



The Longbrake Letter*

Bill Longbrake**

April, 2018

I. Introduction

Optimism abounds across the globe and world economies are finally benefiting from years of easy monetary policy. Momentum is incredibly powerful and is currently self-reinforcing. Practically all economies are growing above potential and slack has already disappeared or is disappearing rapidly.

In the case of the U.S., there is no slack in the labor market and the remaining slack in output is shrinking rapidly. Enormous fiscal stimulus embedded in the “Tax Cuts and Jobs Act,” disaster relief spending, and substantial increases in defense and discretionary spending caps will lift growth substantially above potential in both 2018 and 2019. When an economy has no slack, and operates well above its potential, it risks overheating and that triggers upward pressures on prices and accelerates the buildup of imbalances in the economy. We are in the mature phase of the business cycle and the added stimulus will propel the economy higher in coming months.

Best to enjoy the good times now because we know from history that strong economic momentum, when the economy is operating at or above full capacity, eventually leads to recession and correction of the imbalances that built up during the euphoric period of strong growth.

In response to overheating in the labor market and economic output exceeding its non-inflationary potential, the Federal Reserve will continue to tighten monetary policy systematically. The Federal Open Market Committee now projects that the federal funds rate will need to rise 50 basis points above its long-term equilibrium level. Of course, everyone hopes that policymakers will be able to engineer a soft landing, but history is not supportive of such a benign outcome.

So, enjoy the good times that seem likely to prevail during 2018 and 2019, but in the interests of prudent risk management, prepare for the possibility of recession in

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2020. If recession commences in 2020, such timing would probably have a political impact because 2020 is a presidential election year.

As is always the case, the future trajectory of the economy could change in ways that short-circuit the current good times or extend them. The benign outcome would be one in which the fiscal stimulus prompts an investment boom which increases productivity and lifts the potential rate of growth substantially. This would reduce inflationary pressures and generate more tax revenues, which would make the burgeoning federal public debt more manageable. But, developments could follow a different less sanguine path, perhaps one in which inflation rises more rapidly than expected, inflation expectations become unanchored, and interest rates soar, prompting an even tighter monetary policy which brings a quick and premature end to the good times. And, keep an eye on the possibility of a real global trade war rather than a rhetorical one, or the possibility of a meaningful and disruptive shooting war that roils global financial markets and disrupts supply chains. The steady escalation worldwide in debt leverage has weakened the resiliency of the global financial system to weather shocks.

II. Data Revisions – Congressional Budget Office

Usually **CBO** updates its ten-year federal budget and economic forecast in January or February and, in recent years, has put out a second revision later in the year. Revisions in 2017 occurred in January and June. The Tax Cuts and Jobs Act, passed by Congress in December, and congressional passage of a budget resolution in early 2018, covering fiscal years 2018 and 2019, involved substantial reductions in taxes and increases in spending. This enormous fiscal stimulus will impact the macroeconomic outlook to a considerable extent. Because of the enormity of the changes, it took **CBO** longer than usual, until April, to update its ten-year federal budget and economic forecast. The update drops the most recently completed fiscal year (2017) and adds a fiscal year (2028). Macroeconomic assumptions are also provided for calendar years 2018 through 2028.

CBO bases its budget forecasts on current law and thus revisions will reflect the expected impact of any legislation enacted since **CBO's** previous update. In addition, **CBO** updates key economic assumptions that affect forecast tax revenues, spending and the size of the federal debt and interest expense on that debt.

The difference between its projections of revenues and expenses is the annual budget deficit (once in a very great while it is a surplus). This exercise requires **CBO** to project key economic variables including population, employment, GDP, inflation, interest rates, housing prices, income, profits, productivity and several other measures.

CBO forecasts are similar to those of others, including mine, although there are some important differences because **CBO's** projections are constrained by current law even when it seems highly likely that Congress will change current law. Other forecasters are not constrained in this way and usually attempt to incorporate the impacts of expected policy changes in their projections.

1. My Econometric Model and Scenarios of the Future U.S. Economy

Before examining **CBO's** economic April data revisions and commenting on the implications, it may be helpful to describe briefly how I construct my economic scenarios since they serve not only as a means of making my own forecasts but can also be compared to forecasts of others.

a. Forecasting Perils

Forecasts can be made for individual economic variables or they can be derived from more complex models that attempt to measure the interaction of many variables, the flow through effects of feedbacks and time lags, and the impacts of policy interventions.

Few economists attempt to create their own complex forecasting models and instead either make estimates of economic variables based upon their experience and intuition or rely on “canned” econometric models prepared by others. There are risks to both methods. The “educated guesses” may be well conceived and reasonable, but much of the time the easier and safer approach is to make a forecast that differs little from the consensus of others.

Complex interactive models reduce the risk of overlooking linkages and feedback effects and, arguably, provide more reliable forecasts. However, models generally have two limitations. First, models have a fixed architecture. For example, the architecture of most of the commercially-available econometric models, as well as the Federal Reserve's model, is built around a DSGE – dynamic stochastic general equilibrium – architecture which assumes that over time the economy will always revert to a general equilibrium. These models did not work particularly well in foreshadowing the Great Recession – partially because they did not include non-rational behavioral phenomena and partially because they did not incorporate adequately the interaction between activity in financial markets and real economic activity.

Second, forecasting outputs of models rely upon stochastic equations of historical data relationships. Forecasting outputs will be dependable if the current structure of the economy and relationships among economic variables are similar to the historical structure and relationships upon which the model's predictive equations

are based. Significant changes, such as in the structure of the economy stemming from technological innovations, societal culture influencing behavioral responses, or political governance, can change relationships among economic variables in ways that are not captured particularly well, if at all, in stochastic equations based upon historical data. All models, including my own, suffer from the risk that the past is not a good predictor of the future.

b. Integrate Model Outputs With Logical Analysis and Critical Thinking

For these reasons I have long argued that the forecasting outputs of models need to be combined with rigorous logical analysis of current developments and trends which are often not captured well or at all in models based on historical data.

One can see the wisdom in these cautions about econometric models and reliance upon the stability of past relationships by asking why virtually the entire professional academic and policy establishment did not foresee the dramatic slowdown in real potential GDP growth (see **Chart 1** below) which has occurred over the past decade. Real potential GDP growth depends upon growth in total hours worked and productivity. The establishment missed significant changes in the behavior of both variables which have persisted long enough that they can no longer be dismissed as temporary cyclical causalities of the Great Recession.

c. Persistence of Lower Than Expected Growth in Total Hours Worked

Debate among academicians and policymakers about the decline in the growth rate of total hours worked is more advanced than debate about the causes in the collapse of productivity. The emerging consensus is that the “surprising” decline in the labor participation rate is not all that surprising when cultural changes and demographic trends are factored in. There is still debate, however, about whether some of the cultural changes reflect the unintended effects of government policies. A particularly salient example involves the statistical correlation between the increase in the use of opioids by prime-age males, Medicaid benefits, and the decline in the prime-age male labor force participation rate. Some argue that policy revisions could reverse this adverse trend.

In any event a consensus has emerged that total hours worked will grow about 0.5 percent annually in coming years compared to a 0.9 percent growth rate in the population eligible to work. CBO expects growth in both measures to decline over the next 10 years, averaging 0.4 percent for potential hours worked, falling to 0.3 percent by 2028, and averaging 0.8 percent for the population eligible to work, dropping to 0.6 percent by 2028. The slower growth in potential hours worked means that there will be a steady decline in the employment participation rate and a gradual decrease in the length of the work week, continuing trends that have

persisted in recent years and reflect changing labor force demographics and the structure of jobs in the labor market.

While these developments have negative implications for the long-term solvency of social welfare programs, such as social security and Medicare, general agreement that these trends will be a persistent phenomenon dilutes the typical tendency to engage in denial and will spur two types of policy debates. First, policymakers will eventually be forced to examine how to respond to the consequences because they will no longer be able to assume that the problem will be self-curing. Second, policymakers can explore ways to boost the employment participation rate through a variety of initiatives, such as free community college tuition and government infrastructure investment.

d. Persistence of Lower Than Expected Productivity Growth

Debate about the causes of persistent anemic productivity is at a much earlier state and denial is still a driver. There is general acknowledgement that long-term productivity improvement has moderated some, but most believe that recent weak productivity, averaging 0.7 percent over the past seven years compared to a long-term average of about 2.2 percent, is an aberration driven by short-term and temporary factors. Thus, most models of economic activity assume that productivity will rise over the next few years to a much higher rate than has prevailed over the past seven years. For example, **CBO** expects productivity improvement to average 1.8 percent annually over the next 10 years. This is typical of a mean-reversion mentality and assumptions embedded in standard econometric models. However, the expected rebound has yet to materialize.

Table 1

Historical Average Productivity and Forecasts – CBO, “BASE,” “Strong Growth,” and “Low Productivity”

| | 1955- 2004 | 2005- 2017 | 1955- 2017 | 2023- 2028 | 2018- 2022 |
|-------------------------|---------------|---------------|---------------|---------------|---------------|
| Actual | 2.19 | 1.26 | 1.99 | | |
| CBO | | | | 1.78 | 1.84 |
| BASE | | | | 1.67 | 1.65 |
| Strong Growth | | | | 1.86 | 1.75 |
| Low Productivity | | | | 1.65 | 1.22 |

Persistent weak productivity now that the economy is at full employment is eroding complacency and denial and debate about the causes and future course of

productivity is building. These debates are still at an early stage and thus there is less of a consensus about appropriate policy responses. However, there is growing global sentiment that greater government intervention may be warranted, both through fiscal infrastructure spending and also through policy changes that stimulate greater competition and moderate regulatory constraints, particularly those that inhibit productive activity without there being a meaningful offset in quality of life impacts. The sentiment for more active government policy has also been influenced by the failure of monetary policy to lift potential economic growth rates.

Table 1 shows average productivity over past time periods, as well as projections of future productivity. Over the 50 years from 1955-2004 productivity rose 2.19 percent annually. In the 13 years from 2005 to 2017 productivity has risen 1.26 percent annually and only .66 percent over the past seven years. **CBO** assumes partial mean reversion to an average annual productivity gain over 2023-28 of 1.78 percent. Over the same time period I assume productivity averages 1.67 percent annually in my “**BASE**” scenario and 1.86 percent in my “**Strong Growth**” scenario. I have also constructed an alternative “**Low Productivity**” scenario in which productivity rises 1.65 percent annually during this period, which is still above average growth in productivity over the past 13 years.

e. Bill’s Approach to Econometric Modeling

Like other econometric models, I construct predictive equations for key economic variables based on logical relationships with other available data measures and estimate the parameters of these equations based upon historical data. So, in that regard, my modeling is subject to the same historical structural rigidity risks as are inherent in other econometric models. I do adjust for historical structural shifts. This limits the likelihood that forecasts are flat out wrong right out of the box, but does not accommodate the possibility of future structural shifts or those that might be underway but are too recent to be visible in the data. This is why logical analysis of current developments is important. It is always appropriate to raise the question of whether economic relationships are shifting and what potential impact such shifts might have on model forecasts. Thus, it is always important to consider the viewpoints and analytical justifications offered by others, even when they might be considered to be far-fetched.

In addition to the risk of structural changes in the relationships among economic variables, there is ever present the potential that the historical equations do not properly define the underlying relationships. In economists’ jargon, this is called “specification error.” For example, it is accepted theory that employment influences inflation. When unemployment is low, labor becomes scarce, labor’s wage bargaining power increases, wages grow more rapidly, and inflation pressure builds.

Economists refer to this relationship as the “Phillips Curve.” But, although there is logic in the relationship between employment and inflation, there is not set agreement as to exactly how that relationship will play out. There are timing lags, changes in labor bargaining power, shifts in the composition of the labor market and other factors which may or may not be important to include in specifying the statistical impact of employment on inflation. I have a methodology, which differs in some of its details from the methodology of others. I do not claim that my methodology is better or best. But, I do regularly review my methodology and change it when there is additional information that I judge to be relevant.

Like others, the historical data inputs I use come from publicly available data sources. However, when it comes to forecasting values for economic variables I do have choices. I can accept the forecasts of others or I can make my own, either arbitrarily based on logic and “common sense” or derive them through modeling. The only forecasts of data from others I use as model inputs come from **CBO**. These data inputs are limited to historical (not future) growth in potential real GDP, historical non-inflation increasing rate of unemployment (NAIRU), future growth in the non-institutional population, and future growth in the eligible labor force over the next ten years. I could provide arbitrary assumed values for each of these variables in my model, but have chosen to rely on **CBO’s** expertise.

In addition, I provide arbitrary assumptions for several variables, which judgmentally vary for each economic scenario. These include: payroll employment, oil prices, housing prices, stock prices, business investment growth, government investment growth, and annual federal budget deficit. I can choose values for anyone of these measures based on the assumptions of others. I have done this for payroll employment growth in the “**BASE**” scenario where I approximate **CBO’s** April 2018 forecast for payroll employment growth with minor modifications. But, I hasten to add that my assumptions for payroll growth differ from **CBO’s** in my other economic scenarios.

Forecast values for all other economic variables are derived from the model itself.

f. Summary Comment

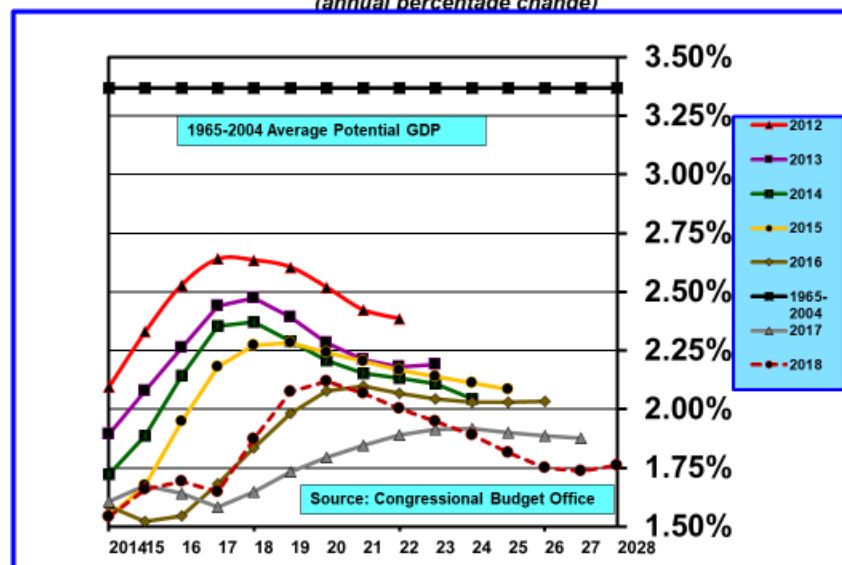
In summary, models can be useful tools, but if their use is not accompanied by critical thinking, their data inputs and outputs can be misleading. Keep these observations in mind as I summarize **CBO’s** April 2018 update of its economic assumptions and forecasts. The tendency to engage in “reversion to the historical mean” is present at times as is a tendency to craft data inputs to conform to predetermined views of “what should be.”

2. CBO's Estimates of Potential Real GDP and Growth Rates

CBO's April 2018 update involved revisions to its projections for potential real GDP. The important revisions were for 2018 through 2028, but **CBO** also revised its estimates of potential real GDP for past years.

Estimates of potential growth were increased in each year from 2018 through 2023 by an average of 21 basis points, peaking at an increase of 34 basis points in 2019 and 33 basis points in 2020, reflecting the expected benefits of recent federal tax and spending legislation. However, for the years 2024 to 2028, **CBO** lowered forecast real potential GDP growth by an average of 10 basis points to 1.8 percent. This continued an ongoing trend of lowering its forecasts with each revision and acknowledges the reality that weak growth is likely to continue in the long run.

CHART 1 – CBO Potential Real GDP Rate of Growth
(annual percentage change)

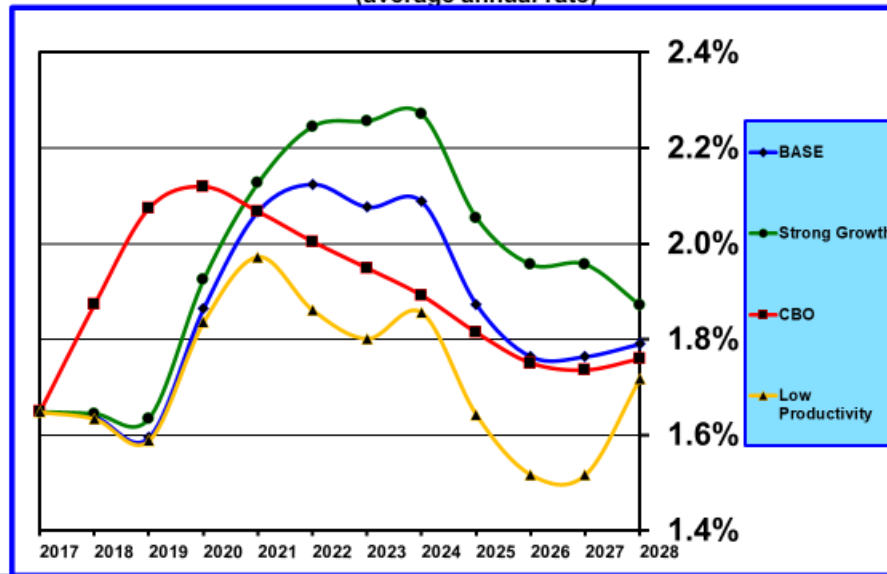


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Importantly, as can be seen in **Chart 1**, **CBO** expects, contrary to proponents of the tax cuts legislation, that the boost in the rate of growth in potential real GDP will prove to be only temporary rather than permanent. In this regard, **CBO** agrees with the views of most other professional forecasters.

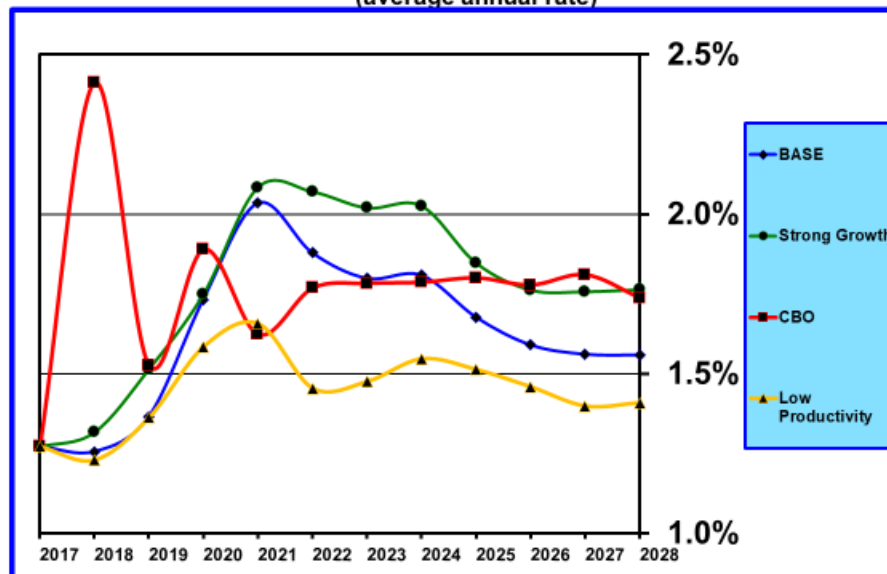
I calculate potential real GDP growth by combining assumptions about potential growth in total hours worked and productivity. **Chart 2** compares my potential GDP growth projections for my “**BASE**,” “**Strong Growth**,” and “**Low Productivity**” scenarios with **CBO's** April 2018 projections.

CHART 2 – Potential Real GDP Growth
(average annual rate)



Page 1

CHART 3 – Productivity
(average annual rate)



Page 2

Over the 2018 to 2028 period, my “**BASE**” potential real GDP averages about 3 basis points less than **CBO’s** projections. That is because my assumption about growth in total hours worked is 4 basis points stronger, but this is more than offset by my productivity forecast, which is about 15 basis points lower. Potential growth

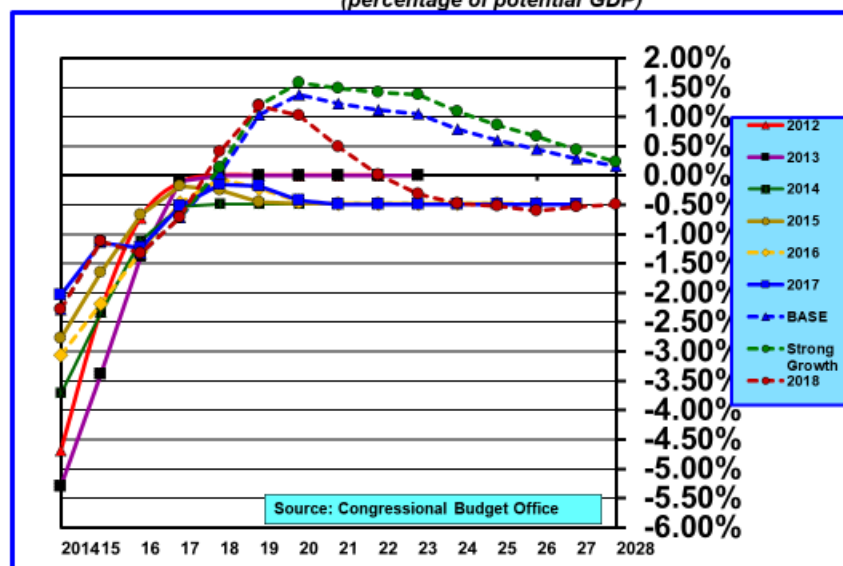
peaks in the “**BASE**” scenario about two years after it peaks in **CBO’s** forecast. This timing difference is an artifact of the lags I employ in calculating potential real GDP.

Productivity assumptions are shown in **Chart 3**. Note the spike in **CBO’s** estimate of productivity in 2018. **CBO** assumes that fiscal stimulus has a relatively immediate impact in boosting productivity. My expectation is that it will take two to three years for productivity to respond. We both agree that fiscal stimulus will boost productivity over the next few years, but we disagree on how rapidly this will occur.

3. **CBO’s Estimates of Actual Real GDP and the Output Gap**

Revisions in **CBO’s** estimates of past potential real GDP change its previous estimates of the real GDP output gap. For example, in 2014 **CBO** estimated that the real GDP output gap was -3.71 percent. Since then, however, it has reduced its estimate of real potential GDP for 2014 and this, in turn, has reduced the estimated real GDP output gap to -2.28 percent in its most recent revision.

CHART 4 – Output Gap – CBO, BASE, Strong Growth
(percentage of potential GDP)



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CBO’s retroactive revisions to potential real GDP this year raised potential real GDP for 2014 through 2017 and thus increased the size of the output gap by 24 basis points in 2014 and 20 basis points in 2017. In **Chart 4**, the April 2018 estimates of the output gap, depicted by the dashed red line, is slightly below (larger gap) the June 2017 estimates, depicted by the solid blue line. **Chart 4** shows **CBO’s** calculated output gap, both retroactively and prospectively, made in 2012, 2013,

2014, 2015, 2016, 2017 and 2018, as well as my current estimates of the GDP output gap for the “**BASE**” and “**Strong Growth**” scenarios.

However, the important story shown in **Chart 4** is the large changes in expected potential and actual real GDP for future years that **CBO** included in its April 2018 revision. In the next few years **CBO** increased its forecast of actual real GDP by more than it increased its estimate of potential real GDP, reflecting its expectation that the economy will operate above its full employment potential. Forecast real GDP exceeds potential beginning in the third quarter of 2018 and extends four years through the fourth quarter of 2022. This positive output gap peaks in the first quarter of 2020 and then slowly declines ultimately turning negative in the first quarter of 2023. This is indicative of an economy that is expected to overheat in coming quarters.

After 2022, **CBO** forces the output gap to return to a level of approximately -.50 percent, which is the level that it has assumed over the past several years will prevail in the long run when the economy is in a state of equilibrium. This is obviously an oversimplification but it is a convenient one because it enables **CBO** to take a neutral position in the long run. **CBO** does not forecast recessions and it forecasts overheating reluctantly and only when it is obvious on its face, as it is now, that the economy is already at full employment and stimulus is highly likely to drive growth above full potential for a period of time.

I do not attempt to estimate the current output gap, preferring instead to accept **CBO's** measure of the current output gap. I also accept **CBO's** retroactive adjustments. The divergence between my measures of the output gap and **CBO's** measure only occurs in future years and depends on my model's forecasts for actual and potential real GDP. Starting from **CBO's** negative output gap of -.71 percent in the fourth quarter of 2017, my projected output gap in the “**BASE**” scenario, shown in **Chart 4**, rises steadily in coming quarters, turns positive in the fourth quarter of 2018 and peaks in the third quarter of 2020 at 1.39 percent. **CBO's** positive output gap peaks two quarters sooner at 1.20 percent. Like **CBO**, I project that the positive output gap will diminish after its peak, but unlike **CBO**, I do not project that the output gap will turn negative. Instead, I estimate that the output gap remains positive in future years but nears a zero level by the end of 2028.

4. CBO's Real GDP Forecasts

Table 2 and **Chart 5** show real GDP growth forecasts for the next several years. Based upon its April 2018 revisions, **CBO's** real GDP forecasts generally exhibit a similar pattern to those of others, including my “**BASE**” scenario, with a couple of important caveats. The first caveat is that **CBO** expects real GDP growth in 2018

and 2019 to accelerate much more than others expect. The second caveat is that this early burst in growth is followed by a large slow down in growth in 2021, 2022, and 2023, which is worse than the slow down in growth expected by other forecasters.

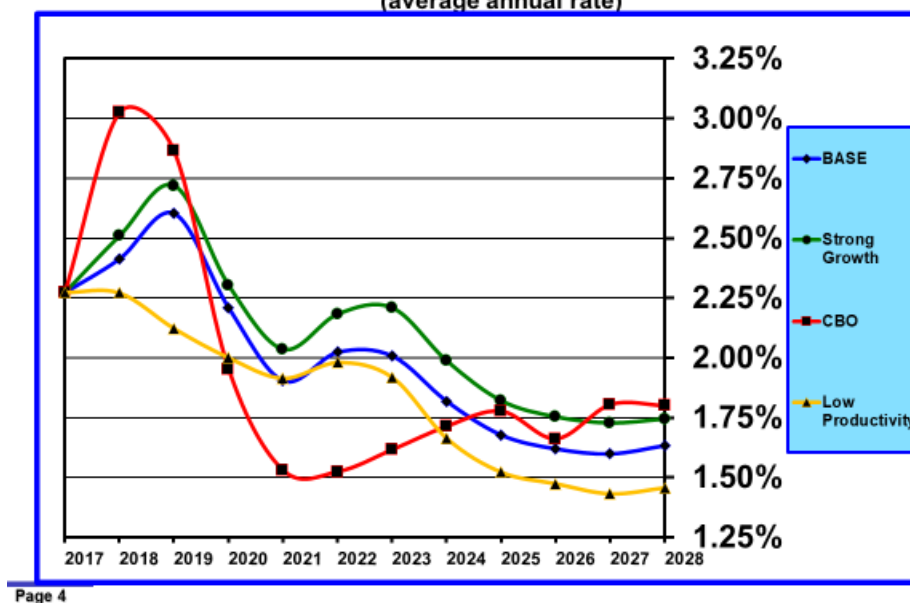
Table 2

Actual Real GDP Growth Rate Forecasts

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|-----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| CBO | 3.03 | 2.86 | 1.95 | 1.53 | 1.52 | 1.62 | 1.71 | 1.78 | 1.66 | 1.80 | 1.80 |
| B of A | 2.89 | 2.76 | 2.15 | 1.87 | 1.73 | 1.69 | 1.69 | 1.69 | 1.69 | 1.69 | 1.69 |
| GS | 2.78 | 2.42 | 1.75 | 1.75 | 1.36 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 |
| Fed High (Q4/Q4) | 3.00 | 2.60 | 2.10 | | | | | | | Long Term | 2.00 |
| Fed Low (Q4/Q4) | 2.60 | 2.20 | 1.80 | | | | | | | | 1.80 |
| BASE | 2.41 | 2.60 | 2.21 | 1.91 | 2.02 | 2.01 | 1.82 | 1.68 | 1.62 | 1.60 | 1.63 |
| Strong Growth | 2.51 | 2.72 | 2.30 | 2.04 | 2.18 | 2.21 | 1.99 | 1.82 | 1.75 | 1.73 | 1.74 |
| Recession-Stagnation | 2.29 | 1.18 | 1.56 | 2.81 | 2.22 | 2.00 | 1.80 | 1.70 | 1.74 | 1.74 | 1.68 |
| Low Productivity | 2.27 | 2.12 | 2.00 | 1.91 | 1.98 | 1.92 | 1.66 | 1.52 | 1.47 | 1.43 | 1.46 |

CHART 5 – Actual Real GDP Growth

(average annual rate)



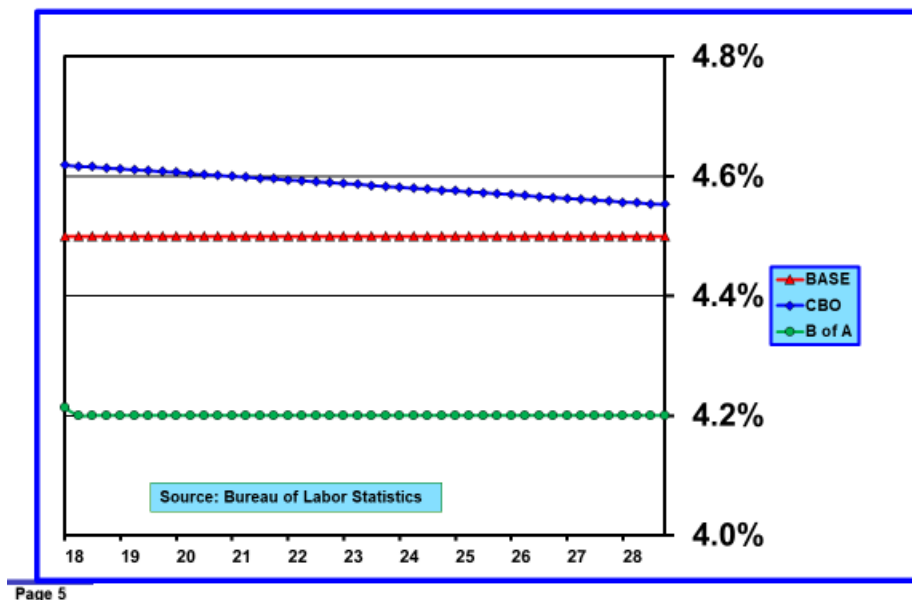
CBO's forecast actual GDP growth rates in the latter part of the ten-year forecast period are about 10 basis points lower in the April 2018 revision compared to the

June 2017 estimates. It attributes this decline to the depressing impact a larger accumulated federal deficit will have on economic growth in the long run.

Notice that my projection for real GDP in my “**BASE**” scenario is at the low end of the forecast range in 2018. My growth forecasts are slightly higher than estimates of other forecasters in 2020 through 2024, primarily due the lagged benefit of increased productivity spawned by investment friendly provisions of the Tax Cuts and Jobs Act. However, after 2024 my estimates of growth are slightly lower than those of others. Again, the culprit is productivity, which I expect to be lower because of slightly weaker investment (see **Table 1**).

5. CBO’s Employment Assumptions – Natural Unemployment Rate

CHART 6 – Natural Rate of Unemployment



Above potential real GDP in coming quarters is primarily the consequence of a labor market that is anticipated to exceed the natural rate of unemployment, often referred to by economists as the non-accelerating inflation rate of unemployment (NAIRU). The natural rate of unemployment is not directly observable and must be estimated. Analysts do not agree on the exact level but there is general agreement that the natural rate of unemployment has declined in recent years for a variety of reasons.

Chart 6 shows three different assumptions for the natural rate of unemployment – **CBO**, **B of A**, and a consensus estimate, which I use in my statistical analysis. **CBO** estimates that the natural rate of unemployment is 4.62 percent currently and declines to 4.55 percent by the end of 2028. In the June 2017 edition of its economic

assumptions, **CBO** estimated that the natural rate of unemployment would be 4.73 percent at the beginning of 2018, 11 basis points higher than its revised estimate, and would fall to 4.65 percent by the end of 2027. This is a modest downward adjustment in the natural rate. Most other forecasters believe the natural rate of unemployment is lower than **CBO's** revised estimate. For example, **B of A** asserts that the natural rate of unemployment is 4.2 percent. In the **FOMC's** summary of economic projections, the long run expected range in the unemployment rate, which is a proxy for the natural rate of interest, is 4.3 to 4.7 percent. The mid-point of the **FOMC's** range is 4.5 percent, which is a level consistent with the consensus.

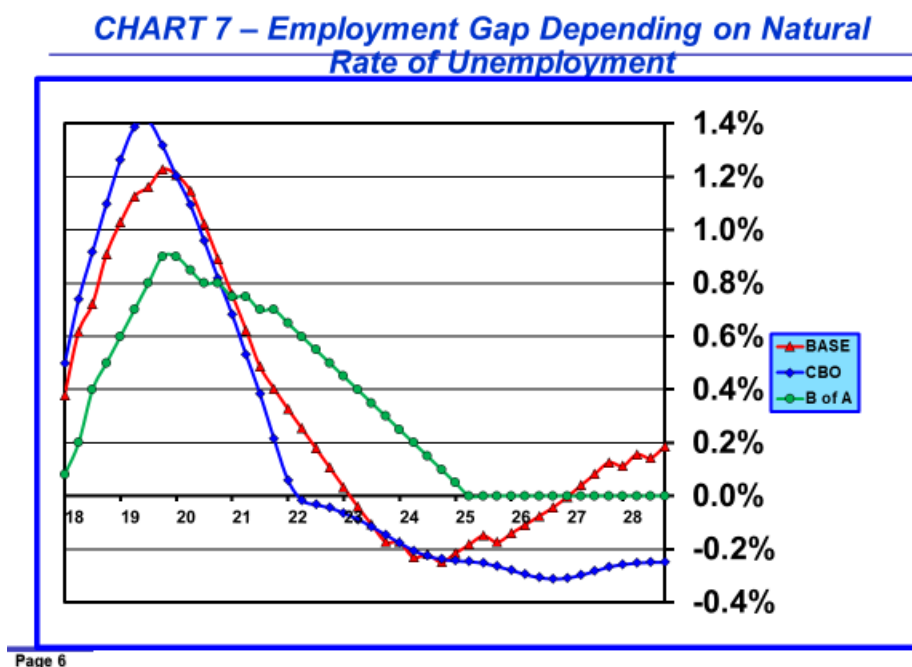
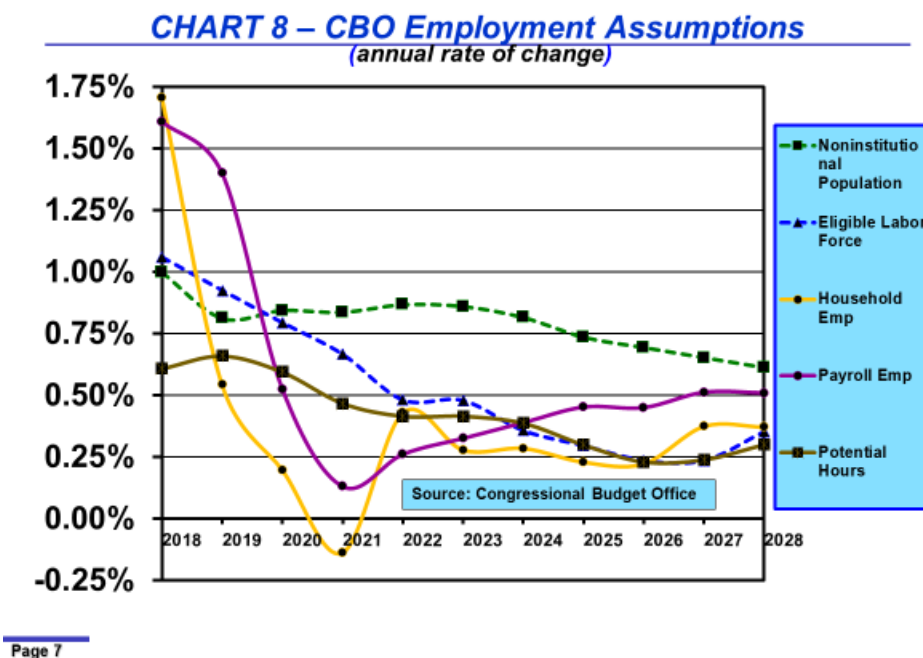


Chart 7 shows the size of the unemployment gap, depending upon assumptions about the natural rate of unemployment and actual unemployment. **CBO** assumes a sharp rise in the labor market unemployment gap to 1.41 percent in the third quarter of 2019. However, employment growth slows rapidly and the positive unemployment gap disappears by early 2022 and becomes modestly negative thereafter. Based upon an assumption that the natural rate of unemployment is 4.5 percent and my forecasts for the actual unemployment rate, the unemployment gap in the “**BASE**” scenario peaks at 1.23 percent in the fourth quarter of 2019 and then declines to zero by early 2023, a year later than assumed by **CBO**. The return of the unemployment gap to a modest positive level in my “**BASE**” scenario in 2027 and 2028 results from my assumption that labor force growth is similar to **CBO's** assumption but my assumption of the natural rate of unemployment is slightly lower than **CBO's** projections in 2027 and 2028.

Because **B of A** assumes that the natural rate of unemployment is 4.2 percent, its estimate of the labor market unemployment gap peaks at a lower level of .90 percent in early 2020 and then declines to zero by early 2025. The size of the unemployment gap is particularly important in estimating inflation and wage growth. A smaller positive unemployment gap should result in lower inflation and wage rate growth.

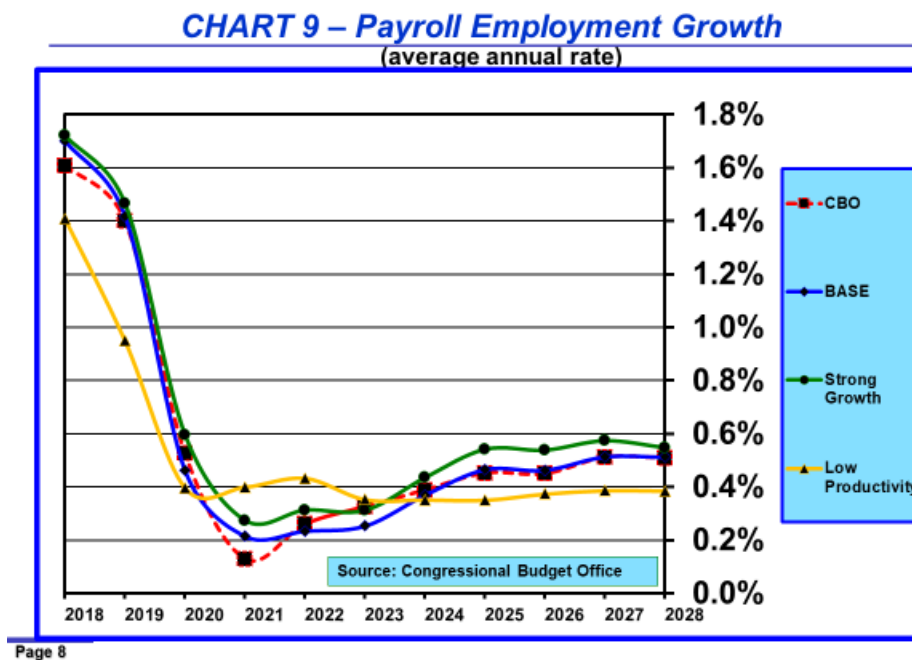
6. CBO's Employment Assumptions

Chart 8 shows trends from 2018 to 2028 in **CBO's** growth rate assumptions for five employment measures – the non-institutional population, the eligible labor force, household employment, payroll employment, and potential total hours worked.



This oddity in **CBO's** employment assumptions is clearly visible in **Chart 8**. Growth rates for the non-institutional population and the eligible labor force trend downward very gradually, reflecting embedded demographic trends. One would expect the same gradual downward trend to prevail for actual household and payroll employment growth. But this would mean that the forecast unemployment rate, which is already below the natural rate (NAIRU) and that gap is expected to widen in coming months, would have to remain well below the natural rate for an extended period. But, accepting this would be inconsistent with **CBO's** estimates of the natural rate of unemployment. **CBO** solves this dilemma by forcing employment growth to near zero until the positive output gap is eliminated (see **Chart 4**). This occurs by 2022. Thereafter, **CBO's** assumptions for the five measures of employment growth generally move in sync.

There are other interesting observations about the data in **Chart 8** and **Table 3**. Annual growth in employment measures decline to a range of 0.3 to 0.8 percent after 2023. Growth in the non-institutional population is the outlier. In a stable employment environment, this measure should be growing at the same rate as the others. The fact that it is not means that participation in the labor force is assumed to decline over time. This is primarily the consequence of an aging population. **CBO** assumes a participation rate of 62.71 percent at the end of 2017. It falls to 60.96 percent by the end of 2028, which amounts to 16 basis points annually or about 444,000 fewer workers annually than would be expected if the participation rate remained constant.



As I mentioned above, I rely on some of **CBO's** assumptions to provide the basic economic inputs for my statistical work. Key among them are data about growth in the non-institutional population and the eligible labor force. I do not use **CBO's** household or payroll employment survey data as basic inputs because these are variables I choose to test in scenario analysis. I do, however, structure my payroll employment projections in my "**BASE**" scenario to end up at the same level by the end of 2028 that **CBO** forecasts. As can be seen in **Chart 9**, I moderate **CBO's** decline in payroll growth during 2021 in my "**BASE**" scenario, but not entirely. Employment growth in my other scenarios is also pulled down a little in 2021. I derive estimates of household employment and the unemployment rate from the payroll data. Payroll and household employment are tightly correlated over time.

After mid-2020, according to assumptions published by **CBO** in April 2018, growth in payroll employment is projected to fall to approximately 30,000 monthly after mid-2020 compared to a 100,000-monthly increase in the eligible labor force. **CBO** then assumes that monthly payroll growth accelerates to about 65,000 by 2024 and remains at that level for the remainder of the forecast period. However, monthly growth in the eligible labor force slows from 100,000 after 2021 and continues to slow, reaching a monthly level of about 35,000 after 2023. Long-term monthly employment growth would average about 90,000, if the participation rate remained constant.

Table 3 compares **CBO's** August 2016, January 2017 and April 2018 assumptions for various measures of employment.

Table 3

Comparison of CBO August 2016, June 2017 and April 2018 Assumptions for Various Measures of Employment

| | | August 2016 | June 2017 | Pct. Change | April 2018 | Pct. Change |
|-------------------------------------|---------|----------------|--------------|----------------|---------------|----------------|
| Non-institutional Population Growth | 2023-28 | 0.911% | 0.744% | -.167% | 0.729% | -.182% |
| Eligible Labor Force Growth | 2023-28 | 0.545% | 0.453% | -.092% | 0.327% | -.218% |
| Household Employment Growth | 2023-28 | 0.552% | 0.465% | -.087% | 0.294% | -.258% |
| Payroll Employment Growth | 2023-28 | 0.525% | 0.523% | -.002% | 0.440% | -.075% |
| Potential Hours Worked Growth | 2023-28 | 0.507% | 0.417% | -.090% | 0.312% | -.195% |
| Participation Rate | 2017:Q4 | 62.55% | 62.90% | .35% | 62.71% | .16% |
| Participation Rate | 2026:Q4 | 60.10% | 61.09% | .99% | 61.35% | 1.25% |
| | 2028:Q4 | | | | 60.96% | |
| Non-institutional Population (000) | 2017:Q4 | 256,940 | 255,938 | -.39% | 255,900 | -.40% |
| Non-institutional Population (000) | 2026:Q4 | 279,173 | 276,143 | -1.08% | 275,700 | -1.24% |
| | 2028:Q4 | | | | 279,200 | |
| Eligible Labor Force (000) | 2017:Q4 | 160,179 | 160,985 | .50% | 160,500 | .20% |
| Eligible Labor Force (000) | 2026:Q4 | 167,778 | 168,409 | .38% | 169,200 | .85% |
| | 2028:Q4 | | | | 170,200 | |
| Household Employment (000) | 2017:Q4 | 153,537 | 154,093 | .36% | 153,900 | .24% |
| Household Employment (000) | 2026:Q4 | 159,507 | 160,109 | .38% | 160,900 | .87% |
| | 2028:Q4 | | | | 162,100 | |
| Payroll Employment (000) | 2017:Q4 | 146,448 | 147,205 | .52% | 147,400 | .65% |
| Payroll Employment (000) | 2026:Q4 | 151,982 | 153,398 | .93% | 156,000 | 2.64% |
| | 2028:Q4 | | | | 157,600 | |

The revised average growth rates over 2023-2028 have slowed by a few basis points for all five employment measures. The growth rate fell less for payroll employment than for other employment measures because of the increase in the

assumed participation rate but also because **CBO** marked up the starting value to reflect recent strong payroll employment growth.

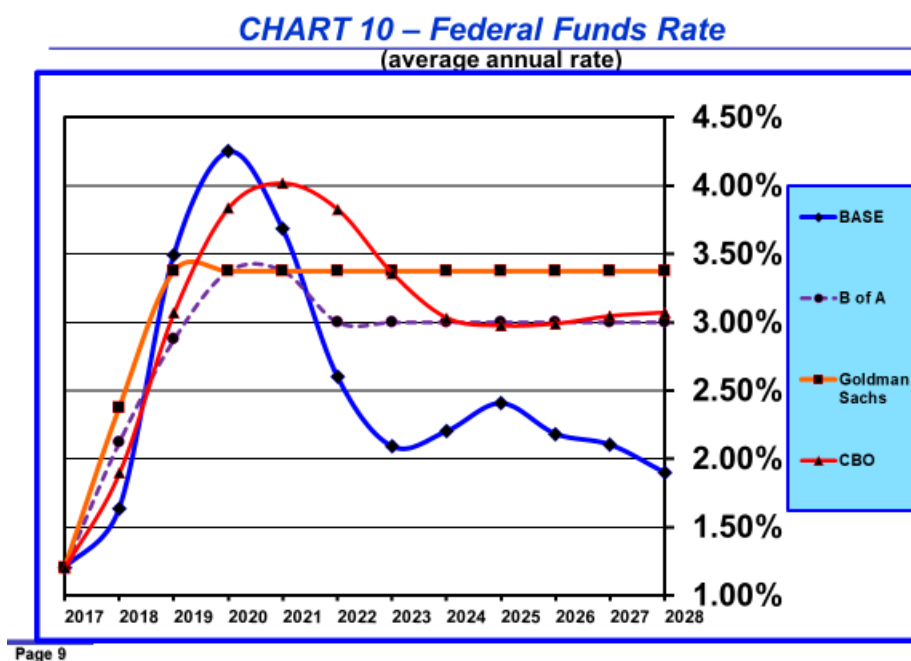
Compared to its August 2016 estimate, **CBO** in its April 2018 revision raised its assumed labor force participation rate by 16 basis points in 2017 and by 125 basis points in the longer run.

Annual growth in the non-institutional population is now expected to be just 0.73 percent in the long run compared to 0.91 percent in the August 2016 update. This means the population is now expected to grow 3.4 million fewer people by the end of 2026. However, the eligible labor force was 321,000 at the end of 2017 than projected in August 2016 due to higher expected participation. Similarly, household employment was 366,000 higher at the end of 2017. However, due to declining participation, the eligible labor force and household employment are both forecast to be 1.4 million lower by the end of 2026 in the April 2018 forecast compared to the August 2016 forecast. However, payroll employment growth by the end of 2026 is 4.0 million higher, reflecting the substantial improvement in the unemployment rate forecast in April 2018 compared to August 2016.

7. CBO's Interest-Rate Projections

CBO projects interest rates federal funds, 3-month Treasury bills, and the 10-year Treasury note for the next ten years as part of its estimation of the amount of interest payable on accumulated U.S. government debt. It updates its interest-rate assumptions along with other data revisions.

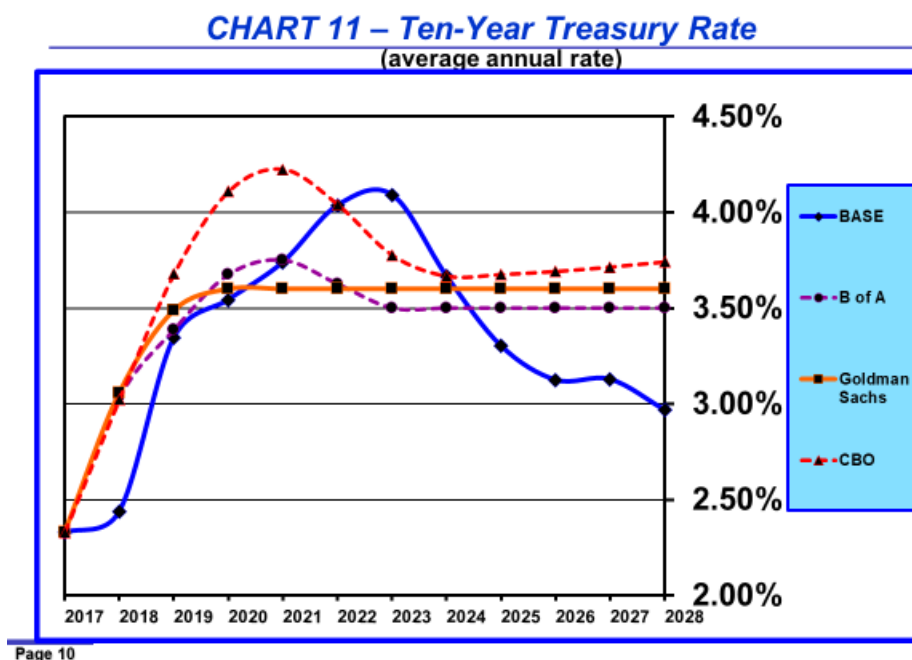
Chart 10 compares **CBO's** federal funds rate estimates with forecasts from my "**BASE**" scenario, **B of A** and **GS**. **CBO** assumes that the federal funds rate will rise from 1.20 percent at the end of 2017 to 4.00 percent by the end of 2020, hold at that level until mid-2022 and then decline to 3.00 percent by early 2024 and remain at that level through 2028. In effect, **CBO** assumes that 3.00 percent is the long-term neutral short-term rate of interest. However, **CBO** assumes that because the economy overheats in 2018-2020, the **FOMC** will be forced to raise the federal funds rate to 4.00 percent, 100 basis points above the neutral short-term rate. Historically, when the **FOMC** has raised rates well above the neutral rate, economic growth has slowed sharply and usually a recession has occurred. **CBO** assumes a soft landing will occur with a gradual slowing in growth. We can hope this is what occurs, but, based on historical experience, a soft landing would be an exceptional outcome.



My “**BASE**” scenario federal funds rate estimates are shown in **Chart 10** for comparative purposes. The federal funds rate in the “**BASE**” scenario rises slightly more rapidly than **CBO’s** forecast and peaks a little higher at 4.25 percent versus 4.00 percent and about two quarters sooner in early 2020. Both **B of A** and **GS** expect the federal funds rate to peak at 3.50 percent during 2020. Then, as the economy cools down, **B of A** projects that the federal funds rate will decline to 3.00 percent by 2022, which is about two years before **CBO** assumes that the federal funds rate will decline to 3.00 percent. **GS** does not expect the federal funds rate to decline as the economy slows down. The rate remains at 3.50 percent, which **GS** believes to be the long-term neutral short-term rate of interest. In the longer run, my “**BASE**” scenario forecast of the federal funds rate is an outlier as the rate falls to a range of 2.00 to 2.50 percent. This is caused by a decline in the inflation rate below 2.0 percent, which in turn is driven by slowing productivity growth and the decline in the labor market unemployment gap.

CBO’s longer-term rate projections for the 10-year Treasury yield are shown in **Chart 11**. **CBO** forecasts that the 10-year Treasury yield will peak at approximately 4.25 percent by the end of 2020, hold at that level for about one year, and then decline to its long-term neutral level of 3.70 percent by late 2023. What is most important in the long-term rate projections is **CBO’s** estimate of the stable long-term level of the 10-year rate, which was 3.63 percent in August 2016, 3.60 percent in January 2017 and 3.67 percent in April 2018. The April 2018 update places modest upside pressure on the size of the federal public debt over time.

Projections of the 10-year Treasury note yield in my “**BASE**” scenario rise more slowly than **CBO’s** projections, and also peak at about 4.25 percent, but about two years later. Long-term rates also rise in **B of A’s** and **GS’s** forecasts and peak in 2021 but at a slightly lower range of 3.60 to 3.75 percent compared to **CBO’s** peak of 4.25 percent. There is little difference in the estimate of the long-term neutral rate of interest – **B of A** = 3.50%; **GS** = 3.60%, and **CBO** = 3.67%. However, my estimate of the long-term rate in the “**BASE**” scenario falls to 3.00 percent by 2028, reflecting lower productivity growth and inflation below 2.0 percent.



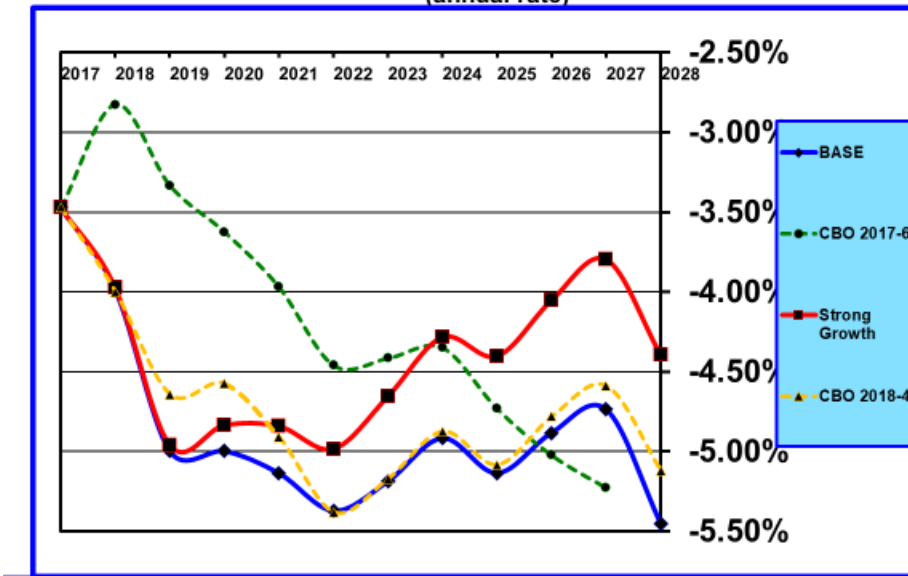
8. CBO’s Fiscal Projections – Annual Budget Deficit and GDP to Public Debt Ratio

Chart 12 shows **CBO’s** annual budget deficit projections for April 2018 (yellow dashed line with black triangles) and June 2017 (dashed green line with black circles). Also shown are my estimates of the annual budget deficit for the “**BASE**” and “**Strong Growth**” scenarios.

Overall, annual budget deficits are much larger in **CBO’s** April 2018 revision through 2025. The improvement in annual budget deficits in 2026 and 2027 in the April 2018 revision compared to the June 2017 revision is a direct consequence of repeal of substantial components of tax cuts after 2025 mandated by the Tax Cuts and Jobs Act. **CBO** is required to abide by current law in formulating its economic projections.

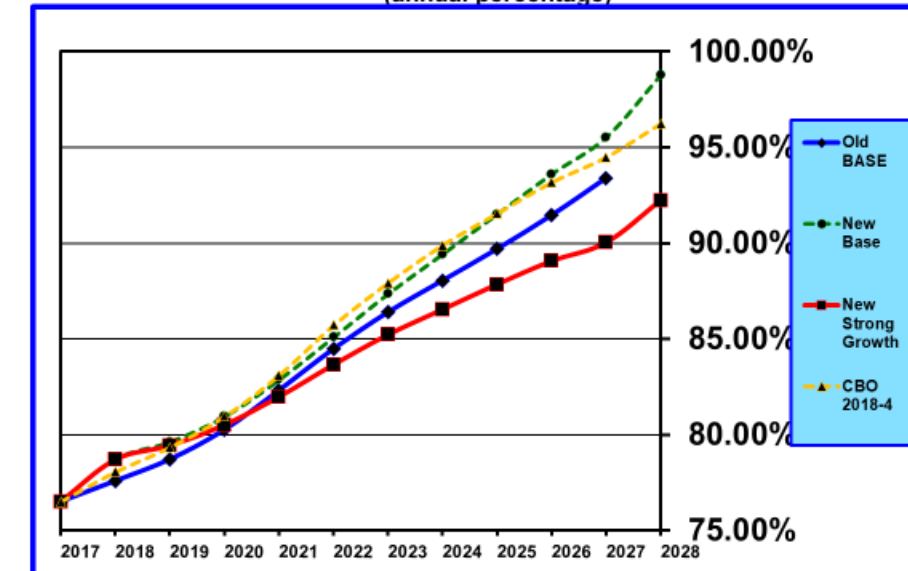
Except for 2019, 2020, and 2021, when my annual deficits are a little higher, my projection of the annual budget deficit in the “**BASE**” scenario hugs CBO’s April 2018 projections in the long run. Larger deficits in the near-term stem from my less bullish outlook for economic growth.

CHART 12 – Federal Budget Deficit
(annual rate)



Page 11

CHART 13 – Federal Debt to GDP
(annual percentage)



Page 12

Chart 13 shows the ratio of the projected level of the accumulated federal public debt to estimated future nominal GDP. Not surprisingly given the increases in annual budget deficits, **CBO's** projections are higher in every year. By 2028 the ratio rises from 76.5 percent for the 2017 fiscal year to 96.2 percent in fiscal year 2028. The total increase in **CBO's** estimate of public debt over the next 10 years in its April 2018 revision is \$1.6 trillion to \$28.7 trillion, due to \$2.7 trillion in tax cuts and additional spending over the next 10 years. The only good news is that **CBO** expects \$1.1 trillion of this increase to be recovered through better economic growth and higher tax revenues. But a 41 percent recovery on the federal government's investment in stimulating economic growth is not an investment any sensible business person would make.

Moreover, matters would be even worse if the repeal of many of the tax cuts during the next 10 years does not occur and other expiring tax breaks are extended. **CBO** estimates that this would add \$2.6 trillion to the public debt. Assuming no change in **CBO's** estimates of growth in nominal GDP, this would raise the public debt to nominal GDP ratio to 105.0 percent by the end of fiscal 2028.

This trend is disquieting and worrisome. **CBO** observes that larger public debt to nominal GDP ratios depress the growth rate in real GDP. That is why **CBO** reduced its estimates of real GDP growth by about 10 basis points in 2026, 2027 and 2028. Thus, if Congress extends tax cuts and tax breaks and the public debt ratio rises to 105.0 percent by the end of fiscal year 2028, GDP growth should be depressed, which means that the public debt ratio would probably be higher than 105.0 percent. My statistical analysis indicates that for each 1 percentage point increase in the public debt ratio, real GDP growth over the long run declines by 1.3 basis points. This implies that an increase in the public debt ratio from 96.2 percent to 105.0 percent would decrease annual real GDP growth by 11 basis points. This is a case where short-term gain comes at the expense of long-term pain. As such, ***the tax cuts and spending increases financed by debt is bad public policy.***

The estimate of the federal debt to GDP ratio in my "**BASE**" scenario is not materially different from **CBO's** April 2018 projections.

III. **Components of U.S. Real GDP**

Fourth quarter real GDP growth was the strongest in several quarters and reflected the hard-economic benefits of heightened confidence. The market took the report in stride as confirmation of expected accelerating growth. Attention is now shifting toward the impact of substantial fiscal stimulus on economic activity and inflation and how the Federal Reserve will respond to above potential economic activity and increasing inflationary pressure.

For the time being, optimists continue to hold sway and favorable economic momentum appears sufficient to guarantee good economic performance for several months and perhaps quarters. However, concerns are beginning to surface about overheating, upside pressure on inflation and the potential for tighter monetary policy and higher interest rates. While good times appear to be assured for the next 18 to 24 months because of substantial fiscal stimulus, worries are surfacing about what happens after that. Will growth slow gradually and dampen overheating – the proverbial soft landing? Or, do we face a classic end of cycle overshoot that will inevitably lead to recession?

1. **“Final Estimate” of Fourth Quarter GDP**

The **“Final Estimate”** of fourth quarter GDP growth was 2.9 percent. Details are shown in **Table 4**. The bottom four panels of **Table 4** show different measures of real GDP growth. These include the traditional **“Total GDP”** measure, and three alternatives – **“Final Sales,” “Private,”** and **“Private Domestic.”**

Reported quarterly **“Total GDP”** growth tends to be highly variable because of volatility in various GDP components, especially inventories, and the methodology of annualizing quarterly growth rates which amplifies the impact of short-term aberrations in the growth of individual GDP components. **“Total GDP”** grew 2.87 percent in the fourth quarter **“Final Estimate”** only slightly less than the 3.16 percent growth rate in the third quarter.

Table 4
Composition of 2017 and 2016 Quarterly GDP Growth

| | Fourth Quarter 2017 Advance Estimate | Fourth Quarter 2017 Preliminary Estimate | Fourth Quarter 2017 Final Estimate | Third Quarter 2017 | Second Quarter 2017 | First Quarter 2017 | Fourth Quarter 2016 |
|-----------------------------|--|---|--|--------------------------|---------------------------|--------------------------|---------------------------|
| Personal Consumption | 2.58% | 2.58% | 2.75% | 1.49% | 2.24% | 1.32% | 1.99% |
| Private Investment | | | | | | | |
| Nonresidential | .84% | .82% | .84% | .58% | .82% | .86% | .02% |
| Residential | .42% | .47% | .46% | -.18% | -.30% | .41% | .26% |
| Inventories | -.67% | -.70% | -.53% | .79% | .12% | -1.46% | 1.06% |
| Net Exports | -1.13% | -1.13% | -1.16% | .36% | .21% | .22% | -1.61% |
| Government | .50% | .49% | .51% | .12% | -.03% | -.11% | .03% |
| Total | 2.54% | 2.53% | 2.87% | 3.16% | 3.06% | 1.24% | 1.76% |
| Final Sales | 3.21% | 3.23% | 3.40% | 2.37% | 2.94% | 2.70% | .70% |
| Private | 2.71% | 2.74% | 2.89% | 2.25% | 2.97% | 2.81% | .67% |
| Private Domestic | 3.84% | 3.87% | 4.05% | 1.89% | 2.76% | 2.59% | 2.28% |

However, inventories and net exports tend to be highly volatile on a quarterly basis and this volatility often makes “**Total GDP**” a poor measure on the underlying strength of the domestic economy. Alternative GDP measures strip away the noise and provide a better sense of economic strength. The “**Final Sales**” measure of real GDP removes the contribution of changes in inventories. “**Final Sales**” grew 3.40 percent in the fourth quarter, which was much stronger than the 2.37 percent growth rate in the third quarter. Data in **Table 4** for “**Final Sales**” show that quarterly growth rates in inventories can be quite volatile and this then is also true for the “**Final Sales**” measure of real GDP growth

“**Private**” GDP omits both inventory changes and government investment spending. Growth in government expenditures rises during periods of economic weakness and falls during periods of strength or when fiscal austerity is the order of the day.

In my opinion, “**Private Domestic**” GDP is the best quarterly measure of fundamental economic momentum. It omits inventory changes, government spending and net exports. This measure gives the truest picture of the performance of the core of the U.S. economy, which accounts for approximately 87 percent to “**Total GDP**.” Annualized quarterly growth rates of this measure are generally less volatile, varying over the past four quarters from 1.89 percent to 4.05 percent. The fourth quarter “**Final Estimate**” was 4.05 percent, which, except for the third quarter, continued an improving trend over recent quarters. The third quarter was probably depressed by transitory negative impacts of last fall’s hurricanes. In a similar fashion, fourth quarter strength in this measure probably benefited in a rebound in economic activity as rebuilding and emergency disaster spending kicked in in the fourth quarter.

Discounting the hurricane impacts, the picture that the various measures of real GDP in recent quarters have painted is one of gradual acceleration in growth, which is somewhat above the potential rate.

2. Growth Rates of Real GDP Components – 4-Quarter Moving Average

Because quarterly annualized GDP data in the customary Bureau of Economic Analysis (**BEA**) reports are highly volatile, without the kind of dissection of details discussed above, quarterly data can be very misleading about the underlying trends in economic growth. **Table 5** and **Chart 14** show four-quarter moving averages of growth rates for GDP components as well as the four alternative measures of real GDP. This smooths out quarterly aberrations in the data and gives a clearer picture of the health and direction of the economy.

Growth in “**Domestic Private**” GDP has been consistently greater than growth in “**Total GDP**.” This has also been the case for “**Private**” GDP since the second

quarter of 2011. Since the fourth quarter of 2014, growth in “**Domestic Private**” GDP has been stronger than growth in “**Private**” GDP. This means that trade has had an unfavorable impact on GDP growth over the past three years.

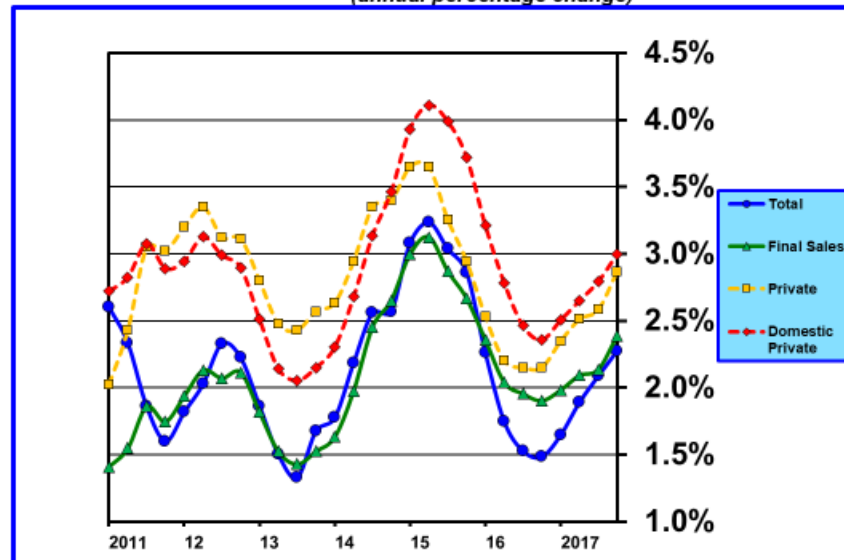
Table 5
Year-Over-Year Growth Rates for Components of Real GDP

| | GDP Com- ponent Weight | Fourth Quarter 2017 | Third Quarter 2017 | Second Quarter 2017 | First Quarter 2017 | Fourth Quarter 2016 | Third Quarter 2016 | Second Quarter 2016 |
|-----------------------------|---|------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|------------------------------------|
| Personal Consumption | 69.55% | 2.75% | 2.75% | 2.80% | 2.81% | 2.73% | 2.78% | 2.99% |
| Private Investment | 17.27% | | | | | | | |
| Nonresidential | 13.54% | 4.69% | 3.28% | 1.94% | .57% | -.59% | -.67% | -.24% |
| Residential | 3.50% | 1.77% | 1.76% | 2.09% | 3.34% | 5.48% | 7.41% | 9.60% |
| Inventories | .09% | -54.5% | -21.9% | -59.8% | -69.7% | -66.8% | -66.3% | -45.7% |
| Net Exports | -3.64% | 6.06% | 7.83% | 5.98% | 6.33% | 7.51% | 10.59% | 18.89% |
| Exports | 12.82% | 3.36% | 2.27% | 1.97% | .76% | -.33% | -.93% | -1.19% |
| Imports | -16.46% | 3.95% | 3.45% | 2.83% | 1.92% | 1.27% | 1.32% | 2.50% |
| Government | 16.98% | .11% | .03% | .13% | .28% | 0.75% | 1.05% | 1.29% |
| Total | 100.0% | 2.27% | 2.09% | 1.89% | 1.65% | 1.49% | 1.53% | 1.75% |
| Final Sales | 99.91% | 2.39% | 2.14% | 2.09% | 1.98% | 1.90% | 1.96% | 2.04% |
| Private | 82.93% | 2.87% | 2.58% | 2.51% | 2.35% | 2.15% | 2.15% | 2.20% |
| Private Domestic | 86.57% | 3.00% | 2.79% | 2.65% | 2.50% | 2.36% | 2.46% | 2.78% |

Since 2015 fiscal policy has been mildly supportive of “**Total GDP**” growth. In recent quarters government’s contribution to real GDP growth has been small and diminishing, which has reduced the growth rate in “**Total GDP**” relative to “**Private**” GDP. This should change in 2018 and 2019 as federal spending (not including transfer payments which are not counted in the government sector of GDP) ramps up.

There are some important takeaways from **Chart 14**. First, all four measures of real GDP growth troughed in the fourth quarter of 2016 and have risen gradually since then, reflecting accelerating growth momentum. Second, “**Private**” GDP, which omits government spending and inventory accumulation, and “**Private Domestic**” GDP, which omits government spending, inventory accumulation and net exports, have been growing more rapidly than “**Total GDP**” and “**Final Sales**.”

CHART 14– Real GDP Growth – Alternative Measures
(annual percentage change)



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3. Consumption and Disposable Income

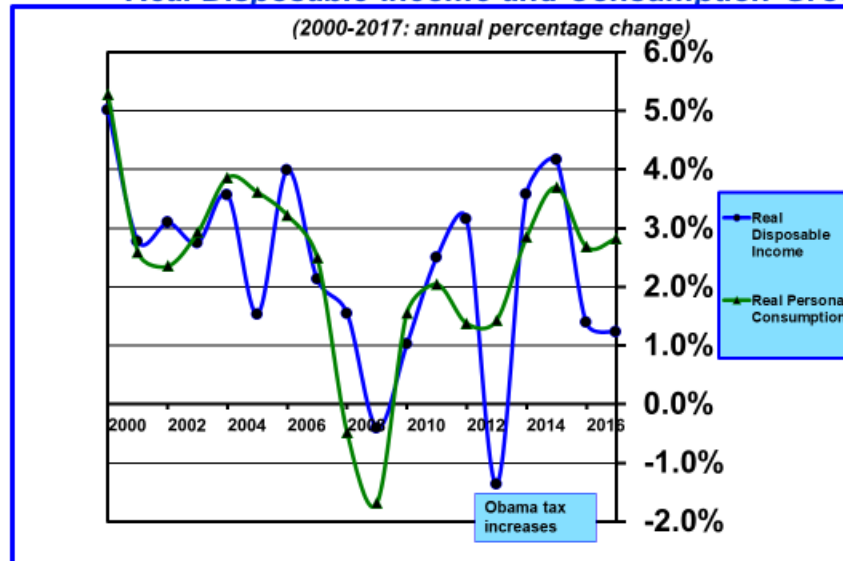
Personal consumption contributed 2.75 percent to fourth quarter real GDP growth compared to 1.49 percent in the third quarter, 2.24 percent in the second quarter and 1.32 percent in the first quarter. This volatility once again emphasizes the limitations of relying on quarterly data to discern trends. The four-quarter moving average trend is a more reliable indicator. It has been very stable over the past six quarters, varying between 2.73 percent and 2.81 percent.

In the long run, growth in nominal disposable income and consumer saving preferences determine growth in nominal personal consumption. Nominal disposable income depends upon a lot of things but the most important ones are the level of employment and wage rates. Tepid growth in employment and lethargic growth in wage rates will result in slow growth in disposable income. In recent months employment growth has been quite strong, but wage growth has been disappointing.

Chart 15 shows annual rates of growth in real disposable income and real consumer spending from 2000 through 2017. The negative impact of the Great Recession on both disposable income and consumption growth is clear in **Chart 15**. So, too, is the temporary depressing effect of the Obama tax increases on disposable income growth in 2012 but not on consumption growth. However, it is unclear why growth in disposable income faltered recently while consumption growth remained relatively strong. Disposable income growth accelerated in the fourth quarter. This improving

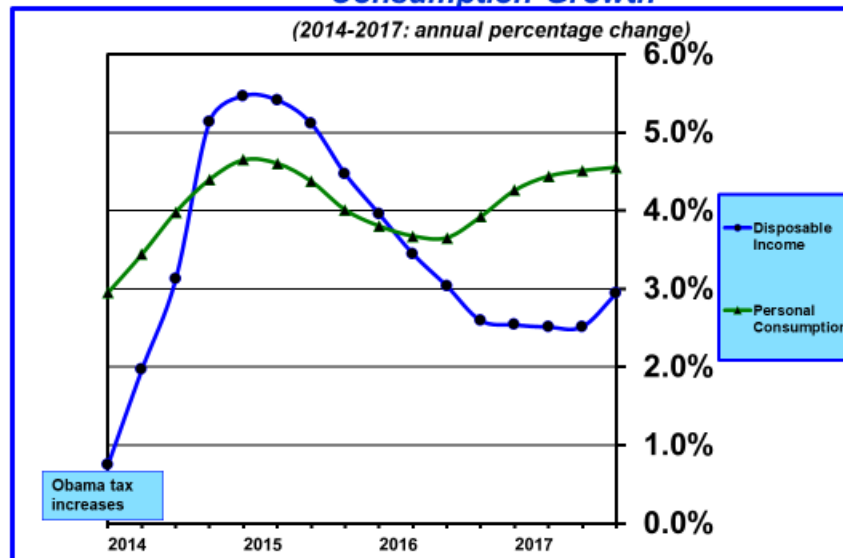
trend will continue in 2018 and will benefit from strong gains in employment, rising wage rates and tax cuts.

CHART 15
– Real Disposable Income and Consumption Growth



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CHART 16 – Nominal Disposable Income and Consumption Growth

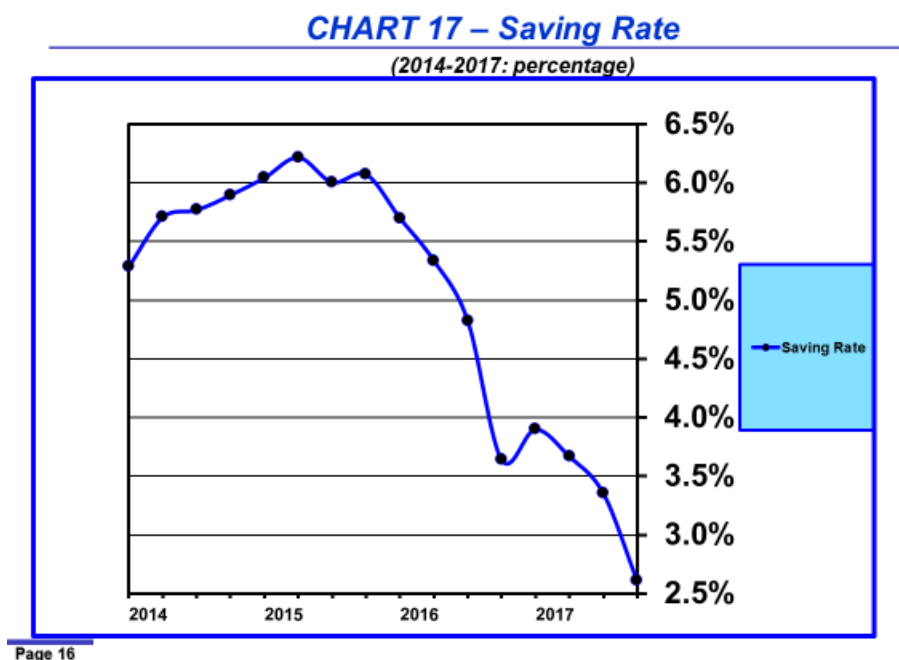


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This divergence is evident in **Chart 16**. Over the past two years, nominal disposable income growth has plunged while spending growth has remained relatively high and even increased over the past five quarters.

Chart 16 shows the 4-quarter moving average growth rates in nominal disposable income and consumption from 2014 through the fourth quarter of 2017. Growth in consumption is typically less volatile than growth in disposable income. Consumer saving serves as the buffer (see **Chart 17**). When growth in disposable income is weak, the saving rate declines as consumers dip into savings and increase borrowing to sustain consumption. This phenomenon is consistent with the permanent income hypothesis which posits that consumers will plan consumption expenditures based upon expected long-run sustainable income rather than adjust consumption to short-term oscillations in disposable income.

As is evident in **Chart 17**, so far as the reported data are concerned, consumer spending has been supported by a collapse in the saving rate from 6.1 percent during 2015 to 3.4 percent in 2017. Continuing the downward trend, the saving rate over the first two months of 2018 was 3.3 percent.



As can be seen in **Chart 16**, disposable income growth slowed considerably over the last several quarters until showing improvement in the fourth quarter of 2017. This phenomenon only became apparent when **BEA** did its annual benchmarking of the National Income Accounts in July 2017. The downward revisions were inconsistent with strong employment growth and some, albeit limited, acceleration in

wage rates. **GS** believes that this inconsistency can be explained, at least in part, by tactical income shifting from one year to another in anticipation of tax reform and in part by its expectation that **BEA** will revise underreported disposable income up by 0.8 percent at the next benchmarking in July 2018. This would also lift the saving rate by 0.4 percent.¹ A simple check is to multiply the rate of growth of total hours worked by all employees in 2017 (2.01 percent) by the rate of growth in nominal weekly wages (2.52 percent). This results in a growth rate in wage income of 4.58 percent, which is closer to nominal growth in consumption of 4.55 percent compared to nominal growth in disposable income of 2.94 percent. This is suggestive evidence of underreporting of disposable income but not definitive since employee compensation only accounts for 63 percent of personal income.

Nonetheless, if the decline in disposable income growth has not been caused by incomplete disposable income data but is due to fundamental factors, then eventually growth in consumption will fall. In turn, since consumption is nearly 70 percent of total GDP, growth in GDP will decline.

Since the election of Donald Trump as president, consumer and business confidence has surged to the highest levels in 20 years. Over the same time, consumption growth has accelerated but income growth has merely stabilized at a relatively low level. Assuming the income data are reliable, which they might not be, income growth in coming months will need to accelerate to validate consumer optimism. Negligible acceleration in wage growth and the probable eventual slowing in employment growth now that the labor market has exceeded full employment do not bode favorably.

Forecasts of growth in real consumer spending over the next several years are shown in **Table 6** and **Chart 18**. Real consumer spending increased 2.69 percent in 2016 and 2.82 percent in 2017. These are not the final numbers as several more revisions will occur over the next few years.

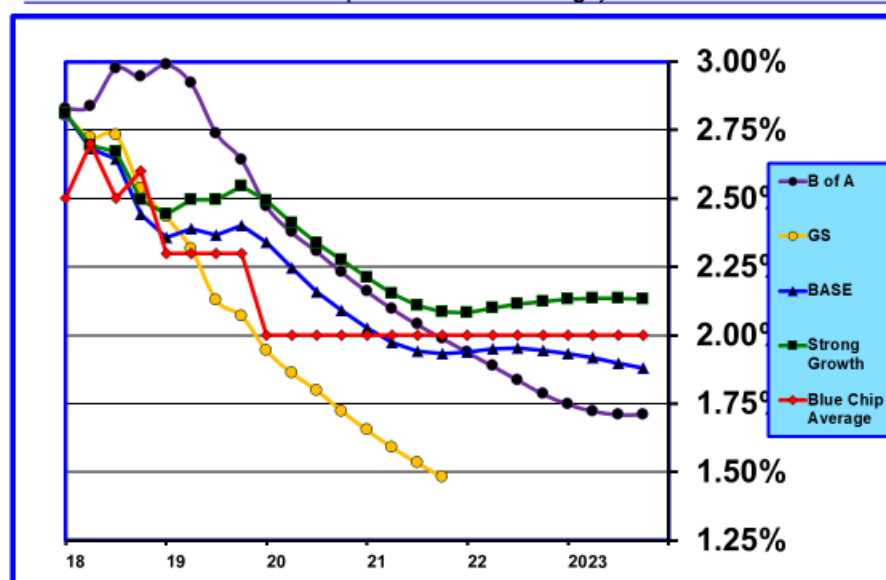
Most forecasters expect real consumer spending growth to slow in coming years because the economy is at or above full employment and employment growth is set to slow in coming quarters to match the underlying demographic dynamics of aging and slowing population growth. Fiscal stimulus will delay this correction for at least another year and possibly two.

¹ Spencer Hill. "Tactical Income Shifting and Compensation Slump," US Daily, Goldman Sachs Economics Research, September 22, 2017.

Table 6
Real Personal Consumption Growth Rate Forecasts

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-----------------------------|------|------|------|------|------|------|------|------|------|
| Actual | 2.84 | 3.70 | 2.69 | 2.82 | | | | | |
| B of A | | | | | 2.94 | 2.64 | 2.23 | 1.99 | 1.79 |
| GS | | | | | 2.54 | 2.07 | 1.72 | 1.48 | |
| ISH Markit | | | | | 2.90 | 2.40 | 2.10 | 2.10 | 2.10 |
| Economy.com | | | | | 2.70 | 2.50 | 1.10 | | |
| Blue Chip | | | | | 2.60 | 2.30 | 2.00 | 2.00 | 2.10 |
| Bill's BASE | | | | | 2.44 | 2.40 | 2.09 | 1.93 | 1.94 |
| Bill's Strong Growth | | | | | 2.49 | 2.54 | 2.27 | 2.08 | 2.12 |

CHART 18 – Real Consumer Spending Forecasts
(annual rate of change)



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This slowing pattern in consumer spending growth is apparent in the data in **Table 6** and **Chart 18**. Growth in real wages might moderate the forecast decline in consumer spending growth, but only if the growth rate in real wages increases. That would require productivity to improve from its recent very low level, which would be a welcome result, but is not at all assured.

All forecasters agree that consumer spending growth will slow. My projections for spending growth in 2018 are at the low end of the forecast range. Beyond 2018, my forecasts of spending growth are generally consistent with those of other forecasters except **GS**. After 2018 **GS** is much more pessimistic than others and expects a

substantial decline in consumer spending growth; the same is the case to a somewhat lesser extent for **B of A** after 2021.

4. Business Investment

Real private investment consists of three principal categories – business investment, which is labeled “nonresidential” in the National Income Accounts, residential investment, and changes in inventories. While changes in inventories are volatile from quarter to quarter, over the very long run the growth rate in inventories closely tracks growth in business and residential investment.

Table 7 shows growth rates for real private investment and separately for two of its three principal components – nonresidential (business) and residential investment. Residential investment is 20 percent of total investment, nonresidential investment is 77 percent, and growth in inventories accounts for approximately 3 percent.

Table 7

**Real Private Investment (Residential and Nonresidential) Growth Rate
Forecasts**

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | Ave. 1947- 2017 |
|--|-------|-------|------|-------------|-------------|-------------|-------------|-------------|-----------------------|
| REAL PRIVATE INVESTMENT | | | | | | | | | |
| Actual | 3.83 | 0.63 | 4.08 | | | | | | 3.75** |
| B of A | | | | 4.89 | 5.06 | 4.07 | 3.60 | 3.19 | |
| GS | | | | 5.03 | 3.97 | 3.01 | 2.70 | | |
| Bill's BASE | | | | 5.24 | 4.70 | 2.20 | 0.86 | 1.41 | |
| Bill's Strong Growth | | | | 5.89 | 5.20 | 2.33 | 1.26 | 1.87 | |
| REAL NONRESIDENTIAL (BUSINESS) INVESTMENT | | | | | | | | | |
| Actual | 2.34 | -0.59 | 4.69 | | | | | | 2.61* |
| B of A | | | | 5.59 | 5.57 | 4.33 | 3.77 | 3.22 | |
| GS | | | | 5.28 | 4.05 | 3.20 | 2.80 | | |
| REAL RESIDENTIAL INVESTMENT | | | | | | | | | |
| Actual | 10.23 | 5.48 | 1.77 | | | | | | -0.16* |
| B of A | | | | 2.19 | 3.03 | 3.03 | 3.03 | 3.03 | |
| GS | | | | 4.04 | 3.66 | 2.25 | 2.30 | | |

*Average 1999-2017

**Real private investment = 1.72% for 1999-2017

Nonresidential investment (business) growth was crushed in 2016 by the collapse in oil and commodity prices. But business investment was down in other sectors as well. Investment growth was negative -0.59 percent in 2016.

Nonresidential investment came out of deep slumber in 2017, rising at an annual rate of 4.69 percent. A recovery in energy investment accounted for much of this surge. Capital investment growth in sectors other than energy and oil has improved slightly but only to about the underlying long-term trend rate of 2.61 percent. Considering the acceleration in global growth and the tightening U.S. labor market, the improvement in growth in investment spending so far has been underwhelming. However, this is expected to change in 2018 and 2019 due to tax breaks contained in the Tax Cuts and Jobs Act, which are intended to stimulate investment

Forecasters expect **real private investment** growth will be well above the long-term trend level in 2018, 2019 and 2020. Strong growth is supported by **GS's** capital expenditures tracker, which has risen strongly in recent months and registered an above trend level of approximately 9.0 percent in April. **GS** expects easier financial conditions and stronger domestic demand, as implied by purchasing manager surveys, to make 2018 a very good year. With the passage of tax reform, as the **GS** capital expenditures tracker is signaling, risks are now tilted in the direction of strong business investment growth in 2018.

Generally, in recent years, analyst forecasts of growth in business investment have been too optimistic and this may again prove to be the case with **B of A's** and **GS's** above trend capital spending forecasts for 2018 and particularly for **B of A's** continued above trend forecasts in 2019, 2020 and 2021. However, several features of tax reform are intended to boost business investment, so the optimistic forecasts might come to pass this time and perhaps even be exceeded in 2018.

Following 2018 and over the next several years **GS** expects **business investment** to slow gradually to the long-term trend growth of 2.61 percent that has prevailed over the last 19 years, while **B of A** expects growth to be above trend for 2018-2022.

B of A and **GS** are optimistic about the outlook for business investment growth to remain at a high level over the next several years because they expect corporate profits to accelerate, credit conditions to remain benign and uncertainty to diminish. The benefits of tax reform must now be added to those positive drivers. A potential weakness in **B of A's** business investment model is the possibility of cumulative negative effects over time of low interest rates and depressed innovation, as reflected in a slower rate of new business formation. (Note that the "Tax Cuts and Jobs" Act could lead to acceleration in new business formation, but such an acceleration would probably be driven by restructuring to take advantage of tax law

rather than to any fundamental acceleration in investment and innovation.) Also, according to the Federal Reserve's data on capacity utilization, because firms are operating at less than full capacity, the incentive to invest has been dampened.

Housing – Real residential investment growth was very strong in 2015. Growth slowed considerably in 2016 but remained well above the long-term trend, which is not difficult considering that the annual rate of growth over the past 19 years has been slightly negative. Growth was positive in 2017 but was disappointingly low.

Housing inventories are lean and demand is relatively strong, resulting in upward pressure on housing prices. However, outsized housing price increases (see **Chart 19**), which are exceeding growth in wages and nominal disposable income, will eventually dampen single-family residential demand and inventories should improve with the consequence that residential investment growth should slow in coming years. Forecasts generally reflect this scenario, although trend growth is expected to exceed slightly (**GS** and **B of A**) that of overall real GDP growth over the next three years.

Housing starts are still historically low relative to family formation rates. The long-term trend rate in housing starts should be about 1.4 million based upon growth in household formation and replacement of existing homes. But, starts were 1.21 million in 2017, up just 2.6 percent from 1.18 million in 2016.

B of A expects housing starts will be 1.28 million in 2018 because of lower than expected activity in multifamily housing construction. **GS's** forecast is similar – 1.26 million in 2018.

According to **B of A**, the shortfall in housing starts relative to the level implied by demographics and historical trends in household formation can be traced to high levels of student debt, tighter credit standards, including higher down payment requirements, which many have difficulty meeting, and lifestyle changes among Millennials including delays in marriage and having children. The consequence is that Millennials have much lower homeownership rates, a phenomenon that seems likely to persist. This is depressing single family construction.

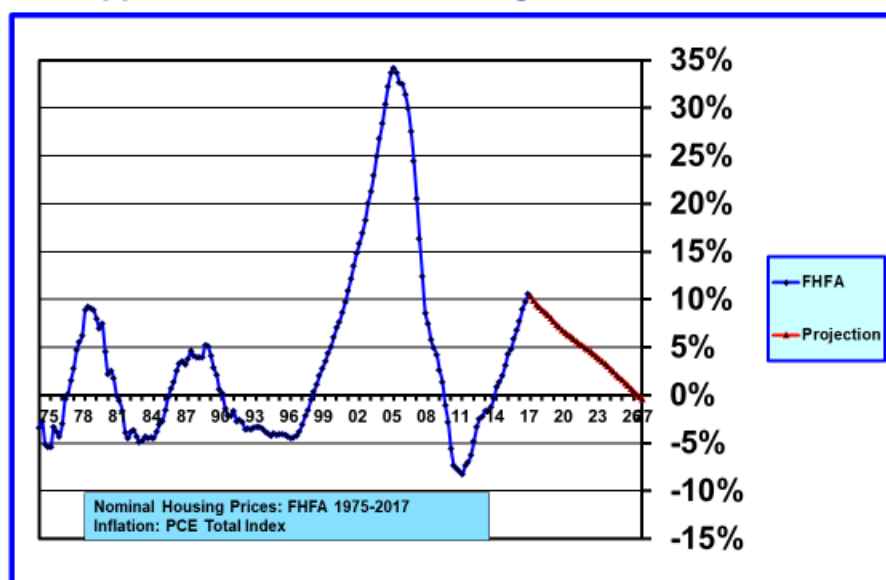
On the supply side, the number of homebuilders declined substantially during the Great Recession and has not recovered. Credit standards remain tight for construction loans and this is reducing the extent of speculative building.

In summary, housing demand is depressed relative to demographics and historical trends in household formation and supply is weak. Overall housing inventory is very lean. In response, average housing prices have been rising faster than growth in nominal incomes. All else equal, this creates a feedback loop which depresses

demand. Ordinarily, this would be offset by increased construction. But in the wake of the Great Recession's cataclysmic impact on builders and lenders, increased construction activity has been constrained.

Housing prices continue to move higher and were up 6.2 percent (S&P CoreLogic Case-Shiller National Home Price Index) in January over the prior year; the Federal Housing Finance Agency's purchase only housing price index was up 6.7% in the fourth quarter of 2017 compared to the fourth quarter of 2016. These increases are well above the 3.1 percent growth in aggregate nominal disposable income and 2.4 percent growth in per capita nominal disposable income over the past 12 months. This differential is eroding affordability and, thus, is not sustainable over the long run. Any increase in mortgage rates will simply make matters worse.

CHART 19 – Cumulative Real Housing Price Appreciation Relative to Long-Term Trend (1975-2017)



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As **Chart 19** shows, average national housing prices were 10.6 percent above the long-run equilibrium trend level in the fourth quarter of 2017. Except for the housing bubble in the mid 2000's, this level of overvaluation matches or exceeds the housing price peaks in the late 1970s and late 1980s. The forecast slow downward drift in the amount by which average prices exceed the equilibrium trend level is probably optimistic. In all previous cycles the decline from an overvaluation peak has been steep and significant. If the economy continues to run hot for a few more quarters, it is likely that housing prices will become even more overvalued. As a reminder, the amplitude of the housing price cycle matters in the sense that the greater the excess overvaluation becomes, the greater will be the consequences and pain of the

inevitable price correction, with prices not just returning to trend level but falling below trend. In all previous cycles, prices have fallen below fair value during the correction and the severity of the decline mirrors to an extent the excess on the upside.

In summary, residential investment growth, which rose only 1.8 percent in 2017, will continue to be weak in coming quarters because of continuing tight credit standards, higher housing prices and the potential for somewhat higher mortgage interest rates. I would place greater confidence in **B of A's** conservative 2.2 percent forecast housing investment growth in 2018 relative to **GS's** more optimistic 4.2 percent housing investment forecast.

5. Change in Inventories

Inventories subtracted 0.54 percent from “**Total GDP**” growth in the fourth quarter, added 0.79 percent to “**Total GDP**” growth in the third quarter, subtracted 1.46 percent in the first quarter and added 1.06 percent in the fourth quarter of 2016 (see **Table 4**). The change in inventories was very subdued in the second quarter of 2017, adding only 0.12 percent to real GDP. Quarterly changes in inventories are very volatile and that skews interpretation of quarterly “**Total GDP**” data.

As can be seen in **Table 8**, real inventory accumulation declined each quarter from the first quarter of 2015 to the second quarter of 2016. Inventory growth bounced back to \$63.1 billion in the fourth quarter of 2016, but sagged to \$1.2 billion in the first quarter of 2017 and \$5.5 billion in the “**Final Estimate**” for the second quarter; then rose to a trend level of \$38.5 billion in the “**Final Estimate**” for the third quarter, but returned to a below trend level of \$15.6 billion in the “**Final Estimate**” for the fourth quarter.

Inventories generally add between 0.1 and 0.2 percent to annual real GDP growth. Based on the historical record, inventory accumulation in the second and third quarters of 2016 and the first, second and fourth quarters of 2017 was well below average. Accumulation in the third quarter was actually very close to the long-term trend level of \$37.1 billion.

As can be seen in **Table 8**, initial inventory data are crude estimates and are subject to substantial revision over the next three years. The \$15.6 billion inventory accumulation in the fourth quarter “**Final Estimate**” will be revised three more times in the next three years.

To add to the data quality problem, quarterly changes are annualized and this can greatly amplify the impact of data errors and contribute to misperceptions about the

trend in real GDP growth. Volatile inventory data are especially troublesome in this regard.

There are two ways to gain a better sense of the underlying trend in real GDP growth. One way is to omit highly volatile data, especially data that are subject to substantial subsequent adjustment. That is why many analysts report the growth rate in “**Final Sales**,” which omits inventory data, as I do in **Tables 4** and **5**.

Another method that helps give a better sense of the underlying trend in real GDP growth is to focus on year-over-year growth rates, which are calculated by dividing the average of the most recent four quarters by the average of the preceding four quarters. The result of that calculation methodology can be seen in **Table 5** by comparing the growth rates in “**Total GDP**” and “**Final Sales**.” Quarterly data volatility in growth rates largely disappears – the impact of inventories on “**Total GDP**” growth is very small and the growth trends in “**Total GDP**” and “**Final Sales**” are similar.

Table 8
Quarterly Real Inventory Data
(most recent data are in red)

| | Advance Estimate | Preliminary Estimate | Final Estimate | First Annual Revision | Second Annual Revision | Third Annual Revision |
|---------|---------------------|-------------------------|-------------------|--------------------------|------------------------------|-----------------------------|
| 2017 Q4 | 9.2 | 8.0 | 15.6 | | | |
| 2017 Q3 | 35.8 | 39.0 | 38.5 | | | |
| 2017 Q2 | -.3 | 1.8 | 5.5 | | | |
| 2017 Q1 | 10.3 | 4.3 | 2.6 | 1.2 | | |
| 2016 Q4 | 48.7 | 46.2 | 49.6 | 63.1 | | |
| 2016 Q3 | 12.6 | 7.6 | 7.1 | 17.0 | | |
| 2016 Q2 | -8.1 | -12.4 | -9.5 | 12.2 | | |
| 2016 Q1 | 60.9 | 69.6 | 68.3 | 40.7 | 40.6 | |
| 2015 Q4 | 68.6 | 81.7 | 78.3 | 56.9 | 68.2 | |
| 2015 Q3 | 56.8 | 90.2 | 85.5 | 70.9 | 96.2 | |
| 2015 Q2 | 110.0 | 121.1 | 113.5 | 93.8 | 105.6 | |
| 2015 Q1 | 110.3 | 95.0 | 99.5 | 112.8 | 114.4 | 132.2 |
| 2014 Q4 | 113.1 | 88.4 | 80.0 | 78.2 | 76.9 | 76.9 |
| 2014 Q3 | 62.8 | 79.1 | 82.2 | 79.9 | 66.8 | 85.6 |
| 2014 Q2 | 93.4 | 83.9 | 84.8 | 77.1 | 55.2 | 69.9 |
| 2014 Q1 | 87.4 | 49.0 | 45.9 | 35.2 | 36.9 | 38.7 |
| 2013 Q4 | 127.2 | 117.4 | 111.7 | 81.8 | 87.2 | 103.6 |
| 2013 Q3 | 86.0 | 116.5 | 115.7 | 95.6 | 93.6 | 109.0 |
| 2013 Q2 | 56.7 | 62.6 | 56.6 | 43.4 | 39.6 | 52.6 |

6. Government Investment

Government investment added 0.11 percent to real GDP growth in 2017 (see **Tables 4** and **9**). Federal government spending rose at an annual rate of 0.16 percent and state and local spending rose 0.08 percent.

Table 9

Federal and State and Local Investment Spending Growth Rates

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|--------------------------|-------|------|------|-------------|-------------|-------------|-------------|-------------|
| Federal | -0.08 | 0.05 | 0.16 | | | | | |
| State and Local | 2.31 | 1.18 | 0.08 | | | | | |
| Total Government | 1.39 | 0.75 | 0.11 | | | | | |
| GS Federal | | | | 4.82 | 7.15 | 4.26 | 0.97 | |
| GS State and Local | | | | 0.98 | 0.88 | 0.36 | 0.04 | |
| GS Total | | | | 2.46 | 3.35 | 1.95 | 0.43 | |
| B of A Total | | | | 1.52 | 2.29 | | | |
| BASE | | | | 1.51 | 1.63 | 1.29 | 1.00 | 0.88 |
| Strong Employment | | | | 1.51 | 1.63 | 1.30 | 1.39 | 1.41 |

Table 9 shows recent growth rates in government spending and forecasts for 2018-2022. **GS** and **B of A** expect strong growth in government investment spending in 2018 and 2019. The substantial increase in growth is due entirely to federal spending. **B of A's** forecast is considerably lower than **GS's**. Given customary delays in actual federal spending, I am more comfortable with **B of A's** forecast and expect government investment spending to return to its recent trend level of 1.01 percent by 2021.

7. Net Exports

In the “**Final Estimate**” for the fourth quarter of 2017 net exports subtracted 1.16 percent from fourth quarter real GDP growth after adding 0.36 percent in the third quarter, 0.21 percent in the second quarter and 0.22 percent to first quarter real GDP growth (see **Table 4**). After three quarters of small positive contributions to real GDP growth, the large negative in the fourth quarter of 2017 continued the negative trend that prevailed in 2014, 2015 and 2016 when the dollar strengthened. It is too early to tell whether the fourth quarter represents a continuation of the previous negative trend or whether it was simply a one-quarter anomaly. However, a possible explanation is that stronger consumption growth in the U.S. is driving increased growth in imports, even though the weaker dollar makes imports more expensive.

Since the end of 2016 the trade deficit in goods and services has risen from 2.67 percent of nominal GDP to 2.96 percent in February 2018. The shares of both imports and exports as offsetting components of GDP have increased over the past 14 months. Exports of goods have increased from 7.85 percent to 8.14 percent of GDP and imports of goods have risen from 11.91 percent to 12.45 percent of GDP.

These trends should continue as long as the dollar remains weak and consumer spending remains robust. Exports will also continue to do well because of the weak dollar and strong global demand. However, the increase in the dollar amount of imports will overwhelm the dollar amount of exports which will drive the trade deficit higher. Consequently, I expect the trade deficit in goods and service to rise substantially during the remainder of 2018.

Trade trends could be impacted negatively if a serious trade war breaks out. The Trump administration wants to reduce the trade deficit and has proposed tariffs on steel and aluminum imports and threatened to impose tariffs on other imported goods. So far this has been more bark than bite, but the possibility of significant tariffs should not be dismissed. If this were to come to pass, it would reduce imports but it through retaliatory tariffs, it would reduce exports as well. It is not clear that an all-out trade war would reduce the size of the U.S. trade deficit. What it would do, however, is to slow global trade and weigh on global economic activity. It is this potential that has spooked the stock market recently, although the market is oscillating between fear that a trade war will erupt and the hope that rhetoric will not lead to consequential tariffs and substantial decreases in trade.

8. First Quarter 2018 GDP Forecasts

B of A's current first quarter real GDP forecast is 1.7 percent and **GS's** is 1.9 percent. This weakness is expected to be a one quarter phenomenon, with robust growth resuming over the remainder of 2018.

9. Longer-Term Real GDP Forecasts

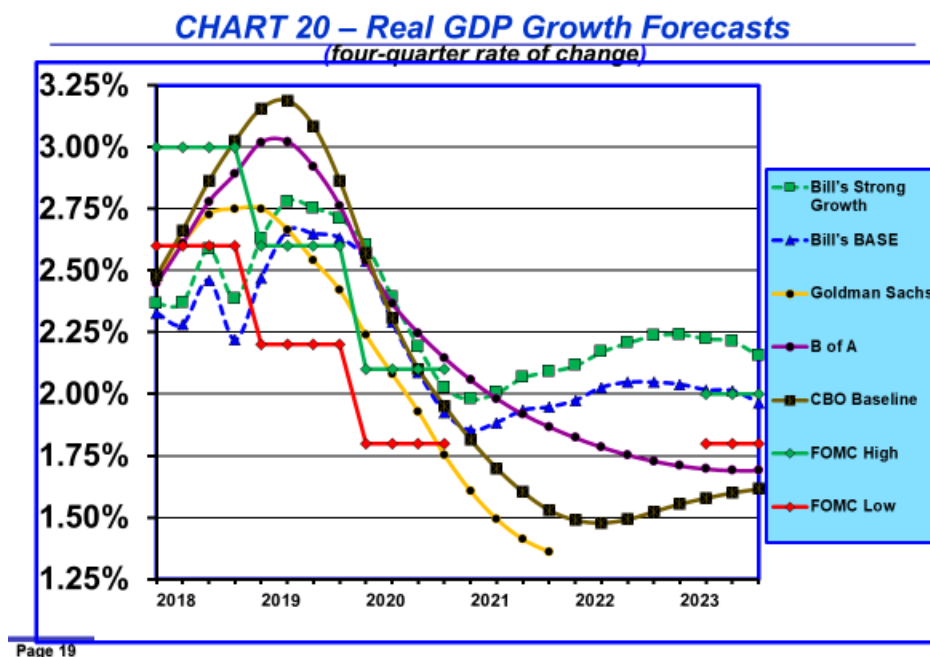
Chart 20 shows quarterly real GDP growth projections from the first quarter of 2018 to the fourth quarter of 2023. **Table 10** includes annual real GDP growth for 2015-17 and forecasts for 2018 to 2023. Forecasts for 2018 range from 2.4 percent (my "**BASE**" scenario) to 3.0 percent (**CBO's** forecast). Forecasts for 2019 are more tightly clustered and my "**BASE**" and "**Strong Growth**" forecasts are in the middle of the pack.

All forecasters expect real GDP growth to slow considerably in 2020 after the impact of the massive federal fiscal stimulus wears off. Economy.com is especially pessimistic. Forecasters almost never foresee a recession until it is well underway.

Table 10
Real GDP Growth Forecasts
 (year-over-year average)

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|-----------------------------|------|------|------|------|------|------|------|------|------|
| Actual | 2.86 | 1.49 | 2.27 | | | | | | |
| B of A | | | | 2.89 | 2.76 | 2.15 | 1.87 | 1.73 | 1.69 |
| GS | | | | 2.75 | 2.42 | 1.75 | 1.36 | 1.75 | 1.75 |
| IHS Markit | | | | 2.70 | 2.70 | 2.10 | 1.90 | 1.90 | 1.90 |
| Economy.com | | | | 2.90 | 2.60 | 0.90 | | | |
| Blue Chip Average | | | | 2.70 | 2.40 | 2.10 | 2.00 | 2.00 | 2.01 |
| CBO | | | | 3.03 | 2.86 | 1.95 | 1.53 | 1.52 | 1.62 |
| FOMC High* | | | | 3.00 | 2.60 | 2.10 | | | |
| FOMC Low* | | | | 2.60 | 2.20 | 1.80 | | | |
| Bill's BASE | | | | 2.41 | 2.60 | 2.21 | 1.91 | 2.02 | 2.01 |
| Bill's Strong Growth | | | | 2.51 | 2.72 | 2.30 | 2.04 | 2.18 | 2.21 |

*Q4 to Q4 – sensitive to specific Q4 values and may diverge from year-over-year trend.



However, because fiscal stimulus comes at a time when the economy is already operating above full employment, monetary policy will be very challenged to engineer a soft landing. The risk of recession in 2020 is significant but not certain.

After 2019 most forecasters expect real GDP growth to track long-term potential, which most believe is in a range of 1.75 to 2.00 percent. Note that CBO forecasts growth in 2021 and 2022 to be below potential, which is an assumption necessary to eliminate the positive output gap.

IV. U.S. Employment Developments

Payroll employment growth was a strong 326,000 in February and a weak 103,000 in March. However, the three-month average monthly gain in jobs was 201,667, which is slightly higher than 2017's monthly average of 182,333. Thus, hiring remains brisk and well above the natural increase in labor supply, which is growing about 100,000 monthly. Consequently, the labor market continues to tighten. The unemployment rate was 4.1 percent for the sixth consecutive month and remains at the lowest level in 16 years. All agree that the unemployment rate is below the natural rate, which means that the labor market is tight. All also expect the unemployment rate to decline further in coming months as the economy responds to massive fiscal stimulus.

However, disappointing to some and somewhat perplexing considering strong payroll employment growth and low unemployment, is the failure of wages to show much upward momentum.

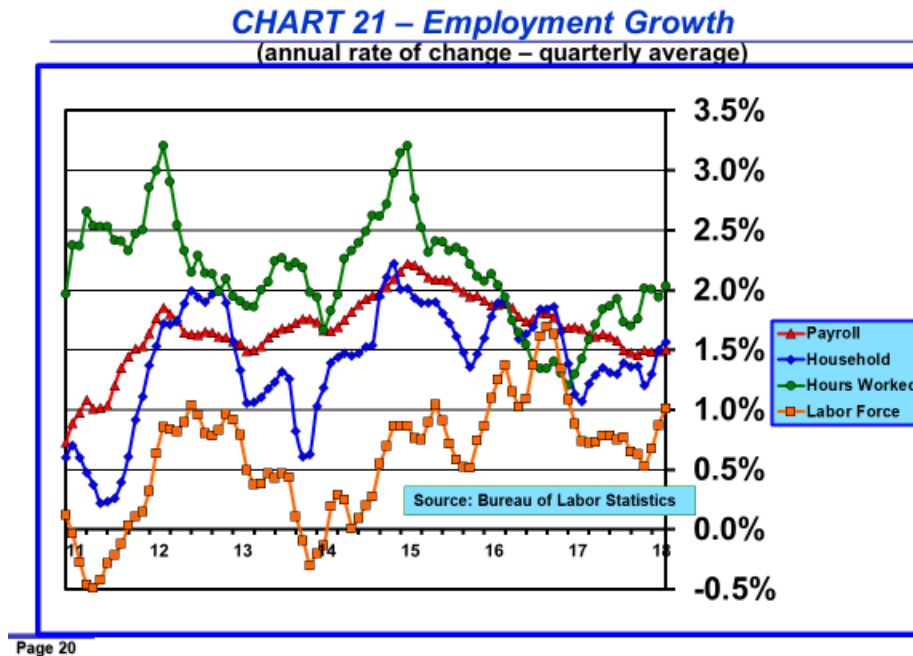
1. Employment Growth

Chart 21 shows the four measures of employment growth – payroll employment, household employment, total hours worked, and the growth rate in the eligible labor force, which indicates the expected equilibrium rate of employment growth when the economy is at full employment. When growth in the various measures of employment exceeds growth in the eligible labor force, the unemployment rate declines and the labor market tightens. This is exactly what continues to happen currently.

As can be seen in **Chart 21**, the trend in the annual rate of quarterly growth in payroll employment slowed gradually from the cyclical peak of 2.27 percent in February 2015 to 1.39 percent in September 2017. However, since then payroll growth has accelerated as the economy picked up momentum. The annual growth rate was 1.55 percent in March and is expected to rise to 1.70 percent by the end of 2018.

Monthly payroll employment growth averaged 226,000 in 2015, 195,333 in 2016 and 182,333 in 2017.

Household employment growth also had been decelerating gradually, averaging 211,600 in 2015, 174,800 in 2016, and 148,900 in 2017, but, like payroll employment, growth bottomed at 1.30 percent in August 2017 and has since accelerated to 1.57 percent in March. Payroll and household employment growth generally are similar when averaged over several months but can diverge substantially from month to month, primarily due to sampling error.



Over the past 12 months the annual rate of quarterly household employment growth has been 1.57 percent, approximately the same as payroll employment growth of 1.55 percent. Growth in these two measures of employment should be nearly identical over long periods of time, but as is clear in **Chart 21**, the growth rates can diverge.

Growth in total hours worked by all employees had been slowing as well. But, like the other employment measures, growth bottomed in 1.21 percent in January 2017 and has accelerated since then to 2.03 percent in March. Growth is higher for this measure because the length of the workweek has risen from 34.38 hours to 34.43 hours. This is also indicative of a very tight labor market.

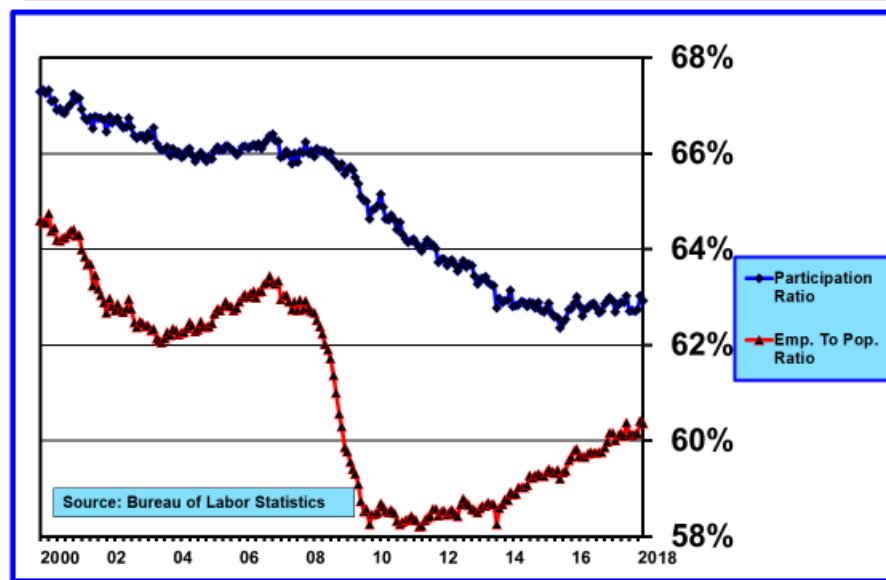
2. Employment Participation

Employment participation had been declining until about a year ago, reflecting demographic shifts and an increase in discouraged workers exiting the labor force due to poor job prospects during and following the Great Recession. Between 50

and 75 percent of the downward trend in participation has been driven by retiring baby boomers and, according to **CBO**, this trend should continue to reduce participation by about 0.16 percent annually over the next ten years.

As the labor market continues to tighten, it appears that most of other 25 to 50 percent of the decline in the participation rate since the Great Recession have returned to the labor force.

CHART 22 – Labor-Force-Participation and Eligible-Employment-to-Population Ratios (U-3 Measure)



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Because discouraged workers are not counted in the labor force there has been debate about their numbers and whether they would reenter the labor force once the labor market tightened. As can be seen in **Chart 22**, the increase in the participation rate from 62.35 percent in September 2015 to 62.92 percent in March 2018 is evidence that most discouraged workers have reentered the labor market in the last few months as jobs have become more abundant. If that were not the case, retirements would have driven the participation ratio down to about 61.95. This is a swing of approximately 1.55 million workers many of whom were probably discouraged but have now reentered the labor force.

This is corroborated in a recent **GS** analysis.² **GS** studied whether some long-term unemployed workers and those not currently in the labor market have reentered the labor market as jobs have become more plentiful. **GS** found that this has occurred and is likely to continue. Employment of people in these categories should continue

² David Mericle, Daan Struyven, and Avisha Thaaker. "A Divided Labor Market," US Economics Analyst, Goldman Sachs Economic Research, October 29, 2017.

to boost labor force participation and slow the decline in the unemployment rate. The potential policy implication is that the labor market might not be quite as tight as implied by the U-3 unemployment rate and this could provide room to the **FOMC** to slow the rate of monetary policy tightening because the non-accelerating inflation rate of unemployment (NAIRU) would be lower. No one knows for sure how much longer re-entry of discouraged workers can continue before a point of exhaustion is reached. So far, this phenomenon explains, at least in part, why wage rate growth has been weak. However, as the pool of workers who decide to reenter the labor market diminishes, and if the economy remains hot and the demand for labor is strong, wage pressures surely will eventually gain traction.

Categories of nonparticipation include disabled people, discouraged people who say they want a job, and those who say they don't want a job. **GS** found that nearly half of the participation decline in each of these categories since the Great Recession has reversed over the past two years.

Looked at from a different angle, **GS** analyzed reemployment rates for various employment categories over the past year. It found that reemployment occurred for 56 percent of short-term unemployed, 39 percent of long-term unemployed, 27 percent of discouraged workers, 22 percent of those who said they did not want a job, 5 percent of disabled people, and 3 percent of retirees.

There is one category in particular in which participation fell substantially following the Great Recession. This category is prime-aged males from 25-54 years of age. Participation for this category declined from 90.5 percent to 88.0 percent and has only recovered modestly to 88.5 percent over the past two years. And, even this small improvement is more than accounted for by those aged 45-54. In contrast, participation of prime age women has recovered to the pre-Great Recession level.

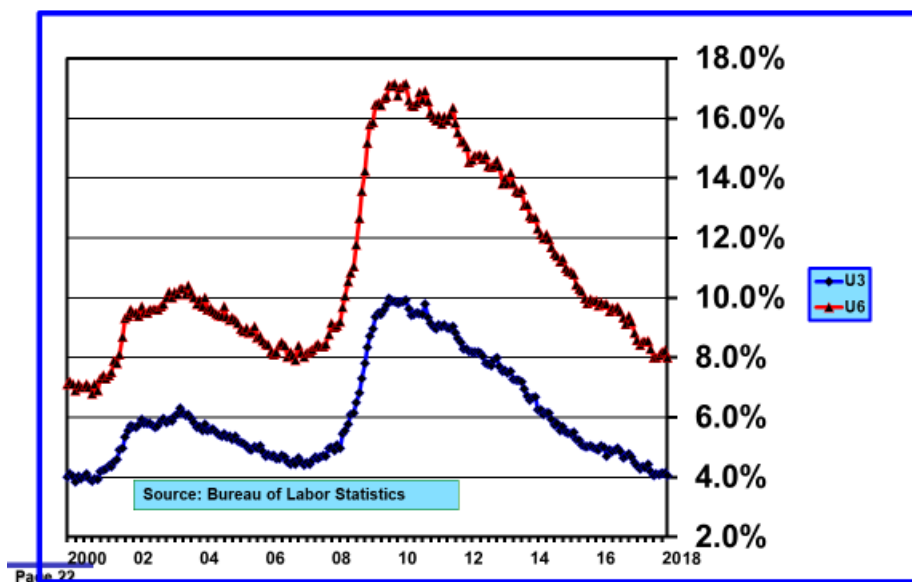
Some of the decline in prime-age male participation is due to structural change involving more at-home dads whose spouses pursue professional careers. However, there is ample evidence that a considerable portion of the decline stems from social issues. For example, the incarceration rate of prime-age males in the U.S. is more than 3 times the level in the next highest country. Mortality rates have ceased to improve in recent years and are considerably about rates in other developed countries – 2.5 percent versus 1.5 percent. The opioid epidemic among prime-age males is surely a factor. And, some cite video-game addiction as a contributing factor.

Analysts do not expect prime-age male participation to improve much and consequently the labor market will continue to tighten and employers will increasingly complain about an inadequate supply of skilled workers.

3. Measures of Unemployment Reflect a Labor Market That Is Above Full-Employment

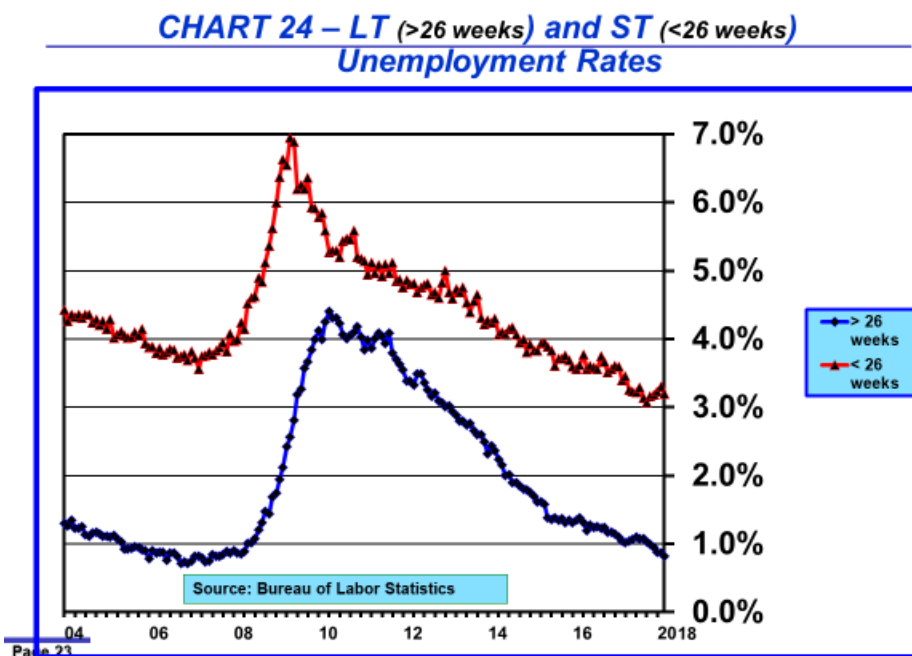
As can be seen in **Chart 23**, the U-3 unemployment rate has fallen to 4.07 percent and is now below the minimum level reached prior to the Great Recession and is nearing the lows reached just prior to the 2001 recession. The March U-3 unemployment rate was considerably below **CBO's** full employment (NAIRU) estimate of 4.62 percent.

CHART 23 – U-3 and U-6 Unemployment Rates



The U-6 measure of unemployment, which adds those working part time who would prefer full-time employment and those marginally attached to the labor force to the U-3 measure, has fallen to 8.00 percent and nearly matches the pre-Great Recession low of 7.92 percent reached in December 2006. The U-6 measure of unemployment has fallen 186 basis points since the end of 2015 compared to a decline of 93 basis points in the U-3 measure, which underscores an improving labor market that is now above full employment.

Long-term and short-term unemployment rates are also indicators of labor market tightness and are shown in **Chart 24**. The short-term unemployment rate has now fallen well below the minimum level reached prior to the Great Recession. The long-term unemployment rate has declined from over 4 percent in the aftermath of the Great Recession to 0.82 percent in March and nearly matches the low level reached in 2006 just prior to the onset of the Great Recession.



4. Forecasts of the U-3 Unemployment Rate

Forecasters expect the labor market to continue to tighten. The current U-3 unemployment rate is 55 basis points below **CBO's** full-employment estimate of the non-accelerating inflation rate of unemployment (NAIRU).

As the term NAIRU implies, when unemployment falls below this level for any length of time not only is it likely that wages will increase but inflation will probably increase as well. For that reason, the **FOMC** is now crafting monetary policy to maintain full employment but limit the potential for tight labor markets to foster inflation. The traditional monetary policy tool involves raising interest rates. The recent acceleration in economic growth, both domestically and globally, have emboldened the **FOMC** to “normalize” monetary policy more rapidly.

Chart 25 shows U-3 unemployment rate forecasts for **B of A**, **GS**, **CBO**, **FOMC** high and low range, and my “**BASE**” and “**Strong Growth**” scenarios. **CBO's** estimate of NAIRU is also shown in **Chart 25**.

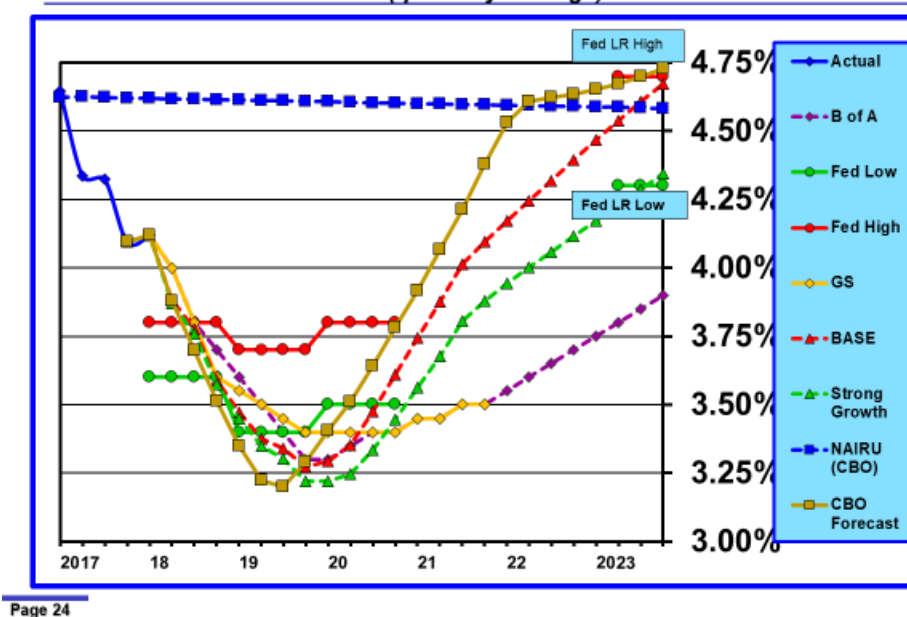
Most forecasters project the unemployment rate to continue falling until mid to late 2019 to approximately 3.3 percent. After that most forecasters also expect the unemployment rate to rise slowly but to remain below **CBO's** NAIRU for an extended period. The **FOMC's** projections for the unemployment rate are similar to those of other forecasters, falling to a range of 3.4 percent to 3.7 percent in 2019 and 3.5 percent to 3.8 percent in 2020 and then rising gradually to a long-run stable

NAIRU range of 4.3 percent to 4.7 percent, which is consistent with the emerging consensus view.

My unemployment rate forecasts in the “**BASE**” scenario and bottoms at 3.27 percent in late 2019. This parallels the **FOMC** and **B of A**, **GS** and **CBO**.

It is now evident that the unemployment rate will probably stay below **CBO’s** April 2018 natural unemployment rate estimates for a period of time. **CBO** forecasts that the unemployment rate will bottom at 3.20 percent in mid-2019 and then rise gradually over the next two years, reaching the neutral rate of unemployment in late 2021 rising quickly to nearly 5.0 percent by the end of 2021.

CHART 25 – NAIRU and Unemployment Rate Forecasts
(quarterly average)



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After 2019 most forecasts, including the **FOMC’s** long-run projected range, move upwards gradually but, except for CBO’s forecast, the unemployment rate remains below **CBO’s** estimate of NAIRU for several years.

All of these forecasts, including my own, seem a bit too tidy. Forecasters acknowledge that the labor market cannot remain overheated perpetually and so all expect the unemployment rate to bottom in about 18 months and then gradually return to a less overextended state. The problem with this is that historical experience doesn’t substantiate this benign scenario. In the past, whenever the unemployment rate has moved up by approximately 0.3 percent, a recession almost always has ensued and the unemployment rate has risen much more and much

faster than these scenarios assume. If there is a reality check, it is most likely to occur sometime during 2020, which just happens to be a presidential election year.

Increasingly, it appears that structural changes in the labor market have lowered NAIRU to a greater extent than indicated by **CBO's** estimates, even though it lowered its estimate of the neutral rate of unemployment by about 12 basis points in its April 2018 revision. The implication of a lower NAIRU is straightforward – the labor market is not quite as tight as past cyclical experience would imply. To the extent that this turns out to be the case there will be less upward pressure on wages and inflation and the **FOMC** could slow the rate at which the federal funds rate is normalized. While financial markets seem inclined toward this view, the **FOMC** remains on a course to raise the federal funds rate much more than financial markets currently expect.

5. As the Labor Market Has Tightened, Wage Growth Has Accelerated Less Than Expected

Now that the labor market is above full employment, theory and experience indicate that growth in wages should be accelerating. That is what is supposed to happen when excess supply disappears and demand is increasing. The data indicate this is occurring but to a more limited extent than experience implies should be the case.

Historically, there has been considerable inertia in wage adjustments which has resulted in a slow rise in average wages even after the labor market has reached or exceeded full employment. Inertia may be greater in this cycle than previously for several reasons. First, collective bargaining power provided by unions on the behalf of labor continues to decline as a catalyst for higher wages. Second, because wage increases might not have slowed as much as they could have during the extended period of labor market slack, there may be less pressure to increase wages as much now that the labor market has tightened. Third, lingering employee long-term job insecurity may be dampening demands for higher wages. Responses to a University of Michigan survey question addressing concerns about layoff risk over the next five years remain elevated. Also, the long-term unemployment rate remains elevated. Fourth, falling inflation expectations may also be a factor. Fifth, retirement of high-wage baby boomers and replacement with low-wage new entrants may be depressing the average level of wage rates, which would moderate the average rate of wage increases. Sixth, there may be more capacity in the labor market than **CBO's** NAIRU unemployment rate implies, if NAIRU has declined. The **FOMC's** Summary of Economic Projections implies a median estimate of NAIRU of 4.5 percent and the median estimate from the Survey of Professional Forecasters is 4.5

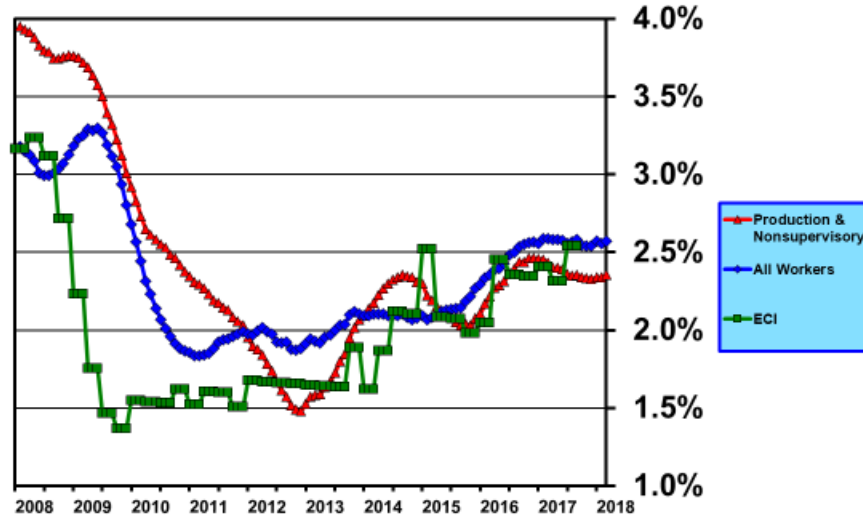
percent compared to **CBO's** current estimate of 4.62 percent.³ Seventh, low productivity gains in recent years may also be a factor in retarding wage rate acceleration.

On the other hand, however, some of the historical inertia may have been offset as many states and local governments have raised minimum wage floors over the past two years.

Interestingly, the University of Michigan survey indicates that the share of workers who have not received a pay increase over the previous 12 months has been edging up and remains above the highest level that occurred following the dot.com bust in 2001.

As can be seen in **Chart 26**, increases in wage growth are following the traditional upward cyclical trend as the labor market tightens. But those increases are not as great as historical experience indicates should be occurring. Consequently, forecasts of wage rate increases, which have been based largely upon historical relationships, have been consistently higher than have actually materialized.

CHART 26 – Hourly Wage Rate Growth – ECI, All Workers and Production and Nonsupervisory Workers
(annual year over year and 12-month moving average rates of change)



Source: Bureau of Labor Statistics

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There are three primary broad-based measures of labor compensation that provide information about compensation trends. All are compiled by the Bureau of Labor

³ Regis Barnichon and Christian Matthes. "The Natural Rate of Unemployment over the Past 100 Years," Federal Reserve Bank of San Francisco Economic Letter, 2017-23, August 14, 2017. In this paper, the authors conclude that NAIRU has fluctuated within a tight band of 4.5 percent to 5.5 percent over the past 100 years. The authors' estimate of the current level of NAIRU is close to the lower bound of this range.

Statistics (**BLS**). One is released monthly as part of the monthly labor situation report and includes both hourly and weekly wage rates for all employees and separately for production and nonsupervisory workers, but includes no information about benefits which comprise approximately 30 percent of total compensation. A second measure, the employment cost index (ECI), is released quarterly and consists of wages and salaries, benefits, and total compensation indices (see **Chart 26**). A third measure is also released quarterly as part of **BLS's** report on output, total hours worked, and productivity.

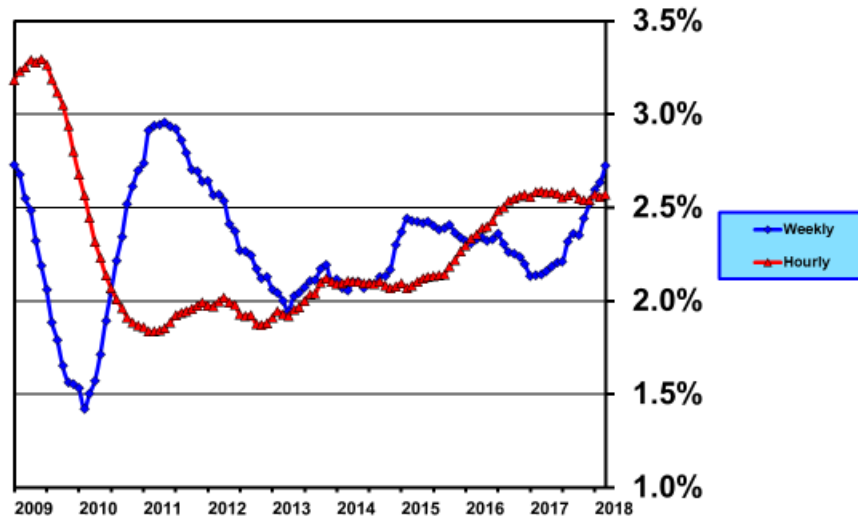
Chart 26 shows the rate of growth in hourly wages for all workers, production and nonsupervisory workers, and ECI (total wages and salaries). All three sets of measures in **Chart 26** track each other closely over time. All three measures had been rising gradually, but growth has stalled over the past few months for the all workers measure and has edged down for production and nonsupervisory workers, even as the unemployment rate has fallen well below NAIRU.

Although these measures are highly correlated over time, because compilation methodologies differ for each set percentage changes over fixed time periods will not always be in sync. Currently, all three sets are exhibiting a similar level and trend. Average hourly wages (12-month moving average) of all employees have risen 2.57 percent annually over the past 12 months compared to 2.59 percent a year ago. Increases in average hourly wages (12-month moving average) of production and nonsupervisory workers have edged down a little, rising 2.36 percent annually in March compared to 2.43 percent a year ago. ECI growth in wages and salaries has risen from 2.34 percent in the fourth quarter of 2016 (4-quarter moving average) to 2.61 percent in the fourth quarter of 2017.

To a certain extent, focusing only on hourly wages is a bit misleading. Growth in average weekly earnings for all employees, which factors in the length of the workweek and thus incorporates changes in the mix of full and part-time employees, has been faster than growth in hourly wages, rising from 2.14 percent in March 2017 to 2.72 percent in March 2018 (see **Chart 27**). This outcome reflects primarily an increase in the average length of the work week from 34.38 hours in March 2017 to 34.43 hours in March 2018.

CHART 27 – Hourly & Weekly Wage Rate Growth – All Workers

(annual year over year and 12-month moving average rates of change)



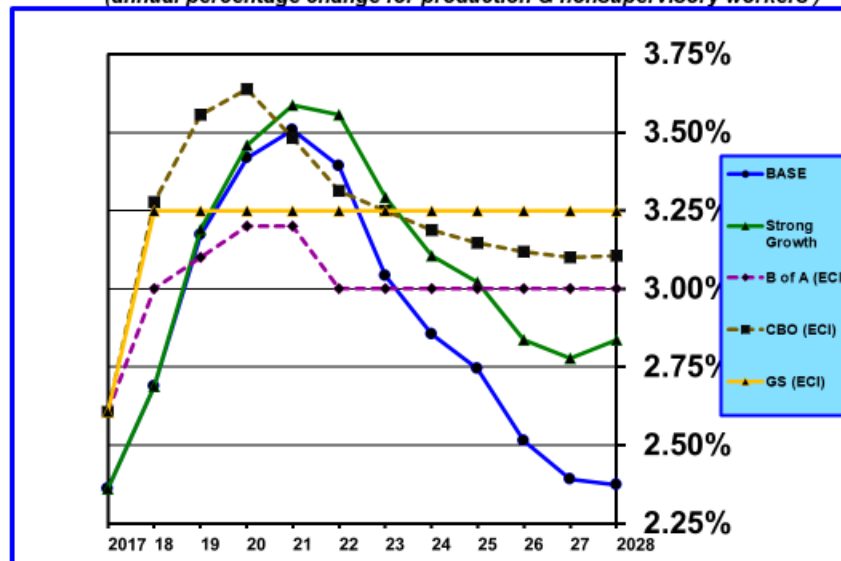
Source: Bureau of Labor Statistics

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Chart 28 shows **CBO's**, **GS's** and **B of A's** projections for growth in the wages and salaries component of ECI for all workers and my projections for wage growth for production and nonsupervisory workers over the next ten years.

CHART 28 – Hourly Wage Rate Forecasts

(annual percentage change for production & nonsupervisory workers)



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CBO, GS and **B of A** forecast wage rate growth only for ECI. Although the methodologies for constructing these different wage data series differ, the directionality of all is highly correlated over time, even if the levels aren't precisely the same at every point in time. **GS's** ECI wage growth forecast rises to 3.25 percent by 2018 and remains at that level thereafter. **B of A's** ECI forecast rises to 3.2 percent in 2020 but then recedes to 3.0 percent by 2022. **CBO's** ECI forecast rises to 3.64 percent in 2020 but then slows to 3.1 percent over the next several years.

Forecast wage growth for production and nonsupervisory workers in my "**BASE**" and "**Strong Growth**" scenarios rises more slowly than **CBO's**, **B of A's** and **GS's** projections, not exceeding 3.0 percent until 2019. Thereafter, however, wage growth in my "**BASE**" scenario peaks at 3.5 percent in 2021 and then begins to decelerate. After 2023 my wage growth estimates are much weaker than those of other analysts. That result is driven by a decline in the labor market gap, slowing inflation and lower productivity.

Wage growth in my "**Strong Growth**" scenario follows a similar pattern to that of my "**BASE**" scenario, but at a higher level. The sharp increase in wage growth reflects strengthening wage bargaining power due to the excess of labor demand relative to supply and also to greater increases in inflation.

GS's wage tracker registered 2.5 percent in March, about 50 basis points short of **GS's** long-run expected 3.0 – 3.25 percent annual rate of increase. **GS** assumes a 3.5 percent unemployment rate, which is well below NAIRU, 2.0 percent inflation, and 1.0 – 1.25 percent annual productivity increases (nonfarm productivity increases would be higher, about 1.4 – 1.7 percent, as the measure of productivity **GS** cites does not cover the entire economy).

In **GS's** view the recent weakness in wage growth results from inflation and productivity below expected long-run values. In other words, the historical forces determining wage rate growth have not changed. The upward adjustment in wage rate growth will be consistent with historical precedent and levels of the key determinants – inflation, productivity, and labor market slack. **GS** corroborates its view by demonstrating that low unemployment metropolitan statistical areas have experienced faster wage growth acceleration in recent months than high unemployment areas.

GS also compared the recent Federal Reserve's Beige Book wage information with the Beige Books for 1997 and 2006, which were also times when the economy was at full employment. **GS** examined "labor market tightness," "labor market conditions," and "wage pressures." **GS** concluded that the Beige Book assessment of three of

these three labor market dimensions is like what happened in 1997 and 2006. In both of the previous cycles, wage growth accelerated in the following year.⁴

While **GS** is sticking to its guns, others are less certain that wage rate growth will accelerate nearly as much.

6. Modeling the Relationship Between Labor Market Tightness and Wage Growth

Economic theory posits that when the demand for labor increases relative to the available supply, wage rates should rise more rapidly. This theoretical concept is embedded in the Phillips Curve. The Phillips Curve defines a statistical relationship in which decreases in the unemployment rate, improvements in productivity and increases in inflation should increase nominal wage growth. A recent **GS** study using city-level data confirmed the reasonableness of the Phillips Curve theoretical framework.⁵

In recent months, the labor market has tightened considerably and the unemployment rate is well below **CBO's** estimate of NAIRU. However, increases in wage rates have been muted. This has led to speculation about whether the Phillips Curve is dead.

As can be seen in **Chart 28**, analysts, including myself, expect wage growth to accelerate and this acceleration should occur in the next few quarters. These forecasts are based on a Phillips Curve model of wage rate behavior which by and large fits the historical data well. Historically, the apparent slow response of wage rates to a tightening labor market can be explained by time lags between cause and effect and non-linearities in the relationship between labor market variables and wage growth. This historical pattern has repeated predictably over several past cycles and it is this consistency which has prompted forecasters to expect wage rate growth to accelerate in the current cycle.

My statistical estimation of nominal wage rate growth is based upon the following labor variables: short-term unemployment of less than 26 weeks, long-term unemployment of 26 weeks or more, the gap between the U-3 unemployment rate and **CBO's** NAIRU rate adjusted down in recent months to reflect the consensus view that NAIRU is 4.5 percent, the rate of growth in total hours worked, and the square of total hours worked to incorporate a possible nonlinear relationship between nominal wage rate growth and the strength of the labor market. The model

⁴ Spencer Hill. "Quantifying Wage Signals in the Beige Book," US Daily, Goldman Sachs Economic Research, October 4, 2017.

⁵ Dann Struyven. "Will the Phillips Curve Bend or Break?" US Daily, Goldman Sachs Economic Research, October 17, 2017.

also includes the other two standard Phillips Curve variables – nonfarm productivity and core PCE inflation.

Table 11 shows the coefficients of these variables which specify the relationship between each variable, holding the impacts of all other variables constant, and the nominal wage rate. Average time lags, measured in months for each variable, are also shown in **Table 11**.

Table 11

Nominal Wage Rates – Impacts of Labor Market Variables, Productivity and Core PCE Inflation

| | Coefficient | Average Lag (in months) |
|-------------------------------------|-------------|----------------------------|
| ST Unemp. Rate < 26 weeks | -1.92 | 15.1 |
| LT Unemp. Rate >26 weeks | -1.29 | 49.2 |
| Labor Market Gap | -1.40 | 20.0 |
| Growth in Hours Worked | 0.88 | 22.4 |
| Growth in Hours Worked ² | 3.01 | |
| Productivity | 0.32 | 45.5 |
| Core PCE Inflation | 0.74 | 9.0 |

As short-term and long-term unemployment rates rise and labor market slack expands, increases in nominal wage rates decline. The impact of a change in the short-term unemployment rate is greater and affects nominal wage rate growth more quickly than a change in the long-term unemployment rate. A tightening in labor market slack of 1 percentage point raises nominal wage rates by 1.40 percent in an average of 20.0 months.

Growth in total hours worked raises the nominal wage rate, but its incremental effect is nonlinear as can be seen in **Table 12**. The average lag time between cause and effect is about 2 years (22.4 months), which explains in part the apparent slow response of nominal wage rate increases to acceleration in employment market growth.

Core PCE inflation impacts the nominal wage rate with an average lag of nearly one year (9.0 months). A one percentage point increase in core PCE inflation lifts nominal wage rate growth by 74 basis points. Once the labor market has tightened sufficiently, there is probably a positive feedback loop between the increase in the nominal wage rate and changes in inflation, but the statistical analysis indicates that increases in the wage rate lag and depend on increases in inflation to occur first.

Finally, while productivity does have a positive impact on the nominal wage rate, it is smaller than most believe and takes a long-time to have even this small impact. A one percentage point increase in nonfarm productivity raises the nominal wage rate by 32 basis points but this takes an average of almost 4 years (45.5 months) to occur.

Table 12

Incremental Impact of Growth in Total Labor Hours Worked on Nominal Wage Rates

| Growth in Total Labor Hours Worked | Incremental Impact on Nominal Wage Rate Growth |
|------------------------------------|--|
| 3.0% | 2.92% |
| 2.0% | 1.88% |
| 1.0% | 0.91% |
| 0.0% | 0.00% |
| -1.0% | -0.85% |
| -2.0% | -1.64% |
| -3.0% | -2.37% |

You can see in **Chart 28** how a very tight labor market sustained over time, as is the case in the “**Strong Growth**” scenario, can result in a much higher rate of increase in the nominal wage rate.

Although my econometric model describes well the historical relationships between nominal wage rate growth and the economic variables in the Phillips Curve, over the past 8 months the model has overestimated the rate of increase in the nominal wage rate and that error has averaged nearly 3 standard deviations. This pattern has now persisted long enough that speculation that a structural change has occurred in the labor market, which is retarding wage growth acceleration, needs to be taken seriously.

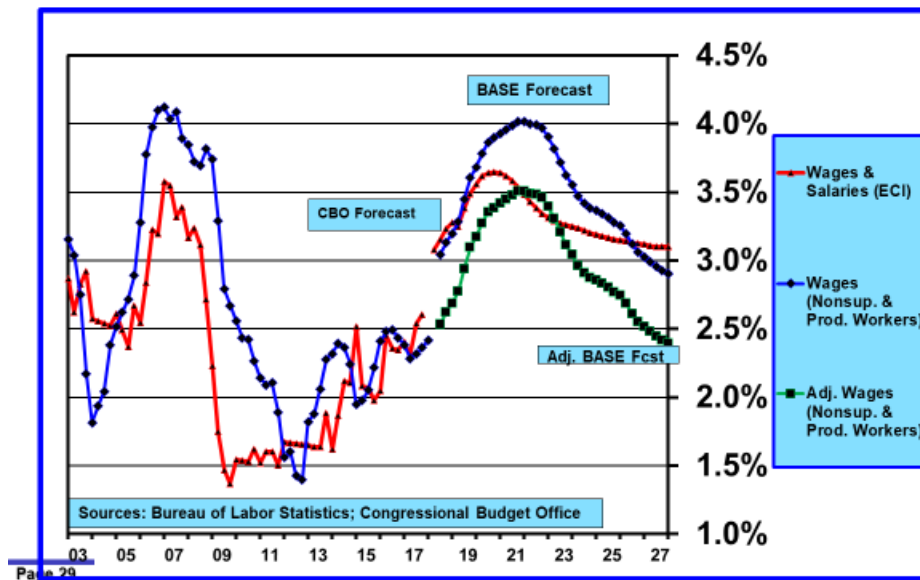
Chart 29 shows that the wage rate for nonsupervisory and production workers and the rate of growth in salaries and wages reported by the **BLS** in the employee cost index (ECI) data respond to the strength of the labor market over the cycle in a similar pattern.

My model’s forecast of rising wage rate growth for nonsupervisory and production workers and **CBO’s** forecast of rising ECI salaries and wages growth both indicate that wage growth should already be 3.0 percent or greater rather than stalling out at approximately 2.5 percent over the past six to seven quarters.

Furthermore, even if wage growth does accelerate in coming months, it is unlikely to rise to 4.0 percent as indicated in **Chart 29**. In **Chart 29**, I show an adjusted wages and salaries wage growth alternative which subtracts the large forecast error of the last several months. In so doing, the assumption is that the Phillips Curve still will guide wage rate growth in coming months but the level will be approximately 50 basis points lower than it would be if the historical relationship held fully.

CHART 29– ECI & Nonsupervisory & Production Worker Wages

(annual rate of change – 4-Quarter Moving Average)



If the nominal wage rate does not accelerate in the next few months and close the forecasting error gap, this will provide substantial evidence that a structural change in the historical Phillips Curve has occurred. This is not a trivial matter. If wage rate growth is poised to accelerate, as the model predicts, the FOMC should continue to raise the federal funds rate to contain a buildup in inflationary pressures. However, if wage growth does not accelerate meaningfully, an overly aggressive monetary policy could hasten onset of recession.

V. Monetary Policy

Members of the Federal Open Market Committee (**FOMC**) have gone to considerable lengths in recent years to communicate as clearly and transparently as possible their assessment of the economy and what they collectively believe is an appropriate monetary policy to meet the twin objectives of full employment and moderate inflation.

1. Monetary Policy Making Process

FOMC members gather in Washington, DC eight times a year. At the end of each meeting the **FOMC** releases a statement that contains an assessment of economic activity, employment and inflation and commentary about risks to the outlook. The statement concludes with a summary about the course of monetary policy and specific actions the **FOMC** has decided to implement. For several years at the second meeting during a quarter, members update their economic projections and the chairman holds a press conference. The intent has been to provide greater transparency about the conduct of monetary policy. In recent years, it has been the practice to announce changes in monetary policy at the second meeting during the quarter. Because the release of economic projections and a press conference follows this meeting, the chairman has the opportunity to explain reasons for any policy changes. As a result, the markets have been rarely surprised in recent years. This has contributed to a lessening of market volatility.

However, the market keeps its own counsel and does not blindly accept indications of future policy that are embedded in **FOMC** member economic projections, the **FOMC** statement, the press conference and speeches given by Federal Reserve officials. While the market does not always agree with the **FOMC's** assessment of the economic outlook and the likely course of monetary policy, it has come to trust the **FOMC** to update its views as new real-time information becomes available and not to blindly pursue a rigid policy agenda.

At this time, the disagreement between the market forecast for the federal funds rate and the projections of all others, included **FOMC** members, is unusually large. The market expects only four more increases in the federal funds rate to a range of 2.50 percent to 2.75 percent. The median number of increases forecast by **FOMC** members is seven, followed later as the economy cools, by two decreases for an equilibrium range of 2.75 percent to 3.00 percent (**Table 17**). The market's view has increased by 50 basis points since late last year; however, every other forecaster expects the **FOMC** to increase the federal funds rate considerably above a range of 2.50 percent to 2.75 percent in coming quarters. And, quite a few, like **FOMC** members, expect the federal funds rate to peak above the long-term equilibrium level in the current monetary policy tightening cycle.

Federal Reserve Board of Governors Chair, Janet Yellen, said in a speech to the G30 on October 15, 2017, "... *we continue to expect that the ongoing strength of the labor market will warrant gradual increases in that rate [federal funds] to sustain a healthy labor market and stabilize inflation around our 2 percent longer-run objective.*" Apparently, market participants collectively believe that inflation will remain low and this will cause the **FOMC** to deliver fewer increases in the federal

funds rate than projected by the **FOMC** median. Yellen pushed back on this view saying that “... *my best guess is that these soft readings will not persist and with the ongoing strengthening of labor markets I expect inflation to move higher next year. Most of my colleagues on the **FOMC** agree.*” Jerome Powell, in his early days as **FOMC** chair, has endorsed this view. He has consistently supported the recent approach to monetary policy and is expected to continue to stay the course. There is considerable inertia in the formulation of monetary policy, and Jerome Powell is unlikely to initiate any kind of significant monetary policy course adjustment.

There is a possible alternative explanation for the market’s view. Perhaps the market foresees that monetary policy tightening will be effective more quickly in slowing the economy and preventing an outbreak in inflation so that the **FOMC** will not feel compelled to continue raising rates. After all, there is little disagreement about the long-term equilibrium level of the federal funds rate.

Whatever the reasons, the disagreement between the market and others about the pathway of rate increase and the level of the long-run equilibrium federal funds rate is continuing and the eventual outcome will depend upon future developments.

2. Beige Book – Assessment of the Economy

Three weeks prior to each **FOMC** meeting, the Beige Book is published. It summarizes in anecdotal form recent economic activity in each of the 12 Federal Reserve districts. The most recent Beige Book covered the period from late February to April 9th. Overall, economic activity is stable, with one district upgrading its assessment. All 12 district banks reported “modest” or “moderate” growth, which means trend real GDP growth is about 2 percent.

Labor markets are considered to be tight, but there is little evidence that wages are accelerating – wage growth was modest in most districts, which means that some pressures exist but there is no acceleration. This is consistent with macro data. Shortages of qualified skilled workers are widespread, but employers are coping with pay increases, overtime, training and automation.

Price inflation was generally characterized as moderate and increased across all 12 districts. The recent increase in commodity and materials prices was noted, particularly steel prices due to tariffs. Transportation are rising, due to increasing fuel prices and a shortage of truck drivers. Building costs are increasing due both to rising commodity costs and a shortage of construction workers. Businesses expect further price increases in steel and building materials.

3. Economic Activity

Table 13

Economic Projections of Real GDP (Q4/Q4) by Federal Reserve Board Members and Federal Reserve Bank Presidents, March 2018

| Real GDP % | Central Tendency | | | | | | |
|---------------------|------------------|-------------|-------------|------------------|------------------|------------------|------------------|
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Long Run |
| Q4/Q4 Actual | 2.02 | 1.84 | 2.58 | | | | |
| Y/Y Actual | 2.86 | 1.49 | 2.27 | | | | |
| 2018 Mar | | | | 2.6 - 3.0 | 2.2 - 2.6 | 1.8 - 2.1 | 1.8 - 2.0 |
| 2017 Dec | | | 2.4 - 2.5 | 2.2 - 2.6 | 1.9 - 2.3 | 1.7 - 2.0 | 1.8 - 1.9 |
| Sep | | | 2.2 - 2.5 | 1.8 - 2.2 | 1.7 - 2.1 | 1.6 - 2.0 | 1.8 - 2.0 |
| June | | | 2.1 - 2.2 | 1.8 - 2.2 | 1.8 - 2.0 | | 1.8 - 2.0 |
| Mar | | | 2.0 - 2.2 | 1.8 - 2.3 | 1.8 - 2.0 | | 1.8 - 2.0 |
| 2016 Dec | | 1.8 - 1.9 | 1.9 - 2.3 | 1.8 - 2.2 | 1.8 - 2.0 | | 1.8 - 2.0 |
| Sep | | 1.7 - 1.9 | 1.9 - 2.2 | 1.8 - 2.1 | 1.7 - 2.0 | | 1.7 - 2.0 |
| June | | 1.9 - 2.0 | 1.9 - 2.2 | 1.8 - 2.1 | | | 1.8 - 2.0 |
| Mar | | 2.1 - 2.3 | 2.0 - 2.3 | 1.8 - 2.1 | | | 1.8 - 2.1 |
| 2015 Dec | 2.1 | 2.3 - 2.5 | 2.0 - 2.3 | 1.8 - 2.2 | | | 1.8 - 2.2 |
| Sep | 2.0 - 2.3 | 2.2 - 2.6 | 2.0 - 2.4 | 1.8 - 2.2 | | | 1.8 - 2.2 |
| June | 1.8 - 2.0 | 2.4 - 2.7 | 2.1 - 2.5 | | | | 2.0 - 2.3 |
| Mar | 2.3 - 2.7 | 2.3 - 2.7 | 2.0 - 2.4 | | | | 2.0 - 2.3 |
| 2014 Dec | 2.6 - 3.0 | 2.5 - 3.0 | 2.3 - 2.5 | | | | 2.0 - 2.3 |
| Sep | 2.6 - 3.0 | 2.6 - 2.9 | 2.3 - 2.5 | | | | 2.0 - 2.3 |
| June | 3.0 - 3.2 | 2.5 - 3.0 | | | | | 2.1 - 2.3 |
| Mar | 3.0 - 3.2 | 2.5 - 3.0 | | | | | 2.2 - 2.3 |
| 2013 Dec | 3.0 - 3.4 | 2.5 - 3.2 | | | | | 2.2 - 2.4 |
| Sep | 3.0 - 3.5 | 2.5 - 3.3 | | | | | 2.2 - 2.5 |
| June | 2.9 - 3.6 | | | | | | 2.3 - 2.5 |
| Mar | 2.9 - 3.7 | | | | | | 2.3 - 2.5 |
| 2012 Dec | 3.0 - 3.7 | | | | | | 2.3 - 2.5 |

In the March statement, the **FOMC** downgraded its assessment of overall economic activity, opining: "... economic activity *has been rising at a moderate rate.*" It went on to say that: "*Recent data suggest that growth rates of household spending and business fixed investment have moderated from their strong fourth quarter readings.*" But, to make sure the market did not misinterpret this slight downgrade, the FOMC added that "*The economic outlook has strengthened in recent months.*" In the Summary of Economic Projections (SEP), **FOMC** members increased substantially expected GDP growth rates in 2018 and 2019. Overall, the market viewed the **FOMC's** statement as mildly hawkish and moved up the odds that the

FOMC will raise rates four times in 2018 rather than three times, although it remains a close call.

Table 13 shows the **FOMC's** central tendency projections for real GDP growth for 2015 to 2020, as well as the long-term potential real rate of GDP growth. In the wake of Congress' decision to increase spending over the next two fiscal years, most forecasters raised their beginning of the year estimates of real GDP growth in 2018. As can be seen in **Table 13**, the **FOMC** has also raised its expected 2018 GDP growth rate by 0.8 percent and its expected 2019 GDP growth rate by 0.5 percent over the past two quarters. The **FOMC's** central tendency view of long-run potential real GDP growth has remained anchored in a range of 1.8 percent to 2.0 percent. Expected above potential GDP growth over the next two years increases the likelihood that the **FOMC** will continue to tighten monetary policy by raising the federal funds rate.

4. Employment

Most believe the labor market has exceeded the non-accelerating inflation rate of full employment (NAIRU). The U-3 unemployment rate in March was 4.1 percent, which was 0.5 percent below **CBO's** estimate of NAIRU. The **FOMC** noted that "... *the labor market has continued to strengthen ... and the unemployment rate has stayed low,*" wording that has been repeated in recent **FOMC** statements. It repeated its assessment of labor market conditions, stating that "*labor market conditions will remain strong.*" "Remain strong" is somewhat of an understatement.

In the SEP, the central tendency range for the unemployment rate has decreased 0.4 percent for 2018, 0.6 percent for 2019, and 0.6 percent for 2020 over the last two quarters. Significantly, the **FOMC's** projected unemployment rate over the next three years is about 0.8 percent below its estimate of the NAIRU unemployment rate in the long run. This reflects an expectation that the labor market will remain extraordinarily tight for an extended time, which will risk stoking upside inflation pressures.

If the U-3 unemployment rate, which is the simple measure used in the monetary policy Taylor Rule to assess what the level of the federal funds rate should be, were the only relevant employment policy measure, the **FOMC's** task to proceed aggressively in "normalizing" interest rates would be unambiguous. In previous monetary policy tightening cycles, the **FOMC** has always moved more quickly to raise rates when the labor market tightened than it has so far in this cycle.

Table 14

**Economic Projections of Unemployment Rate by Federal Reserve Board
Members and Federal Reserve Bank Presidents, March 2018**

| Unemp. Rate % | Central Tendency | | | | | | |
|------------------|------------------|-------------|-------------|------------------|------------------|------------------|------------------|
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Longer Run |
| Actual | 5.00 | 4.70 | 4.15 | | | | |
| 2018 Mar | | | | 3.6 - 3.8 | 3.4 - 3.7 | 3.5 - 3.8 | 4.3 - 4.7 |
| 2017 Dec | | | 4.1 | 3.7 - 4.0 | 3.6 - 4.0 | 3.6 - 4.2 | 4.4 - 4.7 |
| Sep | | | 4.2 - 4.3 | 4.0 - 4.2 | 4.0 - 4.4 | 4.0 - 4.5 | 4.5 - 4.8 |
| June | | | 4.2 - 4.3 | 4.0 - 4.3 | 4.1 - 4.4 | | 4.5 - 4.8 |
| Mar | | | 4.5 - 4.6 | 4.3 - 4.6 | 4.3 - 4.7 | | 4.7 - 5.0 |
| 2016 Dec | | 4.7 - 4.8 | 4.5 - 4.6 | 4.3 - 4.7 | 4.3 - 4.8 | | 4.7 - 5.0 |
| Sep | | 4.7 - 4.9 | 4.5 - 4.7 | 4.4 - 4.7 | 4.4 - 4.8 | | 4.7 - 5.0 |
| June | | 4.6 - 4.8 | 4.5 - 4.7 | 4.4 - 4.8 | | | 4.7 - 5.0 |
| Mar | | 4.6 - 4.8 | 4.5 - 4.7 | 4.5 - 5.0 | | | 4.7 - 5.0 |
| 2015 Dec | 5.0 | 4.6 - 4.8 | 4.6 - 4.8 | 4.6 - 5.0 | | | 4.8 - 5.0 |
| Sep | 5.0 - 5.1 | 4.7 - 4.9 | 4.7 - 4.9 | 4.7 - 5.0 | | | 4.9 - 5.2 |
| June | 5.2 - 5.3 | 4.9 - 5.1 | 4.9 - 5.1 | | | | 5.0 - 5.2 |
| Mar | 5.0 - 5.2 | 4.9 - 5.1 | 4.8 - 5.1 | | | | 5.0 - 5.2 |
| 2014 Dec | 5.2 - 5.3 | 5.0 - 5.2 | 4.9 - 5.3 | | | | 5.2 - 5.5 |
| Sep | 5.4 - 5.6 | 5.1 - 5.4 | 4.9 - 5.3 | | | | 5.2 - 5.5 |
| June | 5.4 - 5.7 | 5.1 - 5.5 | | | | | 5.2 - 5.5 |
| Mar | 5.6 - 5.9 | 5.2 - 5.6 | | | | | 5.2 - 5.6 |
| 2013 Dec | 5.8 - 6.1 | 5.3 - 5.8 | | | | | 5.2 - 5.8 |
| Sep | 5.9 - 6.2 | 5.4 - 5.9 | | | | | 5.2 - 5.8 |
| June | 5.8 - 6.2 | | | | | | 5.2 - 6.0 |
| Mar | 6.0 - 6.5 | | | | | | 5.2 - 6.0 |
| 2012 Dec | 6.0 - 6.6 | | | | | | 5.2 - 6.0 |

While the **FOMC** overestimated expected real GDP growth for many years until recently, it simultaneously underestimated the decline in the unemployment rate. While these forecasting misses would seem at first blush to be inconsistent, with the benefit of hindsight there have been two drivers. One is that productivity has not recovered to higher levels as expected which explains why real GDP growth has not measured up to expectations. The other is that until recently labor force participation had been much weaker than in previous economic recoveries, resulting in a faster decline in the unemployment rate. Neither of these developments was anticipated. Earlier projections of real GDP growth and the unemployment rate were based on past experience of cyclical recovery patterns which have not repeated as expected.

5. Inflation

In its March statement, the **FOMC** factually reported inflation developments: “*On a 12-month basis, both overall inflation and inflation for items other than food and energy have continued to run below 2 percent. Market-based measures of inflation compensation have increased in recent months but remain low; survey-based measures of longer-term inflation expectations are little changed, on balance.*” Market-based measures of inflation compensation have risen about 25 basis points since late 2017.

In the outlook paragraph of the policy statement the **FOMC** opined that: “*Inflation on a 12-month basis is expected to move up in coming months and to stabilize around the Committee’s 2 percent objective in the medium term. ... the Committee is monitoring inflation developments closely.*” Despite the unexpected weakness in inflation during 2017, the **FOMC** is confident that inflation will increase to its target of 2 percent in a reasonable period.

As can be seen in **Table 15**, the **FOMC** increased the projected range for inflation in 2018 modestly from 1.7 to 1.9 percent to 1.8 to 2.0 percent. Perhaps more importantly, the range of expected inflation in 2019 and 2020 was raised to a level that slightly exceeds the **FOMC’s** 2.0 percent long-run objective. This is important because it supports **FOMC** member commentary that its 2.0 percent inflation objective is symmetric and not an absolute ceiling. In other words, it’s all right for inflation to be slightly above 2.0 percent when the economy is very strong and the **FOMC** is tightening monetary policy.

Core inflation has remained consistently below 2.0 percent for the past 20 years. Perhaps now that the economy is at full employment inflation will finally rise to 2.0 percent or a little higher, at least temporarily (see **Chart 31**). Whether the **FOMC** can achieve its 2.0 percent objective on an average basis over the entirety of the economic cycle remains to be seen. The historical record is not encouraging.

Table 15

**Economic Projections of Inflation by Federal Reserve Board Members and
Federal Reserve Bank Presidents, March 2018**

| Variable | | Central Tendency | | | | | |
|-----------------|------------|---------------------|---------------------|---------------------|------------------|------------------|--------------------------------|
| | | 2015 <i>0.53</i> | 2016 <i>1.77</i> | 2017 <i>1.70</i> | 2018 | 2019 | 2020 Long Run |
| PCE Inf. % | <i>Mar</i> | | | | <i>1.8 - 2.0</i> | <i>2.0 - 2.2</i> | <i>2.1 - 2.2</i> <i>2.0</i> |
| 2017 | Dec | | | 1.6 - 1.7 | 1.7 - 1.9 | 2.0 | 2.0 - 2.1 2.0 |
| | Sep | | | 1.5 - 1.6 | 1.8 - 2.0 | 2.0 | 2.0 - 2.1 2.0 |
| | June | | | 1.6 - 1.7 | 1.8 - 2.0 | 2.0 - 2.1 | 2.0 |
| | Mar | | | 1.8 - 2.0 | 1.9 - 2.0 | 2.0 - 2.1 | 2.0 |
| 2016 | Dec | | 1.5 | 1.7 - 2.0 | 1.9 - 2.0 | 2.0 - 2.1 | 2.0 |
| | Sep | | 1.2 - 1.4 | 1.7 - 1.9 | 1.8 - 2.0 | 1.9 - 2.0 | 2.0 |
| | June | | 1.3 - 1.7 | 1.7 - 2.0 | 1.9 - 2.0 | | 2.0 |
| | Mar | | 1.0 - 1.6 | 1.7 - 2.0 | 1.9 - 2.0 | | 2.0 |
| 2015 | Dec | 0.4 | 1.2 - 1.7 | 1.8 - 2.0 | 1.9 - 2.0 | | 2.0 |
| | Sep | 0.3 - 0.5 | 1.5 - 1.8 | 1.8 - 2.0 | 2.0 | | 2.0 |
| | June | 0.6 - 0.8 | 1.6 - 1.9 | 1.9 - 2.0 | | | 2.0 |
| | Mar | 0.6 - 0.8 | 1.7 - 1.9 | 1.9 - 2.0 | | | 2.0 |
| 2014 | Dec | 1.0 - 1.6 | 1.7 - 2.0 | 1.8 - 2.0 | | | 2.0 |
| | Sep | 1.6 - 1.9 | 1.7 - 2.0 | 1.9 - 2.0 | | | 2.0 |
| | June | 1.5 - 2.0 | 1.6 - 2.0 | | | | 2.0 |
| | Mar | 1.5 - 2.0 | 1.7 - 2.0 | | | | 2.0 |
| 2013 | Dec | 1.5 - 2.0 | 1.7 - 2.0 | | | | 2.0 |
| | Sep | 1.6 - 2.0 | 1.7 - 2.0 | | | | 2.0 |
| | June | 1.6 - 2.0 | | | | | 2.0 |
| | Mar | 1.7 - 2.0 | | | | | 2.0 |
| 2012 | Dec | 1.7 - 2.0 | | | | | 2.0 |
| Core PCE Inf. % | <i>Mar</i> | <i>1.37</i> | <i>1.87</i> | <i>1.52</i> | <i>1.8 - 2.0</i> | <i>2.0 - 2.2</i> | <i>2.1 - 2.2</i> <i>2.0</i> |
| 2017 | Dec | | | 1.5 | 1.7 - 1.9 | 2.0 | 2.0 - 2.1 2.0 |
| | Sep | | | 1.5 - 1.6 | 1.8 - 2.0 | 2.0 | 2.0 - 2.1 2.0 |
| | June | | | 1.6 - 1.7 | 1.8 - 2.0 | 2.0 - 2.1 | 2.0 |
| | Mar | | | 1.8 - 1.9 | 1.9 - 2.0 | 2.0 - 2.1 | 2.0 |
| 2016 | Dec | | 1.7 - 1.8 | 1.8 - 1.9 | 1.9 - 2.0 | 2.0 | 2.0 |
| | Sep | | 1.6 - 1.8 | 1.7 - 1.9 | 1.9 - 2.0 | 2.0 | 2.0 |
| | June | | 1.6 - 1.8 | 1.7 - 2.0 | 1.9 - 2.0 | | 2.0 |
| | Mar | | 1.4 - 1.7 | 1.7 - 2.0 | 1.9 - 2.0 | | 2.0 |
| 2015 | Dec | 1.3 | 1.4 - 1.7 | 1.7 - 2.0 | 1.9 - 2.0 | | 2.0 |
| | Sep | 1.3 - 1.4 | 1.5 - 1.8 | 1.8 - 2.0 | 1.9 - 2.0 | | 2.0 |
| | June | 1.3 - 1.4 | 1.6 - 1.9 | 1.9 - 2.0 | | | |
| | Mar | 1.3 - 1.4 | 1.5 - 1.9 | 1.8 - 2.0 | | | |

| | | | | | | | | |
|------|------|-----------|-----------|-----------|--|--|--|--|
| 2014 | Dec | 1.5 - 1.8 | 1.7 - 2.0 | 1.8 - 2.0 | | | | |
| | Sep | 1.6 - 1.9 | 1.8 - 2.0 | 1.9 - 2.0 | | | | |
| | June | 1.6 - 2.0 | 1.7 - 2.0 | | | | | |
| | Mar | 1.7 - 2.0 | 1.8 - 2.0 | | | | | |
| 2013 | Dec | 1.6 - 2.0 | 1.8 - 2.0 | | | | | |
| | Sep | 1.7 - 2.0 | 1.9 - 2.0 | | | | | |
| | June | 1.7 - 2.0 | | | | | | |
| | Mar | 1.8 - 2.1 | | | | | | |
| 2012 | Dec | 1.8 - 2.0 | | | | | | |

6. FOMC Statement – Assessment of Risks

FOMC members concluded that “*Near-term risks to the economic outlook appear roughly balanced, but the Committee is monitoring inflation developments closely.*”

This wording is unchanged in the last several **FOMC** policy statements. So, although **FOMC** members are confident that inflation will eventually reach the 2 percent target level, the use of the word “*monitoring*” acknowledges that there is some uncertainty and communicates to the market that if future data indicate that inflation is not moving up toward the target, the **FOMC** will adjust monetary policy.

7. FOMC Statement – Monetary Policy

As expected, the **FOMC** raised the federal funds rate range by 25 basis points, but noted that the stance of monetary policy remains accommodative and supportive of stronger labor market conditions and a sustained return to 2 percent inflation. The policy paragraph was identical word-for-word with previous recent **FOMC** policy statements.

Interestingly, there was no mention in the policy statement about the balance sheet normalization program, which was commenced in October 2017. Apparently, the **FOMC** regards this as old news and perhaps the lack of mention has been intentional to keep market participants focused on adjustments in the federal funds rate. The market has not focused on the possible longer run implications of balance sheet shrinkage. Perhaps this is because the shrinkage will be very limited initially. But let there be no doubt that liquidity is already being impacted in a meaningful way. Federal tax cuts and spending increases have increased Treasury’s borrowing requirements and it will get no help from the Federal Reserve.

Already measures of the supply of money and credit indicate that growth is slowing and “quantitative tightening” and increases in the federal funds rate will only serve to depress growth further. Annual M2 money supply growth has slowed to less than 4 percent for the first time since the days of the Great Recession.

Another indicator of decreasing liquidity is the narrowing of the yield spread between the 10-year and 2-year Treasury securities from 125 basis points at the beginning of 2017 to an average of 48 basis points in April 2018. The deceleration in growth of money and credit is consistent with a maturing economic cycle but has not yet reached the red zone which in previous cycles has sent a reliable signal of heightened recession risk.

VI. Inflation

Surprising just about everyone, core PCE inflation declined in 2017 even as unemployment fell below **CBO's** estimate of NAIRU. This led to much head scratching. From the vantage point of the present, the behavior of inflation last year seems to have been a bit of an anomaly caused by special factors. Part of the unexpected softness in core PCE inflation in 2017 resulted from quality improvements in cell phones, but other price categories, such as shelter and medical services inflation, were weaker than expected.

Inflation indices will jump in the month of March as last year's special impacts drop out of the index. **FOMC** members and other forecasters are confident that both core and total PCE inflation will return to the 2.0 percent target level in 2018. This conviction has been bolstered by the realities of an extremely tight labor market and substantial fiscal stimulus that will flood the economy over the next several months.

Table 16

Core PCE Inflation Forecasts – B of A, GS, Bill's "BASE", Bill's "Strong Growth" and FOMC High and Low

| Core CPE | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|----------------------|------|------|------|------|------|------|------|------|------|
| Actual | 1.37 | 1.87 | 1.52 | | | | | | |
| B of A | | | | 2.06 | 1.92 | 2.22 | 2.22 | 2.02 | 2.02 |
| GS | | | | 2.00 | 2.10 | 2.10 | 2.10 | 2.00 | 2.00 |
| CBO | | | | 1.77 | 2.11 | 2.18 | 2.17 | 2.11 | 2.08 |
| IHS Markit* | | | | 2.30 | 1.70 | 2.70 | 2.60 | 2.40 | 2.30 |
| Economy.com* | | | | 2.50 | 2.50 | 2.50 | | | |
| Blue Chip Average* | | | | 2.10 | 2.20 | 2.30 | 2.30 | 2.30 | 2.30 |
| Bill's BASE | | | | 2.06 | 2.16 | 2.07 | 1.71 | 1.48 | 1.58 |
| Bill's Strong Growth | | | | 2.06 | 2.18 | 2.16 | 1.86 | 1.67 | 1.75 |
| FOMC – High | | | | 2.0 | 2.2 | 2.2 | | | 2.0 |
| FOMC – Low | | | | 1.8 | 2.0 | 2.1 | | | |

*CPI – total index; on average CPI averages about 25 basis points higher than CPE

As can be seen in **Table 16** (**Chart 30** shows historical core PCE price index data and data from **Table 16** in graphical form), most forecasters expect the core PCE inflation index now to be near 2.0 percent by the end of 2018. Over the longer run, most, including FOMC members, expect core PCE inflation to rise modestly above 2.0 percent but then settle back to that level as economic growth slows and the unemployment rate edges up.

As can be seen in **Chart 30**, my econometric model indicates core PCE inflation will closely track the estimates of others through 2020, but my estimates begin to soften in 2021 and diverge from the consensus view. During 2018, 2019, and 2020 core PCE inflation forecasts in the “**BASE**” and “**Strong Growth**” scenarios are close to 2.0 percent. After that, however, my inflation forecasts fall in a choppy fashion, eventually reaching about 1.5 percent by 2028 in the “**BASE**”) scenario.

CHART 30 – Core PCE Inflation
(annual percentage rate)

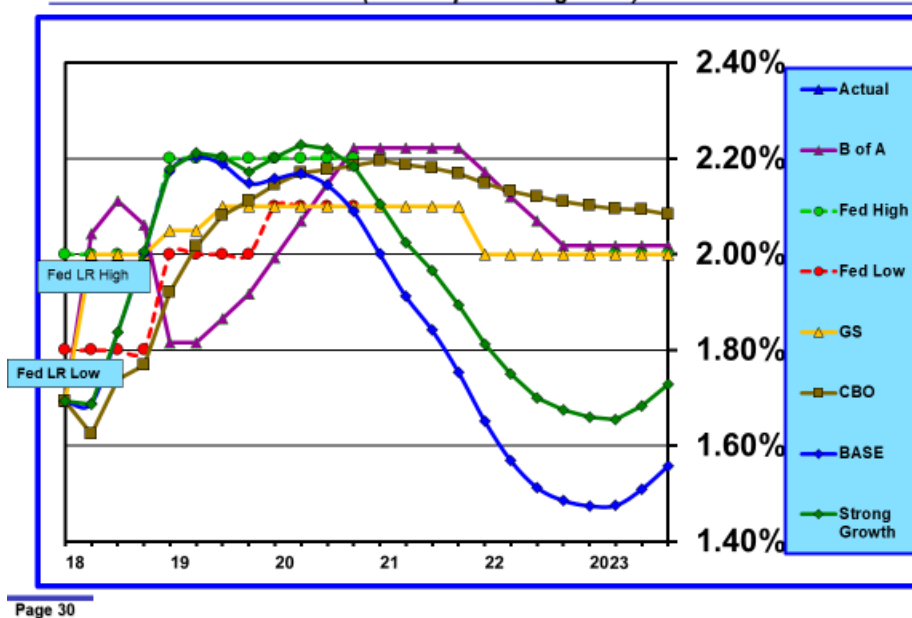
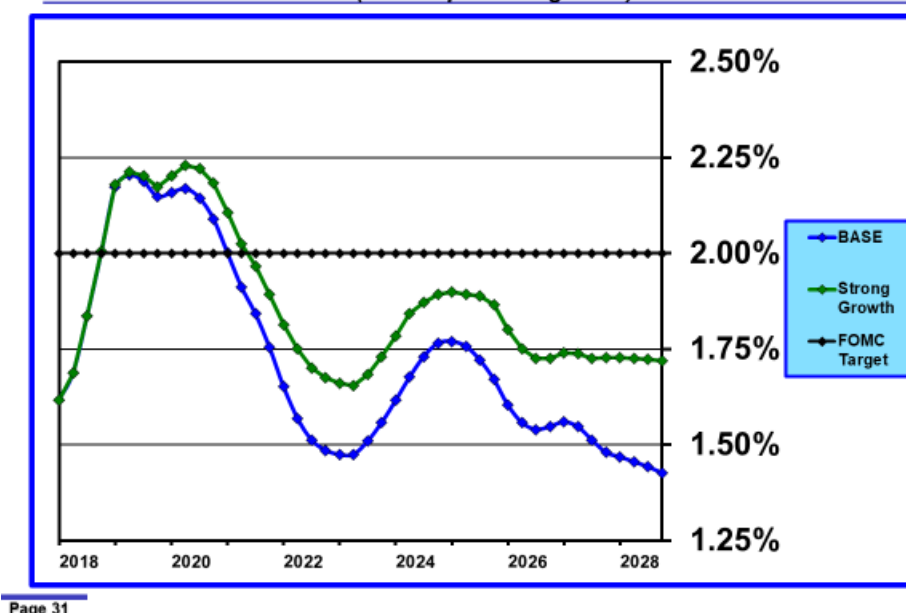


Chart 31 shows core PCE inflation estimates for my “**BASE**” and “**Strong Growth**” scenarios from 2018 to 2028. What is notable in **Chart 31** is that inflation in my “**BASE**” scenario moves above the **FOMC’s** 2.0 percent target in 2019 and 2020.

While one should never discount the possibility of a sea-change in the economic environment in the future that would set inflation on a different course, there are reasons that core PCE inflation could move below 2.0 percent in coming years, notwithstanding an economy that is currently operating at full employment. Inflation has averaged 1.70 percent from 1995 to the present. It has only risen above the level during the mature phase of the cycle, which is currently the case. There is little

historical support for the view that inflation will remain at 2.0 percent when the economy slows, as it must inevitably, as the FOMC tightens monetary policy to a level of the federal funds rate above the long-term equilibrium level. Other secular trends that continue to place downward pressure on inflation, but have been masked by the current strength of the U.S. and global economies, include strong global competition, excess supply, and weak productivity. When the economy cools in response to monetary policy tightening, these trends will reassert themselves.

CHART 31 – Core PCE Inflation
(annual percentage rate)



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VII. Interest Rates

Last month I revised my econometric model to accommodate better for the impact of the long period of zero short-term interest rates. These model revisions improved the reliability of my interest-rate forecasts. Of course, the forecasts themselves depend assumptions about employment growth, labor market tightness, productivity, and inflation. This means that interest-rate forecasts depend upon a lot of assumptions, some or many of which might prove to be inaccurate. Nonetheless, for a plausible range of assumptions, the model provides a bounded range of interest-rate forecasts.

1. Interest Rates – Federal Funds Rate

The **FOMC** raised the federal funds rate 25 basis points at its March meeting to a range of 1.50 to 1.75 percent. **Table 17** shows the forecast pathways for the federal funds rate expected by various analysts over the next several years. The **FOMC's**

median pathway and the market's forward yield curve implied pathway are also shown in **Table 17** for comparative purposes.

Table 17
Number of Federal Funds Rate Increases of 25 Basis Points

| | 2018 | 2019 | 2020 | 2021-28 | Total | Long Run |
|-----------------------------|----------|----------|----------|-----------|----------|-------------------|
| FOMC – median | 3 | 3 | 2 | -2 | 6 | 2.75-3.00* |
| B of A | 3 | 2 | 2 | -1 | 6 | 2.75-3.00* |
| GS | 4 | 4 | 0 | 0 | 8 | 3.25-3.50* |
| CBO | 4 | 4 | 2 | -3 | 7 | 3.00-3.25* |
| IHS Markit | 3 | 4 | 2 | -1 | 8 | 3.25-3.50 |
| Economy.com | 3 | 6 | 1 | 0 | 10 | 3.75-4.00 |
| Market Forecast | 3 | 1 | 1 | 0 | 5 | 2.50-2.75 |
| Bill's BASE | 3 | 6 | 1 | -6 | 4 | 2.25-2.50# |
| Bill's Strong Growth | 3 | 7 | 2 | -6 | 6 | 2.75-3.00# |

*FOMC, B of A, GS and CBO rates are equilibrium estimates

#Bill's estimates are forecasts which peak above the projected equilibrium rate

With respect to the issue of additional increases in the federal funds rate in 2018 and subsequent years, there is considerable divergence among the **FOMC's** own projections, forecasts of analysts and the market forecast embedded in federal funds futures. The expected number and timing of federal funds rate increases made by several analysts, including myself, the **FOMC** and the market is shown in **Table 17**.

In its March Summary of Economic Projections (SEP), the median **FOMC** members' view was three increases in the federal funds rate during 2018 to 2.00 - 2.25 percent; three increases in 2019 to 2.75 - 3.00 percent; and two in 2020 to 3.25 - 3.50 percent, which would lift the federal funds rate 50 basis points above the **FOMC's** expected long-term equilibrium level of 2.75 – 3.00 percent. This seems like a reasonable response to quell the potential inflationary pressures expected to stem from an economy and labor market operating well above full capacity. However, by overshooting the expected long-term equilibrium rate, the FOMC risks triggering a recession.

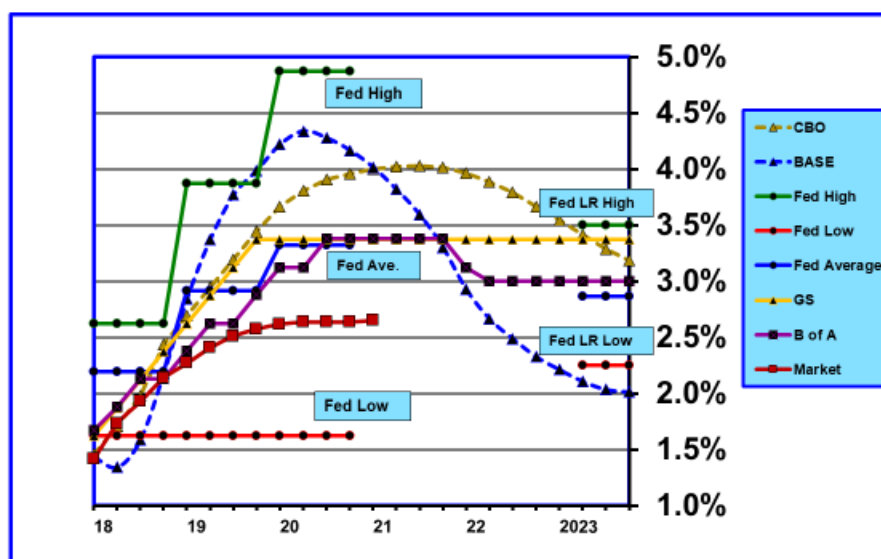
In the past the SEP projections have proved to be very unreliable guides to future monetary policy. For example, at the beginning of 2016 the **FOMC** median projected four increases in the federal funds rate during 2016. Only one occurred. While most seem to agree that 2018 will see three increases, there is divergence of opinion about the total number of increases the **FOMC** will implement during the current monetary policy tightening cycle.

GS expects more tightening than **B of A** and the **FOMC** and a higher equilibrium level of the federal funds rate of 3.25 to 3.50 percent compared to 2.75 to 3.00 percent for the **FOMC** and **B of A**.

My federal funds rate forecast in my “**BASE**” scenario (4.5 percent NAIRU) agrees with the consensus of three increases in 2018. However, my model projects that the **FOMC** will be forced to increase the federal funds rate six times in 2019 and once more in 2020. Curiously, this trajectory coincides with that of Economy.com. However, unlike Economy.com’s forecast, my model forecasts that the federal funds rate will drop sharply after 2020, presumably because the **FOMC** eases monetary policy to try to engineer a soft landing and avoid a recession. The lower long-term equilibrium rate in my long-term “**BASE**” scenario projections is caused by a significant decline in inflation below the 2.0 percent target and to a lesser extent by weak productivity. As a reminder, the long-term projections of my model are speculative. What is more important to consider as a real possibility, is that the federal funds rate in the short run will peak at 4.00 to 4.25 percent. In that regard my model is in good company because that is the peak level **CBO** is forecasting.

Chart 32 shows the quarterly progression in the federal funds rate from the present through 2023 implied by the **FOMC’s** high, low and average projections. It also shows forecasts for **B of A**, **GS**, **CBO**, my “**BASE**” scenario 4.5 percent NAIRU alternative and the **market** forecast embedded in federal funds futures.

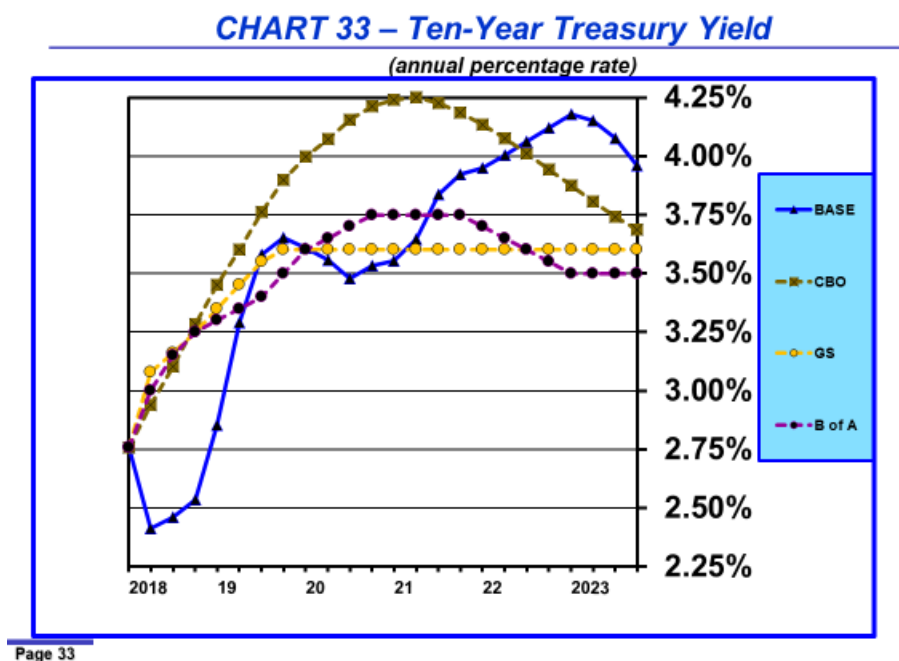
CHART 32 – Federal Funds Rate Forecasts



Over the past several years, **FOMC** members have steadily reduced the median estimate of the long-term nominal value of the federal funds rate from 4.25 percent to 2.75; the central tendency range is currently 2.75 - 3.00 percent. Based upon my model, my sense is that the **FOMC's** median projection for the federal funds rate is reasonable with its estimate of long-term real GDP growth of 1.8 to 2.0 percent and assuming that the real rate of interest when the economy is at full employment and NAIRU is zero is approximately 0.75 percent.

2. Interest Rates – 10-Year Treasury Note Yield

Chart 33 shows forecasts for the 10-year Treasury note yield over the next ten years. Over time analysts have reduced their forecasts for the ten-year yield. Partly this is a mark-to-market exercise driven by the persistent decline in this yield. But the adjustments also reflect a growing consensus that the long-run equilibrium real rate of interest has declined considerably from its historical level. Analysts still expect long-term rates to rise from the current level, but no longer to as high a level.



Assuming an inflation rate of 2.0 percent, my model indicates that the 10-year neutral rate should be between 3.75 percent and 4.00 percent, depending on the level of productivity. The long-term equilibrium rate is 3.60 percent for **GS**, 3.50 percent for **B of A** and 3.70 percent for **CBO**. These estimates do not differ materially from my estimated range of 3.75 percent to 4.00 percent, assuming inflation is 2.0 percent. However, since my model projects inflation falling in the long

run to approximately 1.5 percent, it also projects that the 10-year yield will fall to about 3.00 percent.

My forecast for the 10-year yield in my “**BASE**” scenario (4.5 percent NAIRU), which is shown in **Chart 33**, is similar to **B of A’s** and **GS’s** forecasts over the next three years. **CBO’s** forecast is interesting in that it rises faster and much farther than other forecasts. Although **CBO** does not forecast a recession, it does project a substantial slowing in the economy beginning in 2020. And, as that occurs both short-term and long-term rates fall considerably. It will be hard to avoid a recession if the high rates and flat yield curve that **CBO** forecasts for 2020 occur.