ECONOMIC ASSUMPTIONS AND INTERACTIONS WITH THE BUDGET

2. ECONOMIC ASSUMPTIONS AND INTERACTIONS WITH THE BUDGET

This chapter presents the economic assumptions that underlie the Administration's Fiscal Year 2018 Budget.[1] It describes the recent performance of the U.S. economy, explains the Administration's projections for key macroeconomic variables, compares them with forecasts prepared by other prominent institutions and discusses the uncertainty inherent in producing an eleven-year forecast.

After contracting by more than 4 percent over 2007 to 2009, the United States economy has experienced stable but only relatively modest growth, especially when compared with past recoveries. From the trough in the second quarter of 2009, it took about two years for the economy to recover its previous output peak, much longer than in the other recoveries since World War II. Over the first three years of recoveries from previous postwar recessions, average output growth was a little over 5 percent annually. In the first three years following the most recent recession, average annual growth was only about 2.3 percent.

The disappointing recovery is motivating this Administration's aggressive economic strategy, which entails policies aimed at reforming the tax code and the regulatory framework. In addition, the Administration will introduce policies to encourage domestic energy development and investments in infrastructure, reform the health care system, negotiate more attractive trade agreements, and reduce (and eventually eliminate) Federal budget deficits. Such actions should encourage investment by American firms, stimulate productivity growth, and slow the expected decline in the labor force participation rate, leading to stronger growth in output and putting more Americans to work.

This chapter proceeds as follows:

- The first section reviews the performance of the U.S. economy since the publication of the 2017 Budget, examining a broad array of economic outcomes.
- The second section provides a detailed exposition of the Administration's economic forecast for the 2018 Budget, discussing how a number of macroeconomic variables are expected to evolve over the years 2017 to 2027.
- The third section compares the forecast of the Administration with those prepared by the Congressional Budget Office, the Federal Open Market Committee of the Federal Reserve, and the Blue Chip panel of private sector forecasters.
- The fourth section discusses the sensitivity of the Administration's projections of Federal receipts and outlays to fluctuations in the main macroeconomic variables discussed in the forecast.
- The fifth section considers the errors and possible biases[2] in past Administration forecasts, comparing them with the errors in forecasts produced by the Congressional Budget Office and the Blue Chip panel.
- The sixth section combines results on the sensitivity of the budget deficit to economic assumptions with information on past accuracy of Administration forecasts to provide a sense of the uncertainty associated with the Administration's forecast of the budget balance.

Recent Economic Performance[3]

The U.S. economy continued to exhibit subdued growth throughout 2016. In the fourth quarter of 2016, real Gross Domestic Product (GDP) was 2.0 percent higher than it had been in the fourth quarter of the preceding year. This came on the heels of real GDP growing at a 1.9 percent rate over the four quarters of 2015, and an average growth rate of 2.1 percent (fourth quarter-on-fourth quarter) since 2010. Among the demand components of GDP, real consumer spending accounted for most of the growth in 2016, with consumption of nondurables and services contributing 1.5 percentage points and consumption of durable goods contributing a further 0.7 percentage point, on a fourth quarter-over-fourth quarter basis. Gross private domestic investment and government consumption and gross investment made only minor positive contributions to growth, while net exports had a negative impact. On the supply side, weak productivity growth limited overall growth during 2016, as it has over the past several years. Over the four quarters of 2016, real output per hour in the nonfarm business sector grew by only 1.1 percent, well below the long run average of 2.1 percent during the post-World War II period.

Labor Markets—Labor markets improved in 2016 across a broad array of metrics. The unemployment rate continued to decline, falling from 5.0 percent at the end of 2015 to 4.7 percent at the end of 2016, and further to 4.4 percent in April of 2017, below the long-term average of 5.8 percent. During the first three months of 2017, the labor force participation rate averaged 63.0 percent, up from 62.7 percent in 2015 and and 62.8 percent in 2016. Although the participation rate has stabilized somewhat

[1] Economic performance is discussed in terms of calendar years. Budget figures are discussed in terms of fiscal years.

[2] As discussed later in this chapter, "bias" here is defined in the statistical sense and refers to whether previous Administrations' forecasts have tended to make positive or negative forecast errors on average.

[3] The statistics in this section are based on information available in early May 2017.

following a steep decline since 2000, it is expected to fall further as the baby boom generation continues retiring in large numbers. The proportion of the labor force employed part-time for economic reasons has fallen to 3.3 percent in April 2017, well below its peak of over 6.0 percent during the Great Recession. Furthermore, the proportion of the labor force unemployed for longer than 27 weeks has fallen to 1.0 percent from a peak of nearly 4.4 percent.

In spite of these improvements, several metrics suggest that the economy has not regained the ground it had lost. Compared with the last business cycle peak at the end of 2007, the proportion of the labor force working part-time for economic reasons and the proportion unemployed for more than 27 weeks are still elevated, as are the shares of the working-age population only marginally attached to the labor force or too discouraged to look for work. The labor force participation rate among men aged 20 years old or older has fallen faster than that of the population as a whole, and the same is true of those who have only a high school diploma. Real average hourly wages for production and nonsupervisory workers have grown more slowly than real output since the end of 2007. At the end of 2016, the employment-to-population ratio for Americans aged between 25 and 34 years old was still a full percentage point below where it was at the start of the Great Recession. Even among workers older than 25 with a bachelor's degree or higher, the unemployment rate has stopped falling and remains above the rates seen before the recession started.

Housing—The housing market continued to bolster the broader economy in 2016. House prices, as measured by the Federal Housing Finance Agency's (FHFA) purchase-only index, were 6.2 percent higher in December 2016 than in December 2015, while the S&P-Case Shiller price index (another closely watched measure) estimated the appreciation at 5.5 percent. Higher house prices help fortify household balance sheets and support personal consumption expenditures. They also encourage further activity in the housing sector. Residential fixed investment increased 1.1 percent over the four quarters of 2016. The number of housing starts rose from an annual rate of less than 1.2 million in December 2015 to nearly 1.3 million in December 2016, or a 9.9 percent increase. Building permits increased 2.2 percent over the same period.

Some weakness still remains in the housing market, however. As of February, while the FHFA index was about 8.0 percent higher than its pre-crisis peak, the S&P-Case Shiller index had only barely regained its previous apex. Homeownership rates have steadily declined since the recession began and were near an all-time low at the end of 2016.

Consumption—Consumer spending was a primary driver of growth in 2016, and at close to 70 percent of the economy, it is essential to overall growth. Consumption growth was spread over a number of different categories, including motor vehicles and parts (8.6 percent over the four quarters of 2016), furnishings and household equipment (6.1 percent), recreational goods and vehicles (11.3 percent), food and beverages (4.9 percent), and medical care (4.7 percent).

Investment—Disappointingly, growth in nonresidential fixed investment was negative in 2016. A 3.8 percent decline in spending on equipment over the four quarters of 2016 offset a modest (1.9 percent) increase in spending on structures and a more robust (4.3 percent) rise in intellectual property products. Growth in overall private investment (residential and nonresidential) has been below its postwar average in each of the last three years. Such weakness is likely to be problematic for future productivity growth.

Government—Overall demand from the government added modestly to GDP in 2016, with the State and local sector driving growth in this component. Government consumption and gross investment rose by 0.2 percent over the four quarters of 2016, with 0.4 percent growth coming from State and local governments. Federal purchases, in contrast, were negative. The Federal deficit edged up to 3.2 percent of GDP in fiscal year 2016, the first increase since the end of the Great Recession. While deficits might be expected to lead to higher interest rates and subsequent crowding out of private investment, the low interest rate environment that has obtained in recent years has mitigated this potentially negative force.

Monetary Policy—After holding nominal interest rates near zero for seven years, the Federal Open Market Committee of the Federal Reserve raised the target range for the federal funds rate by 25 basis points at the end of 2015. After a moderate pause, the Federal Reserve continued normalization of monetary policy, with a 25 basis point increase in December 2016 and another in March 2017. In its March policy statement, the FOMC cited "solid" job gains and expectations for continued strengthening of labor markets, as well as rates of inflation around the 2.0 percent target, as reasons for tightening policy. Similarly, the yield on the 10-year Treasury note has also increased recently, from an average of 1.6 percent in the third quarter of 2016 to an average of 2.4 percent during the first quarter of 2017.

Oil and Gas Production—After reaching a post-financial crisis peak above $100 per barrel, crude oil prices began to tumble in mid-2014. They continued to fall in 2015 and bottomed out around $30 in early 2016. Prices have since rebounded, rising above the $50 mark in late 2016. Higher oil prices act as a kind of tax on consumers' purchasing power, so their net decline from $100 per barrel in early 2014 to just above $50 per barrel recently has effectively raised disposable incomes, which has supported consumer spending. With new technology such as hydraulic fracturing, U.S. oil producers have emerged as important swing producers in global oil markets, helping to lower prices and moderate price fluctuations. Domestic production of crude oil averaged about 8.9 million barrels per day in 2016, up from 7.5 million barrels per day in 2013, although slightly down from 9.4 million barrels per day in 2015. The decline from 2015 reflects the decline in oil prices. Production of natural gas has experienced a qualitatively similar path, with production averaging about 72.3 billion cubic feet per day in 2016, down 2.5 percent from 2015 production levels, but still 9.1 percent higher than in 2013.

External Sector—Although real exports grew by 1.5 percent over the four quarters of 2016, real imports grew by an even faster 2.6 percent. As a result, net exports became slightly more negative in 2016, coming in at -$563.0 billion, compared with -$540.0 billion in 2015. Worldwide, 2016 was a weak year for economic growth. The growth rate of real GDP was below 2 percent in all of the other G-7 countries, according to International Monetary Fund (IMF) data.[4] Many large emerging market countries (with the exception of India) have experienced lower growth rates in recent years, while countries such as Brazil and Russia have gone through deep recessions. These developments, as well as a strengthening dollar, have contributed to the soft performance of U.S. exports. Looking ahead, it is possible that faster global growth and better trade agreements will help U.S. export performance to improve.

[4] The other G-7 countries are Canada, France, Germany, Italy, Japan, and the United Kingdom.

Economic Projections

The Administration's economic forecast is based on information available at the end of February 2017 and includes projections for a number of important macroeconomic variables. The forecast is used to inform the Fiscal Year 2018 Budget and rests on the central assumption that all of the President's policy proposals will be enacted.

Table 2–1. ECONOMIC ASSUMPTIONS[1]

(Calendar Years, Dollar Amounts In Billions)

	Actual		Projections										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Gross Domestic Product (GDP)													
Levels, Dollar Amounts in Billions:													
Current Dollars	18037	18566	19367	20237	21197	22253	23379	24563	25806	27111	28483	29924	31439
Real, Chained (2009) Dollars	16397	16660	17045	17458	17928	18452	19005	19576	20163	20768	21391	22033	22694
Chained Price Index (2009=100), Annual Average	110.0	111.4	113.6	115.9	118.2	120.6	123.0	125.5	128.0	130.5	133.1	135.8	138.5
Percent Change, Fourth Quarter over Fourth Quarter:													
Current Dollars	3.0	3.5	4.4	4.5	4.9	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Real, Chained (2009) Dollars	1.9	1.9	2.3	2.5	2.8	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Chained Price Index (2009=100)	1.1	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Percent Change, Year over Year:													
Current Dollars	3.7	2.9	4.3	4.5	4.7	5.0	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Real, Chained (2009) Dollars	2.6	1.6	2.3	2.4	2.7	2.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Chained Price Index (2009=100)	1.1	1.3	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Incomes, Billions of Current Dollars													
Domestic Corporate Profits	1702	1684	1806	1859	1928	1972	2033	2086	2154	2228	2311	2452	2581
Employee Compensation	9693	10102	10556	11037	11572	12171	12801	13466	14169	14909	15698	16497	17339
Wages and Salaries	7855	8189	8551	8950	9384	9880	10387	10922	11489	12085	12725	13371	14066
Other Taxable Income[(2)]	4290	4385	4587	4785	5025	5325	5669	5990	6314	6628	6938	7253	7545
Consumer Price Index (All Urban)[(3)]:													
Level (1982–1984 = 100), Annual Average	237.0	240.0	246.2	251.8	257.5	263.3	269.3	275.4	281.6	288.0	294.5	301.1	307.9
Percent Change, Fourth Quarter over Fourth Quarter	0.4	1.8	2.5	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Percent Change, Year over Year	0.1	1.3	2.6	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Unemployment Rate, Civilian, Percent													
Fourth Quarter Level	5.0	4.7	4.5	4.4	4.7	4.7	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Annual Average	5.3	4.9	4.6	4.4	4.6	4.7	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Federal Pay Raises, January, Percent													
Military[(4)]	1.0	1.3	2.1	1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
Civilian[(5)]	1.0	1.3	2.1	2.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Interest Rates, Percent													
91-Day Treasury Bills[(6)]	*	0.3	0.8	1.5	2.1	2.6	2.9	3.0	3.0	3.1	3.1	3.1	3.1
10-Year Treasury Notes	2.1	1.8	2.7	3.3	3.4	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8

[1] Based on information available as of end of Febuary 2017

[2] Rent, interest, dividend, and proprietors' income components of personal income

[3] Seasonally adjusted CPI for all urban consumers

[4] Percentages apply to basic pay only; percentages to be proposed for years after 2018 have not yet been determined.

[5] Overall average increase, including locality pay adjustments. Percentages to be proposed for years after 2018 have not yet been determined.

[6] Average rate, secondary market (bank discount basis)

* 0.05 percent or less

The Administration's projections are reported in Table 2-1 and summarized below.

Real GDP—In the near term, real GDP is expected to grow faster than in recent years, with a 2.3 percent growth rate in 2017 and a 2.5 percent rate in 2018, on a fourth quarter-over-fourth quarter basis. The Administration's policies for simplifying taxes, cutting regulation, building infrastructure, reforming health care, boosting domestic energy production and eliminating deficits are expected to improve the supply side of the U.S. economy to allow these growth rates. As for demand, lower taxes and an expected pick up in global growth in 2017 and 2018 should bolster demand for American goods and services.

Long-Run Growth—In the longer term, the rate of growth in GDP is expected to increase gradually to 3.0 percent by 2020, and the Administration expects it to remain at that pace for the duration of the forecast window. The Administration projects a permanently higher trend growth rate as a result of its productivity-enhancing policies, such as tax reform, infrastructure investments, reductions in regulation, and a greatly improved fiscal outlook. Expected GDP growth of 3.0 percent per year is slightly below the average growth rate seen in the post-World War II period.

Unemployment—As of April 2017, the unemployment rate stood at 4.4 percent. The Administration expects the unemployment rate to stay low over the next several years, with an annual average of 4.4 percent in 2018. After that, the forecast assumes that it will gradually rise back toward 4.8 percent, a rate roughly consistent with stable inflation. Theory suggests that when the unemployment rate is at this rate, pressures on inflation are broadly in balance, threatening neither excessive inflation nor deflation.

Interest Rates—As growth increases, the Administration expects that interest rates will begin to rise to values more consistent with historical experience. The rate on the 91-day Treasury bill is expected to increase gradually from 0.8 percent in 2017 to 3.1 percent in 2024. The interest rate on the 10-year Treasury note is expected to rise in a similar fashion, from 2.7 percent in 2017 to 3.8 percent in the long run. Economic theory suggests that real GDP growth rates and interest rates are positively correlated, so interest rates are likely to be propelled higher by the stronger growth that the Administration anticipates.

Inflation—Since the onset of the financial crisis, inflation, whether measured by the GDP price index, the Consumer Price Index (CPI), or the price index for Personal Consumption Expenditures (PCE), has been subdued compared with the post-World War II average. This observation holds even when looking at the "core" indexes that exclude volatile food and energy prices. The Administration expects CPI inflation to rise to 2.5

Table 2–2. COMPARISON OF ECONOMIC ASSUMPTIONS IN THE 2017 AND 2018 BUDGETS

(Calendar Years, Dollar Amounts In Billions)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Nominal GDP:											
2017 Budget Assumptions [1]	18780	19626	20466	21363	22287	23258	24272	25329	26428	27576	28773
2018 Budget Assumptions	18566	19367	20237	21197	22253	23379	24563	25806	27111	28483	29924
Real GDP (2009 Dollars):											
2017 Budget Assumptions [1]	16839	17273	17694	18108	18524	18950	19386	19832	20288	20754	21232
2018 Budget Assumptions	16660	17045	17458	17928	18452	19005	19576	20163	20768	21391	22033
Real GDP (Percent Change)[2]:											
2017 Budget Assumptions [1]	2.7	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
2018 Budget Assumptions	1.6	2.3	2.4	2.7	2.9	3.0	3.0	3.0	3.0	3.0	3.0
GDP Price Index (Percent Change)[2]:											
2017 Budget Assumptions [1]	1.6	1.8	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
2018 Budget Assumptions	1.3	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Consumer Price Index (All-Urban; Percent Change)[2]:											
2017 Budget Assumptions	1.5	2.1	2.1	2.3	2.2	2.3	2.3	2.3	2.3	2.3	2.3
2018 Budget Assumptions	1.3	2.6	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Civilian Unemployment Rate (Percent)[3]:											
2017 Budget Assumptions	4.7	4.5	4.6	4.6	4.7	4.7	4.8	4.9	4.9	4.9	4.9
2018 Budget Assumptions	4.9	4.6	4.4	4.6	4.7	4.8	4.8	4.8	4.8	4.8	4.8
91-Day Treasury Bill Rate (Percent)[3]:											
2017 Budget Assumptions	0.7	1.8	2.6	3.1	3.3	3.4	3.4	3.3	3.3	3.2	3.2
2018 Budget Assumptions	0.3	0.8	1.5	2.1	2.6	2.9	3.0	3.0	3.1	3.1	3.1
10-Year Treasury Note Rate (Percent)[3]:											
2017 Budget Assumptions	2.9	3.5	3.9	4.1	4.2	4.2	4.2	4.2	4.2	4.2	4.2
2018 Budget Assumptions	1.8	2.7	3.3	3.4	3.8	3.8	3.8	3.8	3.8	3.8	3.8

[1] Adjusted for July 2016 NIPA Revisions

[2] Calendar Year over Calendar Year

[3] Calendar Year Average

* 0.05 percent or less

percent in 2017 (on a fourth quarter-over-fourth quarter basis), before settling down to 2.3 percent in the long run. The GDP price index is forecast to rise to 2.0 percent in 2017 (on a fourth-quarter-over-fourth-quarter basis) and maintain that rate throughout the forecast window.

Changes in Economic Assumptions from Last Year's Budget—Table 2-2 compares the Administration's forecast for the 2018 Budget with that from the 2017 Budget, submitted by the previous Administration. The most notable difference is the upward revision to medium- and longer-term GDP growth. Compared with the previous forecast, the Administration expects much faster output growth, as a result of its policies designed to boost productivity and labor force participation. These include deregulation, tax reform, an improved fiscal outlook, inducements for infrastructure investment, and health care reform, which should boost investment and bolster the incentives to save. The Administration's expectations for inflation differ little from the previous forecast, except for the slight boost in CPI inflation in 2017 and 2018 due to higher demand. The forecast for the unemployment rate is also broadly similar, although the Administration's projections have the unemployment rate dropping to a trough of 4.4 percent, lower than was previously expected, and it has a slightly lower estimate of the unemployment rate at which inflation pressures are broadly balanced. On 91-day Treasury bills, the Budget's terminal rate is

Table 2–3. COMPARISON OF ECONOMIC ASSUMPTIONS

(Calendar Years)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Nominal GDP:												
2018 Budget	18566	19367	20237	21197	22253	23379	24563	25806	27111	28483	29924	31439
CBO	18563	19352	20114	20838	21565	22381	23261	24182	25143	26142	27181	28258
Blue Chip	18570	19336	20221	21099	21973	22883	23831	24843	25872	26943	28059	29222
Real GDP (Year-over-Year):												
2018 Budget	1.6	2.3	2.4	2.7	2.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0
CBO	1.6	2.3	2.0	1.7	1.5	1.8	1.9	1.9	1.9	1.9	1.9	1.9
Blue Chip	1.6	2.1	2.4	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0
Real GDP (Fourth Quarter-over-Fourth Quarter):												
2018 Budget	1.9	2.3	2.5	2.8	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
CBO	1.8	2.3	1.9	1.6	1.6	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Blue Chip	1.9	2.1	2.4	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.0
Federal Reserve Median Projection	1.9	2.1	2.1	1.9				1.8 longer run				
GDP Price Index [1]:												
2018 Budget	1.3	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
CBO	1.3	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	2.0
Blue Chip	1.3	2.0	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Consumer Price Index (CPI-U) [1]:												
2018 Budget	1.3	2.6	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
CBO	1.3	2.4	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Blue Chip	1.3	2.4	2.2	2.3	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.4
Unemployment Rate [2]:												
2018 Budget	4.9	4.6	4.4	4.6	4.7	4.8	4.8	4.8	4.8	4.8	4.8	4.8
CBO	4.9	4.6	4.4	4.5	4.9	5.0	5.0	5.0	4.9	4.9	4.9	4.9
Blue Chip	4.9	4.5	4.3	4.5	4.6	4.6	4.7	4.7	4.7	4.7	4.7	4.7
Federal Reserve Median Projection [3]	4.9	4.5	4.5	4.5				4.7 longer run				
Interest Rates [2]:												
91-Day Treasury Bills (discount basis):												
2018 Budget	0.3	0.8	1.5	2.1	2.6	2.9	3.0	3.0	3.1	3.1	3.1	3.1
CBO	0.3	0.7	1.1	1.7	2.3	2.7	2.8	2.8	2.8	2.8	2.8	2.8
Blue Chip	0.3	1.0	1.8	2.4	2.7	2.8	2.8	2.8	2.9	2.9	2.9	2.9
10-Year Treasury Notes												
2018 Budget	1.8	2.7	3.3	3.4	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
CBO	1.8	2.3	2.5	2.8	3.1	3.4	3.5	3.6	3.6	3.6	3.6	3.6
Blue Chip	1.8	2.6	3.1	3.6	3.7	3.8	3.8	3.8	3.9	3.9	3.9	3.9

Sources: Administration; CBO, The Budget and Economic Outlook: 2017 to 2027, January 2017; March 2017 and May 2017 Blue Chip Economic Indicators, Aspen Publishers, Inc.; Federal Reserve Open Market Committee, March 15, 2017

[1] Year-over-Year Percent Change

[2] Annual Averages, Percent

[3] Median of Fourth Quarter Values

just slightly below that of the 2017 Budget. The yield on the 10-year Treasury note is lower at all points of the forecast horizon relative to the 2017 Budget. This decline is largely driven by the secular trend towards lower interest rates observed in the data. If the Administration's growth forecast had been lower, the interest rate on 10-year Treasuries would be lower still.

Comparison with Other Forecasts

For some additional perspective on the Administration's forecast, this section compares it with others prepared by the Congressional Budget Office (CBO), the Federal Open Market Committee of the Federal Reserve (FOMC), and the Blue Chip panel of private sector forecasters. There are some important differences to bear in mind when making such a comparison.

The most important difference between these forecasts is that they make different assumptions about the implementation of the Administration's policies. As already noted, the Administration's forecast assumes full implementation of these proposals. At the opposite end of the spectrum, CBO produces a forecast that assumes no changes to current law. It is not clear to what extent the FOMC participants and the Blue Chip panel incorporate policy implementation. The Blue Chip, in particular, compiles a large number of private sector forecasts, which are marked by considerable heterogeneity across individual forecasters and their policy expectations.

A second difference is the publication dates of the various forecasts. While the forecasts put out by the Administration, the Blue Chip, and the FOMC were finalized around March 2017, the CBO forecast was published earlier, in January of 2017.

In spite of these differences, the forecasts share several attributes. All of them project a further short-run decline in unemployment, followed by a rise back toward a rate consistent with stable inflation. They all project a minor near-term spike in inflation, followed by a stable path at its long-run rate. The differences among the near-term forecasts for real output growth are not too large Finally, they all foresee a gradual rise in interest rates over the course of the forecast horizon. What separates the Administration's forecast from those of the other bodies is their respective views on real output growth in the long run.

Real GDP—The Administration forecasts a higher path for real GDP growth compared with the CBO, FOMC, and Blue Chip forecasts. Over 2017 and 2018, its real GDP forecast is fairly similar to those at the high end of the Blue Chip panel. The CBO and FOMC, on the other hand, expect a noticeably slower expansion in output in the very short term. After 2018, the Administration's forecast diverges from the other forecasts, with a growth rate 0.7 percentage points faster than the next fastest in 2019 and a full percentage point faster than the others at the end of the forecast window. This reflects the Administration's expectation of full implementation of its policy proposals; other forecasters are unlikely to be operating under the same assumption.

Unemployment—On the unemployment rate, the Administration's expectations are largely aligned with those of the other forecasters. Along with the Administration, the CBO and the Blue Chip panel expect modest further declines in unemployment in 2018. The FOMC expects slightly less improvement, projecting a low point of 4.5 percent. After 2018, all forecasters project a gradual uptick in the unemployment rate to their respective estimates of the long-term rate (4.8 percent for the Administration, 4.9 percent for the CBO, and 4.7 percent for the FOMC and the Blue Chip panel).

Interest Rates—For both short- and long-term rates, the CBO's projections follow a generally lower path throughout the forecast window than those of either the Administration or the Blue Chip panel. The Administration's forecasts for short- and long-term interest rates finish in similar places relative to the Blue Chip, but the respective paths are slightly different. The Blue Chip panel and the Administration expect relatively steep increases over the next couple of years in the 91-day Treasury bill rate, but the Blue Chip path is slightly steeper. The Administration foresees a sharper increase in the interest rate on 10-year Treasury notes in the near term.

Inflation—Expectations for inflation are similar across the Administration, the CBO, and the Blue Chip. All three anticipate a bump in CPI inflation in 2017 (with the Administration expecting a slightly greater increase), before it turns back toward its long run rate. The Blue Chip and the CBO expect an inflation rate of 2.4 percent in the long run, while the Administration expects a 2.3 percent long run rate. For the GDP price index, the three forecasts also exhibit little disagreement, other than a marginally higher long-run rate from the Blue Chip panel.

Sensitivity of the Budget to Economic Assumptions

Federal spending and tax collections are heavily influenced by developments in the economy. Receipts are a function of growth in incomes for households and firms. Spending on social assistance programs may rise when the economy enters a downturn, while increases in spending on Social Security and other programs are dependent on consumer price inflation. A robust set of projections for macroeconomic variables assists in budget planning, but unexpected developments in the economy have ripple effects for Federal spending and revenues. This section seeks to provide an understanding of the magnitude of the effects that unforeseen changes in the economy can have on the budget.

To make these assessments, the Administration relies on a set of rules of thumb that can predict how certain spending and revenue categories will react to a change in a given subset of macroeconomic variables, holding almost everything else constant. These rules of thumb provide a sense of the broad changes one would expect after a given development, but they cannot anticipate how policy makers would react and potentially change course in such an event. For example, if the economy were to

suffer an unexpected recession, the rules of thumb suggest that tax revenues would decline and that spending on programs such as unemployment insurance would go up. In such a situation, however, policy makers might cut taxes to stimulate the economy, and such behavior would not be accounted for by the historical relationships captured by the rules of thumb.

Another caveat is that it is often unrealistic to suppose that one macroeconomic variable might change but that others would remain constant. Most macroeconomic variables interact with each other in complex and subtle ways. These are important considerations to bear in mind when examining Table 2-4.

For real growth and employment:

- The first panel in the table illustrates the effect on the deficit resulting from a 1 percentage point reduction in real GDP growth, relative to the Administration's forecast, in 2017 that is followed by a subsequent recovery in 2018 and 2019. The unemployment rate is assumed to be half a percentage point higher in 2017 before returning to the baseline level in 2018 and 2019. The table shows that receipts would temporarily be somewhat lower and outlays would temporarily be higher. The long run effect on the budget deficit would be an increase of $110 billion over the eleven-year forecast horizon, due in large part to higher interest payments resulting from higher short-run deficits.

- The next panel in the table reports the effect of a reduction of 1 percentage point in real GDP growth in 2017 that is not subsequently made up by faster growth in 2018 and 2019. In addition, the natural rate of unemployment is assumed to rise by half a percentage point relative to that assumed in the Administration's forecasts. Here, the effect on the Budget deficit is more substantial, as receipts are lowered in every year of the forecast, while outlays rise gradually over the forecast window. This is because unemployment will be higher, leading to lower tax revenues and higher outlays on unemployment insurance, as well as higher interest payments that follow from increased short-run deficits.

- The third panel in the table shows the impact of a GDP growth rate that is permanently reduced by 1 percentage point, while the unemployment rate is not affected. This is the sort of situation that would arise if, for example, the economy were hit by a permanent decline in productivity growth. In this case, the effect on the Budget deficit is quite large, with receipts being reduced substantially throughout the forecast window and outlays rising due to higher interest payments. The accumulated effect over the eleven-year horizon is an additional $3.1 trillion of deficits.

For inflation and interest rates:

- The fourth panel in Table 2-4 shows the effect on the Budget in the case of a 1 percentage point higher rate of inflation and a 1 percentage point higher nominal interest rate in 2017. Both inflation and interest rates return to their assumed levels in 2018. This would result in a permanently higher price level and level of nominal GDP over the course of the forecast horizon. The effect on the Budget deficit would be fairly modest, although receipts would increase slightly more than outlays over the eleven years. This is because revenues would respond more quickly to price increases than outlays, which are set in advance. Over the years from 2017-2027, the Budget deficit would be smaller by about $32 billion.

- The fifth panel in the table illustrates the effects on the Budget deficit of an inflation rate and an interest rate 1 percentage point higher than projected in every year of the forecast. As in the previous case, the overall effect on the deficit over the forecast is modest (only $85 billion accumulated), and receipts rise faster than outlays because more spending decisions are determined in advance of price increases. It is still important to note, however, that faster inflation implies that the real value of Federal spending would be eroded.

- The next panel reports the effect on the deficit resulting from an increase in interest rates in every year of the forecast, with no accompanying increase in inflation. The result is a much higher accumulated deficit, as the Federal Government would have to make much higher interest payments on its debt. Receipts would be slightly higher as the Federal Reserve would earn more on its holdings of securities and households would pay higher taxes on interest income, but these increases would not offset the effect on outlays.

- The seventh panel in the table reports the effect on the Budget deficit of an inflation rate 1 percentage point higher than projected in every year of the forecast window, while the interest rate remains as forecast. In this case, the result is a much smaller deficit over the eleven years of the forecast relative to the baseline. Permanently faster inflation results in much higher revenues over the next eleven years, which helps to reduce interest payments on debt. Outlays rise due to higher cost-of-living increases on items such as Social Security, though not so much as to offset the revenue increases.

- Finally, the table shows the effect on the budget deficit if the Federal government were to borrow an additional $100 billion in 2017, while all of the other projections remain constant. Outlays rise over the forecast window by an accumulated $32.7 billion, due to higher interest payments.

It is important to note that these simple approximations that inform the sensitivity analysis are symmetric. This means that the effect of, for example, a 1 percentage point higher rate of growth over the forecast horizon would be of the same magnitude as a 1 percentage point reduction in growth, though with the opposite sign.

Table 2–4. SENSITIVITY OF THE BUDGET TO ECONOMIC ASSUMPTIONS

(Fiscal Years; In Billions Of Dollars)

Budget Effect	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Total of Budget Effects: 2017-2027
Real Growth and Employment:												
Budgetary effects of 1 percent lower real GDP growth:												
(1) For calendar year 2017 only, with real GDP recovery in 2018–2019:1												
Receipts	–16.2	–26.0	–13.4	–2.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	–57.1
Outlays	6.9	16.5	8.3	2.3	2.4	2.6	2.6	2.7	2.7	2.8	2.9	52.7
Increase in deficit (+)	23.1	42.5	21.6	4.5	2.3	2.5	2.5	2.6	2.6	2.7	2.8	109.7
(2) For calendar year 2017 only, with no subsequent recovery:[1]												
Receipts	–16.2	–34.4	–40.2	–42.1	–44.1	–46.3	–48.5	–50.9	–53.3	–55.9	–58.6	–490.5
Outlays	6.9	20.1	22.3	23.9	26.8	29.1	31.8	34.8	37.7	41.0	44.1	318.5
Increase in deficit (+)	23.1	54.5	62.5	66.0	70.9	75.4	80.2	85.7	91.0	97.0	102.7	809.0
(3) Sustained during 2017–2027, with no change in unemployment:												
Receipts	–16.2	–51.0	–93.0	–138.6	–188.1	–242.0	–300.0	–363.2	–431.1	–504.2	–582.8	–2,910.2
Outlays	–0.1	0.1	1.3	3.9	8.5	14.1	20.7	28.6	37.7	48.3	60.9	224.0
Increase in deficit (+)	16.2	51.2	94.3	142.5	196.5	256.1	320.6	391.8	468.8	552.5	643.7	3,134.2
Inflation and Interest Rates:												
Budgetary effects of 1 percentage point higher rate of:												
(4) Inflation and interest rates during calendar year 2017 only:												
Receipts	17.0	34.0	36.5	37.0	38.8	40.7	42.6	44.7	46.9	49.2	51.6	439.0
Outlays	20.4	39.3	36.6	37.6	37.7	39.0	37.8	38.3	38.6	40.2	41.5	407.0
Decrease in deficit (–)	3.4	5.3	0.2	0.7	–1.1	–1.7	–4.8	–6.4	–8.3	–9.0	–10.1	–31.8
(5) Inflation and interest rates, sustained during 2017–2027:												
Receipts	17.0	51.8	91.4	133.9	181.2	233.1	289.7	352.2	420.0	494.1	574.7	2,839.3
Outlays	18.4	60.6	105.6	152.8	202.5	257.6	308.7	360.9	422.4	484.4	550.1	2,923.9
Increase in deficit (+)	1.4	8.8	14.2	18.9	21.3	24.4	19.0	8.7	2.3	–9.7	–24.6	84.6
(6) Interest rates only, sustained during 2017–2027:												
Receipts	1.0	2.3	2.9	3.2	3.6	3.9	4.3	4.6	4.9	5.1	5.3	41.0
Outlays	6.6	27.9	47.4	65.2	82.9	100.3	114.9	128.4	139.3	149.8	159.5	1,022.3
Increase in deficit (+)	5.6	25.6	44.5	62.0	79.4	96.4	110.7	123.8	134.4	144.7	154.3	981.3
(7) Inflation only, sustained during 2017–2027:												
Receipts	16.0	49.5	88.5	130.6	177.5	229.0	285.2	347.3	414.8	488.5	568.9	2,795.6
Outlays	11.8	32.6	58.2	87.6	119.7	157.6	194.2	233.1	283.9	335.5	391.8	1,905.9
Decrease in deficit (–)	–4.2	–16.9	–30.3	–43.0	–57.8	–71.4	–91.0	–114.1	–130.9	–153.0	–177.1	–889.7
Interest Cost of Higher Federal Borrowing:												
(8) Outlay effect of $100 billion increase in borrowing in 2017	0.4	1.3	2.0	2.7	3.2	3.5	3.7	3.8	3.9	4.1	4.2	32.7

[1] The unemployment rate is assumed to be 0.5 percentage point higher per 1 percent shortfall in the level of real GDP.

Forecast Errors for Growth, Inflation, and Interest Rates

As with any forecast, the Administration's projections will not be fully accurate. It is impossible to foresee every eventuality over a one–year horizon, much less ten or more years. This section evaluates the historical accuracy of the forecasts of past Administrations for real GDP, inflation, and short-term interest rates, especially as compared with the accuracy of forecasts produced by the CBO or Blue Chip panel. For this exercise, forecasts produced by all three entities going as far back as the Fiscal Year 1983 Budget are compared with realized values of these important variables.

The results of this exercise are reported in Table 2-5 and contain three different measures of accuracy. The first is the average forecast error. When a forecaster has an average forecast error of zero, it may be said that the forecast has historically been unbiased, in the sense that realized values of the variables have not been systematically above or below the forecasted value. The second is the average absolute value of the forecast error, which offers a sense of the magnitude of errors. Even if the past forecast errors average to zero, the errors may have been of a very large magnitude, with both positive and negative values. Finally, the table reports the square root of the mean of squared forecast error (RMSE). This metric

Table 2–5. FORECAST ERRORS, JANUARY 1982-PRESENT

	Administration	CBO	Blue Chip
REAL GDP ERRORS			
2-Year Average Annual Real GDP Growth			
Mean Error	0.2	–0.1	–0.1
Mean Absolute Error	1.2	1.0	1.1
Root Mean Square Error	1.5	1.3	1.4
6-Year Average Annual Real GDP Growth			
Mean Error	0.4	0.1	0.1
Mean Absolute Error	1.1	1.0	0.9
Root Mean Square Error	1.3	1.2	1.1
INFLATION ERRORS			
2-Year Average Annual Change in the GDP Price Index			
Mean Error	0.3	0.3	0.4
Mean Absolute Error	0.7	0.7	0.7
Root Mean Square Error	0.9	0.9	0.8
6-Year Average Annual Change in the GDP Index			
Mean Error	0.4	0.5	0.7
Mean Absolute Error	0.6	0.8	0.9
Root Mean Square Error	0.8	1.0	1.0
INTEREST RATE ERRORS			
2-Year Average 91-Day Treasury Bill Rate			
Mean Error	0.3	0.5	0.6
Mean Absolute Error	1.0	0.9	1.0
Root Mean Square Error	1.2	1.3	1.2
6-Year Average 91-Day Treasury Bill Rate			
Mean Error	0.9	1.4	1.5
Mean Absolute Error	1.4	1.5	1.6
Root Mean Square Error	1.7	1.8	1.9

applies an especially harsh penalty to forecasting systems prone to large errors. The table reports these measures of accuracy at both the 2-year and the 6-year horizons, thus evaluating the relative success of different forecasts in the short run and in the medium term.

For real GDP growth rates, at both the 2-year and 6-year horizons, the mean forecast error suggests that all of the forecasts (Administration, the CBO, and the Blue Chip panel) have been broadly unbiased, with small average errors close to zero. The mean absolute error and the RMSE both suggest that the Administration's past forecasts have tended to make slightly larger errors than the others, but the difference has been minor.

When it comes to inflation, there is more evidence of some systematic bias in all three forecasts. The mean errors at the 2- and 6-year horizons are all positive and larger than the errors in projecting real GDP growth. This implies that the Administration, the CBO, and the Blue Chip have expected faster inflation than ultimately materialized. A closer look at the data reveals that the errors were largest in the 1980s, as the U.S. economy shifted from a period of high inflation in the 1970s to a period of more moderate price rises. The mean absolute error and the RMSE metrics imply that the errors in the Administration's inflation forecast have tended to be of smaller magnitude than those of the CBO or Blue Chip panel.

Finally, on interest rates, the story is similar to that for inflation. All of the forecasts have historically projected interest rates that were higher than what later occurred, probably because they expected higher inflation as shown above. Across the three forecasters, the Administration has generally made errors of lesser magnitude than the other two.

Uncertainty and the Deficit Projections

This section assesses the accuracy of past Budget forecasts for the deficit or surplus, measured at different time horizons. The results of this exercise are reported in Table 2-6, where the average error, the average absolute error, and the RMSE (as well as the standard deviation of the forecast error) are reported.

In the table, a negative number means that the Federal Government ran a greater surplus than was expected, while a positive number in the table indicates a smaller surplus or a larger deficit. In the current year in which the Budget is published, the Administration has tended to understate the surplus (or, equivalently, overstate the deficit). For every year beyond the current year, however, the historical pattern has been for the Budget deficit to

Table 2–6. DIFFERENCES BETWEEN ESTIMATED AND ACTUAL SURPLUSES OR DEFICITS FOR FIVE-YEAR BUDGET ESTIMATES SINCE 1986

(As A Percent Of Gdp)

	Current Year Estimate	Budget Year Estimate	Estimate for Budget Year Plus:			
			One Year (BY + 1)	Two Years (BY + 2)	Three Years (BY + 3)	Four Years (BY + 4)
Average Difference [1]	-0.8	0.2	1.1	1.7	2.1	2.5
Average Absolute Difference [2]	1.1	1.4	2.2	2.8	3.4	3.7
Standard Deviation	1.0	2.0	2.8	3.3	3.5	3.5
Root Mean Squared Error	1.3	2.0	3.0	3.7	4.0	4.2

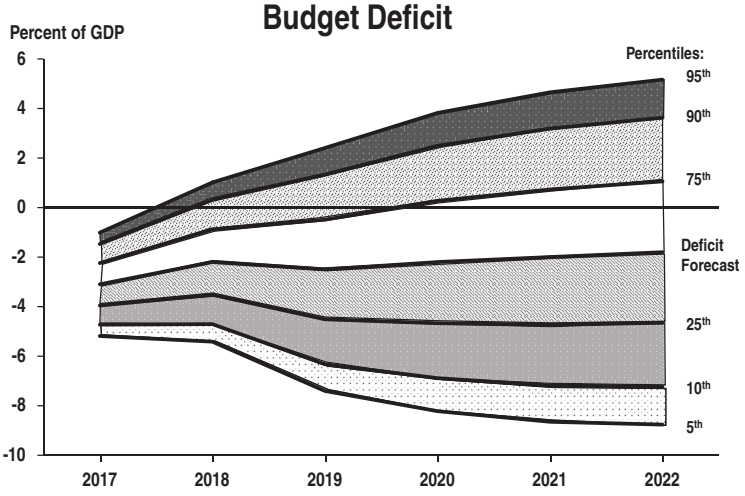
[1] A positive number represents an overestimate of the surplus or an underestimate of the deficit. A negative number represents an overestimate of the deficit or an underestimate of the surplus.

[2] Average absolute difference is the difference without regard to sign.

be larger than the Administration expected. One possible reason for this is that past Administrations' policy proposals have not all been implemented.[5] The forecast errors tend to grow with the time horizon, which is not surprising given that there is much greater uncertainty in the medium run about both the macroeconomic situation and the specific details of policy enactments.

It is possible to construct a probabilistic range of outcomes for the deficit. This is accomplished by taking the RMSE of previous forecast errors and assuming that these errors are drawn from a normal distribution. This exercise is undertaken at every forecast horizon from the current Budget year to five years down the road. Chart 2-1 displays the projected range of possible deficits. In the chart, the middle line represents the Administration's expected budget balance and can be interpreted as the 50th percentile outcome. The rest of the lines in the chart may be read in the following fashion. The top line reports the 95th percentile of the distribution of outcomes over 2017 to 2022, meaning that there is a 95 percent probability that the actual balance in those years will be more negative than expressed by the line. Similarly, there is a 95 percent probability that the balance will be more positive than suggested by the bottom line in the chart. In 2017, there is a 95 percent chance of a budget deficit greater than 1.0 percent of GDP. By 2022, there is only a 5 percent chance of a budget deficit greater than 8.8 percent of GDP. In addition, the chart reports that there is a substantial probability of a budget surplus by 2022.

Chart 2-1. Range of Uncertainty for the Budget Deficit



[5] Additionally, CBO has on average underestimated the deficit in their forecasts.