suggests that while there is some short-term forecastability, earnings growth is in general unpredictable.

In short, there may be a sharp discrepancy between share valuations along with analysts' predictions on the one hand, and realized operating performance growth on the other. The discrepancy may reflect investors' judgmental biases or agency distortions in analysts' behavior. In any event, the divergence is potentially large, judging from current market conditions. For instance, take a firm with a ratio of price to forecasted earnings of 100. Such cases are by no means minor irregularities: based on values at year-end 1999, they represent about 11.9 percent of total market capitalization. To infer the growth expectations implicit in such a price earnings ratio, we adopt a number of conservative assumptions. In particular, suppose the multiple reverts to a more representative value of 20 in 10 years, during which time investors are content to accept a rate of return on the stock of zero (assume there are no dividends). A multiple of 20 is conservative, since Siegel (1999) argues that a ratio of 14 may not be an unreasonable long-term value. Further, an adjustment period of 10 years is not short, in light of the fact that many of the largest firms at year-end 1999 did not exist 10 years ago. These

assumptions imply that earnings must grow by a factor of five, or at a rate of about 17.5 percent per year, for the next 10 years. Alternatively, suppose investors put up with a paltry 10 percent rate of return (Welch (2000), reports that financial economists' consensus expected return is considerably higher). Then earnings must grow at an even more stellar rate (29.2 percent per year) over 10 years to justify the current multiple.

The above example highlights the two questions we tackle in this paper. How plausible are investors' and analysts' expectations that many stocks will be able to sustain high growth rates over prolonged periods? Are firms that can consistently achieve such high growth rates identifiable ex ante? We begin by documenting the distribution of growth rates realized over horizons of 1, 5, and 10 years. This evidence lets us evaluate the likelihood of living up to the expectations of growth that are implicit in market valuation ratios. To justify rich valuations, investors must believe that high growth persists over many years. Accordingly, we also examine whether there is persistence in operating performance growth. Individual firms' earnings and incomes can be very erratic, so a robust empirical design is a crucial consideration. We employ nonparametric tests on multiple indicators of operating performance across a large cross section of stocks over relatively long horizons. In addition, we focus our tests for persistence by examining subsets of firms where future growth is more likely to be predictable (e.g., stocks in the technology sector and stocks which have displayed persistence in past growth). To give the benefit of the doubt to the possibility of persistence, we relax the definition of consistency in growth and redo our tests. Finally, we expand the list of variables to forecast growth beyond past growth rates. We examine whether valuation measures, such as earnings yields and ratios of book-to-market equity and sales-to-price, are associated with growth on an ex ante as well as ex post basis. Security analysts' earnings forecasts are also widely used as measures of the market's expectations of growth in future earnings. As a check on the quality of analysts' predictions, we evaluate how well realized growth rates align with IBES consensus forecasts.

Our main findings are as follows. Our median estimate of the growth rate of operating performance corresponds closely to the growth rate of gross domestic product over the sample period. Although there are instances where firms achieve spectacular growth, they are fairly rare. For instance, only about 10 percent of firms grow at a rate in excess of 18 percent per year over 10 years. Sales growth shows some persistence, but there is essentially no persistence or predictability in growth of earnings across all firms. Even in cases that are popularly associated with phenomenal growth (pharmaceutical and technology stocks, growth stocks, and firms that have experienced persistently high past growth), signs of persistent growth in earnings are slim. Security analysts' long-term growth estimates tend to be overoptimistic and contribute very little to predicting realized growth over longer horizons. Market valuation ratios have little ability to discriminate between firms with high or low future earnings growth. An expanded set of forecasting variables also has scant success in predicting future earnings growth. All in all, our evidence on the limited predictability of earnings growth suggests that investors should be wary of stocks that trade at very high

multiples. Very few firms are able to live up to the high hopes for consistent growth that are built into such rich valuations.

Related prior research in the financial literature on the behavior of earnings growth is meager. Little (1962) and Little and Rayner (1966) examine the growth in earnings of a limited sample of U.K. firms in the 1950s. Early evidence for U.S. firms is provided by Lintner and Glauber (1967) and Brealey (1983). Beaver (1970) and Ball and Watts (1972) start a long line of papers that apply time-series models to earnings. However, few firms have sufficiently long earnings histories to allow precise estimation of model parameters, and the emphasis in this line of work has been on short-term forecasting. More recently, Fama and French (2002) examine the time-series predictability of aggregate earnings for the market. Our work is closest in spirit to that of Fama and French (2000), who look at the cross-sectional predictability of firms' earnings, but even they focus on one-year horizons.

A much larger number of studies by academics and practitioners rely on estimates of expected long-term earnings growth for stock valuation, or for estimating firms' cost of capital. A selective list includes Bakshi and Chen (1998), Lee, Myers, and Swaminathan (1999), Claus and Thomas (2001), and Gebhardt et al. (2001). In particular, many studies use long-term consensus IBES forecasts for expected growth rates (see, e.g., Mezrich et al. (2001)). Given the widespread use of IBES long-term estimates, it is important to evaluate their correspondence with realized growth rates.

The rest of the paper is organized as follows. Section I discusses our sample and some basics of the methodology. The cross-sectional distribution of firms' growth rates is reported in Section II. Section III presents the results of runs tests for consistency in growth of operating performance. Section IV takes up the issue of survivorship bias. Although our main focus is not on the determinants of valuation multiples, Section V examines the relation between growth and valuation ratios such as earnings yields and book-to-market ratios, on both an ex ante and ex post basis. We compare IBES long-term forecasts with realized growth rates in Section VI. Section VII uses cross-sectional regressions to forecast future growth using variables including past growth, valuation ratios, and IBES estimates. A final section concludes.

I. Sample and Methodology

Our sample of firms comprises all domestic common stocks with data on the Compustat Active and Research files. Firms are selected at the end of each calendar year from 1951 to 1997. The earlier years are included for the sake of completeness, even though there is a backfill bias in the earlier part of the sample period (see Chan, Jegadeesh, and Lakonishok (1995)), which may impart an upward bias to growth rates in the beginning of the sample. The number of eligible firms grows from 359 in the first sample selection year to about 6,825 in the last year; on average, the sample comprises about 2,900 firms.

We consider three indicators of operating performance: net sales (Compustat annual item number 12), operating income before depreciation (item 13), and

income before extraordinary items available for common equity (item 237). While researchers and practitioners tend to focus exclusively on income before extraordinary items, measuring growth in this variable is beset with pitfalls. In many cases, earnings before extraordinary items is negative, so prospective growth rates are undefined (for our sample, in an average year, 29 percent of firms have negative values for earnings before extraordinary items). In other cases, firms grow from low positive values of base-year net income, introducing large outliers.[1] These include such disparate cases as beaten-down companies with depressed earnings and growing startup companies that are beginning to generate profits. To avoid hanging all our inferences on such a noisy variable, therefore, we also consider growth in net sales and growth in operating income before depreciation. These are relatively better-behaved measures of operating performance.

Researchers have adopted different conventions for calculating growth rates. Given our focus on the predictability of growth rates, we measure growth on a per share basis so as to strip out any predictability due to changes in the scale of the firm's operations. This also corresponds to the measurement convention in the investment industry.[2]

Thus, we take the perspective of an investor who buys and holds one share of a stock over some horizon and track the growth in sales or income that accrues to one share, after adjusting for stock splits and dividends. Moreover, two firms can offer the same expected return, but have different earnings growth rates because of their dividend payout policies. From an investor's standpoint, these two stocks would be considered equivalent. To put firms with different dividend policies on an equal footing, therefore, all cash dividends as well as any special distributions (such as when a firm spins off assets) are reinvested in the stock.

II. The Distribution of Growth Rates of Operating Performance

This section documents the distribution of historical growth rates over relatively long horizons (5 and 10 years). For the sake of completeness, results are also provided for 1-year horizons. At each calendar year-end over the sample period, we measure rates of growth in future operating performance for all eligible

[1] Some of these complications may be alleviated by averaging earnings over a number of years and measuring growth in these averages. Since our focus is on point-in-time growth rates, we do not explore this alternative procedure. In unreported work, we also experiment with other ways to calculate growth rates. These include value-weighted growth rates for portfolios, estimated growth rates from least-squares fits of linear and quadratic time trends through sales and income, and growth rates without dividend reinvestment. Generally speaking, the results are robust to how we measure growth rates.

[2] Lakonishok, Shleifer, and Vishny (1994) calculate growth in a firm's overall sales and earnings, while Daniel and Titman (2001) calculate growth on a per share basis. These studies focus on the impact of investor sentiment on stock returns. The hypothesis is that investors tend to favor companies with strong past performance, those in a glamorous line of business, or those which are perceived to be well managed. From this standpoint, it might be argued that it is the performance of the overall company that is relevant, and not just the profits earned per share.

stocks. Percentiles are calculated for the distribution obtained at each year-end. Table I reports the percentiles averaged across years in the sample period, as well as the most recent distribution corresponding to the last selection year of the sample period.

Several points are important as background to the results in Table I. First, since we include reinvestment of dividends and special distributions, the growth rates we report are typically higher than conventionally measured growth rates. The median dividend yield for our sample (averaged across all years) is about 2.5 percent. A second caveat is that the tabulated growth rates are based only on firms who survive for the following 1, 5, or 10 years. The survivorship bias may induce an upward bias in our reported growth rates. Moreover, we follow the conventional approach and do not calculate growth rates for operating income before depreciation or income before extraordinary items when the base-year value is negative.[3] To illustrate the potential magnitude of these complications, on average there are about 2,900 firms available for inclusion in the sample at each year-end. Of these, 2,782 firms survive at the end of the next year and have a reported value for income before extraordinary items. The calculations for 1-year growth in earnings before extraordinary items are based on 1994 of these firms; the remaining 788 firms have negative values for income in the base year. At the 5-year horizon, there are on average 1884 surviving firms. Growth rates are calculated for 1,398 of these; 486 have negative base-year values. At the 10-year horizon, there are 1,265 surviving firms: 1,002 and 263 with positive and negative base-year values, respectively. In a subsequent section, we examine the performance of nonsurviving firms.

Since negative base-year values are quite common for income before extraordinary items, valid growth rates are unavailable in many cases. These observations are symptomatic of another problem. In particular, the high frequency of cases with negative base values suggests that the neighboring portion of the distribution (with low, positive base-year values) contains a large fraction of the observations as well. These instances give rise to some very high growth rates. For growth over five years, for example, the 98th percentile value for growth in income before extraordinary items averages 62.4 percent per year. Hence, while growth in income before extraordinary items captures much of the investment community's interest, its behavior is the most questionable. While the same problem applies to operating income before depreciation, the frequency of negative base-year values is comparatively lower and growth in this variable is less problematic.[4] For growth in this variable, the 98th percentile is 51.2 percent on average. In comparison, sales growth is relatively well behaved, with a 98th percentile value of 40.5 percent on average. These comparisons suggest that looking at

[3] Note, however, that even if we are unable to calculate growth in income before extraordinary items in such a case, we still get a reading on a firm's operating performance growth from sales (or operating income before depreciation if it is positive).

[4] For example, of the firms surviving after one year and with a reported value for income before depreciation, about 14 percent on average have negative base-year values. The corresponding percentage for income before extraordinary items is 29 percent.

other indicators beyond income before extraordinary items helps to give a more robust picture of growth in operating performance.

The results in Table I serve as cautionary flags to analysts and investors who pursue stocks with rich price–earnings multiples. Take our original example of a stock with a current price–earnings multiple of 100, which declines to 20 in 10 years' time with an expected return of 10 percent per year. Earnings must grow at 29.2 percent per year over 10 years to justify the current multiple. This is a tall order by historical standards. In particular, the required growth rate corresponds to about the 95th percentile of the distribution of 10-year growth rates, even putting aside the inclusion of dividends. Put differently, suppose earnings grow at a historically more representative, but still healthy, annual rate of 14.7 percent (the 75th percentile of the distribution from Part I). Then the current ratio of 100 would be justified if the time it takes for the multiple to fall to 20 is stretched out to 38 years.

Small firms start from a smaller scale of operations and so have more room for potential growth, possibly justifying a high current multiple. However, high multiples also apply to many large, well-known firms. To see whether large firms in general can also achieve high growth, Table II reports the distribution of growth rates for large firms (companies ranked in the top two deciles of year-end equity market capitalization, based on NYSE breakpoints). Bigger firms have a larger scale of operations and, hence, are more likely to face limits on their growth, so extremely high growth rates are less prevalent in Table II compared to Table I. For example, the 90th percentiles of growth rates over 10 years for income before extraordinary items, operating income before depreciation, and sales are all close to 16 percent per year. Also, note that dividend yields are generally higher for large firms.

Our estimated median growth rate is reasonable when compared to the overall economy's growth rate. On average over the sample period, the median growth rate over 10 years for income before extraordinary items is about 10 percent for all firms. The behavior over the last 10-year period in the sample roughly matches the overall average. Growth in the other two indicators also exhibit comparable medians. After deducting the dividend yield (the median yield is 2.5 percent), as well as inflation (which averages 4 percent per year over the sample period), the growth in real income before extraordinary items is roughly 3.5 percent per year. This is consistent with the historical growth rate in real gross domestic product, which has averaged about 3.4 percent per year over the period 1950 to 1998. It is difficult to see how the profitability of the business sector over the long term can grow much faster than overall gross domestic product.

Looking forward, if we project future growth using the median of the distribution of historical growth rates, the implication is that the expected future return on stocks is not very high. For example, in a simple dividend discount model with constant growth rates and constant payout ratio, the expected return is equal to the dividend yield plus the expected future growth rate of earnings. Given the low level of current dividend yields (below 1.5 percent) and expected inflation of 2.5 percent, the expected return is only about 7.5 pecent. This is lower than the

Table I

Distribution of Growth Rates of Operating Performance over 1, 5 and 10 Years: All Firms

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one, five, and ten years for all firms in the sample. The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of the sample selection date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. Percentiles of the distribution are calculated each year-end; the simple average over the entire sample period of the percentiles is reported, along with the distribution of growth rates over horizons ending in the last year of the sample period.

	Percentile								
Sample period	2%	10%	25%	40%	50%	60%	75%	90%	98%
Part I: Annualized Growth Rate over 10 Years									
				(A) Sales					
Average	−9.6	0.1	5.5	8.7	10.2	11.5	13.8	18.0	27.6
Ending 1998	−16.1	−3.4	2.9	6.2	7.9	9.5	12.7	19.2	32.9
				(B) Operating Income before Depreciation					
Average	−13.3	−2.3	4.1	7.6	9.5	11.2	14.1	19.4	31.3
Ending 1998	−14.6	−3.3	3.3	7.2	9.0	10.9	14.1	21.5	38.6
				(C) Income before Extraordinary Items					
Average	−15.6	−3.1	3.9	7.7	9.7	11.6	14.7	20.4	33.4
Ending 1998	−21.2	−6.3	2.3	6.9	9.0	11.4	15.3	24.4	48.8
Part II: Annualized Growth Rate over 5 Years									
				(A) Sales					
Average	−18.7	−4.1	4.3	8.2	10.2	12.0	15.3	22.1	40.5
Ending 1998	−22.7	−6.2	2.9	8.0	10.2	12.4	17.1	27.6	56.3
				(B) Operating Income before Depreciation					
Average	−26.8	−8.4	1.9	7.2	9.8	12.4	17.1	26.7	51.2
Ending 1998	−24.4	−7.8	3.5	8.7	11.5	14.4	19.9	33.4	64.4
				(C) Income before Extraordinary Items					
Average	−30.9	−10.3	1.5	7.4	10.5	13.4	18.8	30.4	62.4
Ending 1998	−35.1	−11.5	2.8	9.1	12.4	15.7	23.1	40.1	88.2

Part III: 1-Year Growth Rate

				(A) Sales					
Average	−47.3	−12.9	1.2	7.6	10.9	14.2	21.0	38.7	121.7
Ending 1998	−58.3	−20.8	−1.4	6.3	10.3	14.5	24.9	54.1	181.9
				(B) Operating Income before Depreciation					
Average	−69.4	−30.7	−5.6	5.9	11.8	17.7	30.6	67.4	253.3
Ending 1998	−74.1	−34.7	−4.9	6.7	12.2	18.5	32.2	76.5	273.2
				(C) Income before Extraordinary Items					
Average	−76.8	−37.9	−7.4	6.9	13.3	19.9	35.8	90.2	435.3
Ending 1998	−87.3	−48.2	−13.7	5.4	13.7	21.3	40.4	115.0	727.2

Table II

Distribution of Growth Rates of Operating Performance over 1, 5 and 10 Years: Large Firms

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one, five, and ten years for large firms (in the top two deciles of year-end equity market capitalization, based on NYSE breakpoints). The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. Percentiles of the distribution are calculated each year-end; the simple average over the entire sample period of the percentiles is reported, along with the distribution of growth rates over horizons ending in the last year of the sample period.

	Percentile								
Sample period	2%	10%	25%	40%	50%	60%	75%	90%	98%
Part I: Annualized Growth Rate over 10 Years									
(A) Sales									
Average	−3.4	2.5	6.8	9.4	10.7	11.7	13.3	16.3	22.0
Ending 1998	−7.7	−0.2	4.4	6.7	8.5	9.5	11.1	15.0	21.5
(B) Operating Income before Depreciation									
Average	−8.3	0.6	5.4	8.1	9.5	10.8	12.9	16.1	22.6
Ending 1998	−11.6	−1.7	4.3	7.4	8.7	10.4	11.8	16.3	21.4
(C) Income before Extraordinary Items									
Average	−12.8	−0.9	4.5	7.5	9.3	10.8	13.1	16.6	23.8
Ending 1998	−25.6	−3.8	1.7	6.1	8.2	9.9	13.3	18.5	36.4
Part II: Annualized Growth Rate over 5 Years									
(A) Sales									
Average	−9.7	−0.6	6.9	9.4	10.8	11.9	14.1	18.1	27.9
Ending 1998	−13.6	−3.0	4.0	8.8	10.2	11.5	13.7	19.6	32.5
(B) Operating Income before Depreciation									
Average	−16.9	−3.5	4.3	7.9	9.8	11.5	14.3	19.3	32.1
Ending 1998	−13.6	−6.6	4.5	7.5	10.8	12.7	15.6	19.9	32.0
(C) Income before Extraordinary Items									
Average	−26.4	−6.4	2.8	7.6	9.8	12.0	15.3	21.3	37.2
Ending 1998	−39.5	−10.1	4.3	9.5	11.8	14.4	19.6	30.4	57.4
Part III: 1-Year Growth Rate									
(A) Sales									
Average	−36.4	−2.4	5.7	9.3	11.3	13.3	17.0	25.2	47.7
Ending 1998	−49.8	−14.7	1.5	6.6	8.9	11.8	18.1	29.1	53.0
(B) Operating Income before Depreciation									
Average	−52.3	−15.2	0.2	7.1	10.6	13.8	19.8	33.7	82.3
Ending 1998	−60.0	−30.3	−1.9	6.6	11.1	14.0	20.8	33.4	73.1
(C) Income before Extraordinary Items									
Average	−67.5	−25.3	−2.8	6.9	11.0	14.9	23.1	45.9	216.6
Ending 1998	−80.0	−46.9	−13.5	4.7	11.5	15.5	27.1	56.7	213.6

consensus forecast of professional economists (see Welch (2000)), but is in line with Fama and French (2002).

III. Persistence in Growth

Differences in valuations indicate a pervasive belief that stocks with high or low future growth are easily identifiable ex ante. For example, analysts and investors seem to believe that a firm that has grown rapidly in the past for several years in a row is highly likely to repeat this performance in the future. Conversely, stocks that have done poorly over prolonged periods are shunned and trade at low multiples. This section checks whether there is consistency in growth. We examine whether past growth or other characteristics, such as industry affiliation or firm size, help to predict future growth.

A. Consistency across All Firms

Tables I and II suggest that year-to-year growth in income can take on quite extreme values. As a result, multiyear growth rate levels may look impressive because of one or two isolated years of sharp growth, although growth in other years may be unremarkable. However, many of the firms with lofty multiples grow rapidly every year for several years. Accordingly, we test for consistency in growth using a design that does not rely heavily on the level of growth rates.[5] In our first set of tests, we define consistency as achieving a growth rate above the median for a consecutive number of years: Such cases are labeled as runs.[6]

At each year-end over the sample period, we calculate how many firms achieve runs over horizons of 1 to 10 years in the future. A run over 5 years, for example, denotes a case where in each of the subsequent 5 years, a firm's growth rate exceeds the median growth rate that year. Each year's median is calculated over all growth rate observations available in that year. Again, note that survivorship bias affects our runs tests. To see how many firms achieve runs above the median for 5 years in a row, we necessarily look at firms that survive over the full 5 years. In each of these years, we compare the survivors to a median which is based on all available firms that year, including those that do not survive for the full 5 years,

[5] Brealey (1983) uses a similar procedure.

[6] We want to avoid discarding an entire sequence of observations because one year's growth rate cannot be calculated when earnings are negative. Instead, we handle such cases as follows, taking growth in operating income per share OI_t as an example. In addition to calculating the percentage growth rate of operating income as $(OI_{t+1} - OI_t)/OI_t$ for each firm, we also scale the change in operating income by the stock price as of the base year t, $(OI_{t+1} - OI_t)/P_t$. All firms in a given year are ranked by their values of change in income relative to stock price. For any firm with negative income in a base year, we find its percentile rank based on income change relative to price. We then look up the corresponding percentile value from the distribution of growth rates of income (based on firms with positive base-year values) for that year. This growth rate is then assigned to the firm with negative base-year income. At the same time, however, it would be dangerous to pin our estimates of growth over a 5- or 10-year horizon in Tables I and II on some imputed value of base-year earnings. Accordingly, we do not impute growth rates in those tables for cases with negative base-year values.

Table III

Persistence in Growth Rates of Operating Performance: All Firms

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one to ten years (or until delisting) for all firms in the sample. The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales (panel A), operating income before depreciation (panel B), or income before extraordinary items available to common equity (panel C). Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. For each of the following ten years, the number of firms with valid growth rates, the number of firms whose growth rate exceeds the median growth rate each year for the indicated number of years, the percentage these firms represent relative to the number of valid firms, and the percentage expected under the hypothesis of independence across years, are reported. Statistics are provided for the entire sample period, and for the ten-year horizon corresponding to the last sample formation year.

	Firms with Above-Median Growth each year for Number of Years									
Variable	1	2	3	4	5	6	7	8	9	10
					(A) Sales					
Average Number of Valid Firms	2771	2500	2263	2058	1878	1722	1590	1471	1364	1265
Average Number above Median	1386	721	382	209	118	70	42	26	17	11
Percent above Median	50.0	28.8	16.9	10.2	6.3	4.0	2.7	1.8	1.3	0.9
1989–1998	50.0	30.0	18.6	11.9	7.8	5.6	3.4	2.4	1.5	1.2
					(B) Operating Income before Depreciation					
Average Number of Valid Firms	2730	2456	2219	2014	1833	1678	1546	1428	1322	1223
Average Number above Median	1365	628	290	136	67	34	18	10	6	4
Percent above Median	50.0	25.6	13.0	6.8	3.6	2.0	1.2	0.7	0.5	0.3
1989–1998	50.0	25.0	13.1	7.0	4.0	2.1	1.3	0.8	0.5	0.5
					(C) Income before Extraordinary Items					
Average Number of Valid Firms	2782	2509	2271	2065	1884	1727	1593	1473	1365	1265
Average Number above Median	1391	625	277	125	57	28	14	7	4	2
Percent above Median	50.0	24.9	12.2	6.0	3.0	1.6	0.9	0.5	0.3	0.2
1989–1998	50.0	24.8	12.2	5.7	2.6	1.3	0.8	0.5	0.2	0.0
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	1.6	0.8	0.4	0.2	0.1

and newly listed firms. Since the survivors are likely to have better performance than the population, they tend to have a greater chance of being above the median. Section IV examines differences between the growth rates of surviving and nonsurviving firms.

Table III reports the counts of runs, averaged across the year-ends. For growth in sales (Panel A), for example, out of an average number of 2,900 firms available for sample selection at each year-end, 2,771 firms on average survive until the end

of the following year. Over the following 10 years, there are on average 1,265 surviving firms. Of these, 11 have sales growth rates that exceed the median in each of the 10 years, representing 0.9 percent of the eligible firms. If sales growth is independent over time, we should expect to see 0.5^{10} (about 0.1 percent) of the surviving firms achieve runs above the median over 10 years (see the last row of the table). To give a flavor of what happens in the more recent years, we also report the percentage of firms with runs over the 10-year period ending in the last year of our sample period.

There is a great deal of persistence in sales growth. Over a five-year horizon, for example, on average 118 firms, or 6.3 percent of the 1878 firms who exist over the full five years, turn in runs above the median. The number expected under the hypothesis of independence over time is about 59 (3.1 percent of 1,878), so roughly twice more than expected achieve runs over five years.

The persistence in sales growth may reflect shifts in customer demand, which are likely to be fairly long-lasting. A firm can also sustain momentum in sales by expanding into new markets and opening new stores, by rolling out new or improved products, or by granting increasingly favorable credit terms. Persistence in sales may also arise from managers' "empire-building" efforts, such as expanding market share regardless of profitability. In all these cases, however, profit margins are likely to be shrinking as well, so growth in profits may not show as much persistence as sales growth.

While it may be relatively easy for a firm to generate growth in sales (by selling at a steep discount, for example), it is more difficult to generate growth in profits. The recent experience of Internet companies, where sales grew at the same time losses were accumulating, provides a stark example. Panel B confirms that there is less persistence in operating income before depreciation compared to sales. On average, 67 firms a year, or 3.6 percent of 1,833 surviving firms, have above-median runs for 5 consecutive years. The expected frequency of runs is 3.1 percent or 57 firms. There are, thus, 10 firms more than expected out of 1,833, so the difference is unremarkable. An average of 4 firms a year (or 0.3 percent of 1,223 survivors), which is only 3 more than expected, pull off above-median growth for 10 years in a row. The patterns in the more recent years do not deviate markedly from the averages across the entire sample period.

Any sign of persistence vanishes as we get closer to the bottom line (Panel C). On average, the number of firms who grow faster than the median for several years in a row is not different from what is expected by chance. An average of 57 firms out of 1,884 survivors (3 percent) beat the median for 5 years in a row, while 59 (3.1 percent) are expected to do so. Runs above the median for 10 years occur in 0.2 percent of 1,265 cases (or 2 firms), roughly matching the expected frequency (0.1 percent, or 1 firm). To sum up, analysts and investors seem to believe that many firms' earnings can consistently grow at high rates for quite a few years. The evidence suggests instead that the number of such occurrences is not much different from what might be expected from sheer luck. The lack of consistency in earnings growth agrees with the notion that in competitive markets, abnormal profits tend to be dissipated over time.

Table IV

Persistence in Growth Rates of Operating Performance: Selected Equity Classes

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one to ten years (or until delisting) for all firms in the sample. The sample period is 1951 to 1998, and the underlying sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of (the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. For each of the following ten years, the number of firms whose growth rate exceeds the median growth rate each year for the indicated number of years is expressed as a percentage of the number of firms with valid growth rates. Statistics are provided for the following sets of stocks: technology stocks (panel A), comprising stocks whose SIC codes begin with 283, 357, 366, 38, 48, or 737; value stocks (panel B), comprising stocks ranked in the top three deciles by book-to-market value of equity; glamour stocks (panel C), comprising an equivalent number as in panel B of the lowest-ranked stocks by book-to-market value of equity; large stocks (panel D), comprising stocks ranked in the top 2 deciles by equity market value; mid-cap stocks (panel E), comprising stocks ranked in the third through seventh deciles by equity market value; and small stocks (panel F), comprising stocks ranked in the bottom three deciles by equity market value. All decile breakpoints are based on domestic NYSE stocks only.

	Percent of Firms with Above-Median Growth each Year for Number of Years									
Variable	1	2	3	4	5	6	7	8	9	10
					(A) Technology Stocks					
Sales	51.6	30.7	19.1	12.5	8.5	5.9	4.2	3.0	2.3	1.7
Operating Income	51.0	27.2	14.9	8.7	5.3	3.3	2.2	1.4	1.0	0.7
Income before Extraordinary Items	50.9	25.9	13.5	7.3	4.1	2.5	1.5	0.9	0.5	0.4
					(B) Value Stocks					
Sales	50.6	30.0	18.2	11.1	6.9	4.3	2.8	1.9	1.3	0.9
Operating Income	49.3	25.3	13.2	6.8	3.5	1.8	0.9	0.5	0.3	0.2
Income before Extraordinary Items	48.3	23.8	11.4	5.4	2.5	1.2	0.7	0.4	0.3	0.2
					(C) Glamour Stocks					
Sales	48.3	26.6	15.1	8.5	4.7	2.7	1.7	1.0	0.8	0.6
Operating Income	50.1	25.2	11.9	5.9	3.3	1.7	1.0	0.6	0.4	0.3
Income before Extraordinary Items	50.7	25.2	12.0	5.8	2.9	1.6	0.9	0.4	0.2	0.1
					(D) Large Stocks					
Sales	53.2	31.3	18.9	11.7	7.5	4.8	3.2	2.2	1.6	1.1
Operating Income	49.4	25.2	13.0	6.9	3.7	2.0	1.1	0.6	0.4	0.3
Income before Extraordinary Items	46.7	21.9	10.0	4.7	2.2	1.2	0.7	0.4	0.3	0.2
					(E) Mid-cap Stocks					
Sales	53.9	32.4	19.8	12.1	7.6	4.9	3.3	2.2	1.5	1.0
Operating Income	50.5	26.6	13.9	7.5	4.2	2.4	1.5	1.0	0.7	0.4
Income before Extraordinary Items	49.4	24.9	12.4	6.2	3.1	1.6	0.9	0.5	0.3	0.2
					(E) Small Stocks					
Sales	47.0	26.1	14.7	8.6	5.2	3.2	2.1	1.4	1.0	0.7
Operating Income	50.1	25.2	12.6	6.4	3.3	1.8	1.0	0.6	0.4	0.2
Income before Extraordinary Items	51.0	25.5	12.6	6.3	3.2	1.7	0.9	0.4	0.2	0.1
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	1.6	0.8	0.4	0.2	0.1

B. Consistency for Subsets of Firms

While Table III suggests that there may not be much consistency in growth across all firms, it is possible that consistency may show up more strongly in subsets of firms. Table IV focuses our tests by looking at the performance of subsamples of firms. For a subsample such as small stocks, we consider a "run" as a case where the firm's growth rate exceeds the median for a consecutive number of years, where each year the median is calculated across all firms in the entire sample, not just small stocks. This explains why the percentage of runs is not identically 50 percent in the first year.

Many observers single out technology and pharmaceutical firms as instances of consistently high growth over long horizons. Such firms may be able to maintain high growth rates because of their intangible assets, such as specialized technological innovations or drug patents. Panel A examines firms in these sectors. Specifically, the sample comprises firms that are relatively heavily engaged in research and development activity, and are predominantly drawn from the computer equipment, software, electrical equipment, communications, and pharmaceutical industries.[7] Growth in sales and operating income for the set of technology firms both display strong persistence. However, the percentage of runs in income before extraordinary items does not differ markedly from the expected frequency. For example, over a five-year horizon, 14 firms (or 4.1 percent of the 331 surviving technology stocks) have above-median runs. This is only 4 more than the expected number of runs (10 firms, or 3.1 percent). The recent experience of Internet companies provides numerous examples where sales grow rapidly for several years, at the same time that losses are mounting.

Panel A may exaggerate the degree of persistence in growth for technology stocks on two accounts. First, the technology stocks are evaluated against the median growth rate of the entire sample of firms, which would include, for example, utility stocks with relatively unexciting growth rates. Second, technology stocks are relatively more volatile, so survivorship bias may be a particularly acute problem in this subsample.

Technology stocks that are intensive in research and development also tend to be glamour stocks with low ratios of book-to-market value of equity. The popular sentiment regarding persistence in growth applies to glamour stocks generally. These stocks typically enjoy higher past growth in operating performance than value stocks with high book-to-market ratios (see Lakonishok et al. (1994)). The evidence from psychology suggests that individuals tend to use simple heuristics in decision making. As LaPorta et al. (1997) argue, investors may think that there is more consistency in growth than actually exists, so they extrapolate glamour stocks' past good fortunes (and value stocks' past disappointments) too far into the future. Panels B and C of Table IV test for consistency in growth for value and glamour stocks, respectively. Value stocks comprise stocks that are ranked

[7] Specifically, the sample includes all firms whose SIC codes begin with 283, 357, 366, 38, 48, or 737. See Chan, Lakonishok, and Sougiannis (2001).

in the top three deciles by book-to-market ratio based on NYSE breakpoints, while glamour stocks represent an equivalent number of stocks with the lowest positive book-to-market ratios. Growth in sales is persistent for both sets of stocks. The results for the other measures of operating performance, however, are not markedly different across the two sets of stocks.

The remaining panels perform our runs tests for large, midcapitalization, and small stocks. Large stocks include stocks in the top two deciles of market capitalization based on NYSE breakpoints as of June in the sample selection year, midcapitalization stocks fall in the next five deciles, and small stocks include the bottom three deciles. While sales growth tends to be more persistent for large firms, it does not translate into persistent growth in income. Of the large stocks, 2.2 percent achieve five-year runs in growth of income before extraordinary items, while 3.2 percent of small stocks achieve the same result (the expected fraction is 3.1 percent).

C. Runs Tests Conditional on Past Growth

It might be expected that firms that have demonstrated consistently superior past growth would be able to maintain their growth in the future. In the case of firms such as Microsoft and EMC, their valuations at year-end 1999 reflected investors' bets that these firms will beat the odds and continue the streak. Table V checks whether firms that have demonstrated consistently high (or low) past growth have continued success in the future.

Part I of Table V applies runs tests to those firms that have achieved superior past growth. In Panel A, at every year-end, we select those firms with above-median growth in each of the prior five years (or three years), and examine their subsequent growth.

Superior past growth in sales carries over into the future. In Panel A1, out of all firms whose sales grow above the median rate each year over the prior three years, on average 305 firms survive over the three years following sample selection. Of these, 70 firms have above-median growth rates in each of the three postselection years. They represent 22.8 percent of the survivors, compared to the 12.5 percent that is expected by chance. Growth in income, on the other hand, is an entirely different matter (Panels A2 and A3). For example, there are 222 firms with the impressive track record of above-median growth in income before extraordinary items in each of the three prior years and that survive over the following three years. Yet over the postselection period, only 28 or 12.5 percent manage to repeat and beat the median over all available firms each year. This matches the number expected under the null hypothesis of independence. Although sample sizes become much smaller in the case of firms with favorable growth over the past five years, the findings are similar. Starting out with roughly 2,900 eligible firms on average, 43 firms enjoy a run over the preceding five years for growth in income before extraordinary items and survive over the subsequent five years. In these five years, the percentage of firms who manage to repeat the run is 5.1 percent, while the percentage expected by chance is 3.1 percent. This corresponds to only one run more than expected, however, so the difference is not outstanding.

Table V

Persistence in Growth Rates of Operating Performance: Firms with Superior and Poor Past Growth

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one to five years (or until delisting) for firms with superior (part I of the table) or inferior (part II) past growth in operating performance. Firms with superior (inferior) past growth include: firms with above-median (below-median) operating performance growth each year over the past five or past three years; firms whose average rank on growth rate each year over the past five or past three years falls in the top (bottom) quartile. The sample period is 1951 to 1998, and eligible firms include all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales (panel 1), operating income before depreciation (panel 2), or income before extraordinary items available to common equity (panel 3). Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. For each of the following five years, the number of firms with valid growth rates, the number of firms whose growth rate exceeds the median growth rate each year for the indicated number of years, the percentage these firms represent relative to the number of valid firms, and the percentage expected under the hypothesis of independence across years are reported.

	Part I: Firms with Superior Past Growth (A) Firms with Past Above-Median Run									
	Firms with Above-Median Growth each Year for Past 5 Years and Above-Median Growth each Year for Number of Future Years:					Firms with Above-Median Growth each Year for Past 3 Years and Above-Median Growth each Year for Number of Future Years:				
	1	2	3	4	5	1	2	3	4	5
					(A1) Sales					
Average Number of Valid Firms	110	103	96	90	83	355	329	305	285	265
Average Number above Median	70	42	26	17	11	209	118	70	42	26
Percent above Median	63.3	41.0	27.3	19.0	13.7	58.9	35.6	22.8	14.8	9.9
					(A2) Operating Income before Depreciation					
Average Number of Valid Firms	61	57	53	50	47	267	245	227	210	194
Average Number above Median	34	18	10	6	4	136	67	34	18	10
Percent above Median	55.9	32.3	19.4	12.2	8.0	51.1	27.2	15.1	8.8	5.3
					(A3) Income before Extraordinary Items					
Average Number of Valid Firms	53	50	47	44	43	259	240	222	207	193
Average Number above Median	28	14	7	4	2	125	57	28	14	7
Percent above Median	51.9	27.8	15.1	8.4	5.1	48.3	23.7	12.5	6.7	3.6
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	50.0	25.0	12.5	6.3	3.1

Table V—*continued*

(B) Firms with Past Average Growth Rank in Top Quartile

	Firms with Average Growth Rank over Past 5 Years in Top Quartile and Above-Median Growth each Year for Number of Future Years					Firms with Average Growth Rank over Past 3 Years in Top Quartile and Above-Median Growth each Year for Number of Future Years				
	1	2	3	4	5	1	2	3	4	5
					(B1) Sales					
Average Number of Valid Firms	78	71	66	61	56	204	187	172	159	147
Average Number above Median	47	27	16	10	6	120	67	39	24	15
Percent above Median	60.8	37.7	24.4	16.6	11.4	58.9	35.8	22.8	14.8	9.9
					(B2) Operating Income before Depreciation					
Average Number of Valid Firms	35	32	30	27	25	133	121	110	100	91
Average Number above Median	18	8	4	2	1	65	31	15	8	4
Percent above Median	50.6	26.4	15.0	8.9	5.9	49.0	25.4	13.6	7.6	4.7
					(B3) Income before Extraordinary Items					
Average Number of Valid Firms	29	27	25	23	22	121	112	103	94	86
Average Number above Median	13	5	3	1	0	56	24	11	5	2
Percent above Median	44.0	19.6	10.2	4.8	2.1	46.4	21.5	10.4	5.5	2.6

Part II. Firms with Inferior Past Growth

(C) Firms with Past Below-Median Run

	Firms with Below Median Growth each Year for Past 5 Years and Above-Median Growth each Year for Number of Future Years:					Firms with Below Median Growth each Year for Past 3 Years and Above-Median Growth each Year for Number of Future Years:				
	1	2	3	4	5	1	2	3	4	5
					(C1) Sales					
Average Number of Valid Firms	106	92	82	73	66	343	302	270	244	221
Average Number above Median	35	15	7	4	2	125	59	28	14	7
Percent above Median	33.0	16.3	8.6	4.9	2.5	36.4	19.4	10.6	5.9	3.4

				(C2) Operating Income before Depreciation						
Average Number of Valid Firms	39	35	32	30	28	229	206	186	170	156
Average Number above Median	20	9	5	2	1	122	58	27	13	6
Percent above Median	51.4	25.7	14.3	6.3	3.5	53.3	28.0	14.7	7.6	3.6
				(C3) Income before Extraordinary Items						
Average Number of Valid Firms	33	30	28	26	25	220	201	184	170	157
Average Number above Median	18	9	4	2	1	127	61	28	13	5
Percent above Median	56.2	30.2	14.8	6.7	3.0	57.7	30.4	15.3	7.7	3.4
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	50.0	25.0	12.5	6.3	3.1

	(D) Firms with Past Average Growth Rank in Bottom Quartile									
	Firms with Average Growth Rank over Past 5 Years in Bottom Quartile and Above-Median Growth each Year for Number of Future Years					Firms with Average Growth Rank over Past 3 Years in Bottom Quartile and Above-Median Growth each Year for Number of Future Years				
	1	2	3	4	5	1	2	3	4	5
					(D1) Sales					
Average Number of Valid Firms	86	74	65	57	51	202	175	154	137	123
Average Number above Median	29	12	6	3	1	71	32	14	6	3
Percent above Median	33.1	16.7	8.6	4.4	2.3	35.2	18.1	9.3	4.5	2.3
					(D2) Operating Income before Depreciation					
Average Number of Valid Firms	23	20	17	15	14	111	97	86	77	70
Average Number above Median	15	7	3	1	1	68	33	15	7	3
Percent above Median	63.8	34.8	19.8	8.9	4.2	61.8	33.7	17.5	8.7	4.1
					(D3) Income before Extraordinary Items					
Average Number of Valid Firms	18	16	14	13	12	100	89	80	72	66
Average Number above Median	13	7	4	2	1	68	34	16	7	3
Percent above Median	73.5	47.1	25.1	12.1	5.3	68.1	38.9	20.7	10.3	9.8

The results caution against extrapolating past success in income growth into the future.

A firm may have extraordinary past growth even though it slips below the median for one or two years, as long as growth in the other years is very high. To include such cases of successful past growth, we use a different criterion for what qualifies as superior past growth. In particular, we also classify firms by their average growth ranks. At every calendar year-end over the sample period, we assign each firm a score based on its past growth. The score is obtained by looking back over each of the preceding five (or three) years, ranking the firm's growth rate each year relative to all available firms (where the firms with the highest growth rate and the lowest growth rate get ranks of one and zero, respectively), and then averaging the ranks over five (or three) years. Firms whose average ranks fall in the top quartile are classified as firms with superior past growth in Panel B. While high past sales growth foretells high future sales growth, there are still no signs of persistence in growth of income before extraordinary items in Panel B3. Out of the firms who survive for three years following sample selection, 103 firms have an average rank based on growth over the preceding three years falling in the top quartile. Only 11 or 10.4 percent of them have above-median runs in the three postselection years, amounting to 2 less than the expected number.

In Part II of Table V, Panel C performs the same analysis for firms with below-median growth over each of the past five or past three years. However, survivorship bias is a particularly grave concern here. After a long period of lackluster performance, the firms that are left standing at the end of the following period are particularly likely to be those who post relatively high growth rates. From Panel C1, future sales growth is persistently low. The fraction of above-median runs in sales growth is notably lower than the expected percentage. On the other hand, they are not less likely to achieve favorable above-median runs with regard to future growth in income. For example, looking at firms with a below-median run for the past three years, over the following three- and five-year horizons, the actual (expected) proportions of above-median runs are 15.3 (12.5) and 3.4 (3.1) percent for growth in income before extraordinary items. While survivorship bias makes it difficult to draw a definitive conclusion, it does not appear that, going forward, the firms with disappointing past growth differ notably from the more successful firms with respect to growth in income.

D. Alternative Criteria for Consistency in Growth

Given the large transitory component of earnings, investors may consider a firm to show persistent growth even if its growth fades for a few years, as long as there is rapid growth for the rest of the time. Even a celebrated example of a growth stock such as Microsoft, for example, falls short of delivering above-median growth in income before extraordinary items for 10 years in a row.[8]

[8] In the 10-year period preceding the latest sample selection date, Microsoft's growth rank of 0.49 in 1994 narrowly misses the median that year.

In Table VI, we adopt more relaxed criteria for defining consistency in growth. In particular, we check whether a firm beats the median for most years over the horizon, but allow it to fall short of the median for one or two years. For example, looking forward from a sample selection date, 269 firms on average have sales growth rates that exceed the median in five out of the following six years. These firms represent 15.6 percent of the surviving firms, more than the expected value of 9.4 percent. In the case of income before extraordinary items, the departures from what is expected under independence are slender, especially over longer horizons. For instance, an average of 9.9 percent have income before extraordinary items growing at a rate above the median for five out of six years, which is close to the expectation of 9.4 percent. Similarly, if we let a firm falter for two years, 4.8 percent of the surviving firms have growth in income before extraordinary items that exceeds the median in 8 out of 10 years, compared to an expected value of 4.4 percent.

As another way to single out cases of sustained high growth while allowing for some slack, we require a firm to post an average annual growth rank over the subsequent five years that falls in the top quartile (where in any year a growth rank of one denotes the highest realized growth rate that year, and zero denotes the lowest rate). The results for this definition of consistency are provided in the last column of Table VI. On average, 1.4 percent of the surviving firms (27 firms) pass this criterion with respect to growth of income before extraordinary items. Assuming independence, the expected value is 2.5 percent.

In summary, analysts' forecasts as well as investors' valuations reflect a widespread belief in the investment community that many firms can achieve streaks of high growth in earnings. Perhaps this belief is akin to the notion that there are "hot hands" in basketball or mutual funds (see Camerer (1989) and Hendricks, Patel, and Zeckhauser (1993)). While there is persistence in sales growth, there is no evidence of persistence in terms of growth in the bottom line as reflected by operating income before depreciation and income before extraordinary items. Instead, the number of firms delivering sustained high growth in profits is not much different from what is expected by chance. The results for subsets of firms, and under a variety of definitions of what constitutes consistently superior growth, deliver the same verdict. Put more bluntly, the chances of being able to identify the next Microsoft are about the same as the odds of winning the lottery. This finding is what would be expected from economic theory: Competitive pressures ultimately dissipate excess earnings, so profitability growth reverts to a normal rate.

IV. The Behavior of Nonsurvivors

Survivorship bias is a serious concern in our tests. By necessity, we condition on surviving into the future in order to calculate growth rates and to carry out our runs tests. Moreover, in our runs tests, the survivors are compared each year to all firms (survivors and nonsurvivors) available that year. To gauge the poten-

Table VI

Distribution of Firms Classified by Above-Median Growth in Operating Performance over Indicated Horizon: All Firms

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one to ten years (or until delisting) for all firms in the sample. The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales (panel A), operating income before depreciation (panel B), or income before extraordinary items available to common equity (panel C). Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. The table reports the average number of firms with above-median growth in each of the indicated categories, as well as the percentage these firms represent relative to the number of valid firms; the last row reports the percentage expected under the hypothesis of independence across years. Statistics are provided for the entire sample period and for the ten-year horizon corresponding to the last sample formation year.

Variable	Firms with Above-Median Growth							
	3 out of 4 years	4 out of 5 years	5 out of 6 years	6 out of 7 years	6 out of 8 years	7 out of 9 years	8 out of 10 years	Firms with Average Growth Rank in Top Quartile over 5 Years
				(A) Sales				
Average Number	697	432	269	170	287	191	127	79
Percent	33.9	23.0	15.6	10.7	19.5	14.0	10.0	4.2
1989–1998	36.6	26.0	18.0	12.6	21.4	16.0	12.7	5.6
				(B) Operating Income before Depreciation				
Average Number	629	341	184	100	205	119	70	34
Percent	31.2	18.6	10.9	6.5	14.4	9.0	5.7	1.9
1989–1998	31.7	19.3	11.5	7.4	15.1	10.4	8.0	2.0
				(C) Income before Extraordinary Items				
Average Number	634	334	171	88	190	109	61	27
Percent	30.7	17.7	9.9	5.5	12.9	8.0	4.8	1.4
1989–1998	29.9	16.5	8.4	5.0	12.8	8.4	5.7	0.9
Expected Percent	25.0	15.6	9.4	5.5	10.9	7.0	4.4	2.5

tial magnitude of the problem, in this section, we replicate some of our tests on firms who do not survive over the entire future horizon.

Specifically, we examine two sets of stocks. Given our focus on long-horizon growth, we first select at each year-end a sample of firms who survive over the full 10-year following period. The behavior of these (the survivors) is compared to a second set (the nonsurvivors) that also includes firms who do not last for the full period. To strike a balance between the mix of survivors and nonsurvivors in this second set, we require firms to survive for the first five years after sample selection, but they may drop out between the 6th to 10th year of the postselection period.

The results are reported in Panels A and B of Table VII. The survivors have a higher chance than expected for achieving runs above the median in growth of income before extraordinary items. Conversely, the fraction of runs is lower for the set of nonsurvivors. Of the survivors, for example, 3.4 percent sustain runs for five years of growth in income before extraordinary items above the median (where the expected proportion is 3.1 percent). The corresponding percentage for nonsurvivors is 2.3 percent. Nonetheless, the differences across the two sets are generally not substantial. Panels C and D apply the same procedure to the technology stocks considered in Table IV. Here the differences across the two sets are more notable. At the five-year horizon, for example, 5.2 percent of the survivors achieve runs above the median for growth in income before extraordinary items, compared to 3.2 percent of the nonsurvivors.

Finally, Panels A and B of Part II of Table VII give the distribution of one-year growth rates for the two sets of firms (where the percentiles are averaged across all sample selection years). The results confirm that survivors realize higher growth rates than nonsurvivors. For example, the median growth in income before extraordinary items for the survivors averages 10.6 percent, compared to 8.2 percent for nonsurvivors.

V. The Predictability of Growth: Valuation Ratios

Based on the historical record, it is not out of the question for a firm to enjoy strong growth in excess of 20 percent a year for prolonged periods. The issue, however, is whether such firms are identifiable ex ante. Our attempts in the previous sections to uncover cases of persistently high future growth using information such as past growth, industry affiliation, value–glamour orientation, and firm size have limited success. In this section, we expand our search for predictability by investigating whether valuation indicators such as earnings-to-price, book-to-market, and sales-to-price ratios distinguish between firms with high or low future growth. Further, several studies suggest that investors are prone to judgmental biases, so they respond to past growth by extrapolating performance too far into the future (see, e.g., La Porta (1996) and La Porta et al. (1997)). Consequently, after a period of above- or below-average growth, the valuations of firms with high (low) realized growth may be pushed too high (or too low).

In Table VIII, stocks are sorted into deciles at each year-end on the basis of their growth rate in income before extraordinary items over the following five years (Panel A) or over the following 10 years (Panel B). Within each decile, we

Table VII

Results for Surviving versus Non-Surviving Firms: Persistence Tests and Growth Rates

At every calendar year-end over the sample period, two sets of firms are selected: firms that survive over the following ten years (survivors), and firms that survive over the following five years but thereafter fail to survive until the tenth year (nonsurvivors). For each set of firms, growth rates in operating performance are calculated over each of the following ten years. The sample period is 1951 to 1998, and all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files are eligible. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. Part I provides runs tests of persistence over each of the following ten years for the two sets of firms: the average number of firms whose growth rate exceeds the median growth rate each year for the indicated number of years is expressed as a percentage of the number of firms with valid growth rates. Part II reports the distribution of annualized growth rates realized over the sixth to tenth year (or until delisting) following sample selection for the two sets of firms. The simple average over the entire sample period of the percentiles is reported.

Part I: Runs Tests for Persistence

	Percent of Firms with Above-Median Growth each Year for Number of Years:									
Variable	1	2	3	4	5	6	7	8	9	10
					(A) Survivors (1265 firms)					
Sales	52.8	30.9	18.1	10.8	6.6	4.2	2.7	1.8	1.3	0.9
Operating Income before Depreciation	51.5	26.8	13.7	7.0	3.8	2.1	1.2	0.7	0.5	0.3
Income before Extraordinary Items	51.7	26.9	13.5	6.7	3.4	1.8	1.0	0.5	0.3	0.2
					(B) Non-Survivors					
Number of Firms	445	445	445	445	445	344	250	165	86	0
Sales	48.7	26.6	14.6	8.1	4.5	2.8	1.7	1.1	0.8	—
Operating Income before Depreciation	50.0	24.2	11.5	5.5	2.5	1.3	0.7	0.5	0.3	—
Income before Extraordinary Items	49.1	23.8	11.1	5.1	2.3	1.1	0.6	0.3	0.1	—
					(C) Survivors, Technology (195 firms)					
Sales	54.6	33.2	20.5	12.9	8.4	5.8	4.2	3.0	2.3	1.7
Operating Income before Depreciation	53.6	29.7	16.5	9.6	5.9	3.6	2.2	1.4	1.0	0.7
Income before Extraordinary Items	54.1	29.9	16.3	9.0	5.2	3.1	1.9	1.1	0.6	0.4

					(D) Non-Survivors, Technology					
Number of Firms	100	100	100	100	100	77	55	37	20	0
Sales	51.5	28.6	16.7	10.6	6.5	4.6	3.1	2.0	1.4	—
Operating Income before Depreciation	49.5	24.3	12.4	6.6	3.3	2.0	1.4	1.3	1.0	—
Income before Extraordinary Items	50.1	25.0	12.4	6.7	3.2	1.7	1.0	0.5	0.0	—
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	1.6	0.8	0.4	0.2	0.1

Part II: Annualized Growth Rates

					Percentile					
Variable	2%	10%	25%	40%	50%	60%	75%	95%	98%	
					(A) Survivors					
Sales	− 15.4	− 2.0	5.6	9.1	10.9	12.5	15.5	21.7	37.6	
Operating Income before Depreciation	− 23.3	− 6.8	2.8	7.6	10.1	12.5	16.9	25.5	48.0	
Income before Extraordinary Items	− 28.6	− 8.6	2.1	7.7	10.6	13.3	18.1	28.4	56.4	
					(B) Non-Survivors					
Sales	− 18.5	− 7.0	1.0	6.0	8.4	10.4	13.9	20.3	36.8	
Operating Income before Depreciation	− 26.1	− 12.5	− 2.6	4.7	8.1	11.5	16.3	25.7	47.9	
Income before Extraordinary Items	− 27.4	− 14.5	− 3.3	4.4	8.2	11.9	17.9	28.6	55.9	–

Table VIII
Valuation Ratios and Characteristics at Beginning and End of Horizon for Firms Classified by Growth in Income before Extraordinary Items

At every calendar year-end over the sample period, growth rates in income before extraordinary items available to common equity are calculated over the following five and ten years for all firms in the sample. The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Growth rates are measured on a per share basis as of the sample selection date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. Firms are classified into one of ten equally-sized categories based on their realized five- and ten-year growth rates. The following statistics are calculated for firms within each category: the median realized annual growth rate over the horizon; the average size decile rank at the beginning and end of the growth horizon; median valuation ratios at the beginning and at the end of the horizon. The ratios are the prior year's income before extraordinary items to price (*EP*), net sales to price (*SP*), and book value to market value of common equity (*BM*). Results are averaged over all years in the sample period, and are also reported for the last five- or 10-year period. Panel A of the table provides results for firms classified by growth rates over five years and for firms with above-median growth each year for five consecutive years; Panel B provides results for firms classified by ten-year growth rates.

Panel A: Classified by Annualized Growth Rate over 5 Years

Variable	Decile 1	2	3	4	5	6	7	8	9	10	5-year run above median
Median Growth Rate	−18.9	−5.0	1.5	5.8	9.1	12.0	15.1	18.9	25.1	41.7	40.9
Beginning Size Decile Rank	4.118	4.773	5.087	5.423	5.447	5.526	5.338	4.989	4.273	3.272	3.699
Ending Size Decile Rank	3.526	4.414	4.831	5.275	5.452	5.668	5.652	5.482	5.056	4.243	5.163
Beginning Median EP Ratio	0.083	0.085	0.086	0.083	0.084	0.082	0.082	0.082	0.079	0.068	0.061
At Start of Last 5-year Period	0.050	0.056	0.059	0.055	0.060	0.055	0.052	0.047	0.037	0.021	0.033
Ending Median EP Ratio	0.055	0.073	0.078	0.080	0.082	0.081	0.080	0.079	0.077	0.075	0.066
At End of Last 5-year Period	0.033	0.047	0.052	0.053	0.052	0.052	0.049	0.050	0.046	0.042	0.040
Beginning Median BM Ratio	0.650	0.654	0.678	0.665	0.685	0.679	0.694	0.726	0.777	0.880	0.694
At Start of Last 5-year Period	0.465	0.485	0.476	0.465	0.494	0.430	0.458	0.437	0.452	0.537	0.446
Ending Median BM Ratio	1.115	0.927	0.845	0.789	0.755	0.700	0.669	0.610	0.574	0.560	0.369
At End of Last 5-year Period	0.549	0.495	0.501	0.461	0.402	0.367	0.350	0.337	0.291	0.292	0.200
Beginning Median SP Ratio	1.723	1.576	1.473	1.304	1.370	1.276	1.328	1.530	1.791	2.323	1.684
At Start of Last 5-year Period	0.962	1.022	1.079	0.825	0.890	0.807	0.822	1.065	1.052	1.423	0.914
Ending Median SP Ratio	2.606	2.062	1.783	1.501	1.422	1.288	1.274	1.305	1.377	1.503	1.012
At End of Last 5-year Period	1.174	0.860	0.972	0.638	0.653	0.587	0.573	0.649	0.563	0.681	0.460

Table VIII—*continued*

Panel B: Classified by Annualized Growth Rate over 10 years

Median Growth Rate	−10.8	−3.4	−0.3	2.1	3.9	5.6	7.4	9.4	12.4	19.3
Beginning Size Decile Rank	4.565	5.223	5.577	5.641	5.597	5.508	5.563	5.480	5.040	3.890
Ending Size Decile Rank	3.950	5.087	5.608	5.818	5.882	5.921	5.981	6.100	5.851	5.100
Beginning Median EP Ratio	0.088	0.088	0.087	0.087	0.087	0.086	0.085	0.081	0.080	0.069
At Start of Last 10-year Period	0.072	0.070	0.077	0.073	0.074	0.065	0.068	0.066	0.056	0.039
Ending Median EP Ratio	0.057	0.072	0.076	0.079	0.081	0.083	0.084	0.082	0.082	0.079
At End of Last 10-year Period	0.035	0.047	0.050	0.053	0.048	0.054	0.056	0.049	0.044	0.049
Beginning Median BM Ratio	0.653	0.699	0.696	0.699	0.726	0.707	0.723	0.706	0.742	0.817
At Start of Last 10-year Period	0.550	0.605	0.548	0.564	0.595	0.543	0.609	0.504	0.597	0.724
Ending Median BM Ratio	1.048	0.860	0.796	0.761	0.748	0.734	0.725	0.673	0.647	0.622
At End of Last 10-year Period	0.626	0.482	0.382	0.439	0.392	0.396	0.409	0.321	0.343	0.337
Beginning Median SP Ratio	1.664	1.560	1.470	1.392	1.429	1.399	1.415	1.408	1.503	2.022
At Start of Last 10-year Period	1.405	1.417	1.164	1.285	1.054	1.106	1.211	1.133	1.455	1.409
Ending Median SP Ratio	2.619	1.928	1.648	1.531	1.535	1.477	1.478	1.411	1.385	1.468
At End of Last 10-year Period	1.520	0.941	0.735	0.853	0.758	0.826	0.805	0.664	0.724	0.756

calculate the median realized growth rate, as well as median characteristics such as size decile rank and valuation ratios. This is done at the beginning of the 5- or 10-year growth horizon and also at the end of the horizon. We report results averaged across all sample selection years, as well as results for the most recent 5-year or 10-year growth horizon in our sample period.

We focus the discussion on Panel A of the table (the results are similar for the 10-year horizon). In line with the results from Tables I and II, the stocks in the extreme growth deciles tend to be smaller firms. The median firm in the top decile (with a growth rate of 41.7 percent a year) falls in the third size decile, while the median firm in the bottom decile (with a growth rate of -18.9 percent) ranks in the fourth size decile. Over the following 5 years, however, the high-growth firms perform relatively well, resulting in a surge in their market values. Conversely, the market values of the low-growth firms show a relative slump.

Sorting by realized future growth induces a mechanical association between growth rates and the level of earnings at the beginning and end of the growth horizon. To weaken this link, we measure earnings one year prior to the base year (or one year before the final year) of the growth horizon. The price is measured at the start or end of the horizon, so the numbers correspond to the conventional measure of trailing earnings yield that is widely used in practice and research. There is reason to be wary about relying too heavily on the earnings yield variable, however, because net income is the most problematic of our measures of operating performance. For example, a firm may have a low earnings yield because its price impounds investors' expectations of high growth in future earnings, but another reason may be its recent performance has been poor and its earnings are currently depressed. On this account, earnings-to-price ratios are not generally used in academic research, or investment industry analysis, to classify firms as "value" or "glamour" stocks. Instead other, better-behaved, indicators such as the book-to-market ratio, are favored.

The top decile of growth firms at the beginning of the growth horizon has a median earnings-price ratio (0.068) that is much lower than the others (which cluster around 0.08). The low earnings yield for this group is consistent with the notion that the market's valuation accurately incorporates future growth. On the other hand, decile portfolios 8 and 9, which also show relatively strong growth, do not have notably low earnings yields. Rather, the association for the highest-growth decile may reflect cases where firms grow from a depressed level of income. At the end of the growth horizon, only the earnings-price ratio of the bottom decile of firms is eye-catching. Contrary to intuition, however, these firms have comparatively low earnings yields so they appear to be relatively "expensive." Instead, the explanation here may also lie in their low earnings levels, since they have gone through a period of disappointing growth.

Given the shortcomings of the earnings yield variable, we also look at valuation measures that tend to be better-behaved. Table VIII provides median ratios of book-to-market and sales-to-price at the beginning and end of the growth horizon for each decile. Firms which are ranked in the highest decile by earnings growth have relatively high sales-to-price and book-to-market ratios at the beginning. For example, their median book-to-market ratio is 0.880 (compared to 0.690

averaged across the other groups) and the median sales-to-price multiple is 2.323 (compared to 1.486 for the other groups). The modest ex ante valuations suggest that the market fails to anticipate their subsequent growth.

On the other hand, ex post valuations closely track prior growth. The top decile of high-growth firms have ending book-to-market and sales-to-price ratios of 0.560 and 1.503, respectively. These are substantially lower than the averages across all the other groups. This finding fits in with earlier evidence on the existence of extrapolative biases in investors' expectations about future growth (see La Porta (1996) and La Porta et al. (1997)).

The last column in Panel A of Table VIII provides corresponding statistics for firms whose income before extraordinary items grows above the median rate for five consecutive years. The difference between these firms' valuation ratios at the beginning and end of the growth horizon is striking. At the beginning, their book-to-market and sales-to-price ratios are not too far out of line from the average, suggesting that their future performance is not foreseen by the market. However, at the end of the growth horizon, the median book-to-market and sales-to-price ratios of this group are the lowest in Table VIII. The rich ending multiples such firms command highlight the importance investors attach to consistently superior growth, and not just high growth per se. Investors handsomely reward firms that have achieved several consecutive years of strong growth, and believe they will continue the streak (counterfactually, as the results in Table V indicate).

In summary, the results suggest that market valuation ratios have little ability to sort out firms with high future growth from firms with low growth. Instead, in line with the extrapolative expectations hypothesis, investors tend to key on past growth. Firms that have achieved high growth in the past fetch high valuations, while firms with low past growth are penalized with poor valuations.

VI. Comparisons with IBES Consensus Forecasts

Security analysts' estimates of near-term earnings are widely disseminated and receive much attention. Dramatic movements in a stock's price can arise when an influential analyst issues a revised earnings estimate. Possibly, therefore, analysts' estimates of long-term earnings growth may also be useful in forecasting future growth over longer horizons. Analysts are not shy about making aggressive growth forecasts either (the dispersion between the top and bottom decile of IBES long-term forecasts is about 31 percent), so they apparently are confident in their own ability to pick the future success stories.

The current dividend yield on a stock may also have predictive power for future growth in earnings per share. Standard textbook analysis suggests that, given a firm's investment policy and ignoring tax effects, it is a matter of indifference to a shareholder whether earnings are paid out as current dividends or retained for growth in future dividends. For example, a firm may choose to raise the amount paid out from earnings as dividends to current shareholders. To maintain investment, however, it must use external financing, thereby diluting current shareholders' claims to future profits. In other words, high current dividends come at the expense of low future growth per share. To use a simple constant-growth

dividend discount model as an illustration, given investors' required rate of return, there is a one-to-one trade-off between future growth per share and the dividend yield. Furthermore, a firm's dividend payout may signal whether it has attractive investment projects available to fuel future growth.

To allow a cleaner comparison with analysts' forecasts, which do not include dividends, in the remainder of the paper, we drop our convention of reinvesting dividends when we calculate growth rates. Analysts' predictions refer to growth in income before extraordinary items, but realized growth in this variable is highly prone to measurement problems (such as the exclusion of cases with negative base-year values for income). For this reason, we also report realized growth in sales and operating income before depreciation. Growth rates in these variables are correlated with growth in income before extraordinary items, but are better behaved and are available for a much larger fraction of the sample.

A. Individual Firm Growth Rates

Table IX relates IBES consensus long-term growth forecasts to realized future growth. At each year-end, we rank all domestic firms with available IBES long-term forecasts and sort them into quintiles. IBES long-term estimates do not become available until 1982, so the sample period in Table IX runs from 1982 to 1998. The breakpoints for the sort use all NYSE firms available as of the sample selection date (regardless of whether they survive in the future). In Table IX, we track the subsequent growth rates of firms who survive over the next one, three, or five years in each quintile. The median realized growth rate over firms in each quintile is then averaged across all sample selection dates.

The dispersion in IBES consensus growth forecasts is large, so analysts are boldly distinguishing between firms with high and low growth prospects. The median estimate in quintile 1 averages 6 percent, while the median estimate in quintile 5 is 22.4 percent on average.[9] Notably, analysts' estimates are quite optimistic. Over the period 1982 to 1998, the median of the distribution of IBES growth forecasts is about 14.5 percent, a far cry from the median realized five-year growth rate of about 9 percent for income before extraordinary items.[10]

Near-term realized growth tends to line up closely with the IBES estimate (Panel A). In the first postranking year, the median growth rate in income before extraordinary items is 18.3 percent on average for quintile 5, and 5.1 percent on average for quintile 1. The difference between the growth rates for the other quintile portfolios is much milder, however. Comparing quintiles 4 and 2, median growth rates in income before extraordinary items are apart by only 2.5 percent.

A naive model for predicting future growth uses the dividend yield, and is based on the trade-off between current dividends and future growth. Suppose,

[9] Note that since the breakpoints are based on NYSE stocks only, the number of stocks differs across the quintiles. In particular, many firms penetrate the top quintile.

[10] To sharpen the point, note that the median realized growth rate of nine percent (without dividends reinvested) is based on all firms, including smaller firms that tend to be associated with somewhat higher growth rates. IBES forecasts, on the other hand, predominantly cover larger firms.

Table IX

Realized Median Growth Rates of Operating Performance for Stocks Classified by IBES Long-Term Growth Forecasts

At every calendar year-end t over the sample period, stocks are ranked and classified to one of five groups based on IBES forecasts of long-term earnings growth. Results are reported for individual stocks and for portfolios. For individual stocks, growth rates in operating performance are calculated over each of the five subsequent years (years $t+1$ to $t+5$) for all firms in the sample with available data. The sample period is 1982 to 1998, and all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files are eligible. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends. The median realized growth over all stocks in each classification is calculated each year, and the simple average over the entire sample period is reported. For portfolios, a value-weighted portfolio is formed at each year-end from all the stocks in each quintile sorted by IBES forecasts. The portfolio's income before extraordinary items is calculated over each of the subsequent five years, with the proceeds from liquidating delisted stocks reinvested in the surviving stocks. Growth rates for each portfolio are calculated in each formation year, and the simple average over the entire sample period of the growth rates is reported. Also reported are the ratios of the prior year's income before extraordinary items per share to current price, and the prior year's cumulative regular dividends per share to current price.

	Quintile Based on IBES Forecast:				
Growth in:	1 (Low)	2	3	4	5 (High)
(A) Growth Rate in Year t+1					
Sales	1.4	4.5	6.3	8.3	13.7
Operating Income before Depreciation	3.6	6.8	7.6	10.3	16.0
Income before Extraordinary Items	5.1	9.5	10.1	12.0	18.3
Portfolio Income before Extraordinary Items	12.6	4.2	4.5	7.2	13.6
No. with Positive Base & Survive 1 year	242	256	266	318	584
No. with Negative Base & Survive 1 year	71	78	60	88	265
(B) Growth Rate in Year t+2					
Sales	1.7	4.5	6.4	7.8	11.6
Operating Income before Depreciation	3.2	7.0	8.4	9.9	14.0
Income before Extraordinary Items	4.7	9.9	10.5	12.2	16.4
Portfolio Income before Extraordinary Items	6.9	7.5	6.1	9.1	10.6
No. with Positive Base & Survive 2 years	225	235	244	296	497
No. with Negative Base & Survive 2 years	62	75	59	85	252
(C) Annualized Growth Rate over 3 Years					
Sales	1.1	4.0	5.6	7.3	11.3
Operating Income before Depreciation	2.5	5.2	6.8	8.1	10.9
Income before Extraordinary Items	3.1	7.4	7.0	9.0	11.5
Portfolio Income before Extraordinary Items	9.0	7.3	5.2	7.1	11.4
No. with Positive Base & Survive 3 years	202	209	230	263	439
No. with Negative Base & Survive 3 years	67	70	56	82	217
(D) Annualized Growth Rate over 5 Years					
Sales	1.2	3.4	5.1	6.9	9.9
Operating Income before Depreciation	2.2	5.1	6.8	7.3	9.2
Income before Extraordinary Items	2.0	6.5	6.5	8.0	9.5
Portfolio Income before Extraordinary Items	8.0	10.7	7.2	7.7	11.3
No. with Positive Base & Survive 5 years	182	179	201	233	356
No. with Negative Base & Survive 5 years	57	63	50	68	170
Median IBES Forecast	6.0	10.2	12.3	15.1	22.4
Median Stock Dividend Yield, %	6.0	3.4	2.7	1.5	0.1
Portfolio Dividend Yield, %	6.9	4.6	3.3	2.5	1.3
Median Stock Earnings to Price Ratio, %	10.0	8.9	7.9	7.2	5.6

as a first approximation, that all stocks have the same long-term expected return. Given this, the naive model forecasts a spread in future growth across stocks that is identical to the spread in their current dividend yields (but in the opposite direction). The naive forecast is quite successful at picking up differences in growth across the intermediate quintiles. Over the first postranking year, the difference between the dividend yields of quintiles 2 and 4 (3.4 and 1.5 percent, respectively) corresponds roughly to the difference in their growth rates. Once differences in the dividend yield are taken into account, then, IBES estimates have forecast power for realized growth over the first year only at the extremes.

In general, IBES long-term forecasts refer to a three- to five-year horizon, so the behavior of realized growth over these horizons is more interesting. Median realized growth rates over three years and over five years are reported in Panels C and D. These panels highlight the upward bias in analysts' long-term growth estimates. In every quintile, median forecasts exceed median realized growth rates, with the most pronounced bias in quintile 5. For five-year growth in income before extraordinary items, for example, the median forecast in the top quintile is 22.4 percent, much higher than the median realized growth rate, which is only 9.5 percent. Furthermore, the realized growth rate for the firms in the top quintile should be taken with a grain of salt. In the highest-ranked quintile, the percentage of firms who survive for the full five postranking years is lower than for any of the other quintiles. For example, there are 849 firms on average who survive in the first postranking year in quintile 5, but this drops to 526 by the fifth year, so about 38 percent of the firms drop out between the first and fifth years. For quintile 3, the corresponding counts are 326 and 251, respectively, so 23 percent disappear from the sample. The upshot is that realized growth in income before extraordinary items is likely to be somewhat overstated for firms in the top quintile.

Over longer horizons, analysts' growth estimates still do not add much information beyond what is contained in the dividend yield. For example, the median realized five-year growth rate is 9.5 percent for the highest-ranked quintile by IBES forecasts, compared to 2 percent for the lowest-ranked quintile. The difference of 7.5 percent is not much higher than the spread in their dividend yields. The yields are 0.1 percent and 6 percent for the highest and lowest ranked quintiles, respectively, so the dividend yield spread is 5.9 percent. The results for growth in operating income before depreciation yield similar conclusions.

To sum up, analysts forecast that long-term earnings growth for the top quintile outperforms the bottom quintile by 16.4 percent. The realized gap in five-year growth rates, however, is only 7.5 percent. Much of the spread in realized growth reflects differences in dividend yields, and some is due to survivorship bias in the top quintile. After accounting for these influences, analyst forecasts add information only over shorter horizons.

B. Portfolio Growth Rates

Issues of survivorship bias and low or negative base-year values for income before extraordinary items are major concerns. Table IX takes another approach to measuring growth rates that tries to work around these concerns. Specifically,

after ranking stocks by IBES long-term forecasts at each year-end, we form a value-weighted portfolio of the stocks in each quintile. Value-weighting affords some degree of robustness to our measures, to the extent that problems in measuring growth are less severe for large companies. We then track over the postformation period the income before extraordinary items of the portfolio as a whole. If a stock is delisted in a year after portfolio formation, we assume it generates the average income of the remaining firms in that year. Then, at the end of the year, we take the proceeds from liquidating nonsurviving firms and reallocate them proportionally across the surviving stocks. As a result, we are able to use all eligible companies to calculate growth rates, regardless of whether they survive over the full growth horizon, or whether they have positive earnings in the base year.[11] The portfolio approach, however, is not without its drawbacks. As firms drop out of the sample and the funds from their liquidation are reinvested in the remaining firms, over time, the portfolio can build up large stakes in a relatively small number of surviving firms who tend to have relatively high growth rates. The implication is that long-term portfolio growth rates for cases where survivorship bias is acute, such as the fastest-growing firms in the top quintile by IBES forecasts as noted above, should be interpreted with caution.

The results for the portfolios' long-term growth rates are in line with our earlier findings. IBES long-term forecasts are essentially unrelated to realized growth in income before extraordinary items beyond one or two years out. For example, over the five postformation years (Panel D), the bottom and top quintile portfolios on average experience growth rates of 8 and 11.3 percent per year, respectively. The spread of 3.3 percent in the portfolios' growth rates is smaller than the gap between their dividend yields (5.6 percent).

One difference between our results for individual stocks' growth rates and the portfolios' growth rate concerns the performance of the bottom quintile in the first postranking year. In the year immediately following portfolio formation, the bottom quintile portfolio experiences a strong recovery. Its short-term growth rate (12.6 percent) falls slightly short of the top quintile portfolio's growth rate (13.6 percent). This difference from the earlier results based on individual stocks reflects several methodological details, specifically the use of value-weights, the inclusion in the portfolios of nonsurviving firms as well as firms with negative income, and the use of a time-series average of the yearly portfolio growth rates rather than the cross-sectional medians. In particular, since firms with low IBES forecasts generally tend to start with low or negative values of income before extraordinary items at the portfolio formation date, the growth rate over the following year is likely to be high.[12]

Analysts' forecasts substantially overstate realized long-term growth in the top three quintile portfolios. In the top-ranked quintile, for example, the median projected future growth rate is about 22.4 percent, but the portfolio's realized

[11] The portfolio approach to measuring growth rates is described further in Chan et al. (2000, 2001).

[12] Our results parallel the findings for the prospective earnings growth of beaten-down value stocks documented in Lakonishok et al. (1994).

growth is only 11.4 percent over three years and 11.3 percent over five years. These results suggest that, in general, caution should be exercised before relying too heavily on IBES long-term forecasts as estimates of expected growth in valuation studies. The bottom quintile portfolios by IBES forecasts predominantly comprise firms in mature industries whose growth prospects are relatively unexciting, so analysts' estimates come closer to the mark here. For instance, about 25 percent of the firms in the first quintile are utilities.

The long-term estimates of analysts may be overly optimistic for several reasons. One explanation draws on evidence from studies in psychology that individuals' forecasts are susceptible to cognitive biases.[13] For example, the confirmation bias suggests that individuals tend to focus on evidence that supports their beliefs, while downplaying other information that is inconsistent. In this regard, analysts' estimates will be particularly bullish for glamour stocks that have shown strong past growth and which enjoy favorable investor sentiment. In addition, an analyst is employed by a brokerage firm and is expected to make contributions beyond predicting earnings. Up-beat forecasts may encourage trading by investors and thereby raise commission income, as well as generate investment banking business from firms that receive favorable coverage. The general perception is that these aspects of the brokerage and investment banking business are larger, and their links to analysts closer, in the U.S. market than overseas. As one piece of evidence that such considerations may lead to inflated forecasts, IBES estimates as of mid-2001 for U.S. companies project long-term growth of about 18 percent on average. At the same time, in non-U.S. markets, analysts are forecasting long-term growth for companies of roughly the same size to average 11 percent. Perhaps the close ties that exist in practice between the brokerage and investment banking businesses in the U.S. market foster an environment where analysts tend to be less impartial and err on the side of optimism.

VII. Regression Models

We close out our analysis by gathering all the variables we have previously considered individually into one model in order to take our best shot at forecasting growth. Table X reports the results from cross-sectional regressions to predict future growth in operating profits. The model is

$$y_{it+j} = \beta_0 + \beta_1 PASTGS5_{it} + \beta_2 EP_{it-1} + \beta_3 G_{it-1} + \beta_4 RDSALES_{it} + \beta_5 TECH_{it} + \beta_6 BM_{it} + \beta_7 PASTR6_{it} + \beta_8 IBESLTG_{it} + \beta_9 DP_{it} + \varepsilon_{it+j}. \quad (1)$$

The dependent variable, y_{it+j}, is the rate of growth for firm i over year $t+j$ in sales (SALES), operating income before depreciation (OIBD), or income before extraordinary items available to common equity (IBEI). We forecast growth over the first year following sample selection, over the three and five years subsequent to sample selection, and over the second to fifth subsequent years.

[13] The evidence is discussed in Kahnemann and Riepe (1998) and Fisher and Statman (2000).

Table X

Forecasting Regressions for Growth Rates of Operating Performance

At every calendar year-end, a cross-sectional regression model is used to forecast growth rates of operating performance, y_{it+j} for firm i over the following one to five years for all firms in the sample with available data. The model is.

$$y_{it+j} = \beta_0 + \beta_1 PASTGS5_{it} + \beta_2 EP_{it-1} + \beta_3 G_{it-1} + \beta_4 RDSALES_{it} + \beta_5 TECH_{it} + \beta_6 BM_{it} + \beta_7 PASTR6_{it} + \beta_8 IBESLTG_{it} + \beta_9 DP_{it} + \varepsilon_{it+j}.$$

The dependent variable is growth in: sales (SALES); operating income before depreciation (OIBD); or income before extraordinary items available to common equity (IBEI). The variables used to forecast a firm's growth are *PASTGS5,* the growth in sales over the five years prior to the sample selection date; *EP,* the ratio of income before extraordinary items available to common equity to equity market value; *G,* the sustainable growth rate given by the product of return on equity (income before extraordinary items available to common equity relative to book equity) and plowback ratio (one minus the ratio of total dividends to common equity to income before extraordinary items available to common equity); *RDSALES,* the ratio of research and development expenditures to sales; *TECH,* a dummy variable with a value of one for a stock in the technology sector and zero otherwise; *BM,* book-to-market ratio; *PASTRGs,* the stock's prior six-month compound rate of return; *IBESLTGs,* the IBES consensus forecast for long-term growth; and *DP* the dividend yield, accumulated regular dividends per share over the last twelve months divided by current price per share.

Growth in:	*PASTGS5*	*EP*	*G*	*RDSALES*	*TECH*	*BM*	*PASTR6*	*IBESLTG*	*DP*	R^2
					(A) Growth Rate in Year t+1					
SALES	0.0890	0.1641	0.0141	0.0979	− 0.0038	− 0.0184	0.0365	0.3018	− 0.5258	0.0709
	(3.7)	(6.0)	(1.5)	(1.6)	(− 0.5)	(− 4.7)	(3.0)	(6.1)	(− 4.8)	
OIBD	− 0.0729	− 0.2400	0.0064	0.2047	− 0.0045	0.0031	− 0.0592	0.2334	− 0.5390	0.0274
	(− 1.3)	(− 3.3)	(0.9)	(1.0)	(− 0.3)	(0.4)	(− 2.4)	(2.6)	(− 3.9)	
OBEI	− 0.0971	− 0.3982	− 0.0242	− 0.0024	− 0.0162	0.0093	− 0.0621	0.1179	− 0.9564	0.0263
	(− 1.4)	(− 3.3)	(− 1.5)	(− 0.0)	(− 0.7)	(0.4)	(− 2.0)	(0.9)	(− 3.5)	
					(B) Annualized Growth Rate over Years t+1 to t+3					
SALES	0.0469	0.1400	0.0099	0.0974	0.0014	− 0.0253	0.0311	0.1901	− 0.5758	0.0984
	(1.3)	(5.4)	(1.6)	(3.1)	(0.6)	(− 9.2)	(6.8)	(9.3)	(− 6.4)	
OIBD	− 0.0547	− 0.0554	0.0014	0.3453	− 0.0127	− 0.0073	− 0.0089	0.1147	− 0.4060	0.0296
	(− 1.5)	(− 1.8)	(0.1)	(3.1)	(− 3.2)	(− 1.1)	(− 1.7)	(2.0)	(− 2.6)	
IBEI	0.0087	− 0.1881	0.0011	0.3436	− 0.0191	− 0.0061	− 0.0279	0.0758	− 0.0630	0.0257
	(0.5)	(− 6.0)	(0.1)	(2.4)	(− 2.9)	(− 0.4)	(− 6.5)	(0.9)	(− 0.3)	

Table X—*continued*

				(C) Annualized Growth Rate over Years t+1 to t+5						
SALES	0.0252	0.1074	0.0067	0.0931	0.0014	−0.0260	0.0227	0.1538	−0.5446	0.1175
	(0.7)	(10.5)	(3.6)	(6.8)	(0.4)	(−7.4)	(3.2)	(3.1)	(−16.6)	
OIBD	−0.0645	−0.0146	−0.0035	0.3476	−0.0115	−0.0069	−0.0133	0.1227	−0.2675	0.0367
	(−3.0)	(−0.6)	(−0.5)	(7.6)	(−10.3)	(−1.8)	(−2.3)	(1.5)	(−7.4)	
IBEI	−0.0163	−0.1222	−0.0098	0.2493	−0.0133	−0.0095	−0.0293	0.0729	−0.0917	0.0313
	(−4.2)	(−2.3)	(−0.6)	(3.7)	(−3.0)	(−1.0)	(−2.8)	(0.9)	(−0.7)	
SALES	0.1128	0.0351	0.0628	0.2554						0.0507
	(2.7)	(1.8)	(2.3)	(4.3)						
OIBD	−0.0080	−0.0518	−0.0166	0.3779						0.0150
	(−0.2)	(−3.3)	(−0.7)	(13.1)						
IBEI	0.0311	−0.1295	−0.0675	0.2229						0.0148
	(25.5)	(−3.8)	(−1.5)	(2.4)						
				(D) Annualized Growth Rate over Years t+2 to t+5						
SALES	0.0175	0.0983	0.0060	0.1020	0.0007	−0.0273	0.0218	0.1237	−0.5122	0.0902
	(0.5)	(5.0)	(2.9)	(5.6)	(0.2)	(−6.3)	(3.7)	(2.8)	(−20.1)	
OIBD	−0.0665	0.0136	−0.0147	0.3856	−0.0130	−0.0049	−0.0042	0.1354	−0.3197	0.0335
	(−2.1)	(1.0)	(−1.1)	(4.9)	(−7.7)	(−0.9)	(−0.3)	(1.7)	(−2.7)	
IBEI	0.0119	−0.0932	0.0018	0.2897	−0.0174	−0.0075	−0.0245	0.0809	−0.0538	0.0268
	(0.6)	(−2.6)	(0.1)	(12.8)	(−5.8)	(−0.6)	(−1.8)	(1.0)	(−0.4)	
SALES	0.0962	0.0279	0.0655	0.2515						0.0398
	(2.1)	(1.6)	(3.1)	(5.2)						
OIBD	−0.0097	−0.0255	−0.0023	0.3840						0.0144
	(−0.2)	(−1.2)	(−0.1)	(8.6)						
IBEI	0.0534	−0.1065	−0.0448	0.2310						0.0144
	(3.2)	(−3.3)	(−0.8)	(5.5)						

Growth in each operating peformance variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends. Values of *PASTGS5, RDSALES, EP, G,* and *PASTR6* are Winsorized at their 5th and 95th percentiles; *IBESLTG* is Winsorized at its 1st and 99th percentiles; and *DP* is Winsorized at its 98th percentile. Stocks with negative values of *BM* are excluded. In the regressions for *OIBD* or *IBEI,* firms with negative values of the operating performance variable in the base year are excluded, as are stocks with ratios of price to the operating performance variable above 100. The reported statistics are the averages over all years of the estimated coefficients, with *t*-statistics in parentheses, as well as the average R^2 of the model. In panels B to D, standard errors are based on the Hansen-Hodrick (1980) adjustment for serial correlation.

To see whether high past growth is a precursor to future growth, we use *PASTGS5*, the growth rate in sales over the five years prior to the sample selection date. Sales growth is correlated with earnings growth, but is much less erratic and so should yield a relatively more reliable verdict on whether past growth helps to predict future growth.[14]

Simple theoretical models of earnings growth suggest one set of variables that, in principle, should help to predict growth. For instance, a firm's earnings-to-price ratio, *EP*, is widely interpreted as impounding the market's expectations of future growth. We measure this as the firm's income before extraordinary items in the year prior to the sample selection date, relative to its price at the sample selection date. Similarly, in the standard constant-growth valuation model, a firm's sustainable growth rate is given by the product of its return on equity and its plowback ratio. Our proxy for this measure is *G*, where return on equity is measured as the firm's earnings before extraordinary items in the year prior to sample selection, divided by book equity in the preceding year; plowback is one minus the ratio in the prior year of dividends to income before extraordinary items.[15] Finally, to capture the firm's investment opportunities, we use the ratio of research and development expenditures to sales, *RDSALES*. The intensity of R&D relative to sales is widely used in practice as an indicator of how much resources a firm is investing in future growth opportunities (see, e.g., Chan et al. (2001)). When a firm has no R&D spending, we set this variable to zero, so all firms are eligible for the regression.

The forecast equation also incorporates variables that are popularly thought to connote high growth. Firms in technologically innovative industries, or more generally, growth stocks as measured by low book-to-market ratios, are popularly associated with high growth. High past returns for a stock may signal upward revisions in investors' expectations of future growth. Analysts' long-term forecasts are another proxy for the market's expectations of future growth. Finally, the dividend yield may provide information on the firm's investment opportunities and hence ability to grow future earnings. Correspondingly, the other forecasting variables are *TECH*, a dummy variable with a value of one for a stock in the pharmaceutical and technology sectors (defined as in Panel A of Table IV) and zero otherwise; *BM*, the firm's book-to-market value of equity; *PASTR6*, the stock's prior six-month compound rate of return; *IBESLTG*, the *IBES* consensus forecast of long-term growth; and *DP*, the ratio of dividends per share cumulated over the previous 12 months to current price. To be eligible for inclusion in the regression at a given horizon, a firm must have nonmissing values for all the predictors. In addition it must have a positive base-year value for the operating performance indicator in question, so as to calculate a growth rate. To screen out

[14] Results using past five-year growth in *OIBD* or *IBEI* as predictor variables indicate that these variables do a worse job in capturing any persistence in growth.

[15] Firms with negative value of book equity are dropped from the sample for the regression. In cases where the measure for sustainable growth is negative (when income is negative, or when dividends to common exceed income so the plowback ratio is negative), we set the sustainable growth rate variable *G* to zero.

outliers due to low values in the base year, we exclude cases where the ratio of the price to the operating performance variable exceeds 100 in the base year.

The model is estimated each year-end, yielding a time series of estimated coefficients and the adjusted R^2. Means for the time series, and t-statistics based on the standard error from the time series, are reported in Table X. Standard errors from the overlapping regressions in Panels B to D use the Hansen–Hodrick (1980) correction for serial correlation.

The results in Table X deliver a clear verdict on the amount of predictability in growth rates. In line with our earlier results, it is much easier to forecast growth in sales than growth in variables such as *OIBD* and *IBEI*, which focus more on the bottom line. For example, the forecasting model that has the highest adjusted R^2 in Table X is the equation for five-year growth in sales (11.75 percent; Panel C). By comparison, the adjusted R^2 in the equations for *OIBD* and *IBEI* barely exceed 3 percent, so there is relatively little predictability for growth in these variables. If anything, our results may be overstating the predictability in growth. Our cross-sectional regressions are reestimated monthly, so we let the coefficients in the model change over time. As a check on the robustness of our results, we also replicated the regressions in the table using growth rate ranks (ranging from zero for the firm with the lowest growth rate in that year to one for the firm with the highest growth rate). The results from the growth rank regressions echo the findings in Table X.

Our full model includes a total of nine predictors, and the correlations between some of them are quite high. As a result, sorting out the relative importance of each variable is not straightforward. Focusing on the models for *OIBD* and *IBEI*, no variable has coefficients that are statistically significant across all forecasting horizons. The coefficient of past sales growth *PASTGS5* is generally negative, suggesting that there are reversals in growth rates. When past sales have been declining, income levels tend to be low in the base year, resulting in relatively higher future growth rates.[16]

At least over longer horizons (Panels B to D), R&D intensity, *RDSALES*, has the strongest forecast power. In accordance with economic intuition, firms that are investing heavily in R&D, and thereby building up their intangible capital base, on average tend to be associated with elevated future growth. Specifically, a firm that spends 10 percent of its sales on R&D tends to have higher five-year growth in *IBEI* by about 2.5 percent, compared to a firm with no R&D (Panel C). However, the high correlation between *RDSALES* and variables like *TECH* or *DP* suggests caution is warranted in interpreting this result.

The variable *IBESLTG* is provided by supposed experts, and is widely used as a proxy for expected future growth. Its coefficient has the expected positive sign, but it is not statistically significant in the equations for *IBEI*. This variable does somewhat better in the equations for *OIBD*, especially over shorter horizons. In general, however, *IBESLTG* does not have higher forecast power than the divi-

[16] The effect of extremely low base-year values is mitigated to some extent because we drop from the regression cases where the ratio of the price to operating performance indicator exceeds 100 in the base year. However, this is only a partial solution.

dend yield, *DP*, which can be viewed as another proxy for the firm's investment opportunities.[17] In terms of predicting long-term growth, the forecasts of highly paid security analysts are about as helpful as the dividend yield, a piece of information that is readily available in the stock listings of most newspapers.

In line with the results in Table VIII, a low earnings yield *EP* is associated with higher future growth rates, especially for *IBEI*. However, the association is driven by a relatively small number of cases with unusually low base-year earnings. Low values of the earnings base result in a low earnings yield, and given that the firm survives, in an unusually high future growth rate. This explanation agrees with the results in Table VIII, where the relation between *EP* and future growth is confined to companies with the highest growth rates. As further confirmation of this line of reasoning, when we use growth in a variable such as *OIBD*, which is less prone to the problem of a low base level, *EP* does a poor job of forecasting in Table X.

The coefficient of the technology dummy *TECH* is highly significant in many cases, but it generally has an unexpected sign. This may be due to the high correlation between *TECH* and *RDSALES*. For example, dropping *RDSALES* from the model substantially reduces the *t*-statistics for *TECH* (although its coefficient retains a negative sign).

Neither the book-to-market ratio nor our proxy for sustainable growth *G* reliably predicts growth in *OIBD* and *IBEI*. Contrary to the conventional notion that high past returns signal high future growth, the coefficient of *PASTR6* is negative. The explanation for this result echoes our explanation for our findings with respect to *EP*. When a firm's near-term prospects sour and current earnings are poor, stock returns tend to be disappointing as well. Once again, these cases of low base levels of earnings may induce a negative association between past return and future growth.

Panels *C* and *D* also provide results that are based on a simple textbook model for predicting growth. Here the predictor variables are earnings yield, sustainable growth, and R&D intensity. The textbook model has weak forecast power. For example, over a five-year horizon, the adjusted R^2 from the equation for *IBEI* is only 1.48 percent.

VIII. Summary and Conclusions

We analyze historical long-term growth rates across a broad cross section of stocks using a variety of indicators of operating performance. All the indicators yield a median growth rate of about 10 percent per year (with dividends reinvested) over the 1951 to 1998 period. With dividends taken out, the median estimate is the same magnitude as the growth rate of gross domestic product over this period, between 3 and 3.5 percent in real terms. Given the survivorship bias underlying the growth rate calculations, the expected growth rate is likely to be lower. Based on these historical values and the low level of the current dividend

[17] Forecasting models with *IBESLTG* and DP as the only predictors yield qualitatively similar conclusions. In particular, the dividend yield does at least as well as the consensus forecast in forecasting growth.

yield, looking forward, the expected return on stocks in general does not appear to be high. In particular, the expected return using a constant-growth dividend valuation model is about 7.5 percent, assuming there is no mispricing.

Expectations about long-term growth are also crucial inputs in the valuation of individual stocks and for estimating firms' cost of capital. At year-end 1999, a sizeable portion of the market commanded price–earnings multiples in excess of 100. Justifying such a multiple under some relatively generous assumptions requires that earnings grow at a rate of about 29 percent per year for 10 years or more. Historically, some firms have achieved such dazzling growth. These instances are quite rare, however. Going by the historical record, only about 5 percent of surviving firms do better than a growth rate of 29 percent per year over 10 years. In the case of large firms, even fewer cases (less than 1 percent) would meet this cutoff. On this basis, historical patterns raise strong doubts about the sustainability of such valuations.

Nonetheless, market valuation ratios reflect a pervasive belief among market participants that firms who can consistently achieve high earnings growth over many years are identifiable ex ante. The long-term growth expectations of one influential segment of the market, security analysts, boldly distinguish between firms with strong and weak growth prospects. To see whether this belief that many firms can achieve persistently high growth holds up in reality, we use an experimental design that singles out cases where a firm consistently delivers favorable growth for several years in a row. Our results suggest that there is some persistence in sales revenue growth. The persistence in sales does not translate into persistence of earnings, however. Even though we measure consistency against a hurdle that is not particularly challenging (the median growth rate), there are few traces of persistence in growth of operating income before depreciation, or in income before extraordinary items. For example, on average three percent of the available firms manage to have streaks in growth above the median for five years in a row. This matches what is expected by chance. The evidence for persistence is still slim under more relaxed criteria for consistency in growth. All in all, the evidence suggests that the odds of an investor successfully uncovering the next stellar growth stock are about the same as correctly calling coin tosses.

A skeptic might argue that while there is little persistence for the population at large, specific segments of the market are able to improve earnings steadily over long periods. In particular, popular sentiment views firms in the pharmaceutical and technology sectors, along with glamour stocks, as being able to maintain consistently high growth rates. To accommodate this argument, we narrow our search to these subsets of firms. While there is persistence in sales growth, when it comes to growth in bottom-line income, over long horizons, the likelihood of achieving streaks is not much different from sheer luck. Conversely, value firms who are out of favor do not seem to do much worse, although survivorship bias makes it difficult to deliver a definitive verdict. To narrow the search even more, we check whether firms with consistently high past growth manage to maintain their performance going forward. While past growth carries over to future sales growth, the income variables do not display strong persistence.

There is a widespread belief that earnings-to-price ratios signal future growth rates. However, the cross-sectional relation between earnings yields and future growth is weak, except possibly in the cases of firms ranked highest by realized growth. For these firms, an inverse association between ex ante earnings yields and growth may arise because they start from a battered level of earnings in the base year, so future growth is high. In light of the noisiness of the earnings yield measure, academic and practitioner research mainly focuses on other valuation ratios such as book-to-market and sales-to-price. These multiples, which are better behaved, show little evidence of anticipating future growth. On the other hand, firms that enjoy a period of above-average growth are subsequently rewarded by investors with relatively high ratios of sales-to-price and book-to-market. Conversely, investors tend to penalize firms that have experienced poor growth. These results are consistent with the extrapolation hypothesis of La Porta (1996) and La Porta et al. (1997).

Additionally, it is commonly suggested that one group of informed participants, security analysts, may have some ability to predict growth. The dispersion in analysts' forecasts indicates their willingness to distinguish boldly between high- and low-growth prospects. IBES long-term growth estimates are associated with realized growth in the immediate short-term future. Over long horizons, however, there is little forecastability in earnings, and analysts' estimates tend to be overly optimistic. The spread in predicted growth between the top and bottom quintiles by IBES forecasts is 16.4 percent, but the dispersion in realized five-year growth rates is only 7.5 percent. On the basis of earnings growth for portfolios formed from stocks sorted by IBES forecasts, the spread in realized five-year growth rates is even smaller (3.3 percent). In any event, analysts' forecasts do not do much better than a naive model that predicts a one-for-one tradeoff between current dividend yield and future growth per share.

A regression forecasting model which brings to bear a battery of predictor variables confirms that there is some predictability in sales growth, but meager predictability in long-term growth of earnings. Only about three percent of the variation in five-year earnings growth rates is captured by the model. One variable that stands out is the level of research and development intensity, suggesting that a firm's intangible assets may have an important influence on its future performance. On the whole, the absence of predictability in growth fits in with the economic intuition that competitive pressures ultimately work to correct excessively high or excessively low profitability growth.

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Economic Growth and Equity Investing

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The performance of equity investments is inextricably linked to economic growth. Nonetheless, few studies on investing have explicitly taken research on economic growth into account. This study bridges that gap by examining the implications for equity investing of both theoretical models and empirical results from growth theory. The study concludes that over the long run, investors should anticipate real returns on common stock to average no more than about 4 percent.

The performance of equity investments is inextricably linked to economic growth. Earnings, the source of value for equity investments, are themselves driven by economic activity. Unless corporate profits rise as a percentage of GDP, which cannot continue indefinitely, earnings growth is constrained by GDP growth. This dynamic means that the same factors that determine the rate of economic growth also place bounds on earnings growth and, thereby, the performance of equity investments. Despite these well-known facts, few studies on equity investing have explicitly taken the literature on economic growth into account. This observation is not meant to imply that research connecting economic growth with equity returns is sparse. Numerous contributions in that area include several provocative pieces by Arnott and Bernstein (2002), Arnott and Asness (2003), and Bernstein and Arnott (2003). Nonetheless, rarely has this research been expressly tied to the literature on the theory of economic growth. By bridging that gap, further insight can be gained into the relationship between economic growth and equity returns and forecasts regarding future returns can be placed on a more solid foundation.

Economic Growth: Theory and Data

The focus of economic growth theory is explaining expansion in the standard of living as measured by real per capita GDP. In the neoclassical model of economic growth, originally developed by Solow (1956), per capita GDP growth over the long run is entirely attributable to exogenous technological innovation.[1] This conclusion may surprise those not steeped in growth theory, given the intuitive thinking that output per capita can always be increased by simply adding more capital. Although adding capital does increase output per capita, it does so at a declining rate. Consequently, rational producers stop adding capital when the marginal product of capital drops to its marginal cost. When the economy reaches that point, it is said to be in a steady state. Once the economy reaches the steady state growth path, the ratio of capital to labor (C/L) remains constant and per capita GDP growth ceases unless the production function changes so as to increase the marginal product of capital.

The source of change in the production function is technological innovation. By increasing the marginal product of capital, technological progress breaks the deadlock imposed by diminishing returns and makes further growth in per capita output profitable. So long as the technological innovation continues, so too does the growth in per capita GDP.

This conclusion is not limited to such early models as Solow's, in which the rate of technological change is exogenous. Following Romer (1990), a variety of growth models have been developed in which the amount of investment in R&D—and thus the rate of technological progress—is endogenous. Even in these more sophisticated models, however, the declining marginal product of capital ensures that long-run per capita growth is bounded by the rate of technological progress. The word "bounded" is important because the ability of a society to exploit modern technology effectively is not a foregone conclusion. For example, from 1960 to 2005, all the countries of sub-Saharan Africa, with the exception of South Africa, experienced little or no growth. This failure of certain poor countries to grow is one of the fundamental mysteries of economics, but it is not a relevant consideration here.[2] Virtually the entire global stock

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market capitalization is concentrated in a relatively few highly developed countries. For those countries, the impediments to effective adoption of technology have proved to be minor, at least to date.

Before turning to the data on economic growth, I need to address one remaining issue. The conclusion that growth is attributable exclusively to technological innovation is based on the assumption that the economy has reached the steady state. If the capital stock is below the steady state—and thus the marginal product of capital exceeds its marginal cost—room still exists for the deepening of capital. In that situation, a country's growth rate can exceed the steady state growth rate because it is spurred by capital deepening, as well as by technological innovation. As C/L rises toward its steady state value, the growth rate converges to the steady state level that is attributable to technological change.

The capital stock of a country may be below its steady state level for a variety of reasons. An obvious example is warfare. Another is the opening of a previously closed society. Whatever the reason, growth theory predicts that a country with a C/L below the steady state level will grow more rapidly during a period of capital deepening. Growth theorists refer to this "catch-up" as convergence.

Convergence is important to bear in mind when analyzing historical growth rates with the goal of forecasting future growth. If the historical sample includes growth rates of countries that are in the process of converging to a steady state, the historical growth rates will exceed the future rates that will apply once the steady state has been achieved.

Convergence also helps explain why long-run growth rates for a particular country are remarkably constant. To illustrate, **Figure 1** plots the log of real per capita GDP in the United States from 1802 through 2008. The long-run average growth rate of 1.8 percent is also shown. Over this period, even the largest downturns (associated with the U.S. Civil War and the Great Depression) appear only as temporary dips in a remarkably smooth progression. That smooth progression is attributable in part to the fact that accelerations in economic growth, associated with capital accumulation, followed the dips, which were tied to a drop in the capital stock below its steady state level.

With that background, **Table 1** presents Barro and Ursúa's (2008) update of Maddison's (2003) compilation of information on world economic growth from 1923 to 2006. The starting point in Table 1 is 1923, the first year for which Barro and Ursúa had data for all the countries in their sample. Extending the sample backward for those countries with longer time series available does not affect the essential nature of the findings. Table 1 also reports growth rates for a shorter sample period (beginning in 1960) to take into account the possibility of nonstationarity in the data.

Figure 1. Logarithm of Real per Capita GDP, 1802–2008

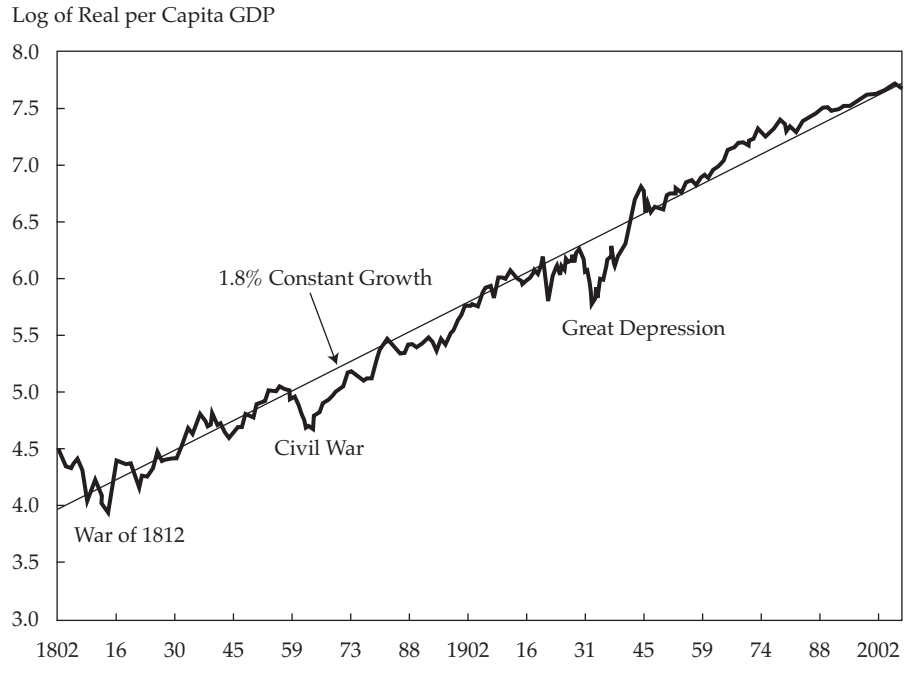


Table 1. Real Growth Rates in per Capita GDP, 1923–2006

Country	1923–2006	1960–2006
A. Mature Economies		
Australia	1.85%	2.16%
Austria	2.53	2.76
Belgium	2.11	2.62
Canada	2.22	2.27
Denmark	1.97	2.11
France	2.28	2.51
Germany	2.41	2.23
Italy	2.57	2.98
Japan	3.11	3.86
Netherlands	2.01	2.35
Spain	2.30	3.42
Sweden	2.50	2.25
Switzerland	1.63	1.51
United Kingdom	1.95	2.15
United States	1.42	1.14
Average	2.19%	2.42%
B. Developing and More Recently Developed Economies		
Argentina	1.10%	1.16%
Brazil	2.68	2.34
Chile	1.95	2.47
Colombia	2.18	2.24
Egypt	1.45	3.09
Finland	2.91	2.92
Greece	2.77	3.23
Iceland	3.24	2.87
India	1.74	2.88
Indonesia	1.81	3.08
S. Korea	3.55	5.72
Malaysia	1.91	2.14
Mexico	2.70	4.16
New Zealand	1.51	1.36
Norway	2.86	3.01
Peru	1.44	0.97
Philippines	1.32	1.46
Portugal	2.75	3.43
S. Africa	1.53	1.01
Singapore	3.33	5.72
Sri Lanka	1.93	3.06
Taiwan	3.78	6.24
Turkey	2.75	2.40
Uruguay	2.19	2.24
Venezuela	2.54	0.45
Average	2.32%	2.79%

Source: Barro and Ursúa (2008).

The results are reported in terms of compound growth rates. The following example illustrates why using compound growth rates is preferable to using averages of annual growth rates. Suppose that the ratio of corporate profits to GDP is stationary but not constant. In particular, assume (as the data will later show) that corporate profits are more variable than GDP. In that case, even though the compound growth rates of the two variables must converge in the long run, the arithmetic mean of annual growth rates for corporate profits will exceed that for GDP because of the variance effect.[3] The higher mean growth rate in earnings is illusory, however, because it fails to take into account the mean reversion in earnings growth that must occur for the ratio to be stationary.

The results reported in Table 1 are divided into two groups. The first group comprises mature economies that were already developed before World War II. These countries, which account for virtually the entire global stock market capitalization, are the focus of this study. The second group consists of economies that were developed more recently or are still considered developing. Results for the second group are presented for completeness and to provide perspective on the impact of convergence.

Consistent with the hypothesis that a common rate of technological advance is driving growth in all the developed countries, the results for the first group are remarkably homogeneous. Virtually all the growth rates for the full sample are close to the average of 2.19 percent. The exceptions are the United States, on the low end, and Japan, on the high end. The former's rate of 1.42 percent reflects the fact that the United States was the closest to steady state growth in 1923, after emerging from World War I relatively unscathed. The higher growth rate for Japan reflects convergence. At the start of the sample period, Japan was a relatively undeveloped country whose capital stock was below the steady state level. Convergence is also evident in the shorter sample period, beginning in 1960. The European countries and Japan, whose capital stocks were damaged in World War II, grew more rapidly than the United States, Switzerland, and Australia, all of which avoided war-related domestic destruction.

The results for the second group are more heterogeneous, reflecting the fact that growth in some countries (e.g., Peru and Venezuela) has stalled for reasons not fully understood whereas others (e.g., South Korea and Taiwan) have experienced rapid convergence. Despite the heterogeneity, however, the average growth rates of 2.32 percent for the sample period beginning in 1923 and 2.79 percent for the sample period beginning in 1960 are close to the averages for the first group of countries.

The averages reported in Table 1 are simple averages. If the growth rates for the first group of countries are weighted by market capitalization,

the average falls to about 2 percent in both periods because of the predominant role of the United States. Giving the United States a higher weight is reasonable not only because of its large market capitalization but also because its economy is closest to steady state growth. Given the long period of time since World War II, to assume that all the countries in the first group will eventually converge to steady state growth is reasonable. Therefore, they are more likely to grow at rates comparable to the U.S. historical rate than at their own historical rates. This likelihood suggests that 2 percent real per capita growth, which exceeds the recent U.S. growth rate by 0.5 percent, is the most that investors can reasonably expect in the long run. Furthermore, although growth could be stalled by a catastrophe, such as another world war, the speed of technological innovation has proved almost impossible to accelerate meaningfully. In the remainder of this article, therefore, I will use 2 percent as the estimate of future per capita GDP growth. This number should be thought of as an achievable, but not necessarily expected, outcome.

In addition to the possibility of a catastrophe are two other reasons why 2 percent may prove to be an optimistic growth forecast. First, national income accounting does not deduct costs associated with pollution and environmental degradation in the calculation of GDP. Although these costs have been a tiny fraction of GDP in the past, concern that they are growing rapidly is widespread. If that concern is justified, properly accounting for these costs will reduce the future growth rate of per capita GDP. Second, whether the historical rate of technological innovation is sustainable is far from clear. Weil (2009, p. 260) noted that the rate of growth of real per capita GDP attributable to technological progress remained largely constant from 1950 to 2005, but over the same period, the number of researchers in the G–20 countries grew from 251,000 to 2.6 million. This finding suggests a declining marginal product of research as making and applying new discoveries become more difficult. If this trend continues, it could lead to falling rates of growth in per capita GDP.

Population Growth

Business opportunities depend on total economic activity, not per capita output. To see why, consider a hypothetical example of an economy for which technological innovation—and thus productivity growth—is zero but which is experiencing 5 percent population growth. Companies that provide goods and services in this economy will, on average, experience 5 percent growth in real revenues. Assuming that their margins remain constant, this rate translates into 5 percent growth in real earnings. Of course, in a dynamic economy, existing companies could lose business to start-ups, which could result in dilution for existing investors (which is a separate issue addressed later in the article). For companies in the aggregate, real earnings should be tied to real GDP, as data presented later in the article reveal to be the case.

Converting per capita growth to aggregate growth requires an estimate of population growth. Fortunately, population growth rates change even more slowly and are more predictable than growth rates of real per capita GDP.

Data on population growth for the sample countries are reported in **Table 2**. The first column presents historical growth rates from 2000 to 2007 taken from the U.S. Central Intelligence Agency's *2008 World Fact Book*. The second column presents United Nations (2007) forecasts of population growth rates from 2005 to 2010. That the two columns are very similar reflects the slowly changing nature of population growth.

The data in Table 2 are consistent with the widely documented fact that population growth is negatively correlated with per capita GDP.[4] The average population growth rate for the first group of countries is less than half that for the second group. Even for the second group, however, both the average historical growth rate and the average projected growth rate are less than 1 percent. Presumably, as per capita GDP continues to rise, these growth rates will continue to decline.

On the basis of the data presented in Table 2, population growth can be expected to add no more than 1 percent to the growth rate in per capita GDP. In fact, an assumption of a zero long-run future growth rate for the developed countries would not be unreasonable. Given real per capita growth of 2 percent, this assumption implies that investors cannot reasonably expect long-run future growth in real GDP to exceed 3 percent.

Earnings and GDP

The fundamental source of value for equity investors is earnings, not GDP. That long-run real GDP growth is reasonably bounded at 3 percent does not necessarily mean that the same is true of earnings, which depends on whether the ratio of earnings to GDP (E/GDP) is stationary. To test that hypothesis requires data on aggregate earnings.

Two primary measures of aggregate earnings are used in the United States. The first measure is derived from the national income and product accounts (NIPAs), produced by the U.S. Department

Table 2. Historical and Projected Population Growth Rates, 2000–2010

	Historical	Projected
Country	2000–2007	2005–2010
A. Mature Economies		
Australia	1.22%	1.01%
Austria	0.06	0.36
Belgium	0.11	0.24
Canada	0.83	0.90
Denmark	0.30	0.90
France	0.57	0.49
Germany	–0.04	–0.07
Italy	0.00	0.13
Japan	–0.14	–0.02
Netherlands	0.44	0.21
Spain	0.10	0.77
Sweden	0.16	0.45
Switzerland	0.33	0.38
United Kingdom	0.28	0.42
United States	0.88	0.97
Average	0.34%	0.48%
B. Developing and More Recently Developed Economies		
Argentina	1.07%	1.00%
Brazil	1.23	1.26
Chile	0.91	1.00
Colombia	1.41	1.27
Egypt	1.68	1.76
Finland	0.11	0.29
Greece	0.15	0.21
Iceland	0.78	0.84
India	1.58	1.46
Indonesia	0.18	1.16
S. Korea	0.27	0.33
Malaysia	1.74	1.69
Mexico	1.14	1.12
New Zealand	0.97	0.90
Norway	0.35	0.62
Peru	1.26	1.15
Philippines	1.99	1.72
Portugal	0.31	0.37
S. Africa	0.83	0.55
Singapore	1.14	1.19
Sri Lanka	0.94	0.47
Taiwan	0.24	0.36
Turkey	1.01	1.26
Uruguay	0.49	0.29
Venezuela	1.50	1.67
Average	0.94%	0.96%

Sources: Central Intelligence Agency (2008) and the United Nations (2007).

of Commerce's Bureau of Economic Analysis. The NIPAs contain an estimate of aggregate corporate profits that is based on data collected from corporate income tax returns. The second measure of aggregate earnings is derived by Standard & Poor's from data collected from corporate financial reports. Because the two measures are not identical, distinguishing what is included in each measure before using the data is important.

The NIPA profit measure is designed to provide a time series of the income earned from the current production of all U.S. corporations. The sample is not limited to publicly traded companies. The tax rules on which the NIPAs are based are designed to expedite the timely and uniform completion of corporate tax returns. For that reason, all corporations use a highly uniform set of rules for tax accounting.

Because the NIPAs are designed to measure economic activity connected with current production, the NIPA definition of corporate profits includes only receipts arising from current production less associated expenses. The NIPA definition, therefore, excludes transactions that reflect the acquisition or sale of assets or liabilities. Dividend receipts from domestic corporations are excluded to avoid a double counting of profits. For the same reason, bad-debt expenses and capital losses are also excluded.

The Standard & Poor's estimate of aggregate earnings is derived from reported financial statements. Rather than being based on a unified set of tax rules, financial accounting is based on GAAP, which is designed to allow management to tailor financial statements so as to reveal information that is useful to a particular company. Furthermore, financial accounting provides for depreciation and amortization schedules that allow companies to attempt to match expenses with the associated stream of income.

The aggregate earnings data available from Standard & Poor's are for the companies in the S&P 500 Index. Each year's data consist of the aggregate GAAP after-tax earnings for the 500 companies in the S&P 500 for that year. Thus, the sample of companies in the aggregate is constantly changing as the index is updated. Because the S&P 500 earnings reflect a shifting sample of corporations, the series of reported earnings can be discontinuous over time. Fortunately, given the size of the index, these discontinuities are small and have little impact on estimated earnings growth.

The differences between financial and tax accounting create two dissimilarities between the measures of earnings for the same company.[5] First,

intertemporal differences arise because of the timing of revenue, and expense recognition often differs between the two systems. The best example is depreciation because tax rules generally allow for more rapid depreciation than companies choose to report under GAAP. Second, permanent differences exist because the revenues and expenses recognized under the two systems are not the same. Although important in the short run, these differences tend to cancel out over long horizons, and thus, the long-run growth rates in the two measures are similar. For example, the average growth rate in NIPA real corporate profits from 1947 to 2008 was 3.23 percent, as compared with a growth rate of 3.17 percent in S&P 500 real aggregate earnings.

As an aid in examining the behavior of E/GDP, **Figure 2** plots after-tax corporate profits from the NIPAs as a fraction of GDP for 1947–2008. The figure reveals no overall trend. The fraction is approximately the same at the end as at the beginning, and thus, the growth rate of corporate profits is almost identical to that of GDP. The same is largely true of S&P 500 aggregate earnings as a fraction of GDP, which is plotted in **Figure 3** (normalized to start at 8.23 percent to facilitate comparison with Figure 2). The fraction for the S&P 500 earnings is smaller because the S&P 500 measure is less comprehensive than the NIPA measure. Unlike the NIPA data, the S&P 500 ratio exhibits a slight downward trend, reflecting the fact that as the economy has grown, the S&P 500 companies have become a progressively smaller fraction of total earnings. Therefore, the data are generally consistent with the hypothesis that over the long run, aggregate earnings are a stationary fraction of GDP. Certainly, no evidence exists of a persistent increase in the ratio, no matter which measure of earnings is chosen. This observation implies that the long-run growth rates of GDP place a limit on the long-run growth rates of earnings.

Although the data largely support the hypothesis that E/GDP is stationary, it is far from constant. Figure 2 shows that corporate profits vary between 3 percent and 11 percent of GDP. The variability of the ratio for S&P 500 earnings is even greater. This variability suggests that when earnings are low relative to GDP, they grow more quickly; the reverse is true when earnings are relatively high. This mean reversion in the growth rate of earnings maintains the stationarity of E/GDP.

Note that in an efficient market, the mean reversion in earnings growth would have no impact on stock returns because it would be impounded into current prices. Campbell and Shiller (1998), however, provided evidence that long-run average earnings are, in fact, predictive of future stock returns. Specifically, when the ratio of price to average earnings over the previous 10 years is high, future stock returns tend to be low; the reverse is true when the ratio is low. This finding suggests that the market does not fully account for the mean-reverting nature of long-run earnings growth.

Figure 2. Corporate Profits as a Percentage of GDP, 1947–2008

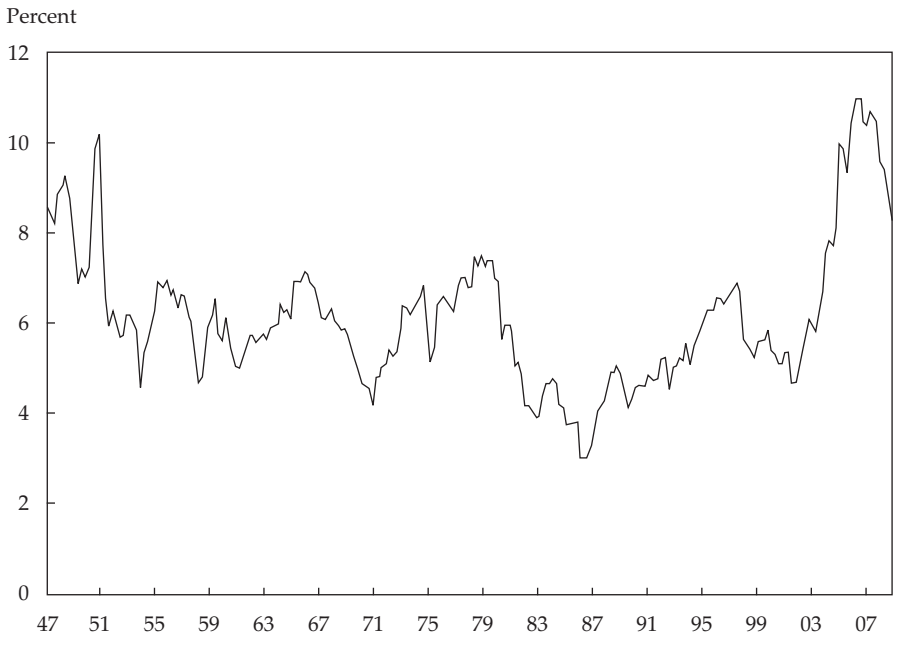
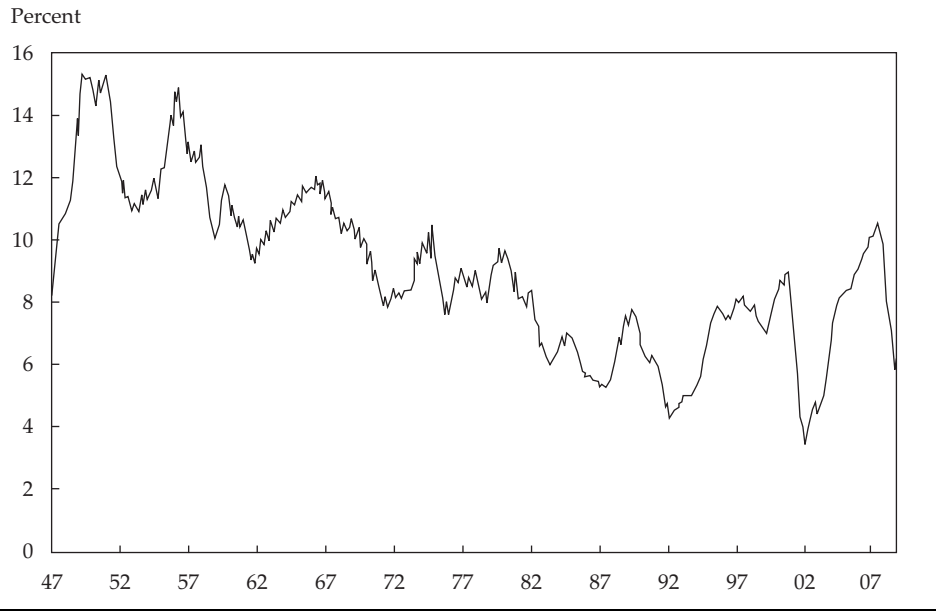


Figure 3. S&P 500 Earnings as a Percentage of GDP, 1947–2008



That the ratio of aggregate earnings to GDP is stationary implies that investors can expect aggregate real earnings growth to match, but not exceed, real GDP growth in the long run. Unfortunately, the same is not true of the earnings to which current investors have a claim. Two reasons explain this discrepancy. First, an investor's pro rata portion of a company's earnings will be affected by the company's share issuances and repurchases. If this dilution (or accretion) is ongoing, growth in aggregate earnings and earnings per share will diverge. Second and more important, current investors do not participate in the earnings of new businesses unless they dilute their current holdings to purchase shares in start-ups. Therefore, start-ups drive a wedge between the growth in aggregate earnings and the growth in the earnings to which current investors have a claim.

To illustrate the second effect, consider a simple example in which all companies in the economy are identical and earn $10 a share per period. Furthermore, assume that each company has a market value of $100 a share and has 1,000 shares outstanding. All earnings are paid out, so the values of the companies remain constant. Finally, assume that at the outset only two companies are in the economy, so aggregate earnings are $20,000. A current investor who holds 1 percent of each company has a pro rata share of aggregate earnings of $200. Now assume that the economy grows and a third company is started. As a result, aggregate earnings rise to $30,000, but the current investor does not participate in that growth and thus still holds 1 percent of the first two companies with rights to earnings of $200. If the current investor wanted to add the third company to the portfolio without investing new cash, the investor would have to dilute the portfolio's holdings in the first two companies. After the dilution, the investor would hold 0.67 percent of each of the three companies and would thus still have rights to earnings of $200. Therefore, the growth in earnings experienced by the current investor does not match the growth in aggregate earnings.

Bernstein and Arnott (2003) suggested an ingenious procedure for estimating the combined impact of both effects on the rate of growth of earnings to which current investors have a claim. They noted that total dilution on a marketwide basis can be measured by the ratio of the proportionate increase in market capitalization to the value-weighted proportionate increase in stock price. More precisely, net dilution for each period is given by the equation

$$\text{Net dilution} = \frac{1+c}{1+k} - 1, \tag{1}$$

where c is the percentage capitalization increase and k is the percentage increase in the value-weighted price index. Note that this dilution measure holds exactly only for the aggregate market portfolio. For narrower indices, the measure can be artificially affected if securities are added to or deleted from the index.

To account for the impact of dilution, the Bernstein–Arnott measure was estimated by using monthly data for the entire universe of CRSP stocks from 1926 to 2008. Using CRSP data for this purpose presents one problem. The CRSP universe was expanded twice during the sample period: in

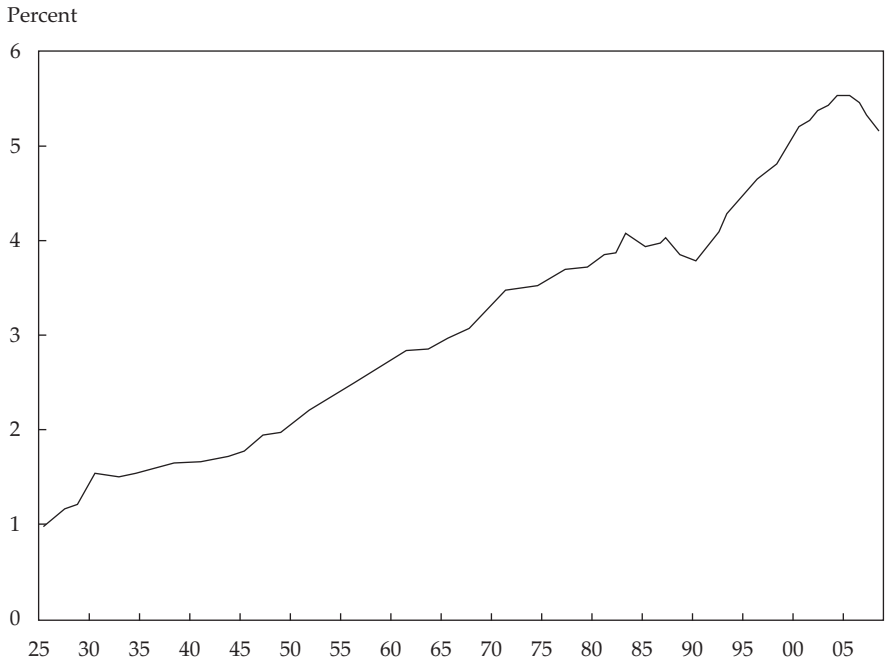
July 1962, when Amex stocks were added, and in July 1972, when NASDAQ stocks were added. Both these additions caused a significant increase in market capitalization unaccompanied by a corresponding increase in the value-weighted price. To eliminate the impact of these artificial discontinuities, I set the estimate of net dilution at zero for both July 1962 and July 1972.

Figure 4 plots the compounded estimate of net dilution from 1926 to 2008. It rises continuously except for downturns in the early 1990s and in 2006–2008. The average rate of dilution over the entire period is 2 percent. The primary source of dilution is the net creation of new shares as new companies capitalize their businesses with equity. The impact of start-ups is not surprising in light of the fact that more than half of U.S. economic growth comes from new enterprises, not from the growth of established businesses. Given the continuing importance of start-ups, the rate of dilution is highly unlikely to subside unless the rate of innovation slows. If the rate of innovation slows, however, GDP growth will also decline. Consequently, to conclude that the rate of growth of earnings, net of dilution, will remain largely constant is reasonable. Therefore, to estimate the growth rate of earnings to which current investors have a claim, approximately 2 percent must be deducted from the growth rate of aggregate earnings.

Putting the pieces together, we can see that growth theory predicts that current investors should count on long-run growth in real earnings of no more than 1 percent. This rate equals real growth of 3 percent in aggregate earnings, adjusted downward by 2 percent to account for dilution.

Arnott and Bernstein (2002) and Bernstein and Arnott (2003, p. 49) observed that "earnings and dividends grow at a pace very similar to that of per capita GDP." This observation correctly summarizes U.S. economic history, but it may not be true for other countries and it may not hold for the United States in the future. In terms of my analysis, the reason that earnings and dividends mirror per capita GDP is that population growth and dilution have both been about 2 percent between 1870 and 2008. Consequently, these two terms cancel each other out when we move from estimated growth in real per capita GDP to estimated growth in real earnings per share. But there is no theoretical reason why this cancellation should necessarily occur. For instance, population growth in Western Europe has fallen essentially to zero. If the United States were to follow suit but dilution were to continue at about 2 percent a year, growth in real earnings would be 2 percentage points *less* than growth in per capita GDP. In short, the Arnott–Bernstein observation is a shortcut that has historically held in the United States but is not a necessary condition. Therefore, a more complete analysis that takes into

Figure 4. The Impact of Dilution on Investor Earnings, 1926–2008



account both population growth and dilution is generally preferable. I do not present that analysis here because of limitations on dilution data for countries other than the United States.

Implications of Economic Growth Theory for Expected Stock Returns

The story thus far is that economic growth places a limit on the long-run growth of real earnings per share available to investors. On the basis of the data I have analyzed here, that limit is what many investors might consider a relatively anemic 1 percent. The next step is to explore the implications of that limitation for future returns on common stocks.

By definition, the rate of return on stock in period t is given by

$$R_t = \frac{D_t}{P_{t-1}} + GP_t, \tag{2}$$

where D_t is the dividend for year t, P_{t-1} is the price at the end of year $t-1$, and $GP_t = (P_t - P_{t-1})/P_{t-1}$. Following Fama and French (2002), we can write Equation 2 in terms of long-run average values, denoted by A(), as

$$A(R_t) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GP_t). \tag{3}$$

Equation 3 states that the long-run average return equals the average dividend yield plus the average capital gain.

Equation 3 holds *ex ante* as well as *ex post*. It implies that the long-run future average return equals the future average dividend yield plus the future average capital gain. Assuming that the earnings-to-price ratio is stationary, the long-run average earnings growth rate, $A(GE_t)$, can be substituted for the average capital gain rate, giving

$$A(R_t) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GE_t). \tag{4}$$

My preceding analysis implies that $A(GE_t)$ in Equation 4 should be no more than about 1 percent in the future. In addition, as of December 2008, the current dividend yield was 3.1 percent and the previous 50-year average was 3.3 percent. Because the two are nearly equal, substituting either into Equation 4 as a proxy for the future average yield suggests that investors should not expect long-run real returns on common stocks to go much beyond 4 percent. Note that this calculation does not need to be adjusted for repurchases because the impact of repurchases is already accounted for in the dilution calculation. An adjustment is required only if future repurchases are expected to exceed their past average.

Equation 4 can also be used to approximate the equity risk premium. Because the real return on short-term government securities has averaged about 1 percent over the last 80 years, Equation 4 implies that the equity risk premium measured with respect to short-term government securities is approximately equal to the expected average dividend yield. Using either the current yield or the past average yield translates this number into a long-run average equity risk premium of just more than 3 percent. If the premium is measured with respect to longer-maturity government securities with greater expected real returns, the equity premium is commensurately less. This result is markedly less than the average historical risk premium measured over the 1926–2008 period that is commonly referenced. It is consistent, however, with a long-running body of empirical work that shows the *ex ante* risk premium to be significantly smaller than the historical average.[6]

Thus far, all the results have been stated in terms of compound growth rates. For many purposes, however, the object of interest is the annual expected return. For example, discounted-cash-flow valuations typically require annual estimates of the discount rate. To convert compound growth rates, which are geometric averages, into arithmetic averages requires taking the variance effect into account. This step can be well approximated by adding one-half of the annual variance of returns to the compound growth rate.

Because earnings are volatile, the variance effect adds about 1 percent to the compound growth rates. This result means that growth theory predicts that future annual real returns on common stocks should average no more than about 5 percent and that the annual equity risk premium for short-term government securities is about 4 percent.

Using annual data, we can tie the growth theory analysis to the long-run performance of company investments. If a company retains a fraction, b, of its earnings and invests those funds at a real rate of return, k, then basic finance theory teaches that the earnings per share will grow at the rate $(b)(k)$. Growth theory predicts that the annual long-run average growth in real earnings per share is about 2 percent, taking into account both dilution and the variance effect. From 1960 to 2008, companies in the S&P 500 retained, on average, 54 percent of their earnings. Solving for k, this retention ratio implies a real return on corporate investments of about 4 percent.

One possible adjustment might be made to the foregoing results. Recall that the dilution calculation was based on the assumption of a stable repurchase rate throughout the sample period. In fact,

repurchases accelerated following the passage, in 1982, of U.S. SEC Rule 10b-18, which greatly reduced the legal risk associated with repurchases. More specifically, a pronounced trend toward repurchases as the preferred form of marginal payout to shareholders took place. Brav, Graham, Harvey, and Michaely (2005) reported that following the SEC ruling, managers began behaving as if a significant capital market penalty were associated with cutting dividends but not with reducing repurchases. Accordingly, dividends are set conservatively and repurchases are used to absorb variations in total payout. To the extent that this reliance on repurchases is expected to continue, the estimated 2 percent dilution effect might be too large and growth rates would have to be adjusted upward. Most of the 2 percent dilution, however, is associated not with the actions of existing companies but with start-ups that finance their businesses with new equity. Therefore, the adjustment in the overall rate of future dilution should not be large.

International Considerations

Thus far, I have limited my analysis to the United States. This restriction is an obvious shortcoming because most major corporations are becoming increasingly global. Although a detailed examination of international data is beyond the scope of this article, several general conclusions can be drawn. First, the data presented in Table 2 suggest that real per capita GDP growth rates for the other developed countries should be comparable to the U.S. growth rate in the future. Second, for the other developed countries, population growth rates are forecasted to be lower. As a result, the implied limitations on earnings growth remain largely unchanged and are perhaps even lower when other developed countries are included in the sample. Third, with respect to the developing countries—particularly India and China, which are the most important by virtue of their size—convergence predicts that they will experience higher growth rates in real per capita GDP than the United States. In addition, most developing countries are forecasted to have comparable or higher population growth rates than the United States. These forecasts suggest that companies doing business in the developing world will experience higher rates of earnings growth than they achieve in the developed world. Nonetheless, as those countries develop, both real GDP and population growth rates should decline. Furthermore, the fraction of total earnings attributable to business in the developing world is relatively small for most companies. Therefore, if a complete analysis were done on a global basis, the earnings bounds derived from U.S. data and the related predictions regarding stock returns would be unlikely to be markedly affected.

Conclusion

The long-run performance of equity investments is fundamentally linked to growth in earnings. Earnings growth, in turn, depends on growth in real GDP. This article demonstrates that both theoretical research and empirical research in development economics suggest relatively strict limits on future growth. In particular, real GDP growth in excess of 3 percent in the long run is highly unlikely in the developed world. In light of ongoing dilution in earnings per share, this finding implies that investors should anticipate real returns on U.S. common stocks to average no more than about 4–5 percent in real terms. Although more work needs to be done before equally definitive predictions can be made with respect to international equities, the basic outlook appears to be quite similar.

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This article qualifies for 1 CE credit.

Notes

1. For details on the Solow model and more recent elaborations, see Barro and Sala-i-Martin (2004).
2. Hall and Jones (1999) described the problem in detail and offered an intriguing solution.
3. As a first-order approximation, the annual arithmetic mean equals the compound growth rate plus one-half the standard deviation of the annual growth rates.
4. See, for example, Weil (2009, ch. 4).
5. For further details on the relationship between reported earnings and NIPA profits, see Mead, Moulton, and Petrick (2004).
6. Contributions in this area include those of Rozeff (1984); Ross, Brown, and Goetzmann (1995); Claus and Thomas (2001); Fama and French (2002); and Cornell and Moroz (forthcoming).

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