

Inflation, the NAIRU, Potential Output and Productivity Growth During the Slow Recovery

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The Many Puzzles of the Slow 2009-13 Recovery

- **Actual real GDP growth since 2009:Q4 = 2.1**
- **In 2007 consensus forecast of potential GDP was 2.5**
- **Therefore, according to Okun's Law, with actual output growth slower than potential, the unemployment rate should have increased over the past 4 years.**
- **But it fell from 10.0 to 7.3. Why?**

Understanding Okun's Law Requires the Output Identity

$$Y^P \equiv \frac{Y^P}{H^P} \cdot \frac{H^P}{E^P} \cdot \frac{E^P}{E^H} \cdot \frac{E^H}{L} \cdot \frac{L}{N} \cdot N$$

$$Y^I \equiv \frac{Y^I}{H^H} \cdot \frac{H^H}{E^H} \cdot \frac{E^H}{L} \cdot \frac{L}{N} \cdot N$$

Okun's Law Predicts Regular Responses of the Right Side to Cycles in the Output Gap

- **This recovery is different because E/L has risen despite slow real GDP growth**
- **Everyone understands one reason: the labor force participation rate (L/N) fell from 64.9 in 2009:Q4 to 63.4 in 2013:Q2**
- **Baby-boom retirement, dropping out of young men and prime-age men**
- **End of postwar rise in female L/N**

The Less Obvious Reason

- **The slower is productivity growth, the faster the growth of aggregate hours of work must be.**
- **Consensus estimates of growth of trend productivity for the total economy are at 1.6 to 1.7.**
- **Yet actual growth per year of total economy productivity growth since 2009:Q4 is 0.5**

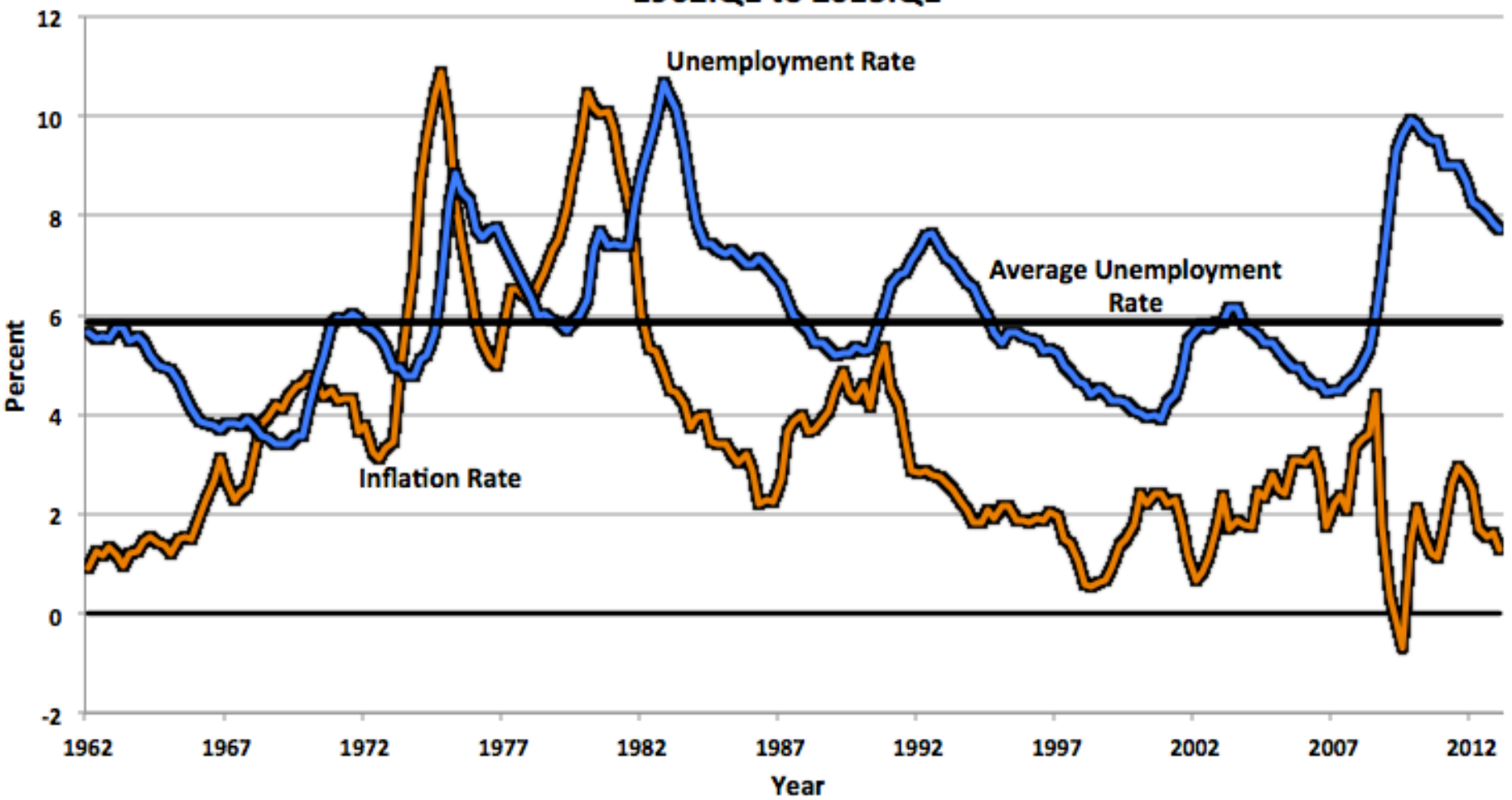
How Can We Disentangle Actual from Trend Growth in Output and Productivity?

- **What we need is an outside indicator of the business cycle.**
- **This allows the computer to look at the history of a variable like productivity and say – these are the fluctuations related to the business cycle. The rest is the underlying trend.**

Where Does This Magical Outside Cyclical Indicator Come From?

- The answer is to use the inflation process to determine the NAIRU (Non-Accelerating Inflation Rate of Unemployment)
- When inflation accelerates, then unemployment is too low, and vice versa.
- The correct inflation model can extract the natural rate of unemployment or NAIRU, and hence the unemployment gap.
- Then we feed that into a detrending program to separate trend and cycle of output and productivity

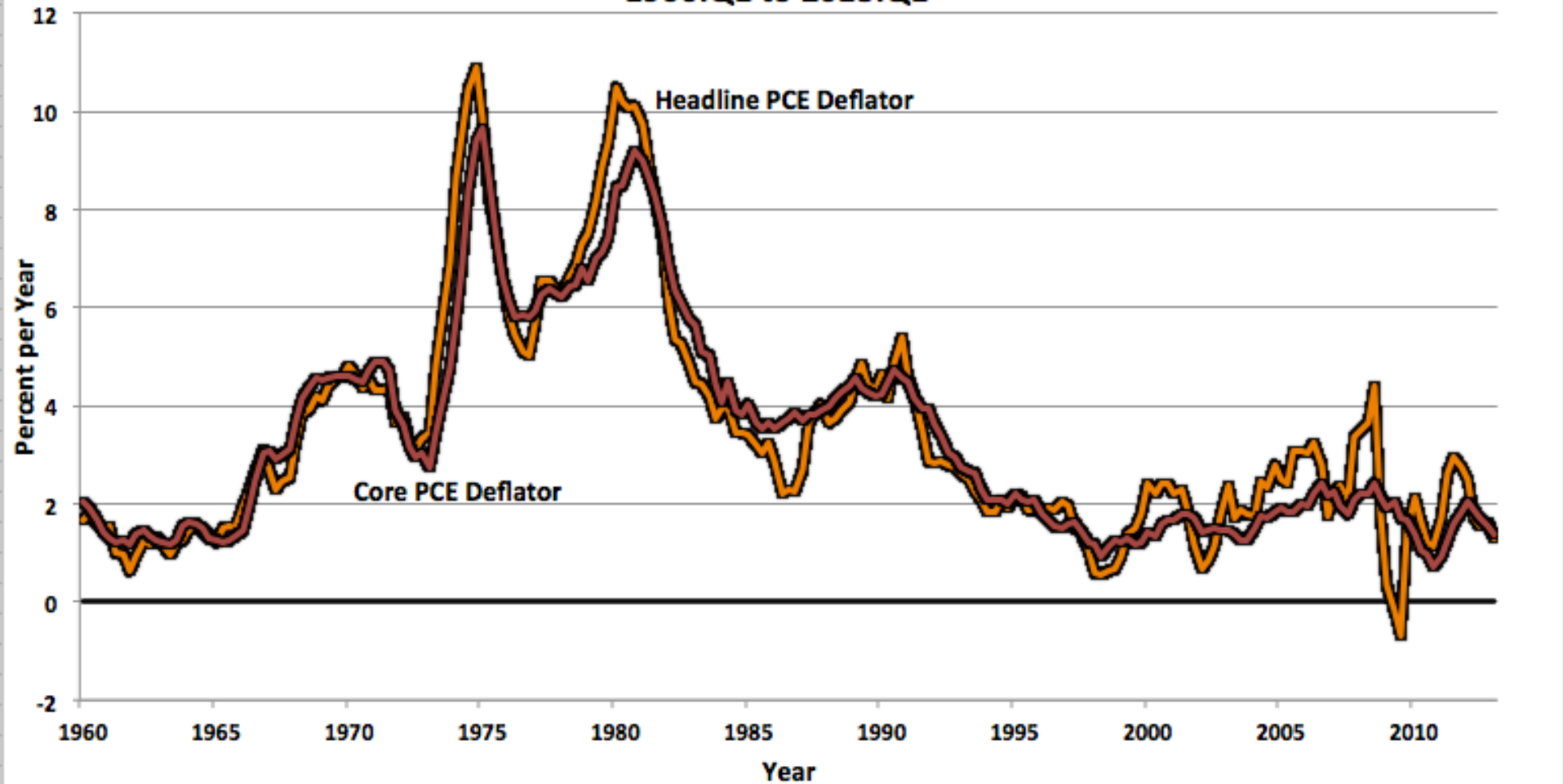
Four Quarter Changes in Headline Inflation Rate vs Total Unemployment Rate, 1962:Q1 to 2013:Q1



Big Problem: Inflation Has No Simple Relationship to Unemployment

- **All this has been well-known since 1975 although mainly forgotten by academic economists.**
- **You can't understand the U.S. inflation process without including in the inflation equation explicit variables to account for supply shocks – the relative price of food, energy, imports, the impact of changing trend productivity growth, and Nixon price-control dummies.**
- **I've recently revived my 1982 “triangle model” specification which did all that.**
- **See NBER WP 19390, which went public last Monday at the NBER web site, “The Phillips Curve is Alive and Well.”**

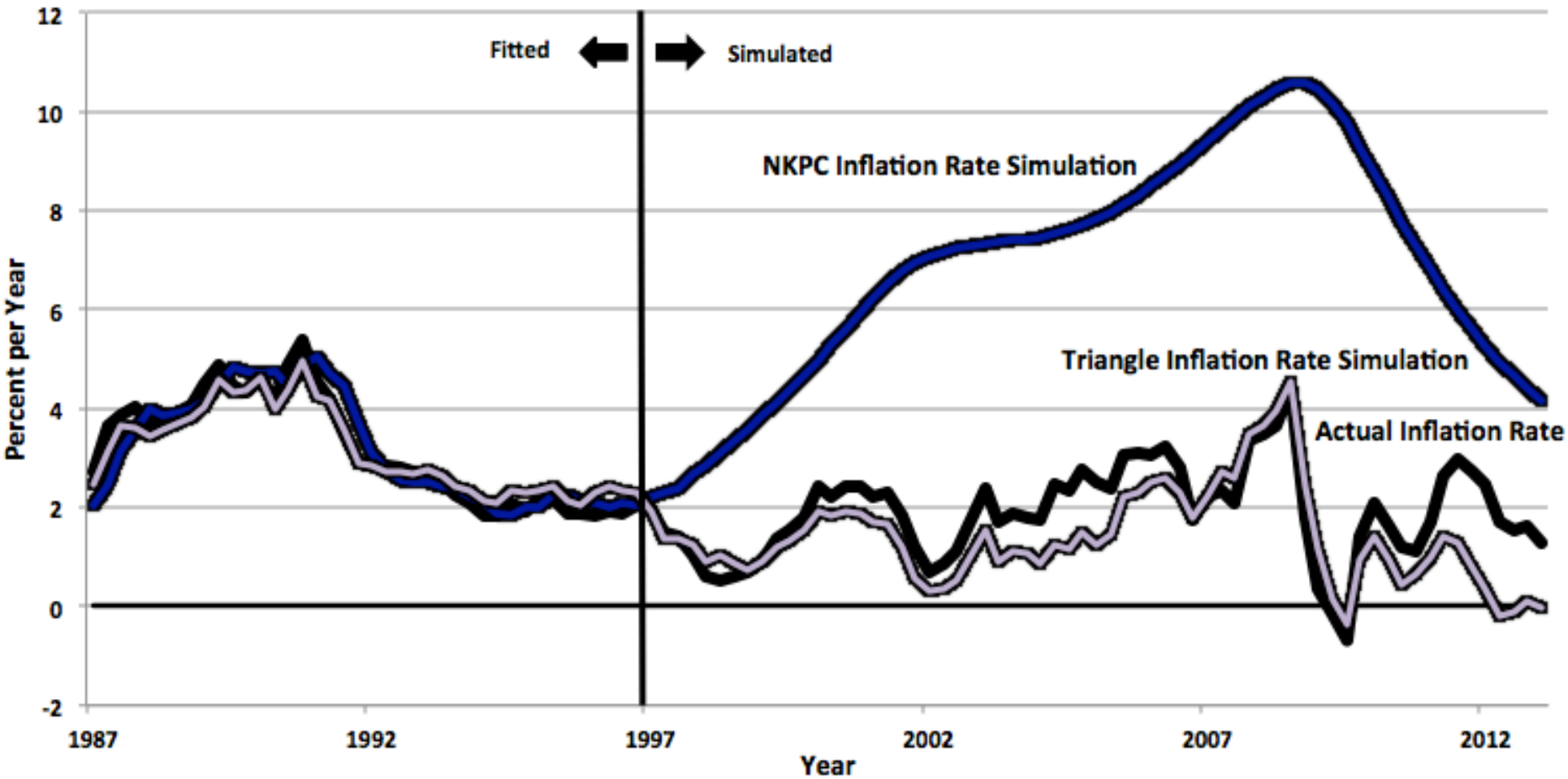
**Four Quarter Changes of Headline and Core PCE Deflator,
1960:Q1 to 2013:Q1**



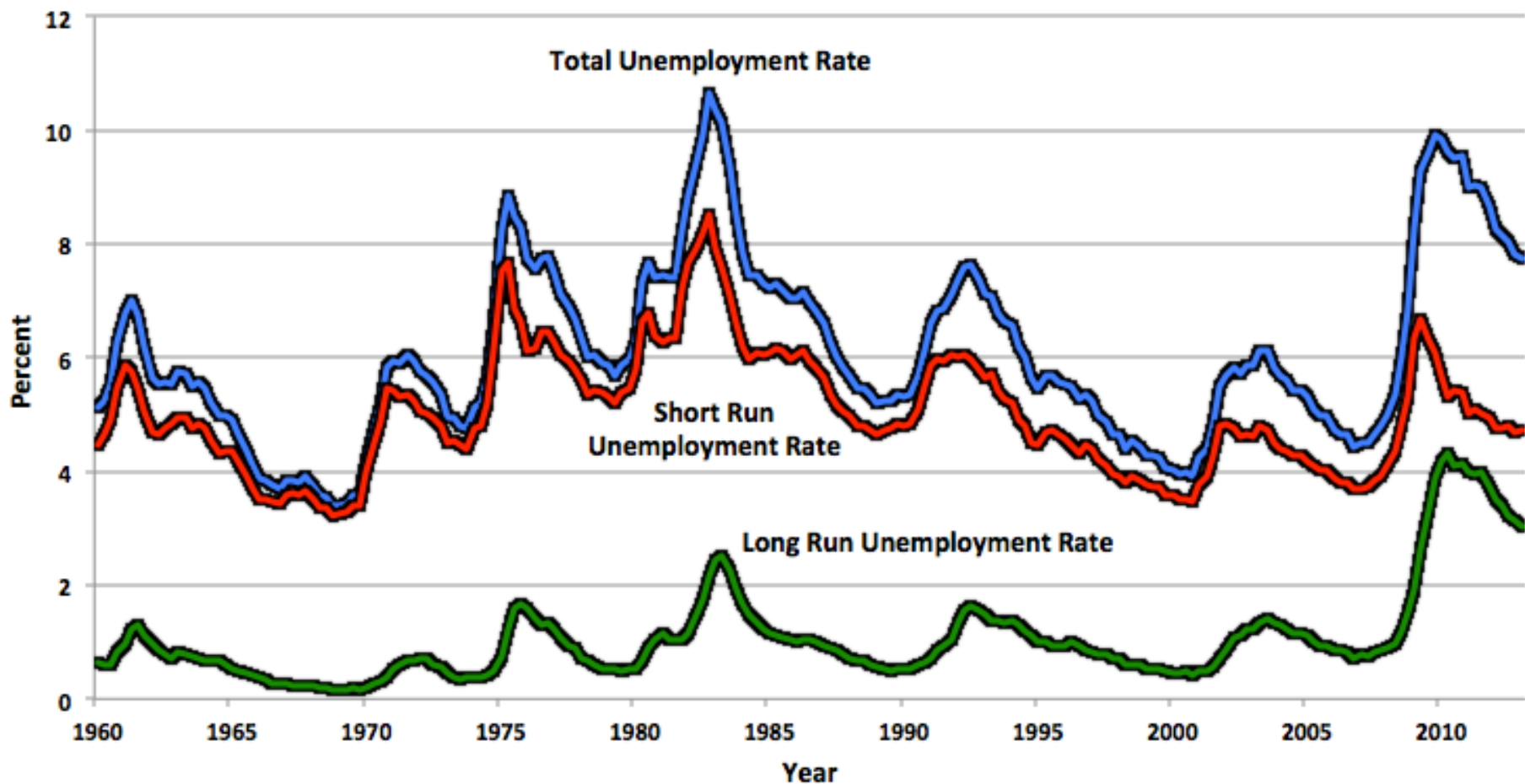
Academic Economics Has Gone Backwards with the NKPC

- **Supply shocks have been forgotten**
- **Reduced form of NKPC involves nothing more than regression inflation on a few lags of inflation and the unemployment rate.**
- **This approach doesn't have a clue about inflation behavior in the 1970s or late 1990s**
- **Diagnostic tool: the “dynamic simulation” uses fitted coefficients only through 1996, values of explanatory variables after 1996 EXCEPT FOR LAGGED INFLATION (generated endogenously 1997-2013).**

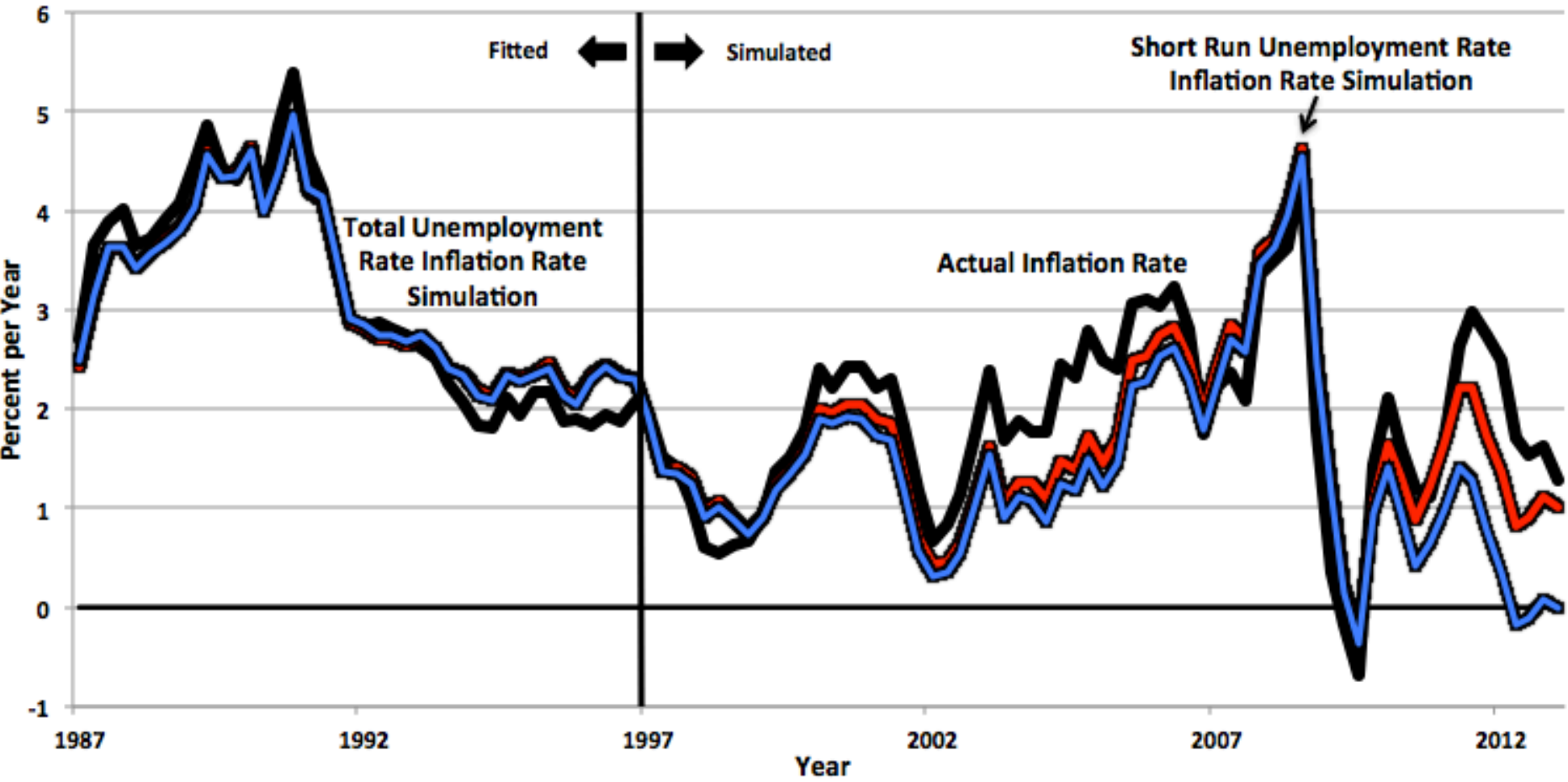
Actual vs Simulated Headline Inflation Rate, 1996:Q4 Sample End, NKPC vs Triangle Model, 1987:Q1 to 2013:Q1



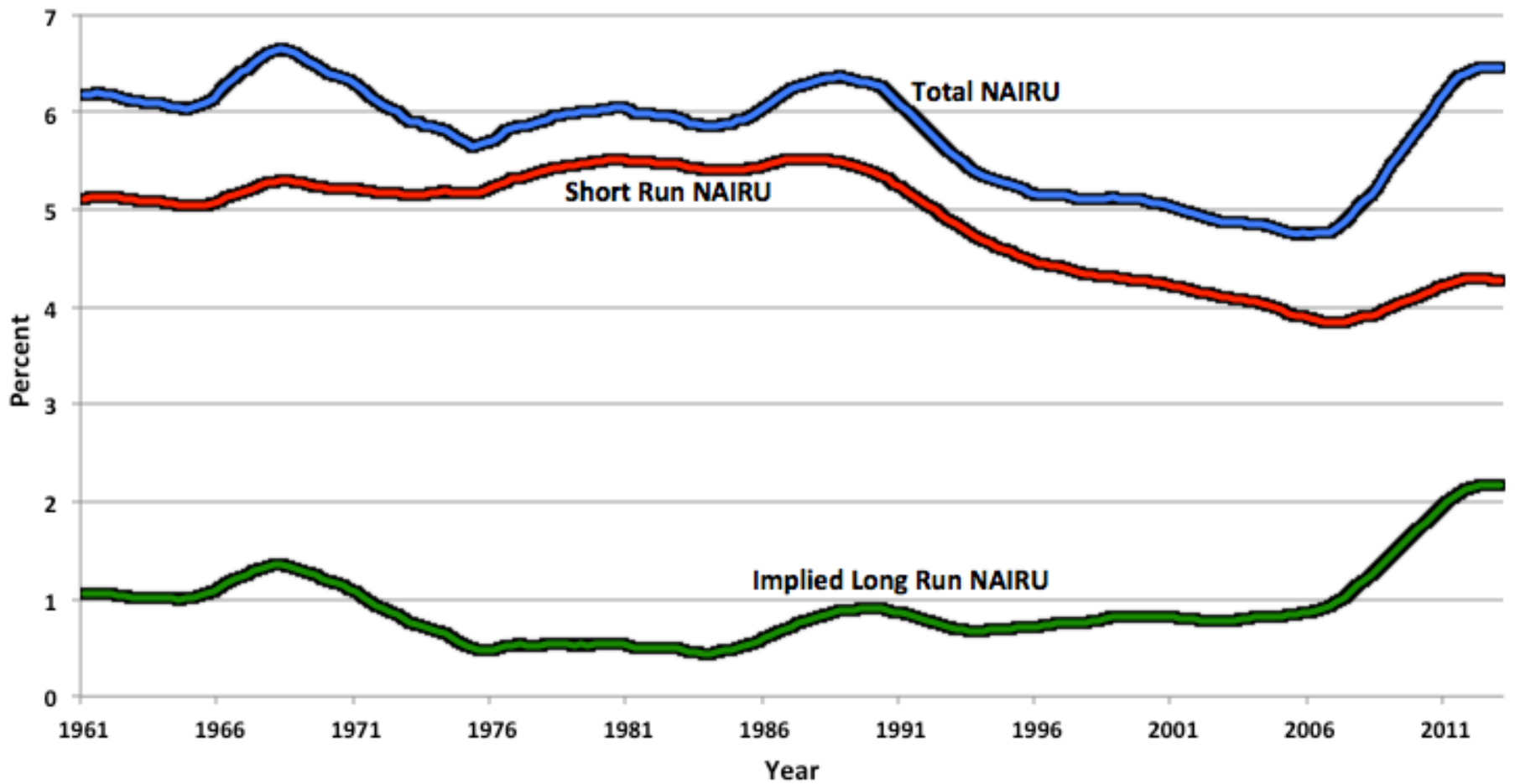
**Total, Short Run, and Long Run Unemployment Rate,
1960:Q1 to 2013:Q1**



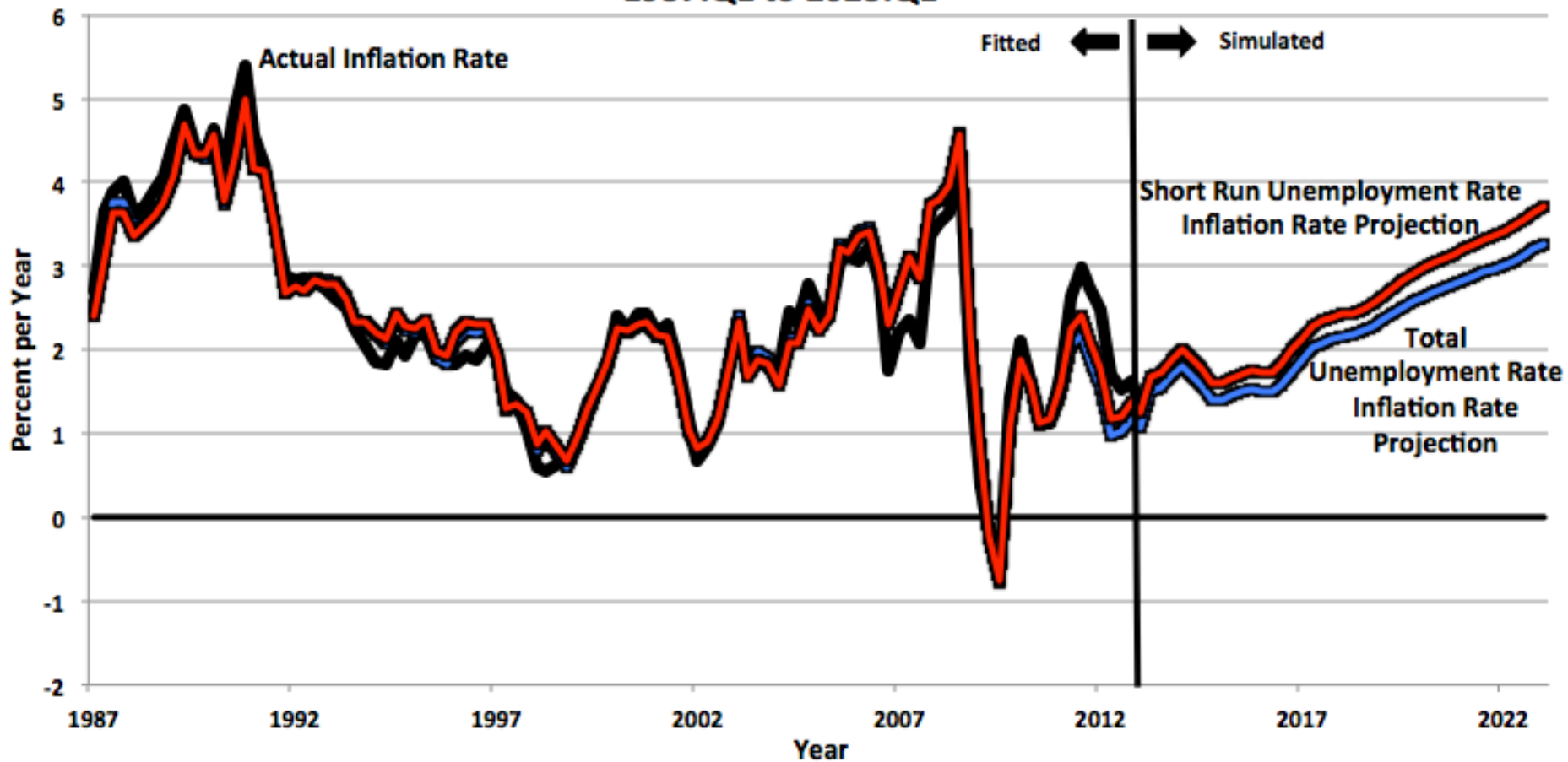
Actual vs Simulated Headline Inflation Rate, 1996:Q4 Sample End, Total vs Short Run Unemployment Rate, 1987:Q1 to 2013:Q1



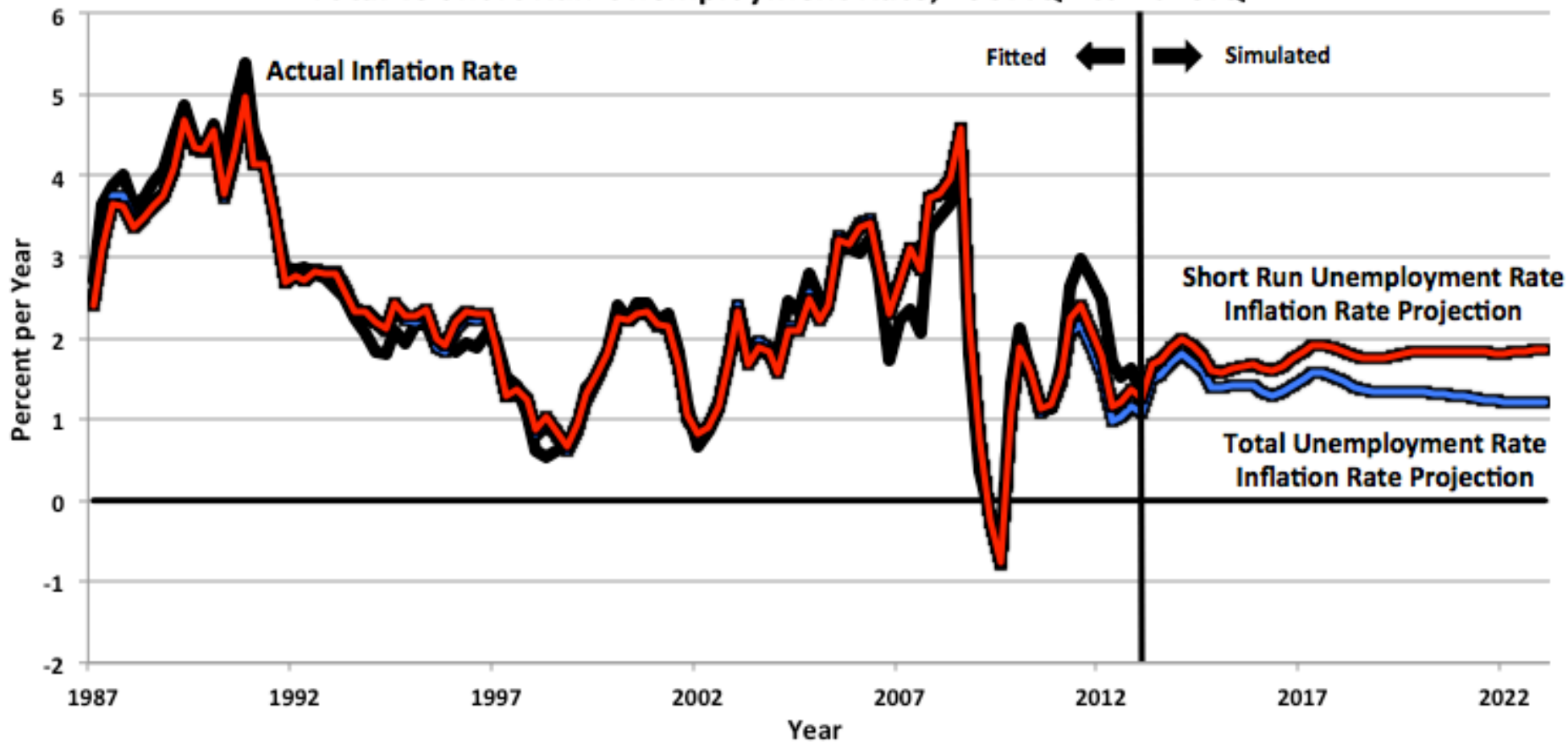
Total, Short Run, and Implied Long Run NAIRU, 1961:Q1 to 2013:Q1



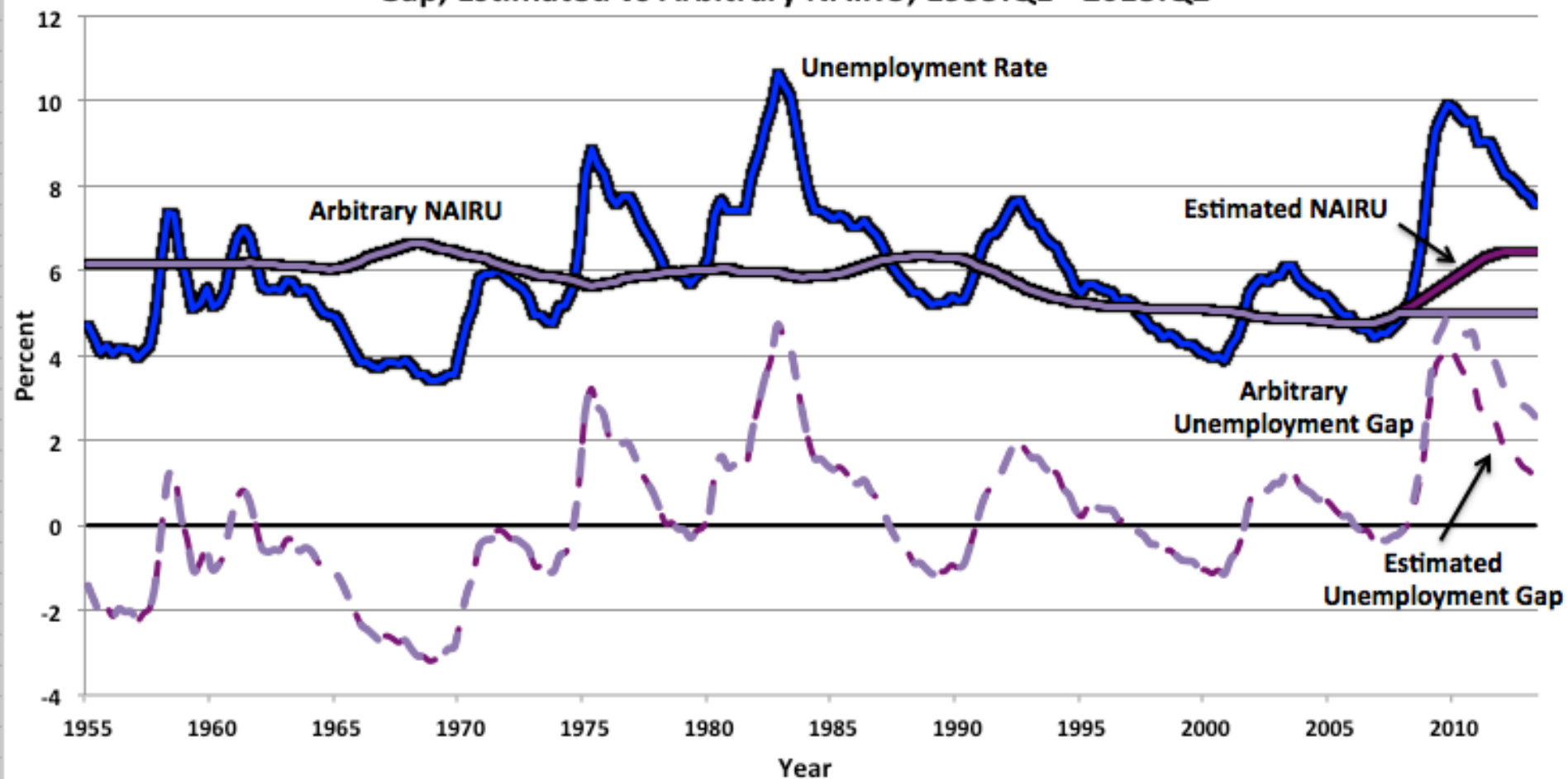
**Triangle Model Headline Inflation Rate Projections,
2013:Q1 Sample End, Total vs Short Run Unemployment Rate,
1987:Q1 to 2023:Q1**



Triangle Model Headline Inflation Rate Projections without Projected Decline in Unemployment Rate, 2013:Q1 Sample End, Total vs Short Run Unemployment Rate, 1987:Q1 to 2023:Q1



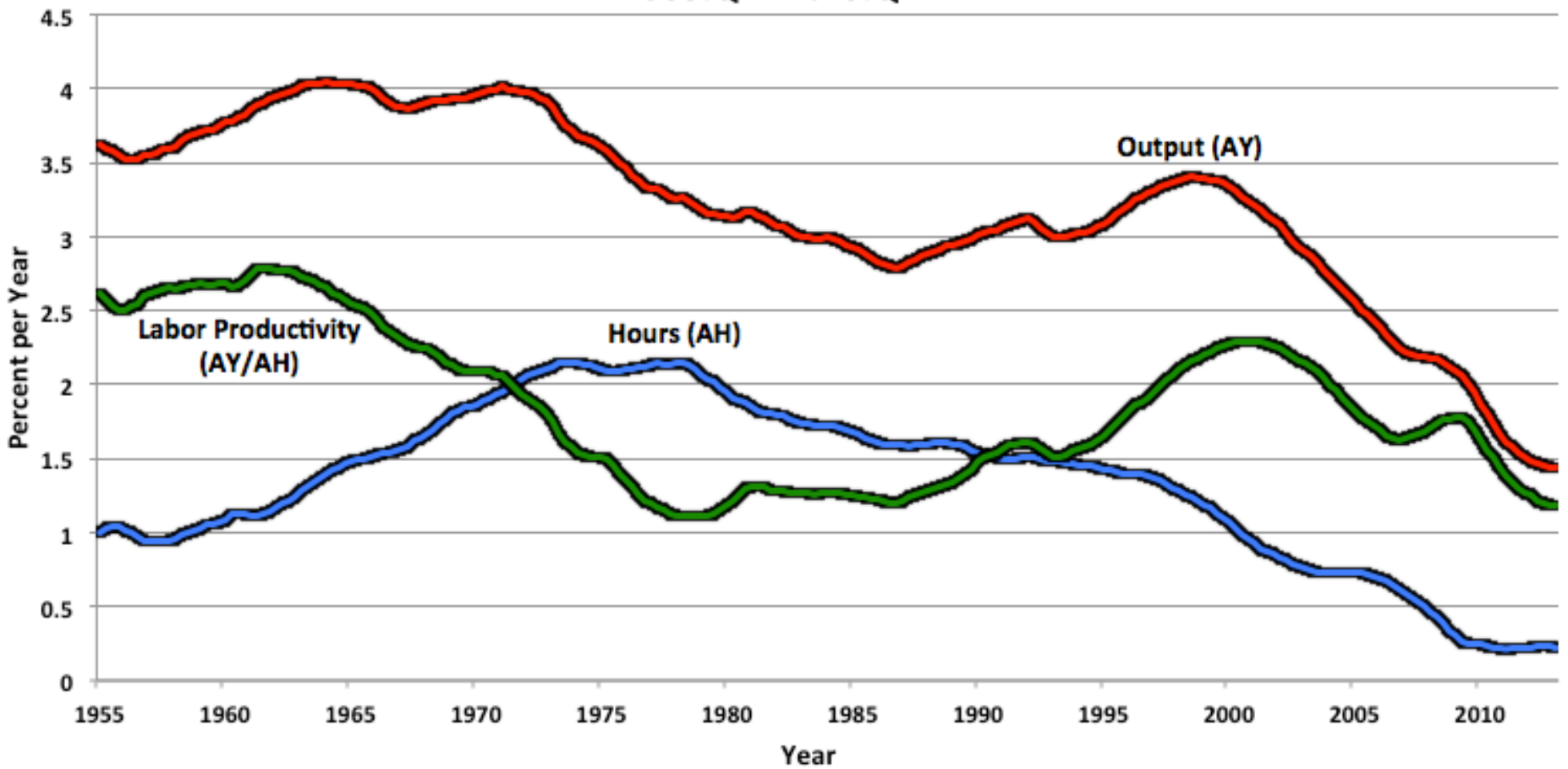
Actual Unemployment Rate, Time-Varying NAIRU, and Implied Unemployment Gap, Estimated vs Arbitrary NAIRU, 1955:Q1 - 2013:Q2



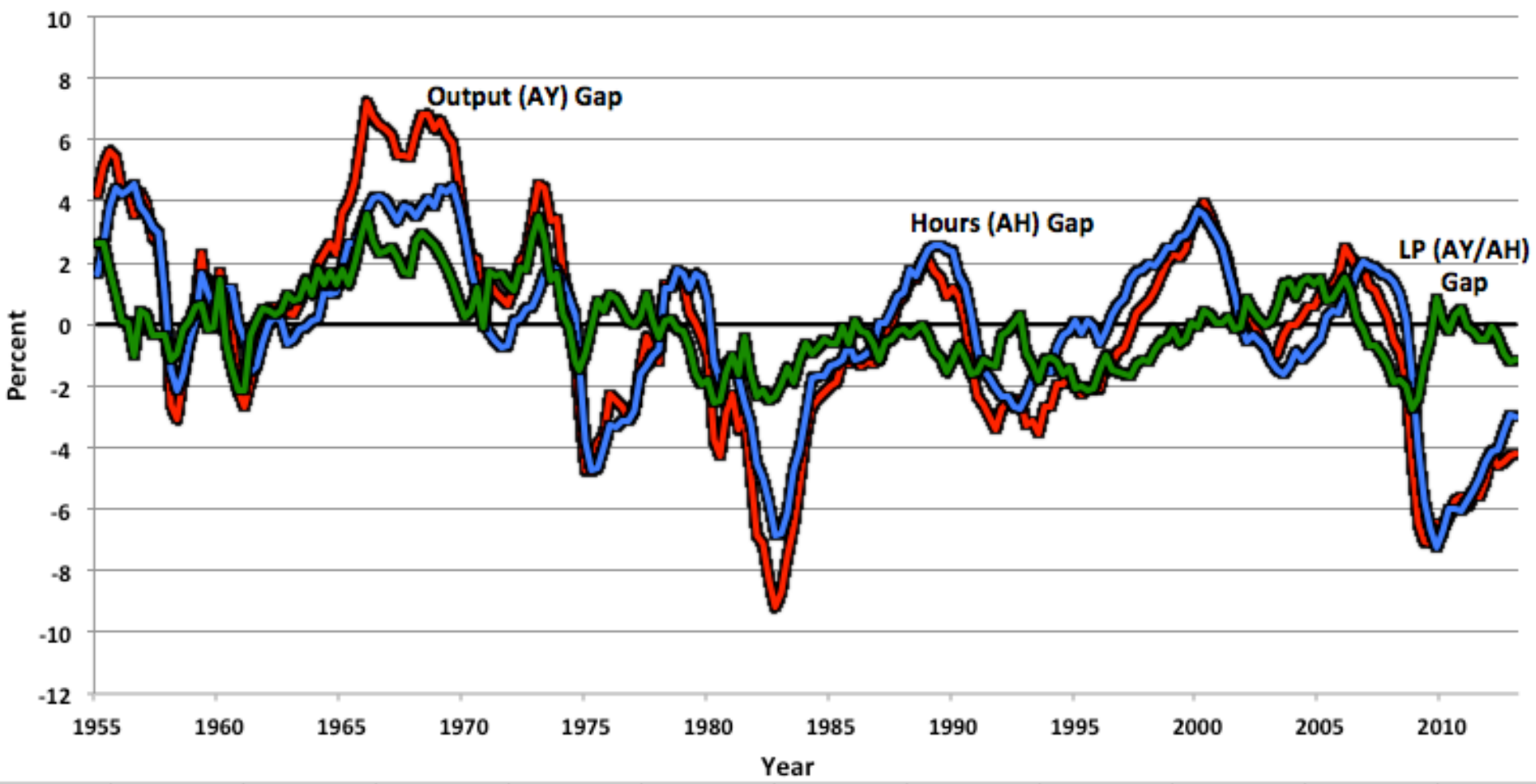
Now We're Ready to See What These Two Alternative Unemployment Gaps Imply

- **We have quarterly data on real GDP, hours of work, and output per hour.**
- **We ask the computer, using the outside unemployment gap estimate, to separate actual data into trends and deviations from trend.**
- **The charts you'll see are the averages of the two alternative gap series (2013 NAIRU of 6.5 vs. 5.0).**
- **They also average the GDP and GDI (which are conceptually identical) and hours of work from the payroll and household surveys.**
- **Nobody has ever done this before.**

Annualized Trend Growth of Labor Productivity, Hours, and Output, Average Identity, Average of Estimated and Arbitrary NAIRU Trends, 1955:Q1 - 2013:Q1



Labor Productivity, Hours, and Output Gap, Average Identity, Average of Estimated and Arbitrary NAIRU Trends, 1955:Q1 - 2013:Q1



Startling Implications

- **Compared to 2007-era estimates of 2.5 percent potential output growth (CBO today clings), central estimate for 2013 is a mere 1.5 percent.**
- **Compared to 2007-era estimates of 2 percent productivity growth, the central estimate for 2013 is a mere 1.2 percent**
- **Monetary policy: The Fed has far less room to maneuver than generally thought**
- **Fiscal policy: Future potential output growth will be slower than CBO so debt/GDP will rise faster**

Seque to Long-run Growth Debate

with Erik

- **One year ago, I produced the NBER WP “Is U.S. Economic Growth Over?”**
- **Compared to historical 1891-2007 growth in productivity of 2.2, I forecast 1.3 for next 25 to 40 years**
- **Compared to historical growth in output per capita of 2.0, I forecast 0.9 for the next 25 to 40 years**
- **Compared to the 0.9 for the average, I forecast only 0.4 for the bottom 99%, and only 0.2% for disposable income**

Today's Conclusion: The Future Has Already Arrived!

- **Current trend of productivity is 1.2, compared to my gloomy future forecast of 1.3.**
- **Output per capita trend is 1.5 – 0.8 population growth = 0.7, below my gloomy future forecast of 0.9.**
- **Hours growth trend is 0.5 slower than population growth, compared to my future forecast of 0.4 slower**

My Long-Run Growth Forecast Does Not Require the End of Innovation

- **My 1.3 productivity forecast is the actual rate of 1.55 for 1972-2012 shifted downward to 1.3 because of stagnating educational achievement.**
- **The big decline in the impact of innovation on productivity happened 40 years ago (1891-1972 = 2.35, 1972-2012 = 1.55).**
- **To match the achievements of the past 40 years over the next 40 will be a stunning achievement**