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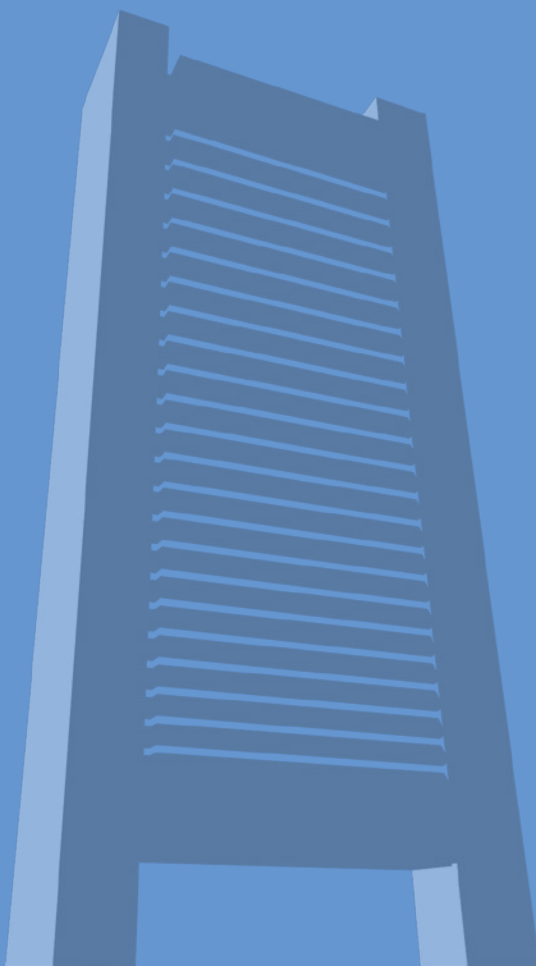

Considering Alternative Monetary Policy Frameworks: An Inflation Range with an Adjustable Inflation Target

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Recent Economic Performance

- Economy has continued to improve and exceed forecaster expectations
  - Unemployment rate is 4.1 percent
  - Real GDP growth is above potential
  - Inflation has been subdued
- Low inflation has allowed monetary policy to remove accommodation slowly despite the strong economy
- Asset prices have been growing strongly

Money and Models – Forecast Errors

- Forecast errors – or “misses” – have received attention
- At the December 2016 FOMC meeting, the median SEP forecast for the fourth quarter of 2017 was:
  - Unemployment rate at 4.5 percent
  - Core PCE inflation rate at 1.8 percent
- Fed’s inflation forecast misses have not been particularly large, in historical context
  - Inflation forecast errors – have not been particularly consistent or persistent
  - If they were persistent, the possibility of structural changes should be considered more seriously

Low and Fixed Inflation *Targets* are a Potential Problem

- Low real and nominal interest rates are likely, if:
  - Low productivity growth
  - Low equilibrium interest rate
  - Slowly growing and aging workforce
- Implications:
  - Low nominal interest rates, on average
  - Monetary policy tools less effective – with low starting policy rate, little room to offset the effects of recession
  - Very low interest rates, hitting lower bound, are likely in most recessions
  - Prolonged low interest rate environment can give rise to financial stability concerns

Alternatives to Achieve Monetary Policy Buffer

- Policymakers should start studying and discussing alternative frameworks to avoid the aforementioned challenges of a prolonged low interest rate environment
- Some alternatives:
  - Higher inflation target
  - Price-level targeting
  - Nominal GDP targeting
  - Inflation range with an adjustable inflation target

One Alternative: Inflation Range with an Adjustable Inflation Target

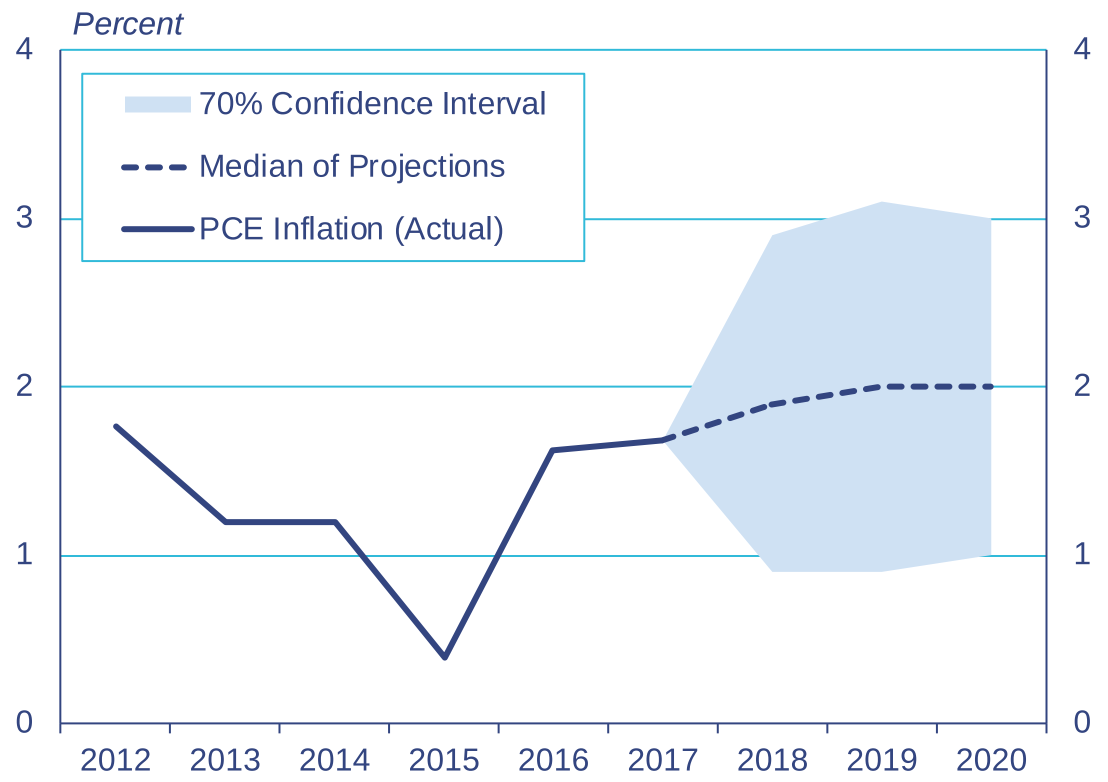
- Optimal inflation rate is not likely to remain constant over time – dependent on economic fundamentals that change such as productivity and labor force growth
- First component: A <u>range</u> of inflation rates that we would find acceptable across many economic circumstances (1.5 – 3.0 percent)
- Second component: A medium-term <u>goal</u> within that range that we would set, perhaps year by year, depending on specific economic circumstances

Allows Some Flexibility in the Inflation Target

- Allows response to changes in economic fundamentals
- Treats the Fed's inflation goal more like the natural rate of unemployment (which can shift over time with demographic and other changes)
- Such flexibility would have costs – e.g., more uncertainty about inflation
  - Depends on how long productivity and demographic trends would persist
  - But, if range was 1.5 to 3.0 percent, and inflation remained mostly in that range, it would be similar to actual historical experience over the past 20 years

Figure 1: PCE Inflation: SEP Median Projection and Confidence Interval Based on Historical Forecast Errors

Actual, 2012 - 2017 and Projection, 2018 - 2020

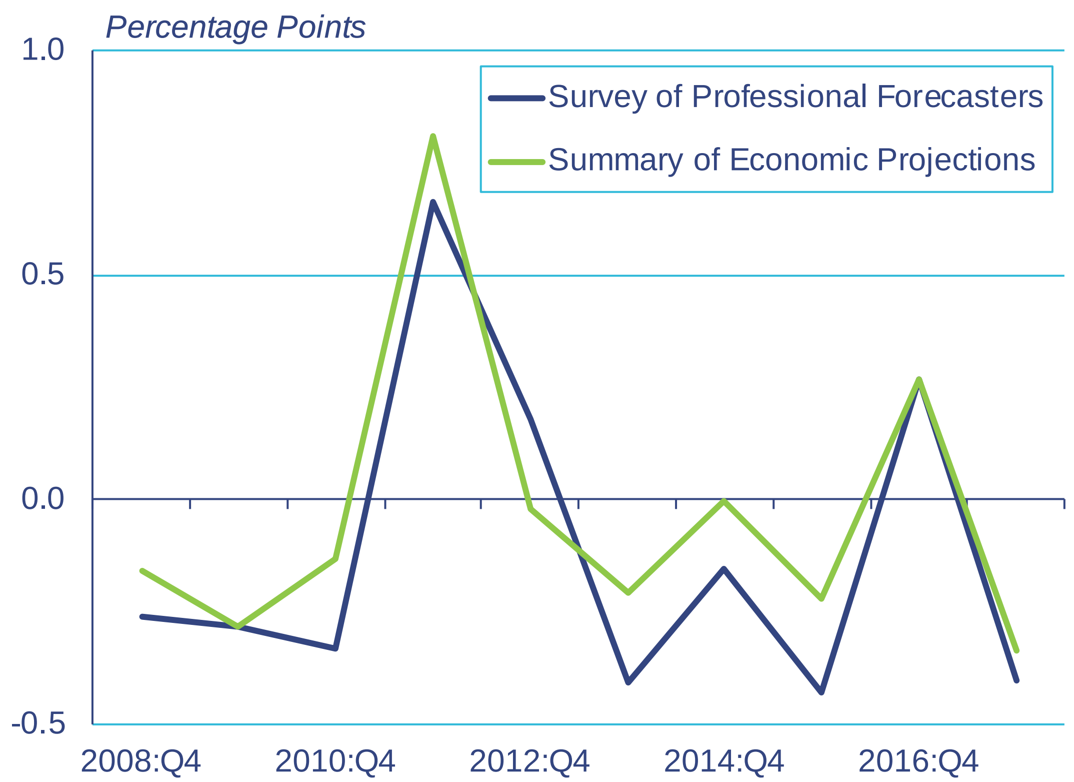


Note: PCE inflation (actual values) and SEP median projected values are for the percent change in the PCE Index from the previous fourth quarter to the fourth quarter of the year specified. The figure for the fourth quarter of 2017 is estimated using the average of Oct and Nov (1.68%).

Source: FOMC, Summary of Economic Projections (SEP) and Meeting Minutes, December 13, 2017; BEA

Figure 2: Forecast Errors (Actual – Forecast) for One-Year-Ahead Core PCE Inflation Forecasts

2008:Q4 - 2017:Q4

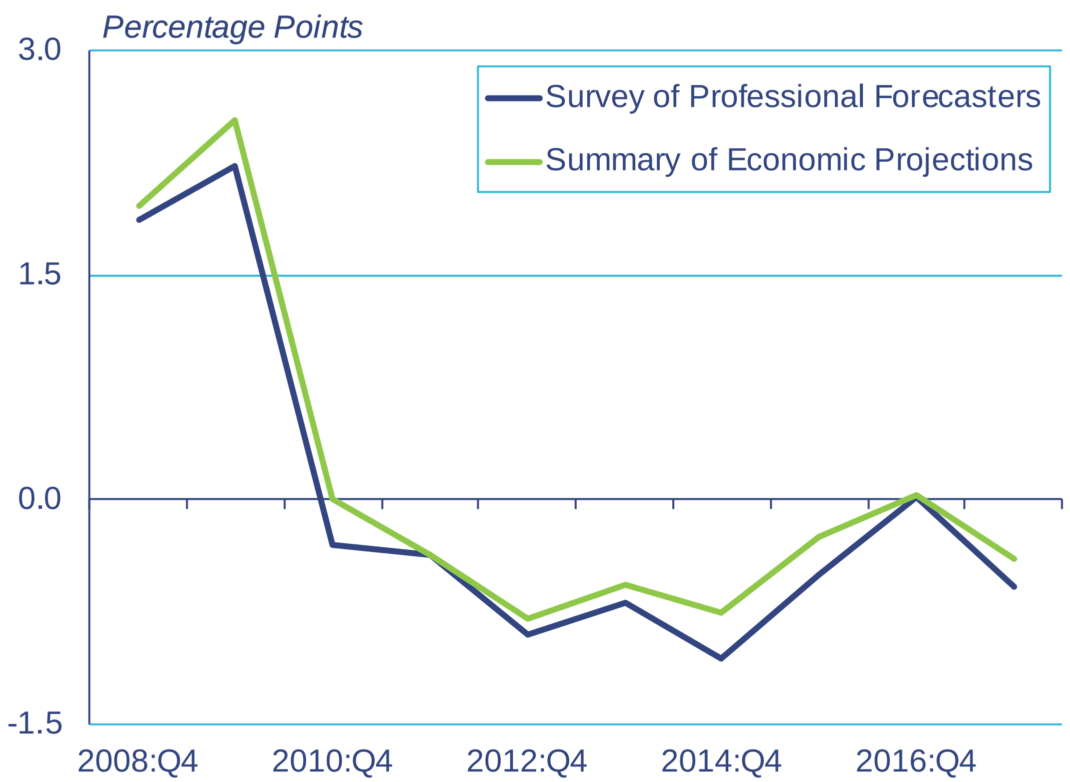


Note: Core PCE inflation is measured as the percent change in the Core PCE Index from the previous fourth quarter to the fourth quarter of the year specified. The figure for the fourth quarter of 2017 is estimated using the average of Oct and Nov (1.46%).

Source: FOMC, Summary of Economic Projections (SEP); Federal Reserve Bank of Philadelphia, Survey of Professional Forecasters; BEA; Haver Analytics

Figure 3: Forecast Errors (Actual – Forecast) for One-Year-Ahead Unemployment Rate Forecasts

2008:Q4 - 2017:Q4



Note: The unemployment rates are the fourth-quarter averages for each year.

Source: FOMC, Summary of Economic Projections (SEP); Federal Reserve Bank of Philadelphia, Survey of Professional Forecasters; BLS; Haver Analytics

Current Forecast Errors

- Inflation forecast errors do not seem to be particularly noteworthy
- In contrast, persistent forecasts that unemployment will not fall as much as it has should give policymakers pause
  - Unemployment at 4.1 percent and likely to fall further
  - Already below most estimates of sustainable long-run rate
    - Median SEP forecast of unemployment rate likely in the longer run is 4.6 percent

FOMC Statement on Longer-Run Goals and Monetary Policy Strategy

- Details tactical approach to achieve both stable prices and maximum sustainable employment – the Fed’s dual mandate
  - Defines the inflation goal as being a 2 percent PCE inflation target
  - Employment mandate does not have a numerical target because the natural rate of unemployment is primarily determined by non-monetary factors, must be inferred, and moves over time
- Describes a balanced approach – equal policy attention to deviations of employment from an estimate of full employment, and to deviations of inflation from its 2 percent target

Current Monetary Policy Framework

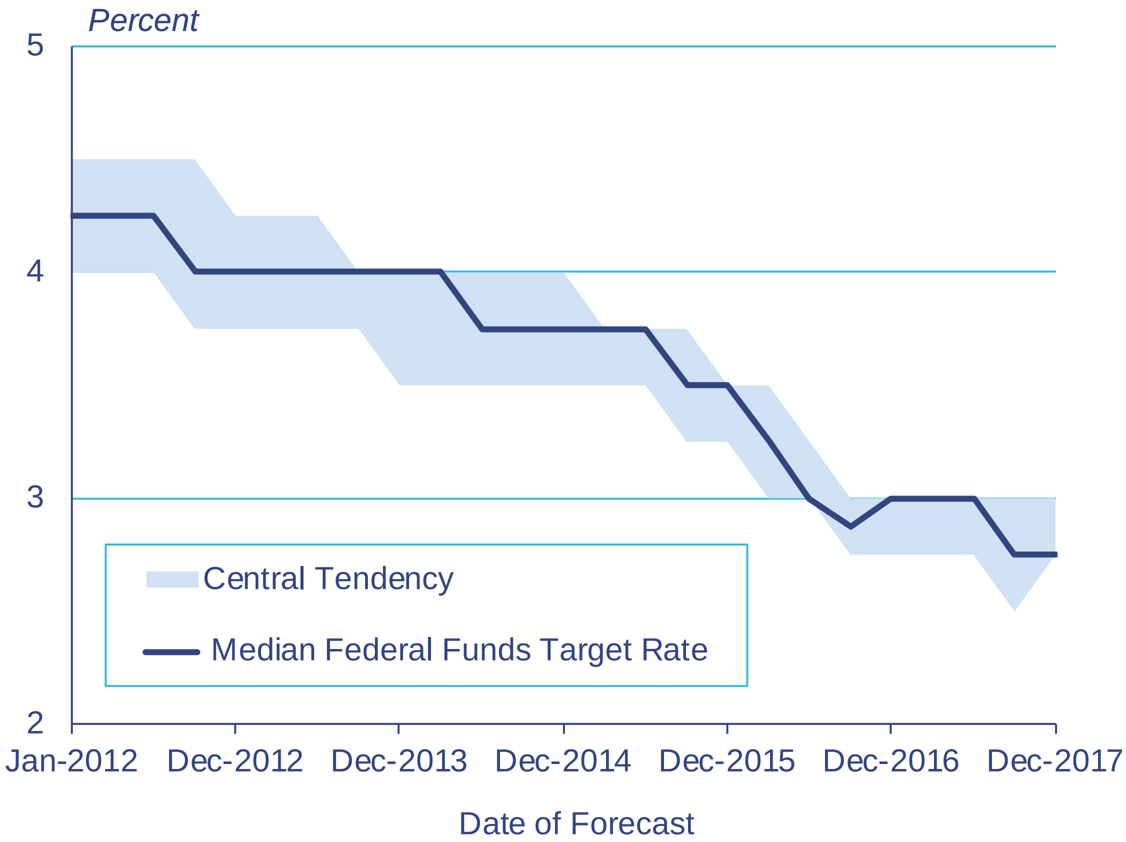
- Two percent inflation target was quite similar to the target set by most other central banks in developed economies
- Viewed as consistent with price stability
- Although much of the research preceded the Great Recession, and assumed:
  - Interest rates were unlikely to reach the effective lower bound
  - If they did, expected duration at near-zero interest rates would be measured in quarters, not years

Recent Experience

- Prolonged low interest rate environments in the U.S., Japan, and Europe
  - Difficult to conduct counter-cyclical monetary policy with short-term rates
  - Potentially undermine financial stability as firms and households "reach for yield" in the face of low interest rates
- Size of Great Recession shock, and changing economic fundamentals, make prolonged low interest rates likely in future recessions and increase the likelihood of nontraditional methods like asset purchases given the effective lower bound
  - Aging population and slow labor force growth
  - Slow productivity growth
  - Low real rate environment

Figure 4: Forecasts for the Longer-Run Federal Funds Rate from the Summary of Economic Projections

January 2012 - December 2017

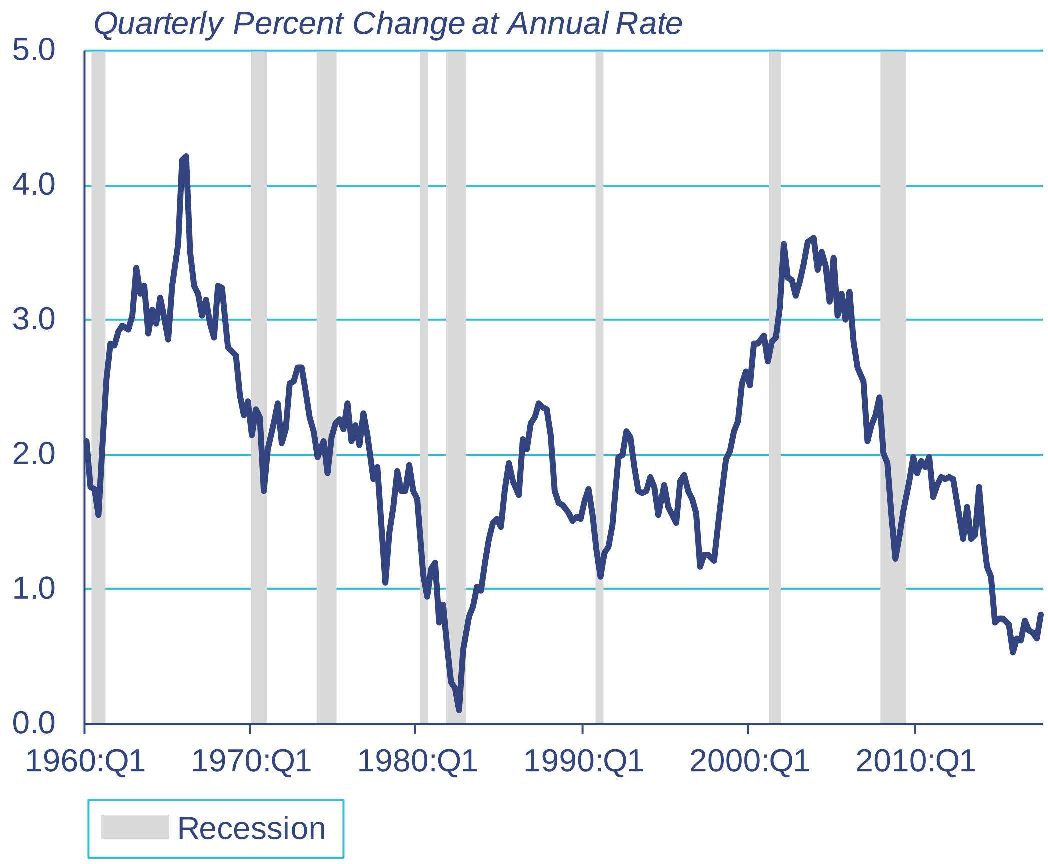


Note: The central tendency excludes the three highest and three lowest observations.

Source: FOMC, Summary of Economic Projections (SEP)

Figure 5: Productivity Growth: Change in Real Output Per Hour, Nonfarm Business Sector, All Persons, 20-Quarter Moving Average

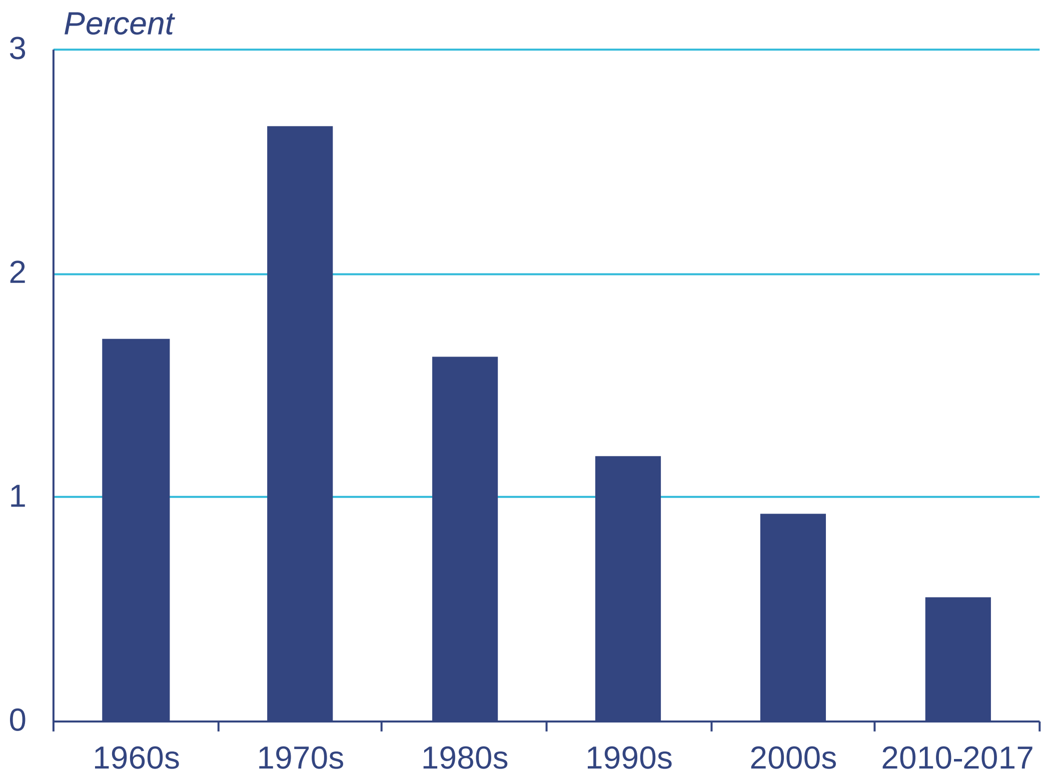
1960:Q1 - 2017:Q3



Source: BLS, NBER, Haver Analytics

Figure 6: Civilian Labor Force Growth by Decade

1960:Q1 - 2017:Q4



Source: BLS, Haver Analytics

Potential Alternative – Inflation Range with an Adjustable Inflation Target

- Potentially make inflation a target that could vary over time (like the natural unemployment rate)
- Possibly maintain an inflation range of 1.5 to 3.0 percent
  - A relatively narrow band consistent with actual experience and thus unlikely to impact inflation expectations
- Then the FOMC could vary its medium-term inflation target to be high, low, or in the middle of the range depending on economic factors determined at the beginning of each year
  - For example, with low population growth and low productivity growth, policy could move even more gradually to remove accommodation, and allow inflation to be somewhat higher in its range
  - If changes in productivity and labor force growth were infrequent, the target would be stable but at a level more consistent with avoiding prolonged low interest rates

Concluding Observations

- Recent forecast errors of inflation and unemployment have not been particularly large
- Current path of gradual increases in the federal funds rate is appropriate
- A more significant longer-run matter, from my perspective, is the opportunity for the Federal Reserve’s current monetary policy framework to adapt to the recent experience with prolonged low real interest rates

Concluding Observations (continued)

- Goal – Appropriate Monetary Policy “Buffer”
  - Avoid long periods where traditional monetary policy cannot be used because the effective lower bound is reached
  - Avoid financial stability risks associated with prolonged low interest rates
  - Variety of approaches worth considering, including price-level targeting and nominal GDP targeting
  - An inflation range with an adjustable inflation target is an alternative worth considering