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.
• 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

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 AreDisconnected 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 \( (y) = \text{Sum of} \) 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.