

How Inflation Behavior Helps In the Estimation of Potential Real GDP

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This Talk is *ONLY* About the U.S.

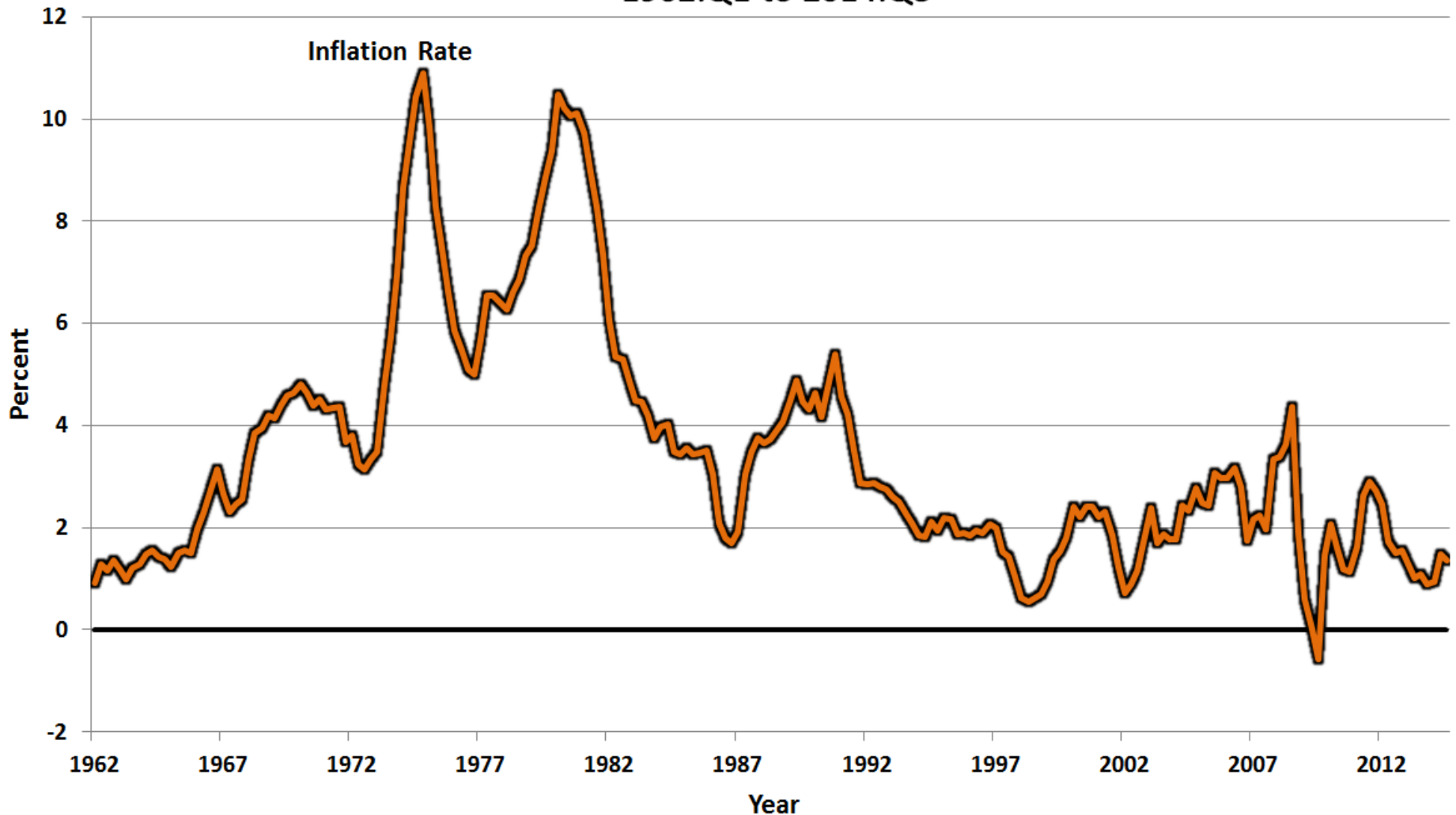
- **First we'll look at the inflation behavior that must be explained, with its twin peaks and later valley**
- **Then we'll look at a startling scatter plot of inflation vs. unemployment. Where is the relationship? There is none visible – how can the Fed discuss monetary policy in the context of Taylor's rule?**

Hidden Down Underneath – *A Stable* Unemployment-inflation Tradeoff

- **We estimate a steady-inflation NAIRU**
- **This allows us to estimate the unemployment gap between actual unemployment and the NAIRU**
- **That “ugap” then can be used to detrend output, hours, and productivity**
- **We emerge in the end with**
 - **A stable inflation equation**
 - **New and startling estimates of potential real GDP growth for the U.S. economy**

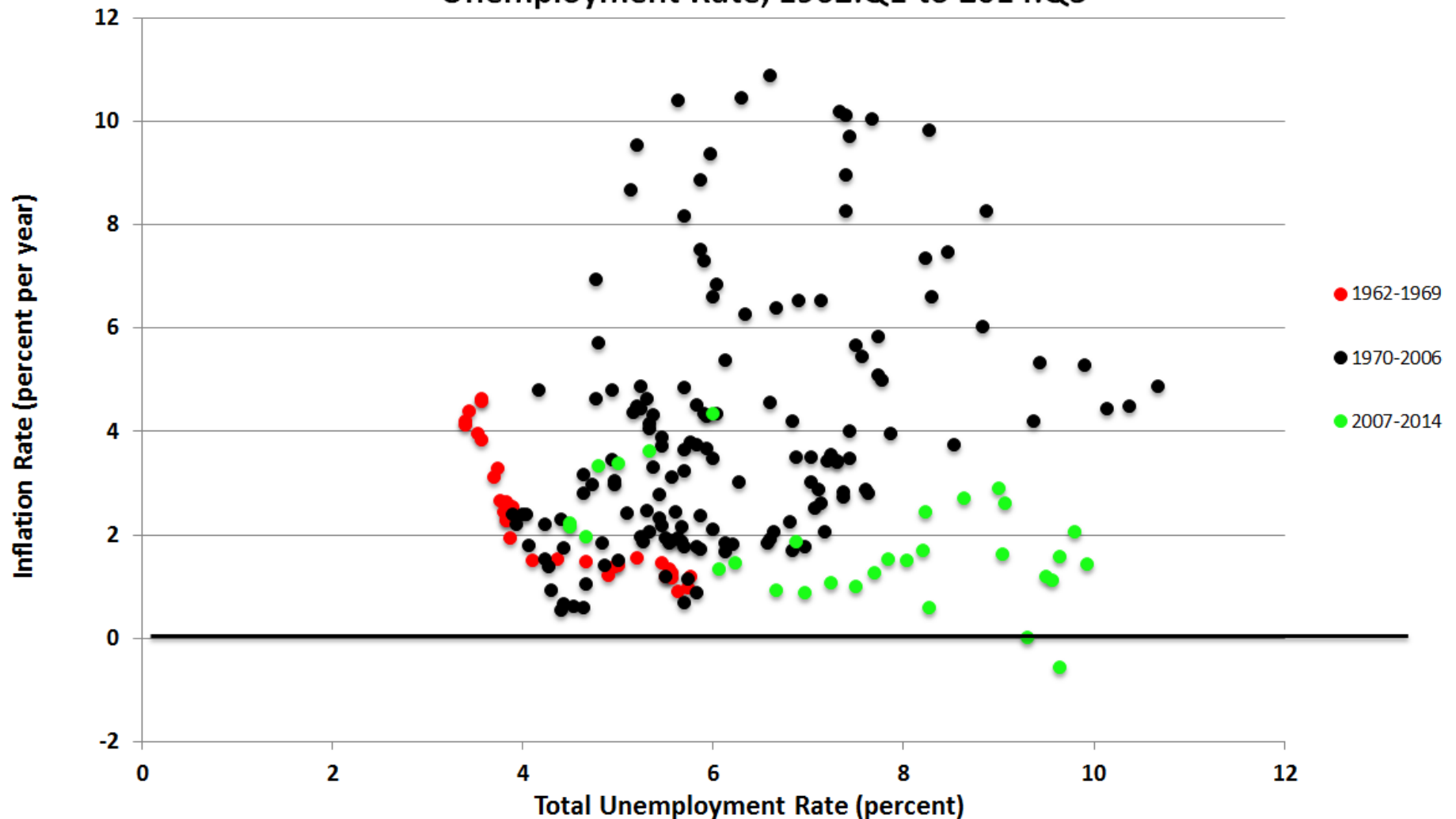
U.S. PCE Deflator Headline Inflation: Notice the Twin Peaks and Valley

Figure A. Four Quarter Changes in Headline Inflation Rate
1962:Q1 to 2014:Q3



Have You Ever Seen A Scatter Plot With a Lower Correlation?

Figure 1b. Four Quarter Changes in Headline Inflation Rate vs Total Unemployment Rate, 1962:Q1 to 2014:Q3



Why Should Inflation Be Related Only to Unemployment?

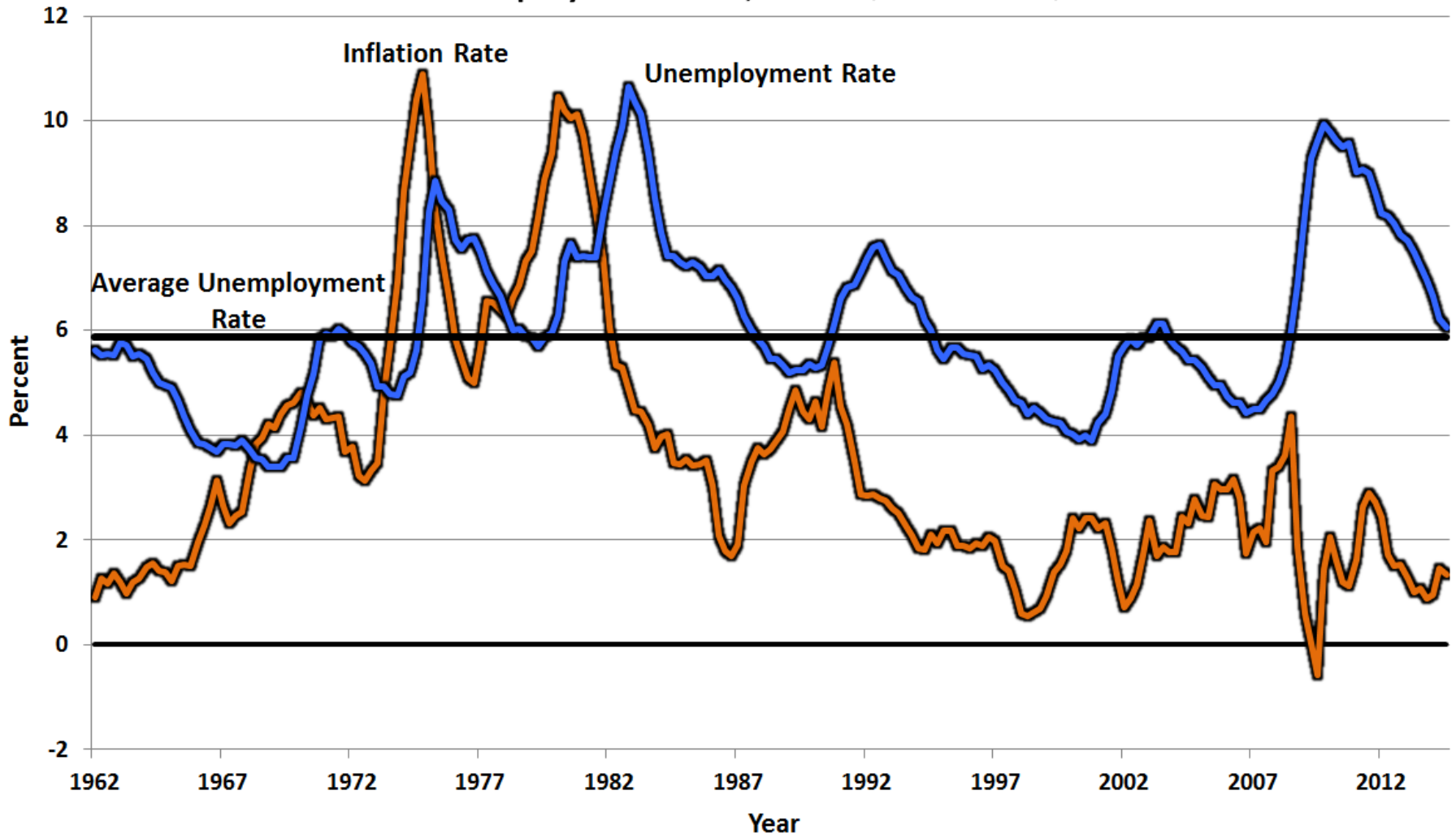
- This casts aside microeconomics as it was developed more than 100 years ago.
- Does the price of oil have one determinant, the demand for oil?
- Of course not, the closing of a refinery in Iraq can raise the price of oil
- **THE PRICE LEVEL OF ANY GOOD DEPENDS ON SUPPLY AND DEMAND**
- Why not also true of macroeconomics – unemployment represents the demand side but the supply side matters as well.

Inflation Depends on Demand and Supply

- **I introduced this theory, that supply matters as much as demand, into macroeconomics in 1975, almost 40 years ago.**
- **“Alternative Responses of Policy to Adverse Supply Shocks,” BPEA, 1975, no. 1, pp. 183-206.**
- **It has been part of macro textbooks since 1978.**
- **An adverse supply shock, e.g., a 6-fold increase of the price of oil as in 1972-74, chews up consumer expenditures and leaves less remaining to buy non-oil/energy products**
- **The rest of the economy outside the energy sector goes into recession.**
- **Price flexibility for energy and price rigidity for non-energy**

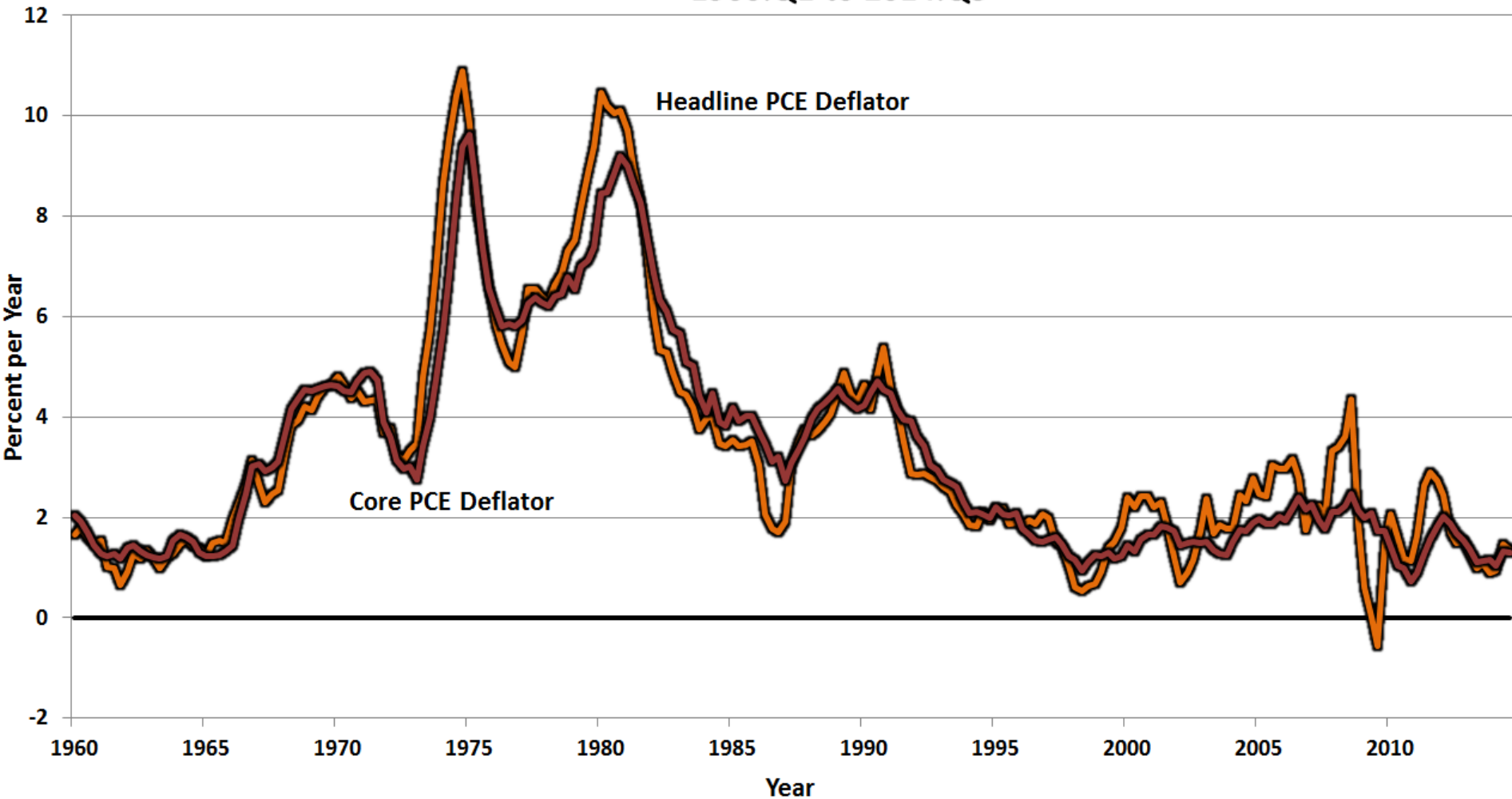
Here You See the Supply Shocks in Action: 1974, 1979-80, 1998-99

Figure 1a. Four Quarter Changes in Headline Inflation Rate vs Total Unemployment Rate, 1962:Q1 to 2014:Q3



Fed Looks at Core PCE Inflation; Tonight We'll Focus on Headline Inflation

Figure 3a. Four Quarter Changes of Headline and Core PCE Deflator, 1960:Q1 to 2014:Q3

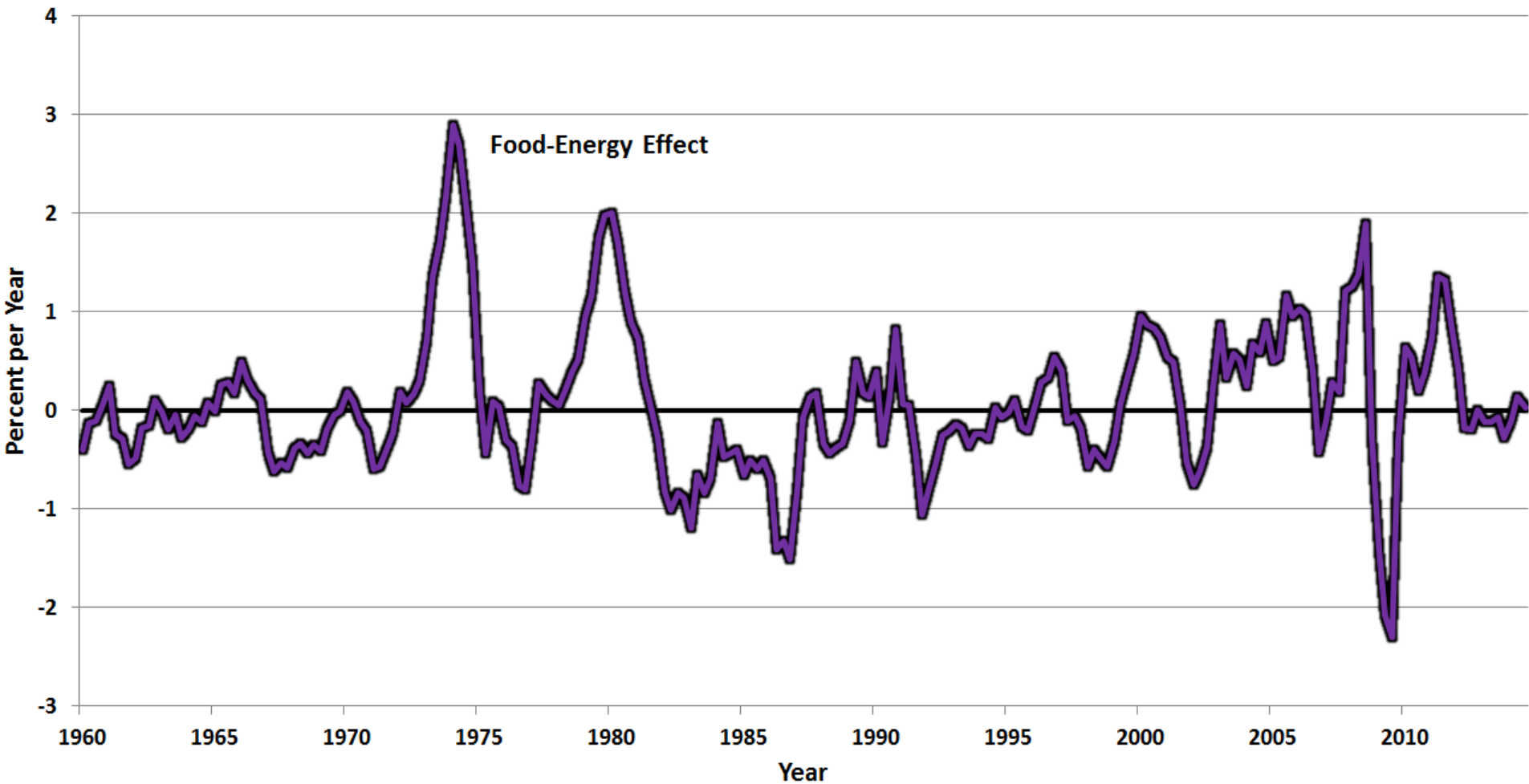


How Do I Translate the Idea of “Demand and Supply” into the “Triangle Model” of Inflation?

- **Current specification is 34 years old, introduced in 1980**
- **Inflation depends on Inertia**
 - Lagged inflation, with freely estimated weights over the past six years.
- **Inflation depends on demand**
 - “ugap,” the deviation of Unemployment from NAIRU
- **Inflation depends on supply**
 - The food-energy effect, difference between headline and core
 - Relative price of nonoil nonfood imports
 - Change in productivity trend
 - Nixon price controls “on” held down inflation, “off” released it

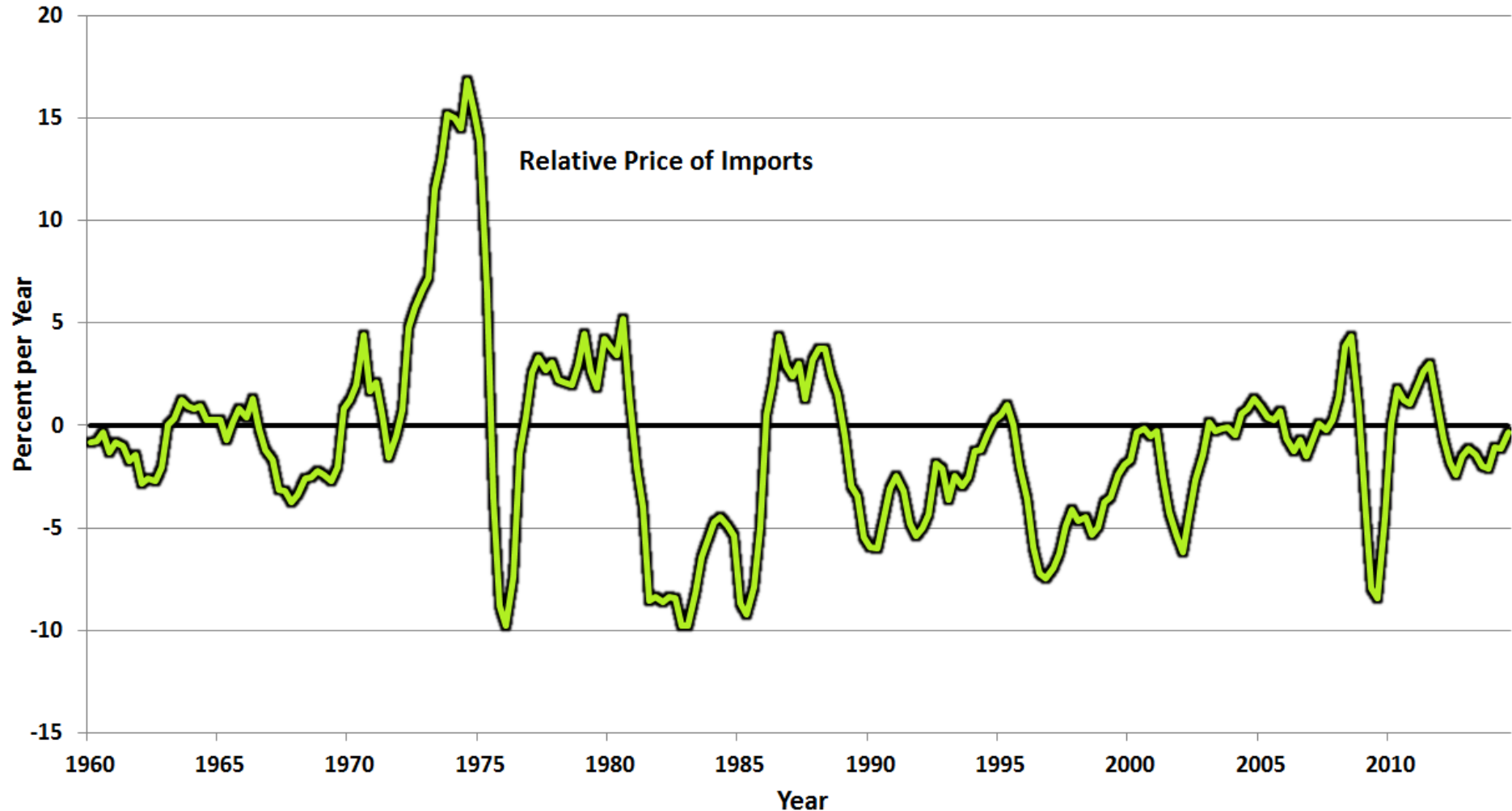
The Food-Energy Effect is the Difference Between Headline and Core Inflation

Figure 3b. Four Quarter Changes of Food-Energy Effect, 1960:Q1 to 2014:Q3



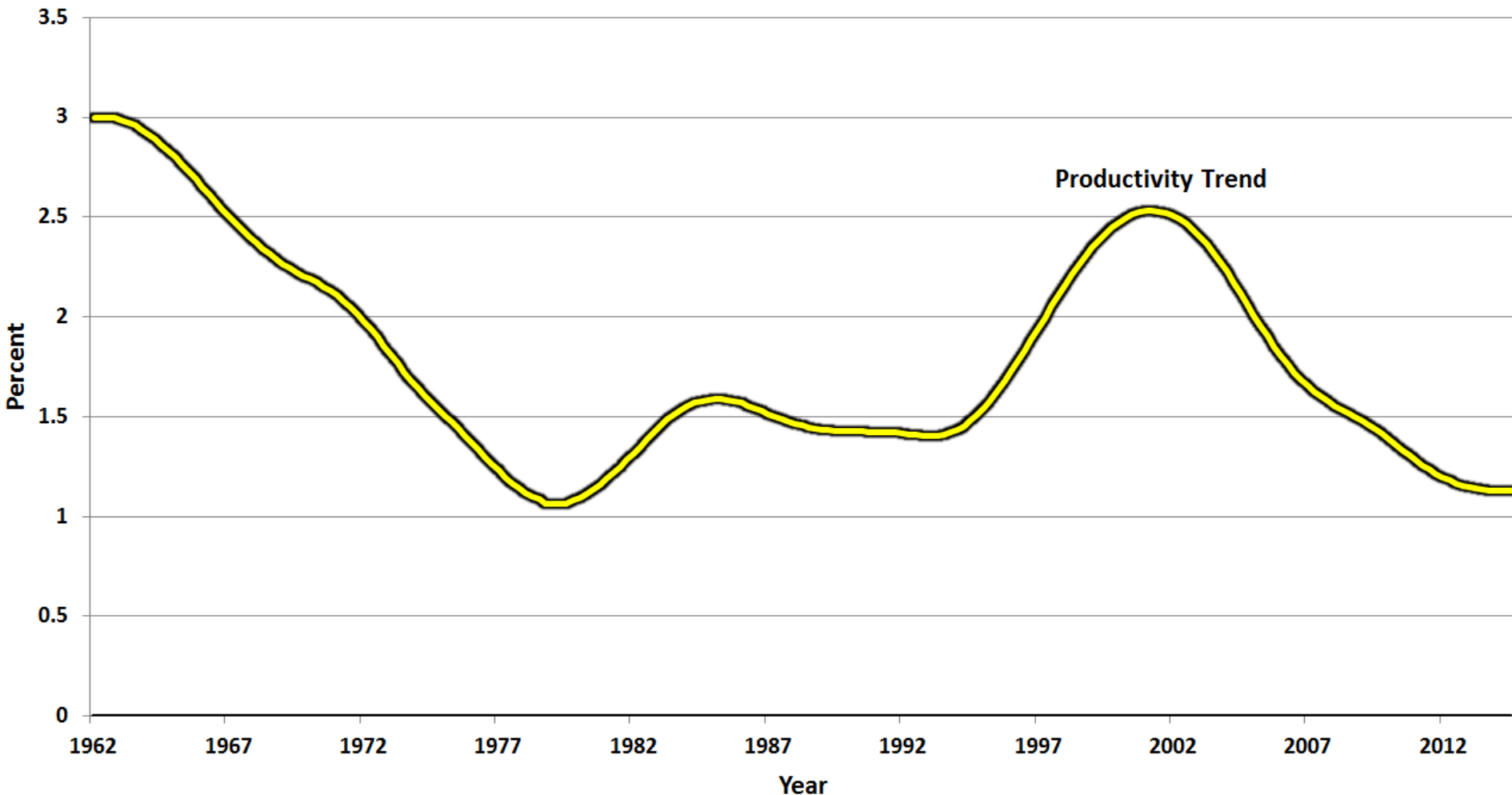
The Relative Price of Nonoil, nonfood Imports Also Matters (Change of scale)

Figure 4a. Four Quarter Changes of Relative Price of Imports, Non-Food Non-Oil, 1960:Q1 to 2014:Q3



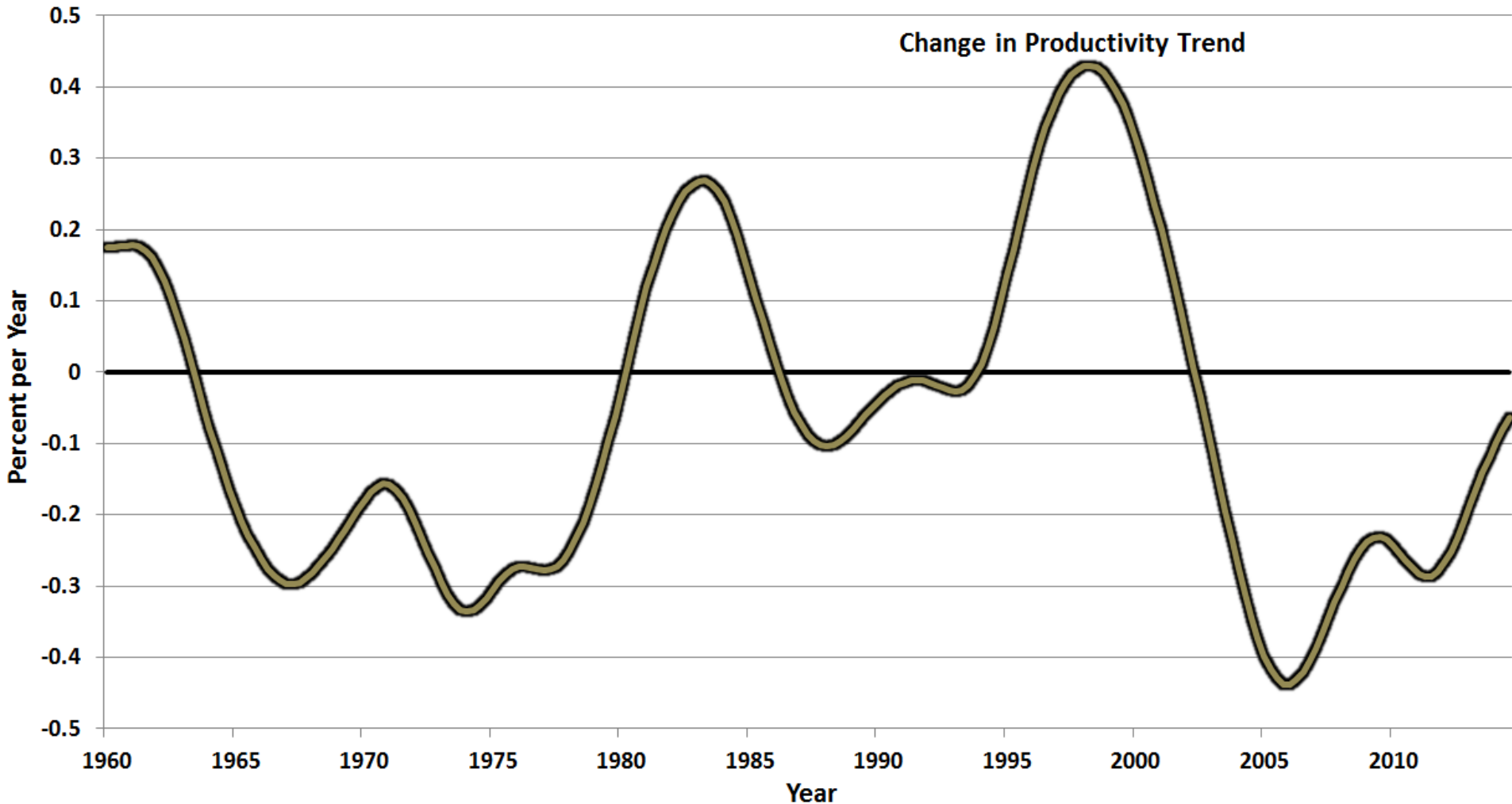
Productivity Growth Matters a Lot: Here is the Productivity Growth Trend

Figure F. Change in Productivity Trend, 1962:Q1 to 2014:Q3



Change in Productivity Trend Helps to Explain Inflation Behavior

Figure 4b. Eight Quarter Changes of Productivity Trend, 1960:Q1 to 2014:Q3

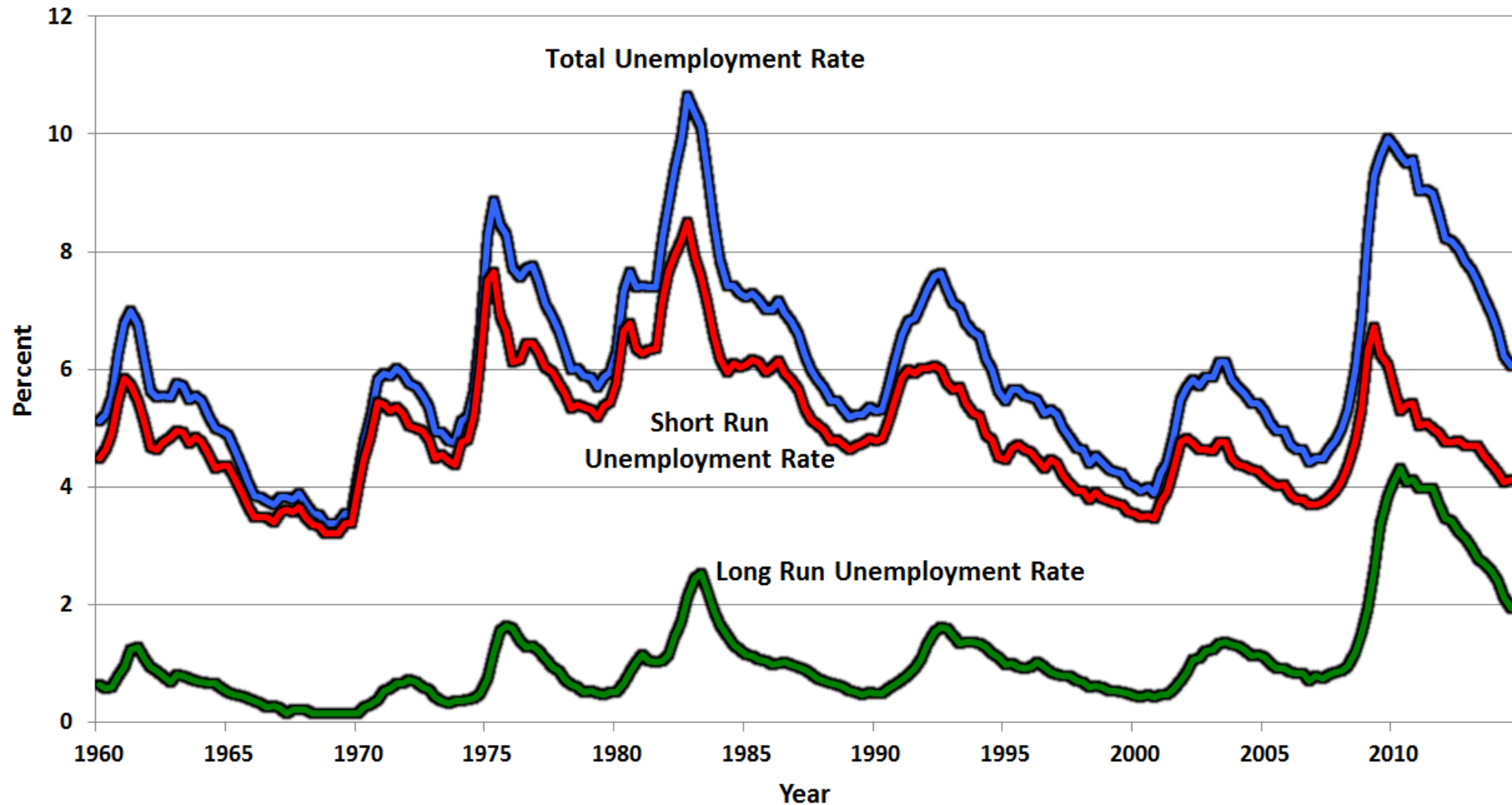


Which Unemployment Rate to Drive the Inflation Process?

- All the literature before my 2013 WP used the total unemployment rate
- In past year there has been a big debate about whether short-term unemployment (< 6 months) matters more for wages and inflation than long-term unemployment (> 6 months).
- The two measures behave identically until 2009, then very different

Which Unemployment Rate Drives Inflation?

Figure 6. Total, Short Run, and Long Run Unemployment Rate, 1960:Q1 to 2014:Q3

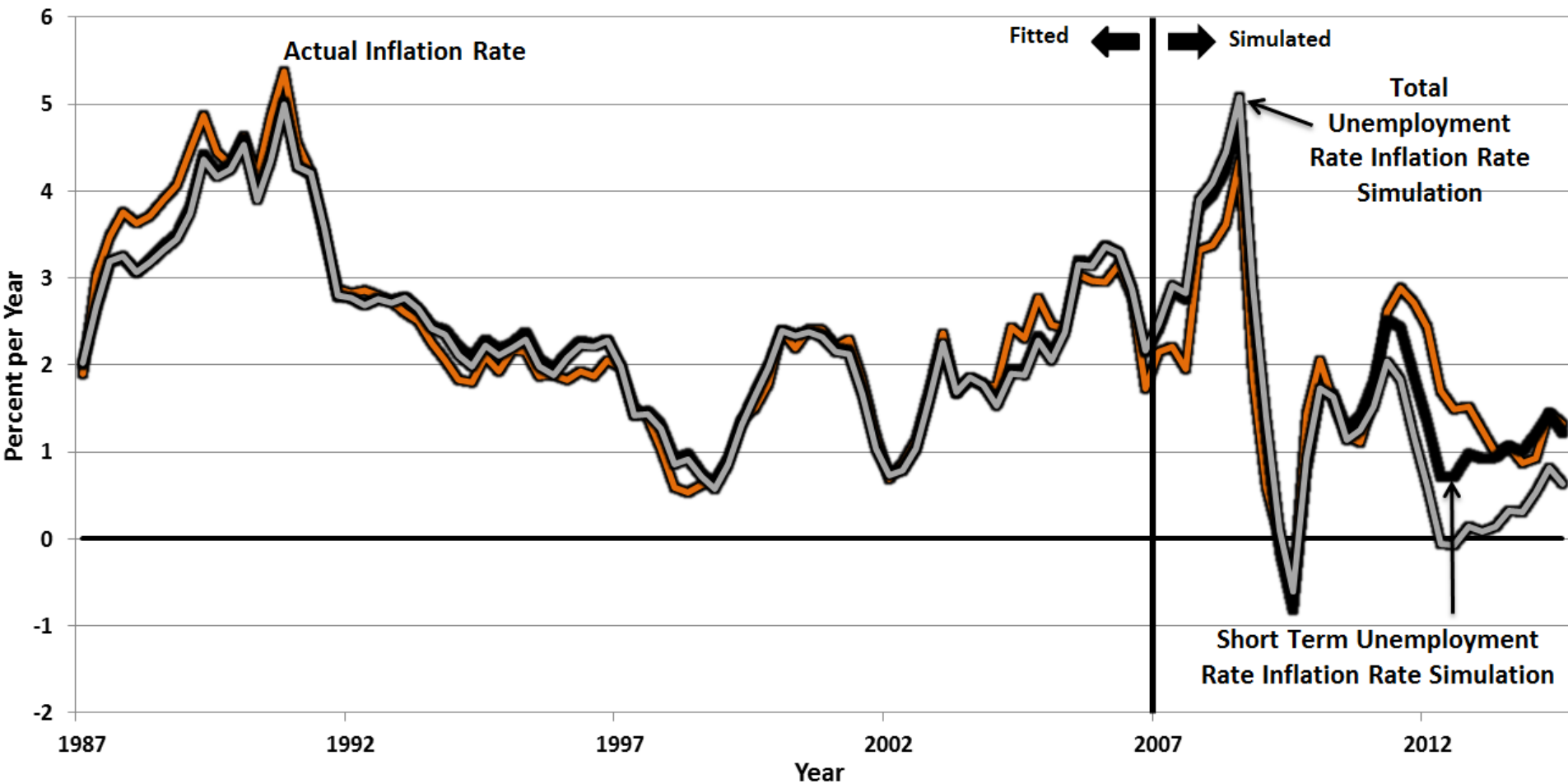


Debate Whether the LTU Are Disconnected from the Labor Market

- Part of this is real: skills atrophy when workers are out of work for 6 months, 1 year, even 5 years
- All the decline in LTU over the past year is more than accounted for by labor-force dropping out. *The average long-term unemployed person leaves the labor force rather than taking a job.*
- Employers are described as rejecting applications from LTU, looking for gaps of 6 months or more in their employment experience. Employers use the lack of employment as a “signal” that something else is wrong with the applicant.

Here's the Key Piece of Evidence, Dynamic Simulation 2007-2014

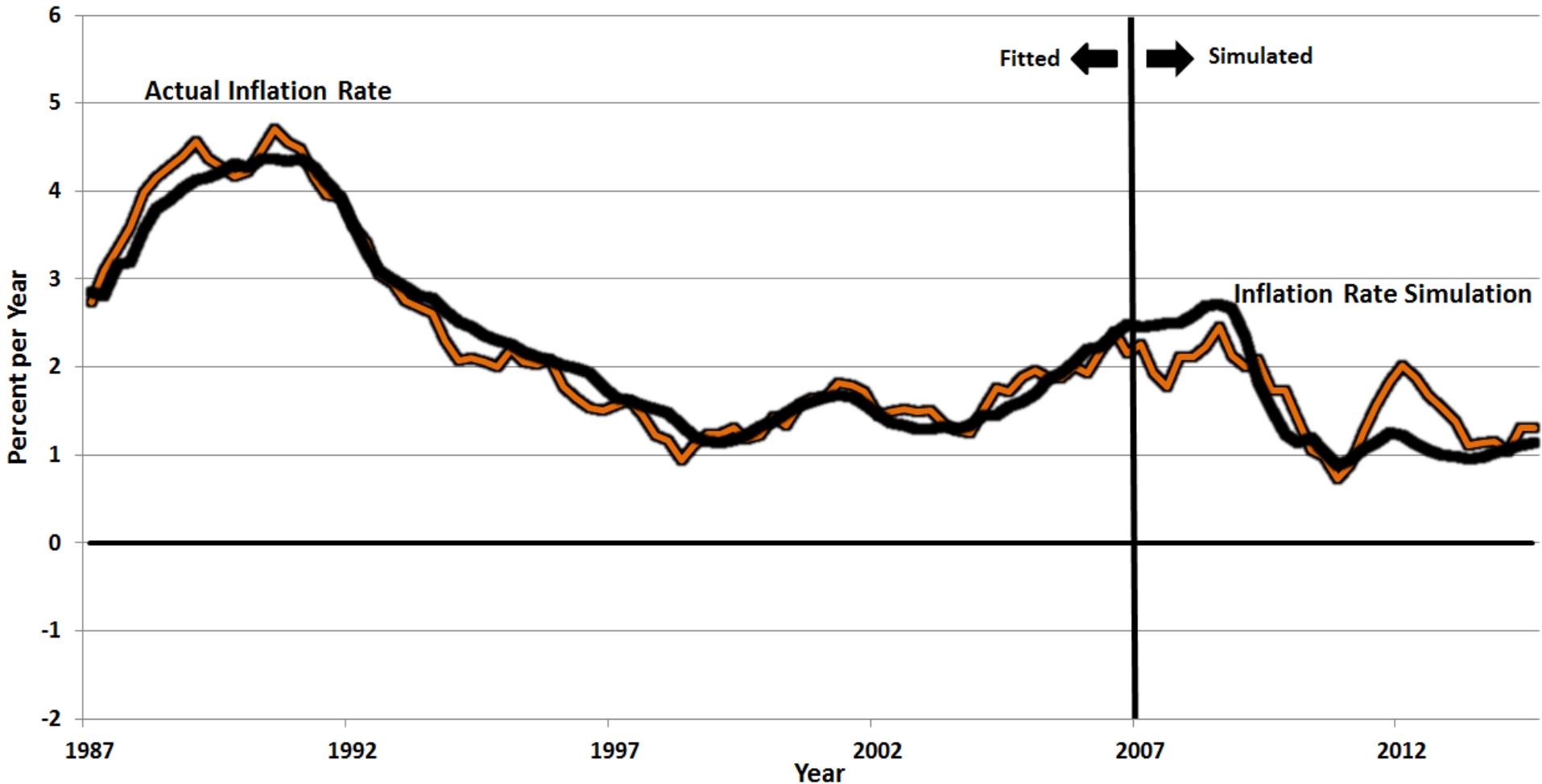
Figure 7b. Actual vs Simulated Headline Inflation Rate, 2006:Q4 Sample End, Total vs Short Term Unemployment, 1987:Q1 to 2014:Q3



What About Core Inflation?

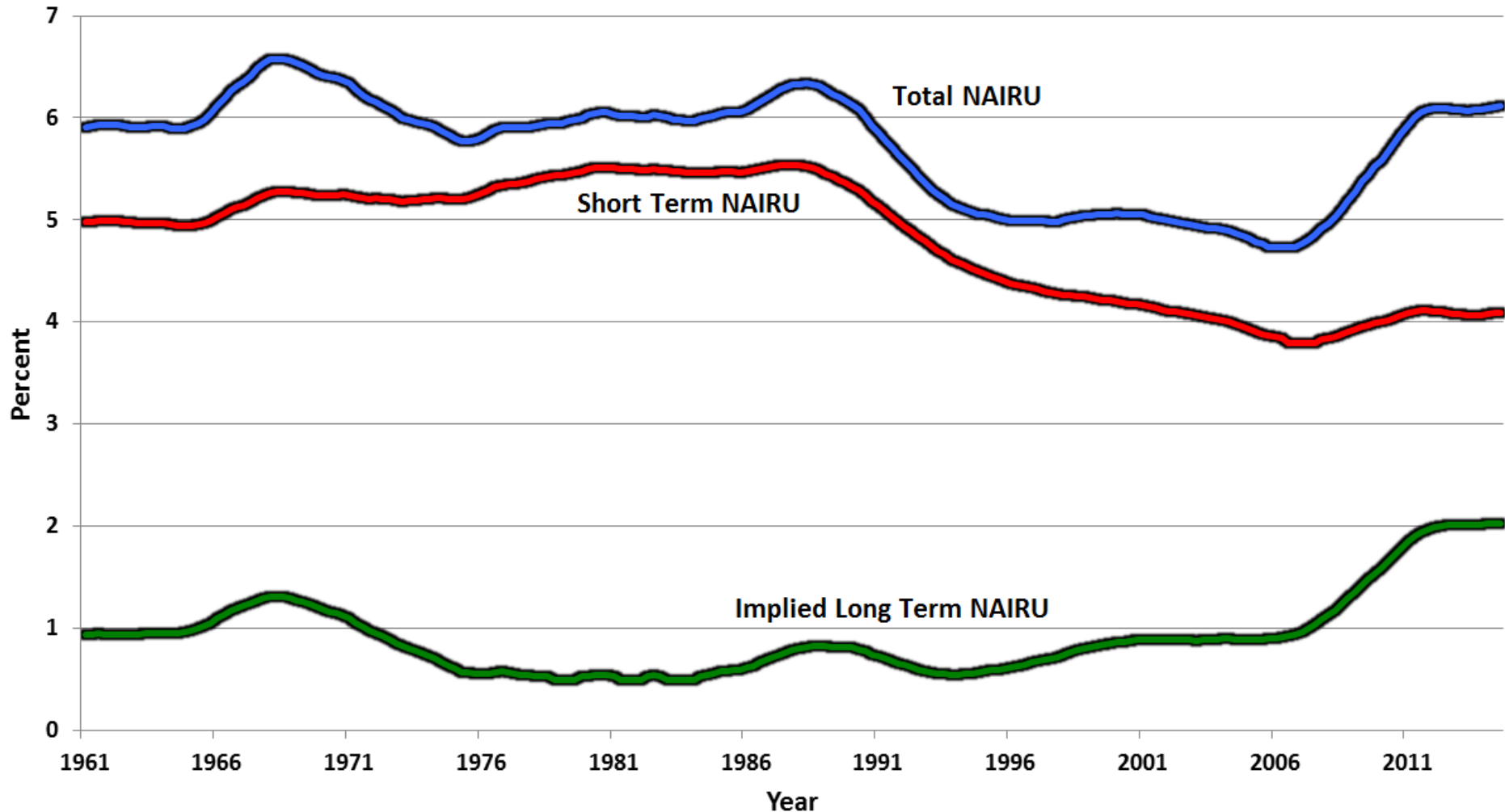
Same Results

Figure 11b. Actual vs Simulated Core Inflation Rate, 2006:Q4 Sample End, Triangle Model, Short Term Unemployment Rate, 1987:Q1 to 2014:Q3



Implication for the Fed's Unemployment Target

Figure 9. Total, Short Term, and Implied Long Term NAIRU, 1961:Q1 to 2014:Q3



Future Inflation: What if the Fed goes for 5% Total Unemployment? What about 6%?

Figure 3b. Total Unemployment Extrapolation, Rising vs. Non-Rising Inflation Projections, 1987:Q1 to 2024:Q4

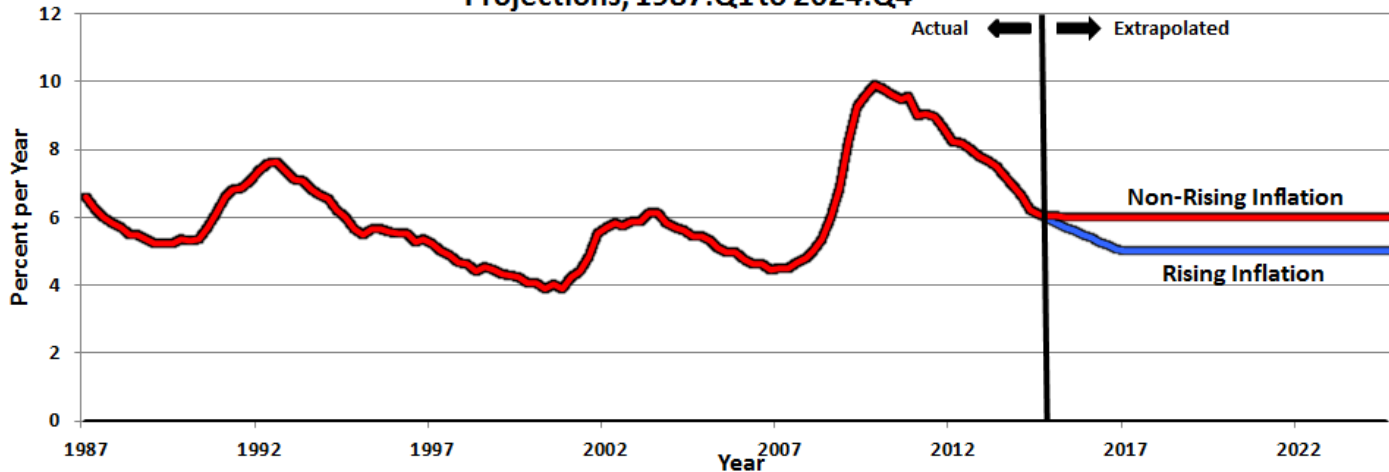
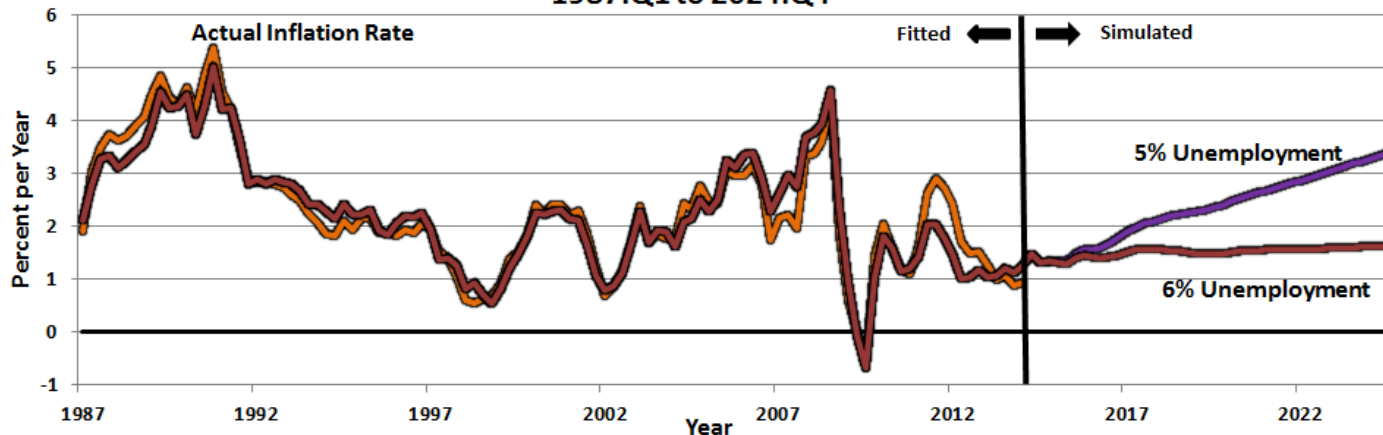


Figure 10a. Triangle Model Headline Inflation Rate Projections, 2014:Q1 Sample End, 5% vs 6% Total Unemployment, 1987:Q1 to 2024:Q4



The Golden Path of Unemployment that Leads to 2% Inflation

Figure 3b. Total Unemployment Extrapolation, Golden Path to a 2% Inflation Rate,
1987:Q1 to 2024:Q4

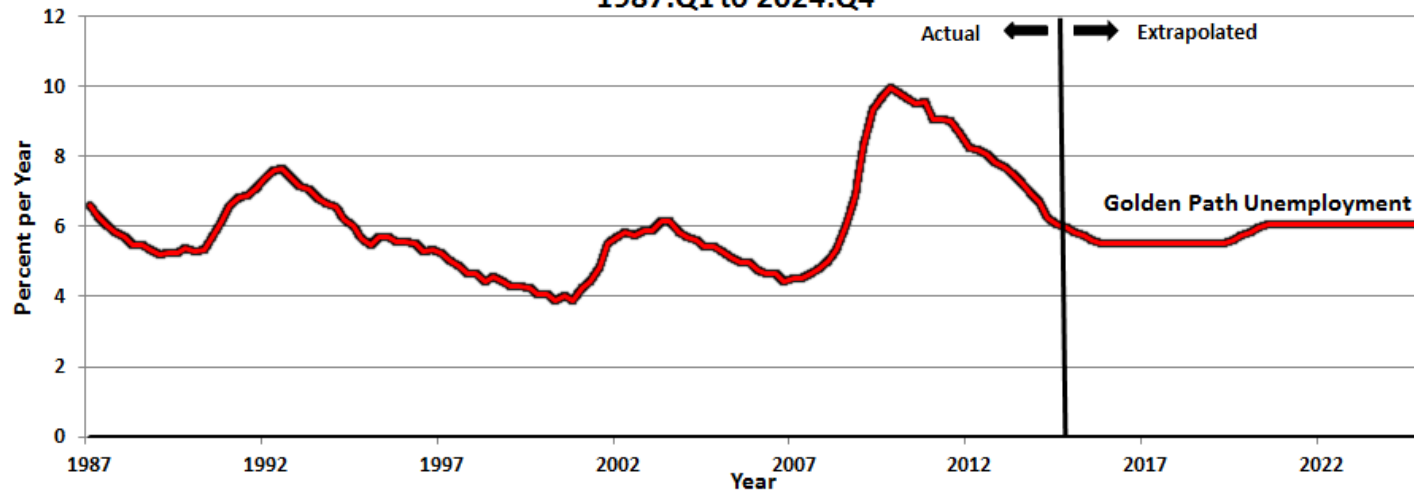
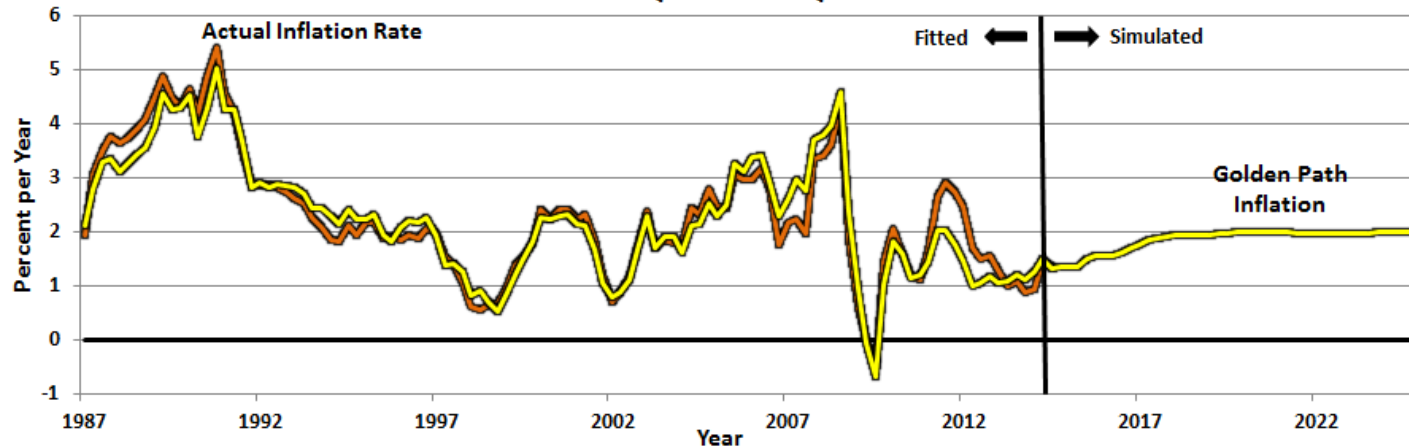


Figure 10a. Triangle Model Headline Inflation Rate Projections,
2014:Q3 Sample End, Golden Path of Total Unemployment,
1987:Q1 to 2024:Q4



Let's Use the Inflation Model to Predict Alternative Outcomes

- **Basic Tool: the Output Identity**
- **By Definition Real GDP Growth (y) = Sum of Growth in**
 - **Output per Hour ($y - h$)**
 - **Hours per employee ($h - e$)**
 - **Employment rate ($e - l$)**
 - **Labor force participation rate ($l - n$)**
 - **Working age population (n)**

Exercise: Choose Three Alternative Paths of the Unemployment Rate

- **Path 1. Conservative, little further decline in U rate**
- **Path 2. Medium, unemployment drops to 5% but then returns to 5.5%**
- **Path 3. Aggressive. Unemployment drops to 4.8% and stays there forever.**

Figure 1. Extrapolated Total Unemployment Rate, NAIRU, and Unemployment Gap, Versions 1 through 3, 2014:Q2 to 2020:Q4

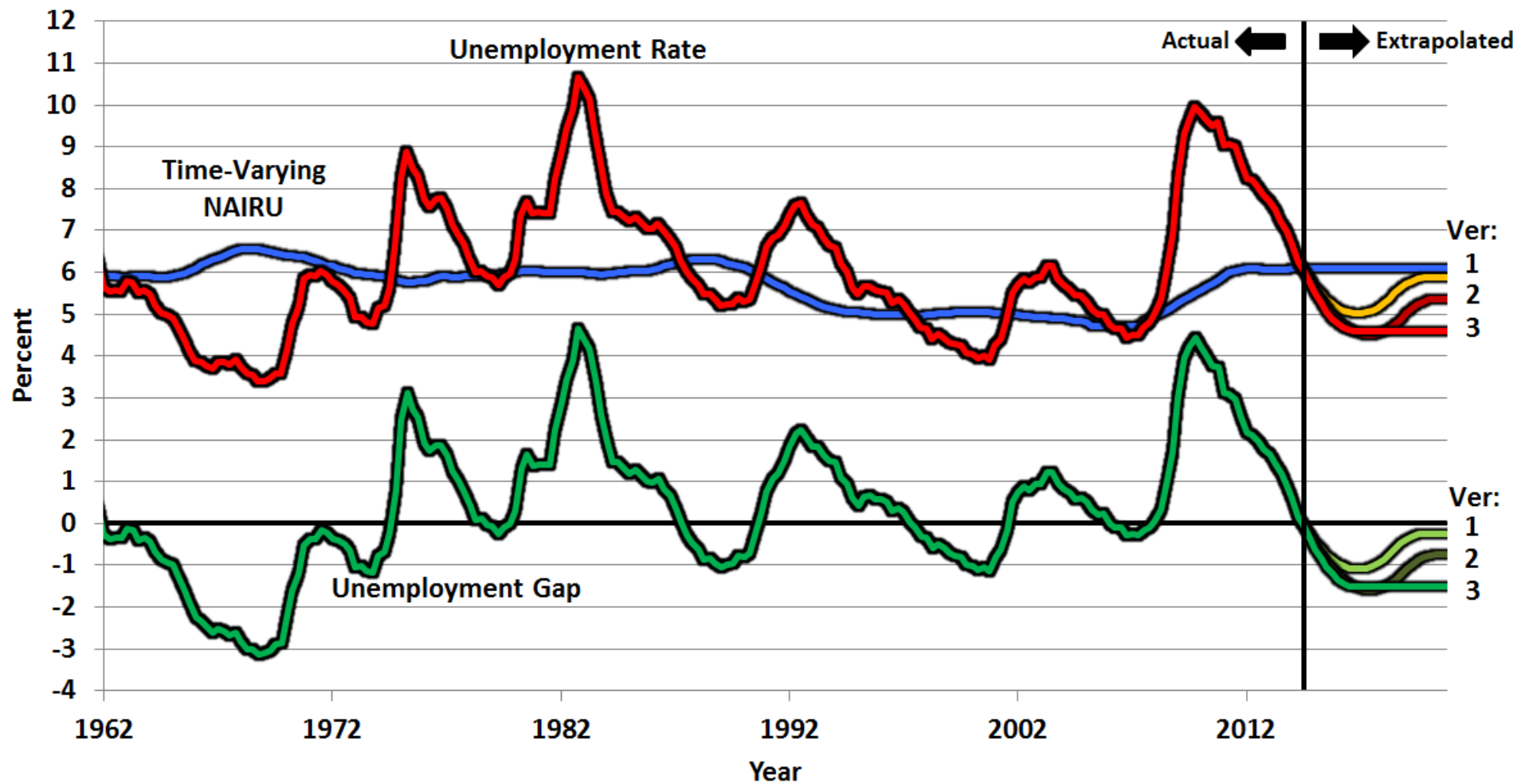


Figure 3. Kalman Growth Trends of Output, Hours, and Productivity, 1953:Q1 to 2014:Q3

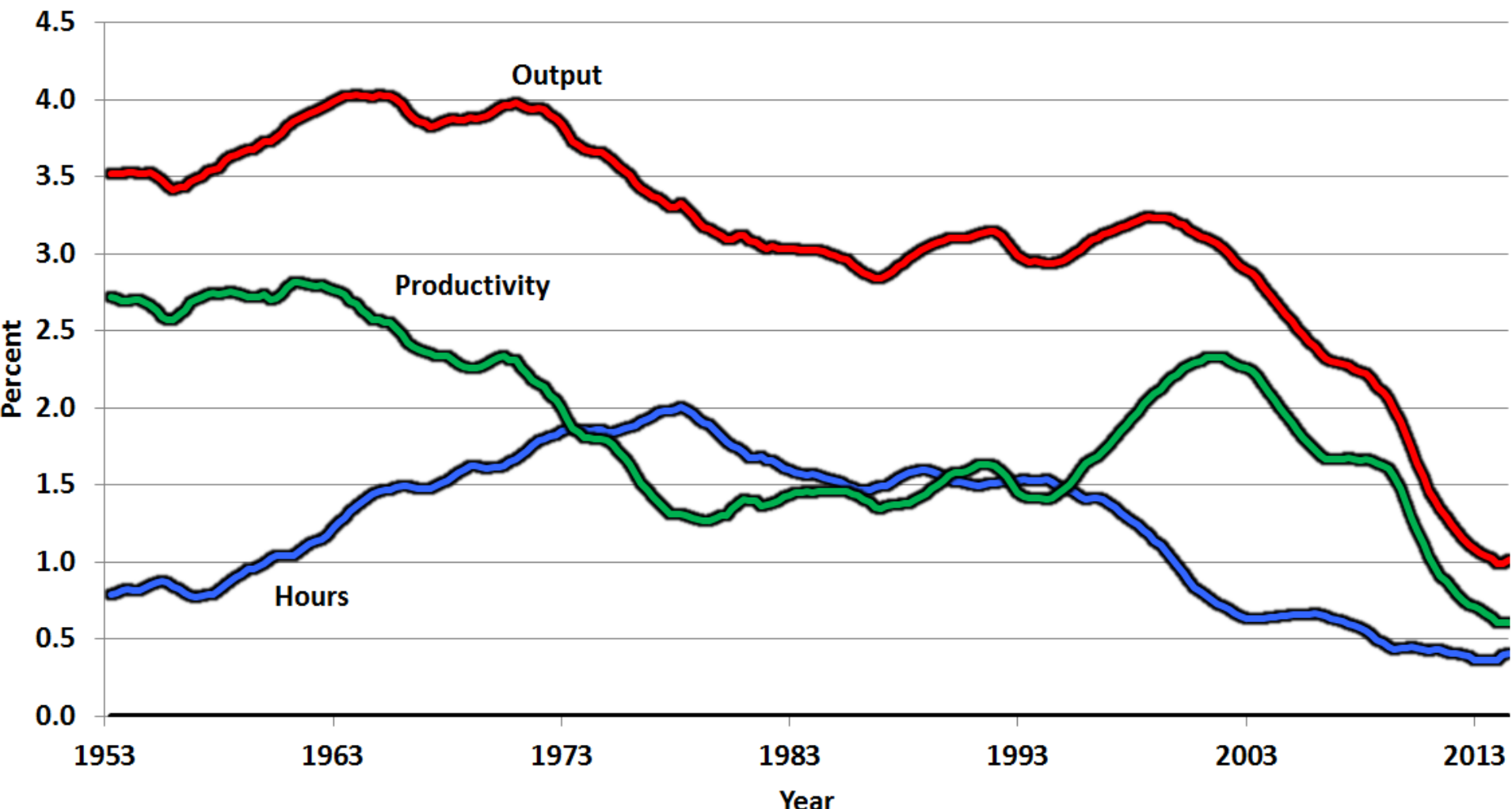


Figure 4. Kalman Growth Trends of Payroll/Household Hours Ratio, Hours per Employee, Employment Rate, LFPR, and Population, 1953:Q1 - 2014:Q3

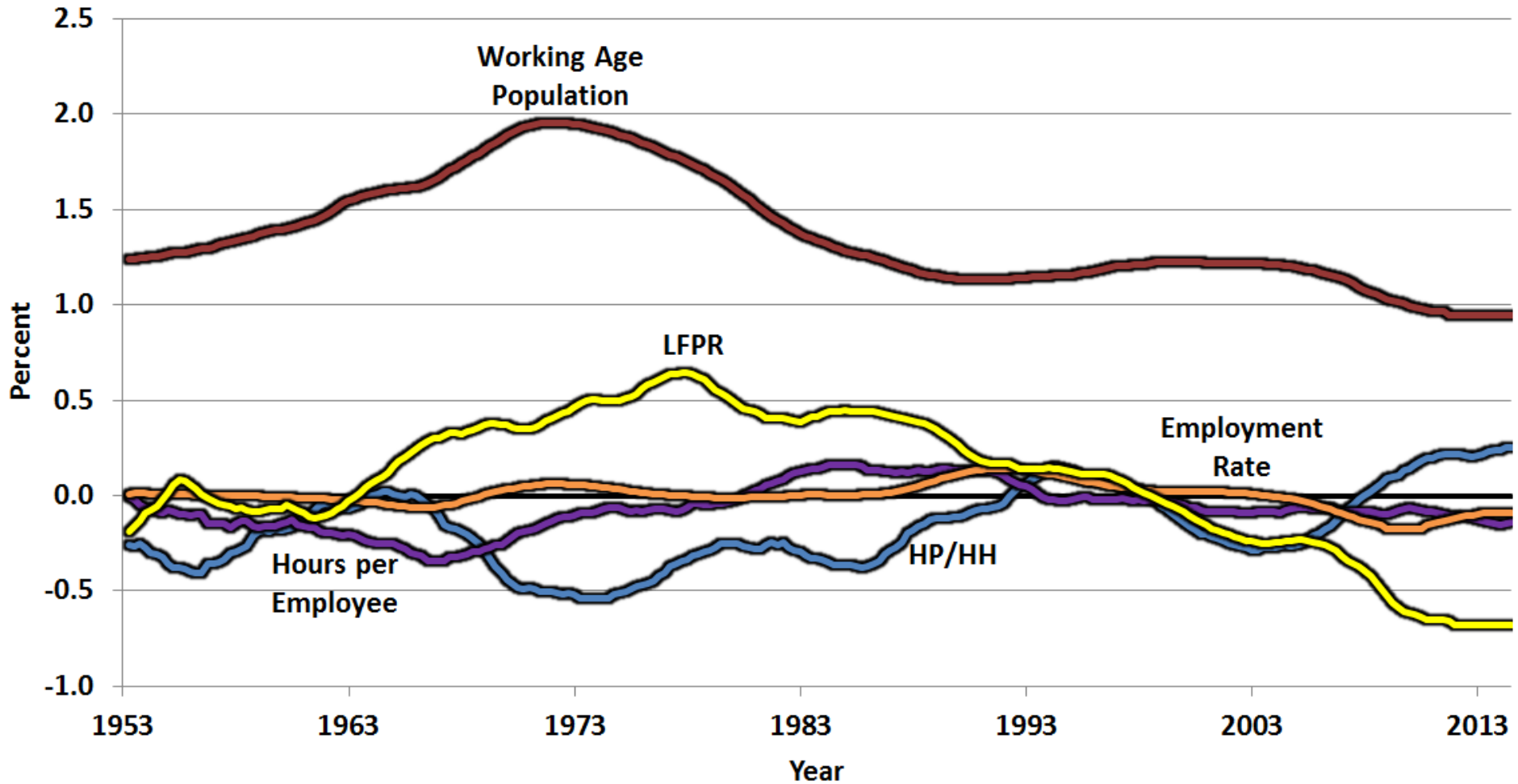


Figure 6. Four Quarter Growth Rate of Productivity and LFPR, Actual and Extrapolated, Versions 1 through 3, 2007:Q1 to 2020:Q4

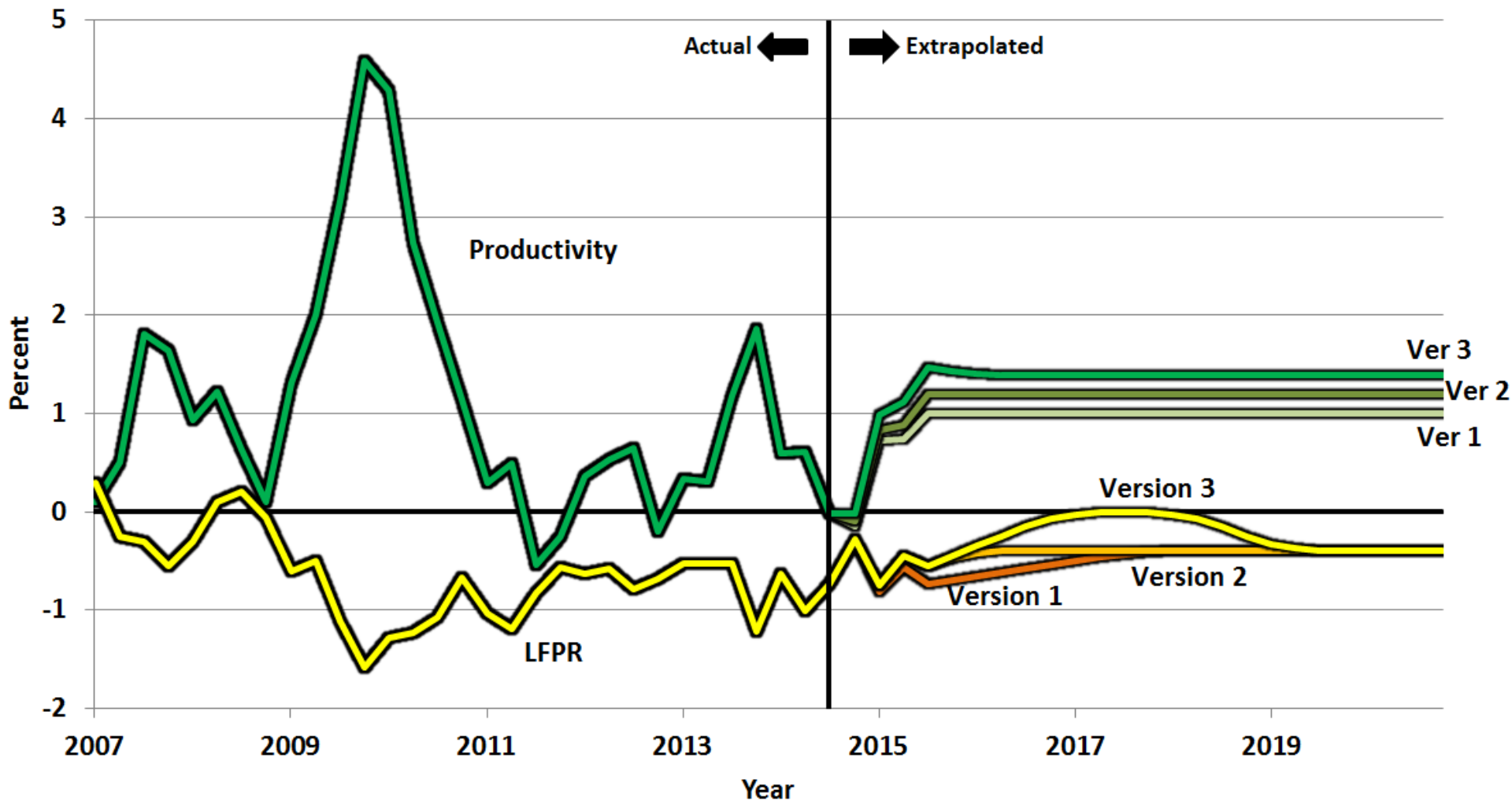


Figure 7. Four Quarter Growth Rate of Output, Actual and Extrapolated, Versions 1 through 3, 2007:Q1 to 2020:Q4

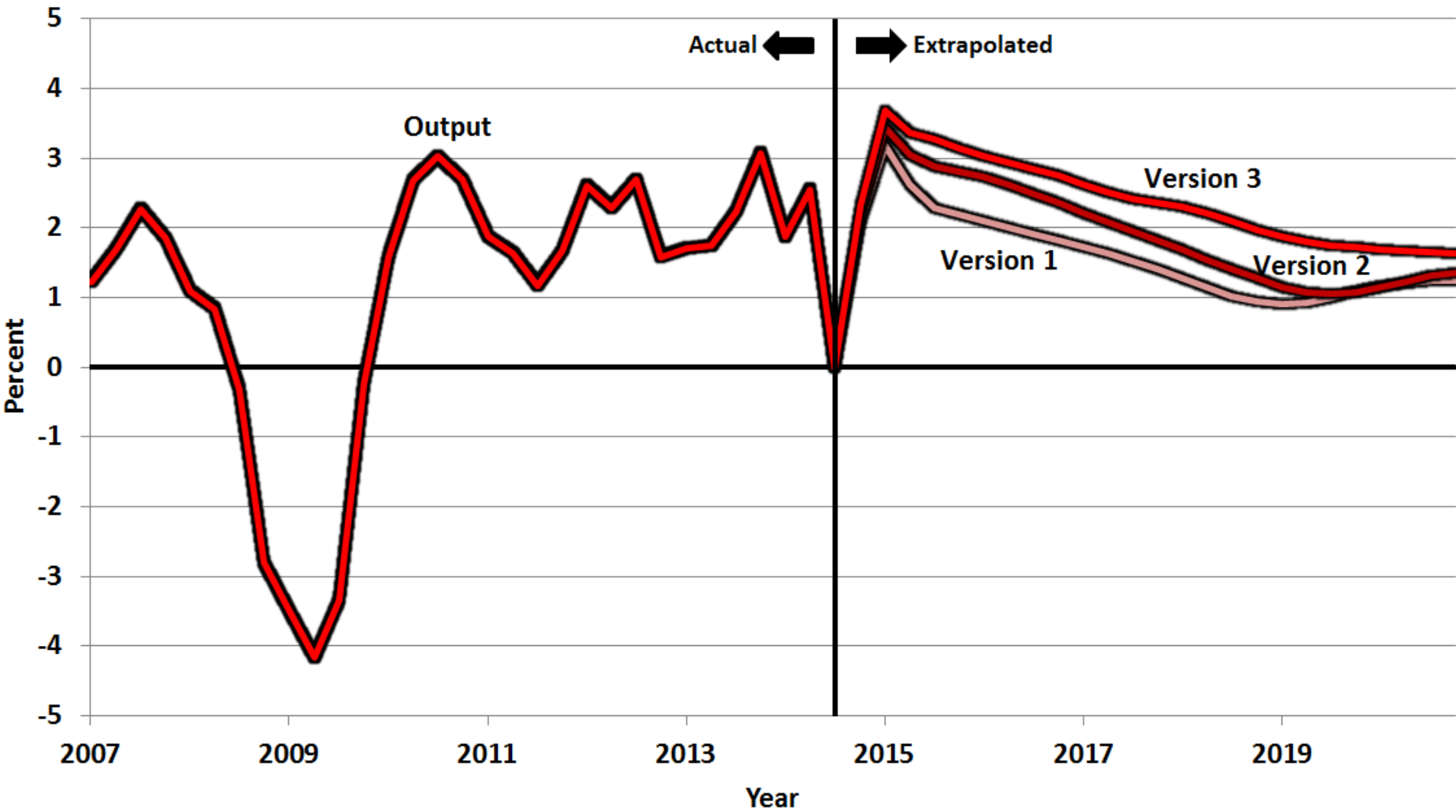


Figure 8. Projected Kalman Growth Trend of Output, Versions 1 through 3, 1990:Q1 to 2020:Q4

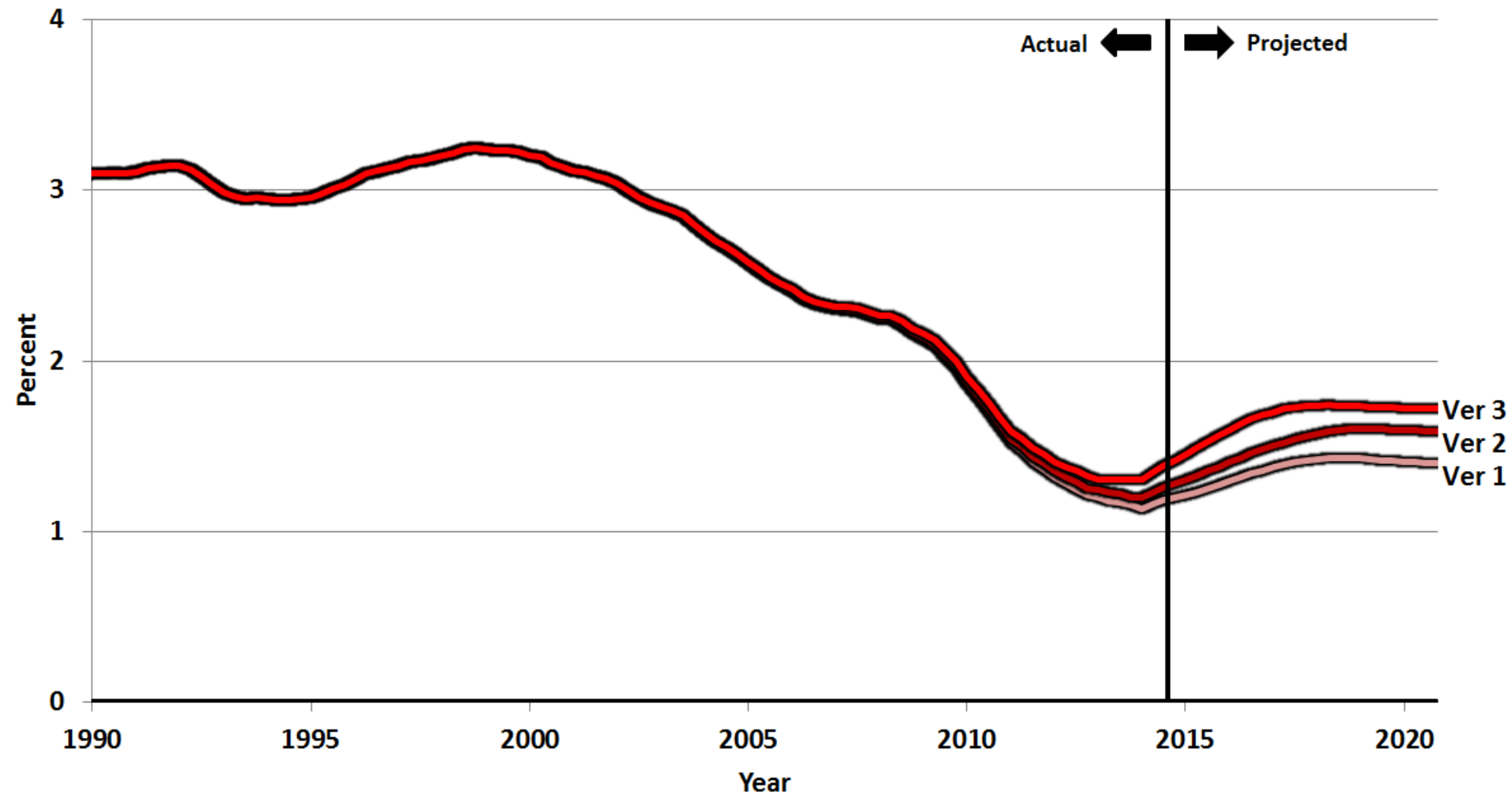


Figure 9. Projected Kalman Growth Trend of Labor Productivity, Versions 1 through 3, 1990:Q1 to 2020:Q4

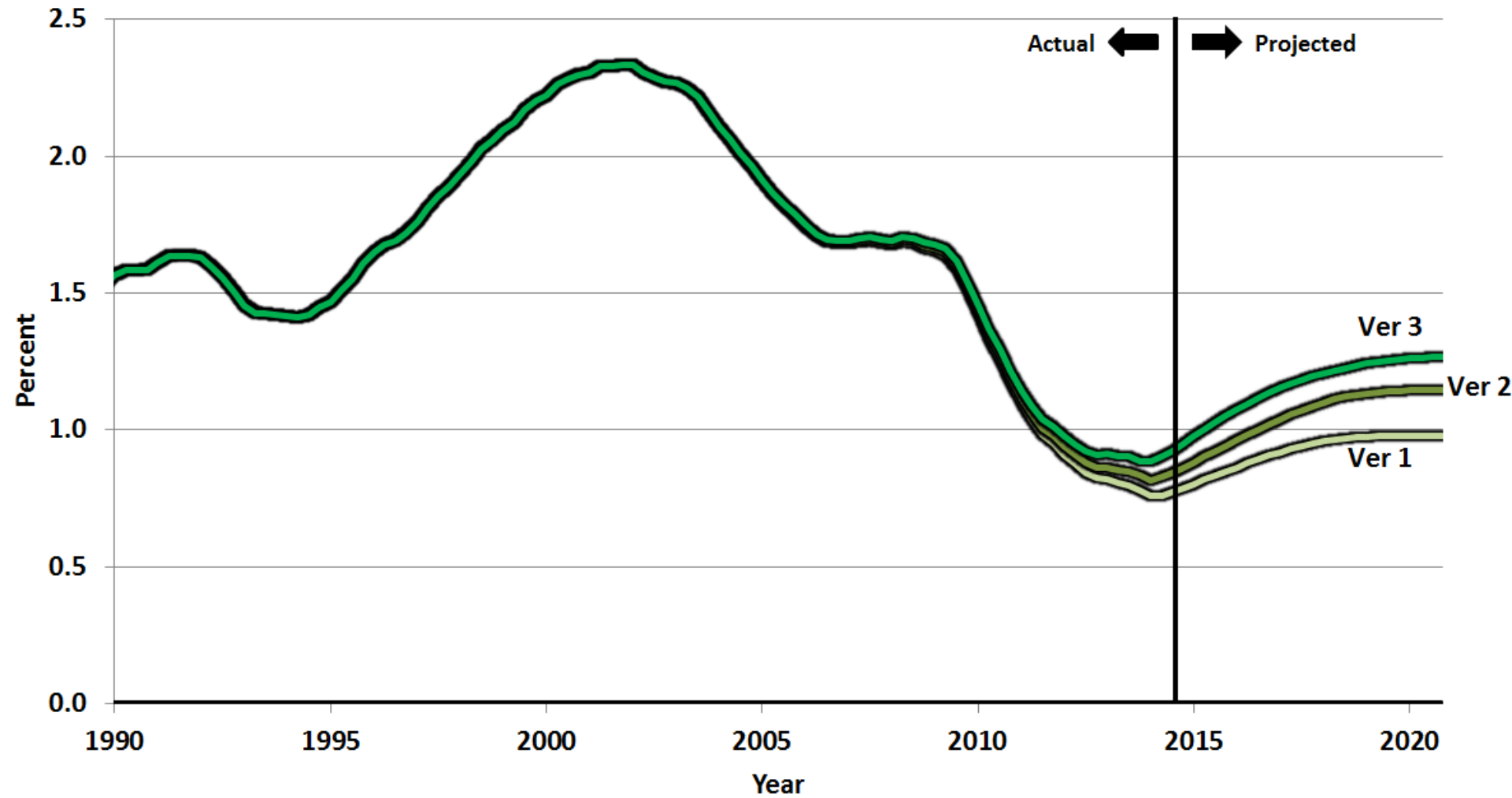


Figure 10. Projected Kalman Growth Trend of Hours, Versions 1 through 3, 1990:Q1 to 2020:Q4

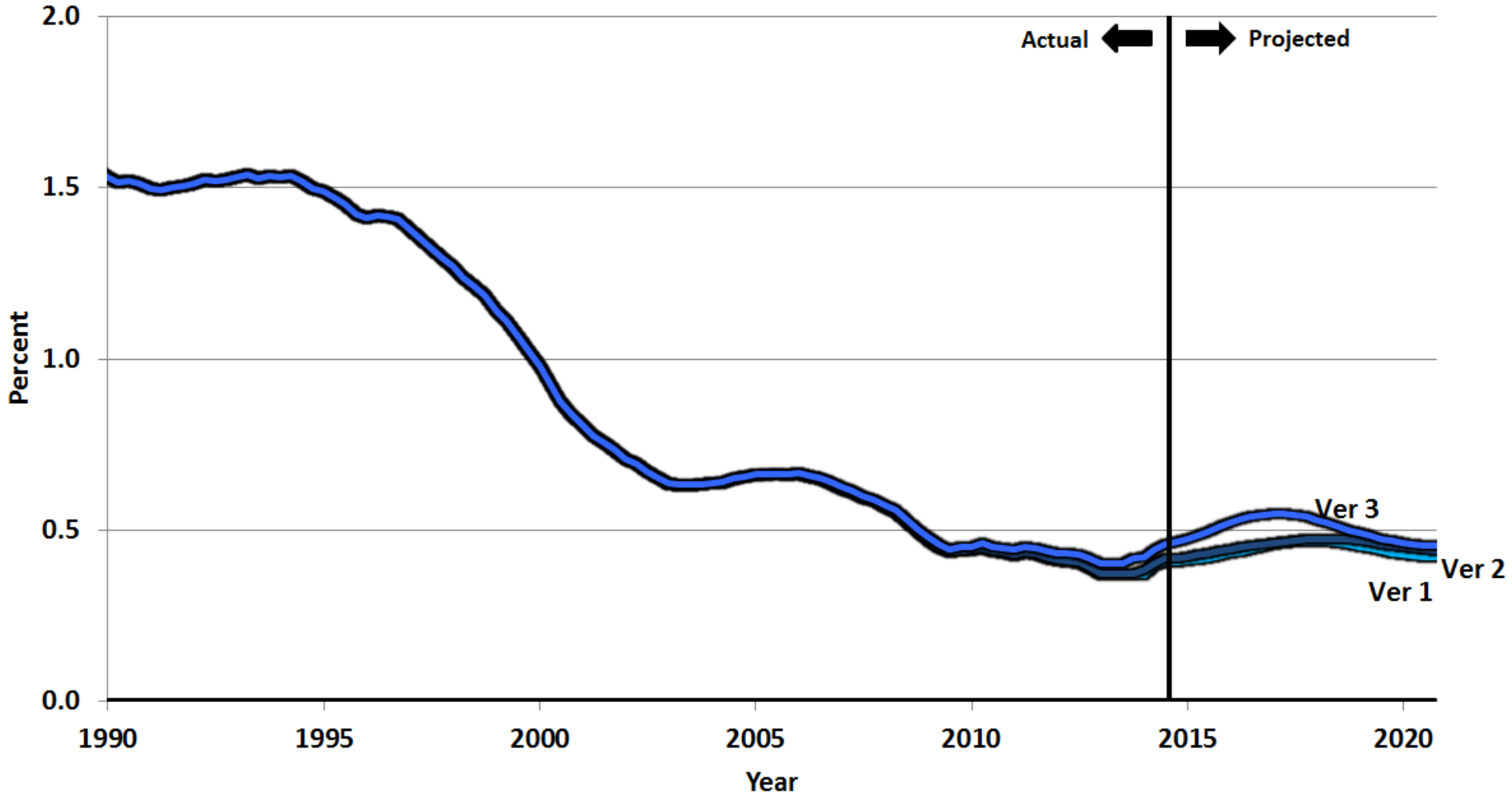


Figure 11. Actual GDP vs. Potential GDP, CBO vs. Alternative Measures, 2004:Q1 to 2024:Q4

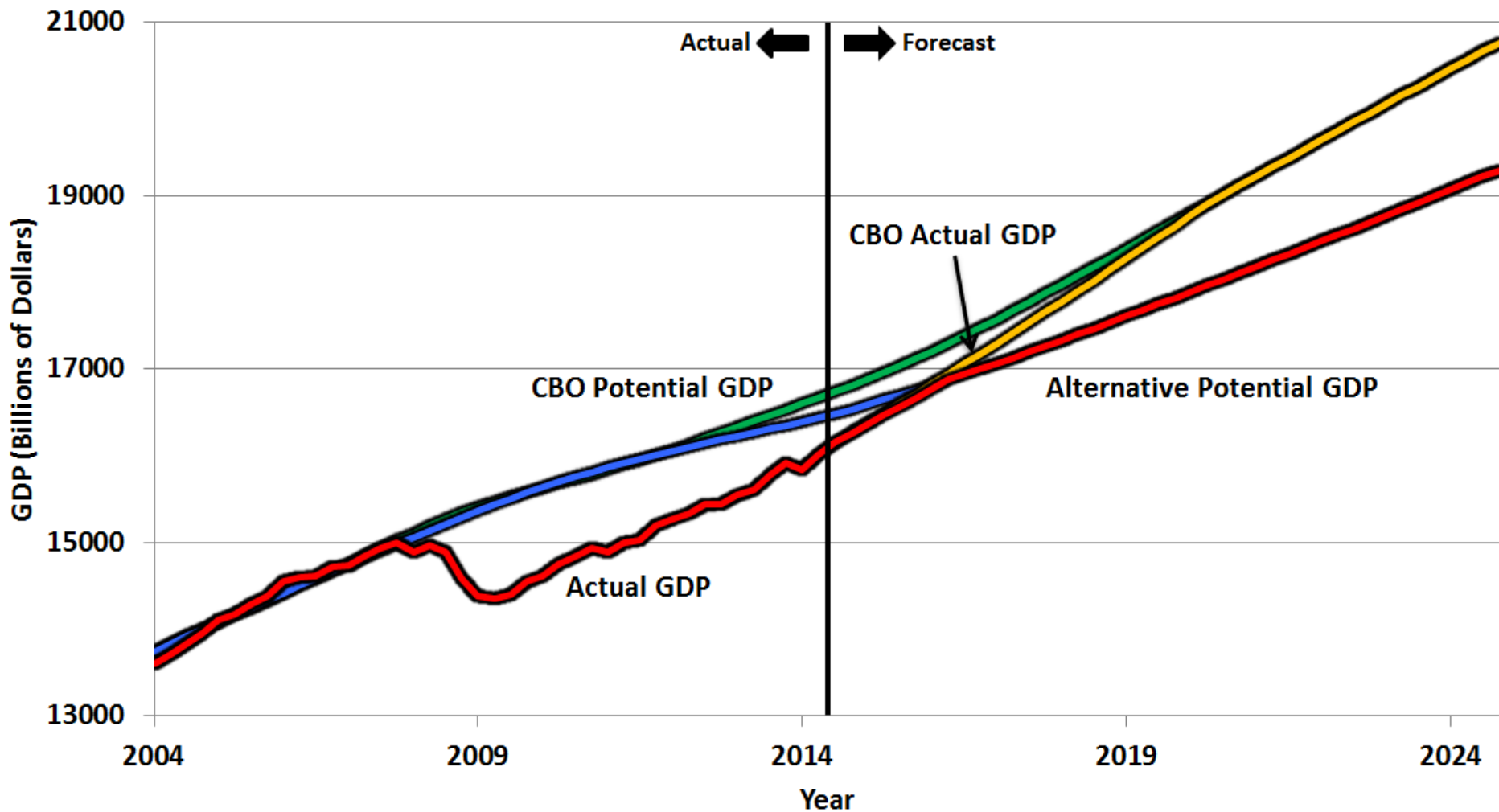


Figure 12. Debt/GDP, Actual and Forecast, CBO and Alternative Projections, 2004:Q1 to 2024:Q4

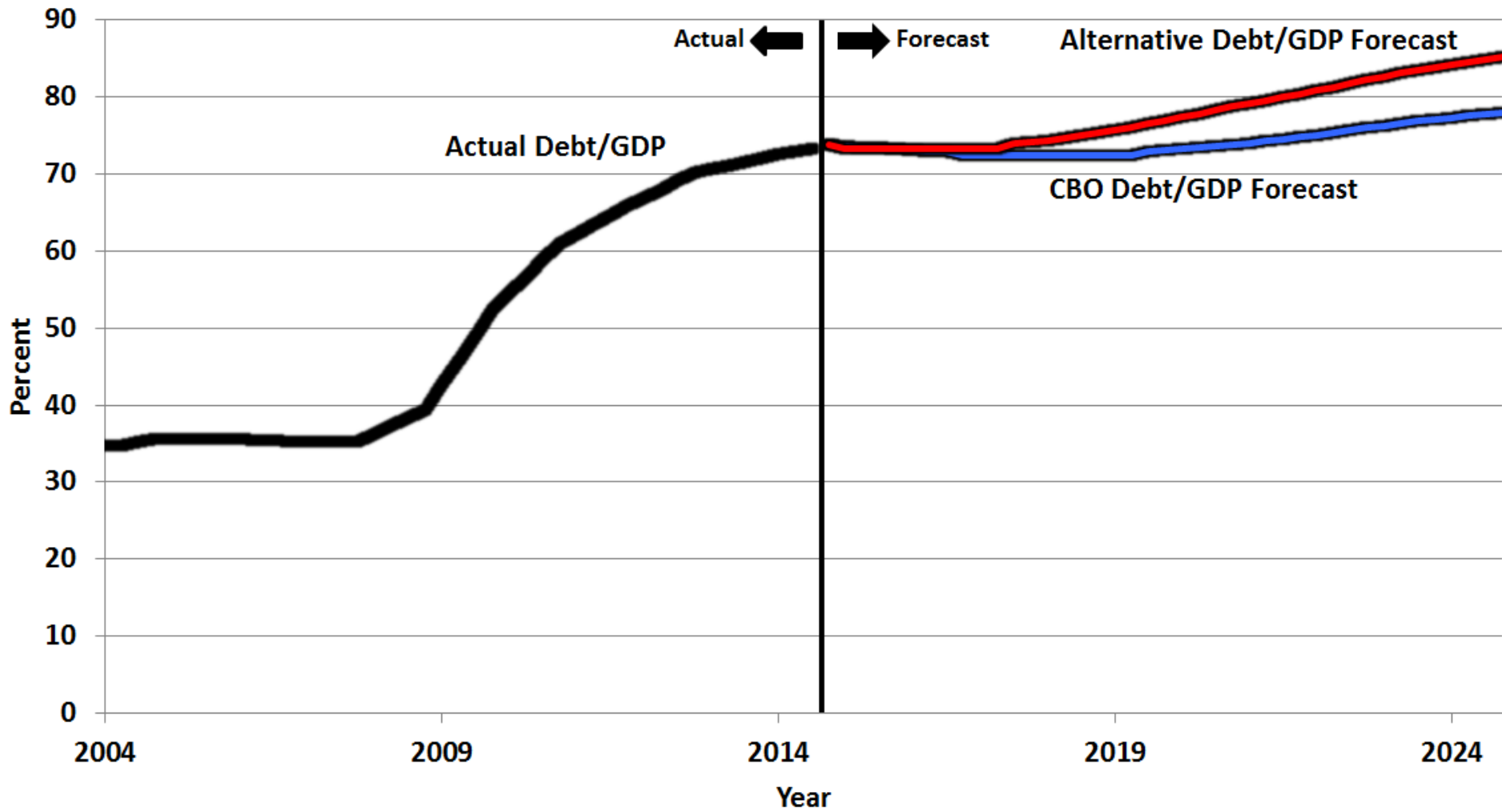
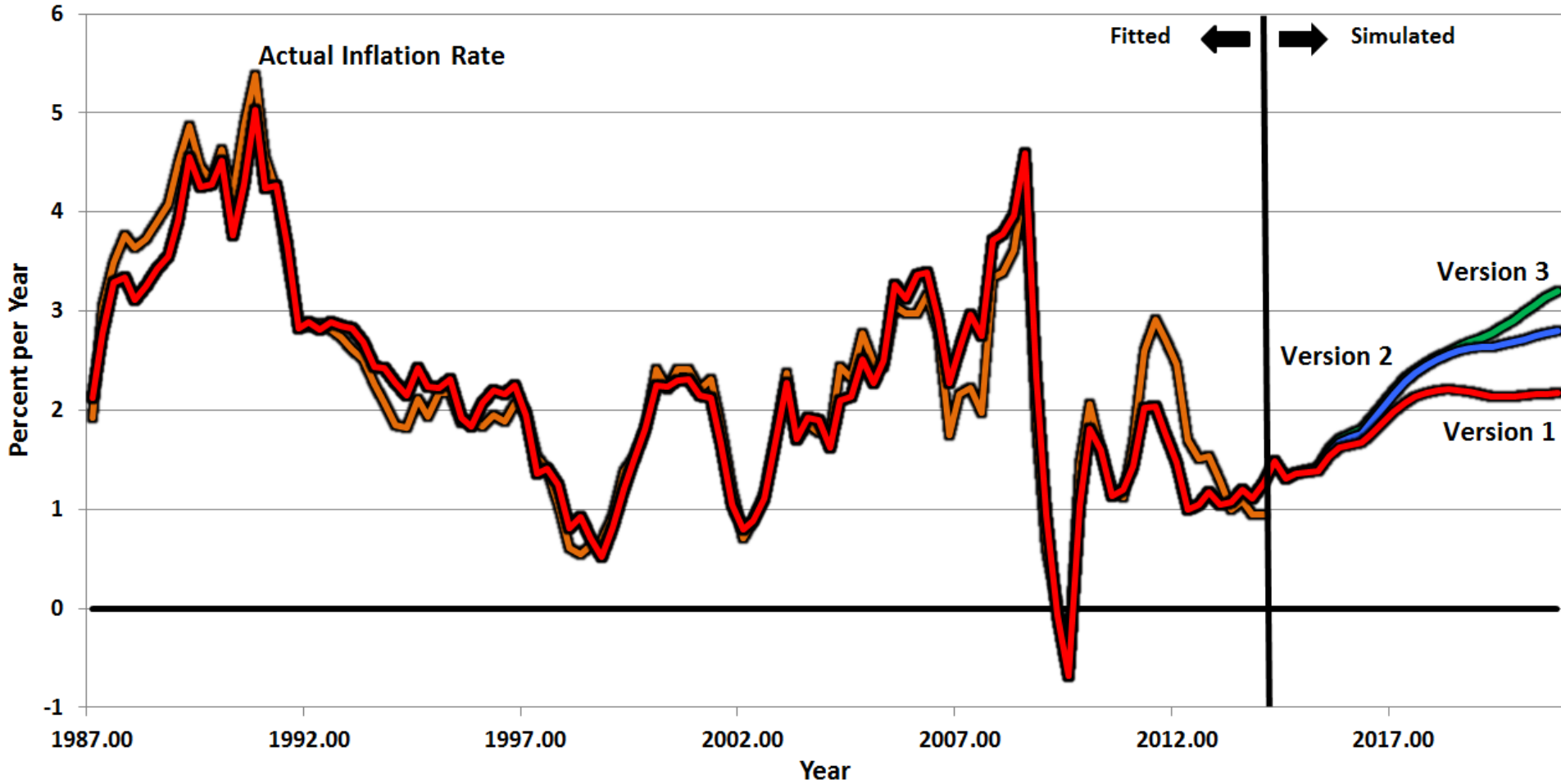


Figure 3a. Triangle Model Headline Inflation Rate Projections,
2014:Q1 Sample End, Versions 1 through 3,
1987:Q1 to 2020:Q4



Broader Conclusions: Is Inflation Still Related to Unemployment?

- In 1975 we translated the microeconomic theory of the price of wheat to the macro economy. The inflation rate depends on demand *and supply*.**
- Any approach to inflation that neglects supply shocks is bound to fail, and to distort the effect of unemployment on inflation**
- Inflation is a very slow-moving process, so that Fed can't react to the latest news. It needs a model.**
- My good old 1980 model matters. The Fed should pay attention, and it is paying attention.**