Alternative Targets for Monetary Policy

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The Fed's Goals

- The purpose of targeting any variable is to achieve the Fed's two goals of maximum employment with a low and constant rate of inflation
- The inflation goal is straightforward but the precise numerical target is not
- The employment goal is ambiguous
  - Set U = NAIRU? Makes employment goal subsidiary to inflation goal
  - How much is $U < NAIRU$ worth relative to $\pi > \pi^*$?
  - NAIRU is uncertain, only known after the fact by π behavior

Consider Four Targets

- Nominal GDP Growth Target
- Inflation Target
- Price Level Target
- Taylor Rule
  - Policy responds to both U – NAIRU and to $\pi - \pi^*$

Nominal GDP Growth Target

- **Originally proposed as an optimal response to adverse supply shocks**
- **Set Δx^* equal to $\Delta y^* + \pi^*$**
  - **Δy^* is potential real GDP growth**
  - **π^* is same inflation target as with inflation targeting**
- **Following an adverse supply shock, splits the difference by compromising between higher inflation and lower output**
  - **Contrasts with accommodative and extinguishing policy**
- **Response to surprise slowdown in Δy^*,**

  maintaining fixed Δx implies faster $\pi > \pi^*$

Inflation Rate Target

- Usually refers to core rather than headline inflation
- Assumes supply shocks not => core inflation have no welfare consequences
  - Ignores higher unemployment caused by large adverse supply shock (1974-5, 1980)
- Long lags of inflation process lead to delays in implementing policy, overshooting, recessions
- My objection: long lags from demand shocks to inflation response introduce unnecessary lags in policy response

Current Discussion of Raising Inflation Target

- Today's 2% target together with low Δy^* implies low interest rates
  - Removes "room" for anti-recession policy response given the ZLB constraint
- Obstacles to raising target
  - Political backlash
  - Woodford point: ZLB is temporary but raising target would make higher inflation permanent
- The case for raising π * from 2 to 3 is now obsolete given how low are both U and π

Price Level Target

- Today's 2% target together with low Δy^* implies low interest rates
- Bernanke Case
  - Inflation targeting "lets bygones be bygones"
  - Price level targeting attempts to reverse past misses, $\pi <> \pi^*$
- Due to ZLB, inadequate stimulus keeps $\pi < \pi^*$ for an extended period
- p level targeting allows overshoot, but only for the period needed to make up for the undershoot
- Anticipation of "rates lower for longer" should stimulate economy and reduce frequency of ZLB

Defects in a Price Level Target

- Overshooting price level target requires reducing price level, implying $\pi < 0$
- If there is pass-through from supply shocks to core π, price level would have to be forced down
- Achieving negative π can be ruled out as infeasible, no negative π in 2008-2010
- Price level targeting leaves ambiguous how long is allowed for the price level to be returned to target path

Bernanke Case for Temporary Price Level Target

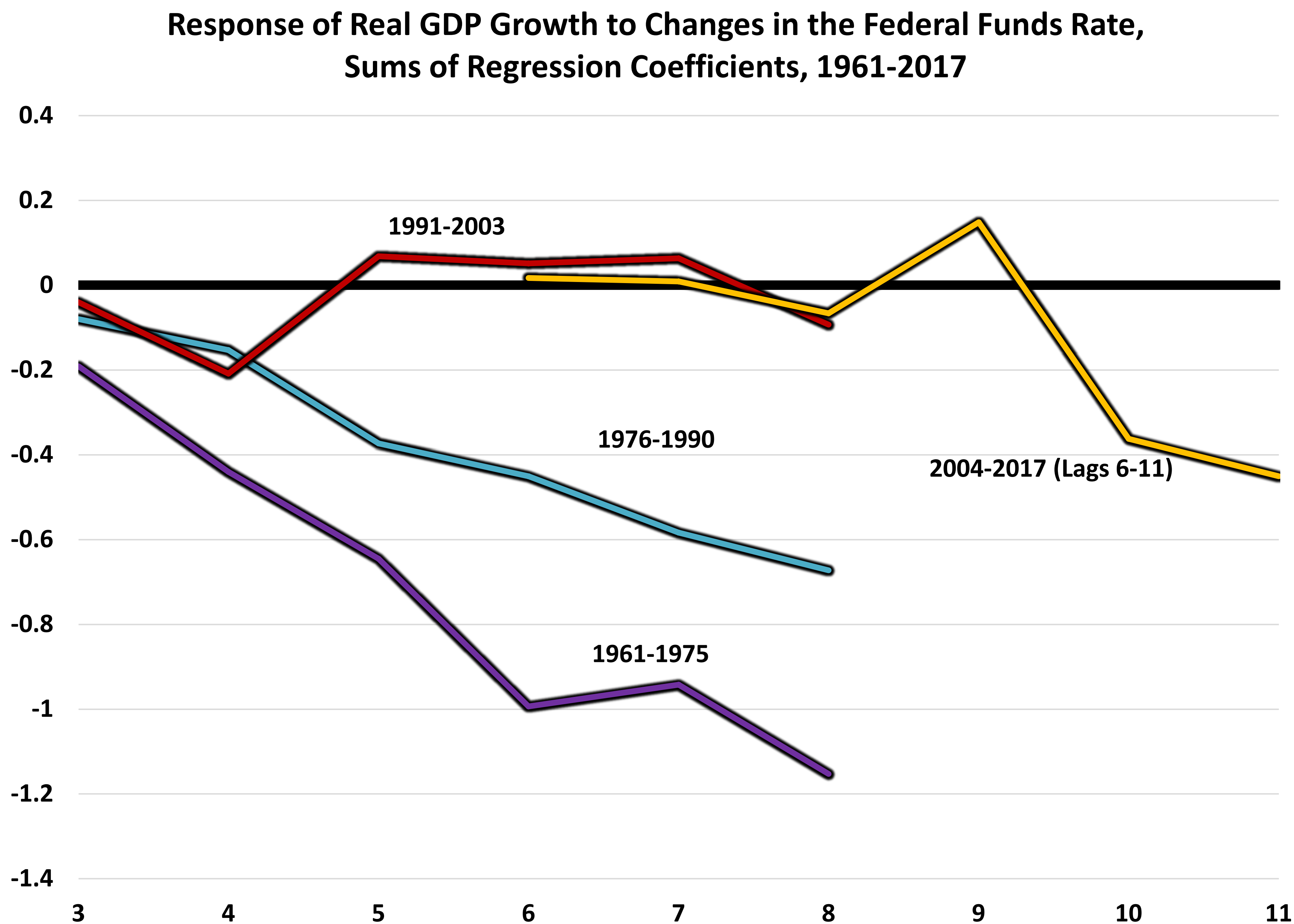
- **When at ZLB a *necessary condition* for raising iFF is that *average* π since iFF first hit zero must be 2%.**
- **Consider today's situation**
  - **π still below 2%**
  - **Average π since 2009:Q1 = 1.5**
  - **Say π reaches 2.0 in 2018:Q3, when U = 3.8**
  - **Say π accelerates at 0.4% per year, the price level would not return to Bernanke's target until 2022:Q4 when π would be 3.7%.**
- **Consider the massive recession that would follow the Fed's rate increases needed to bring π down from 3.7 to 2.0!**
  - **How low would the U rate be in 2022 after five more years at ZLB? 2%? Zero?**

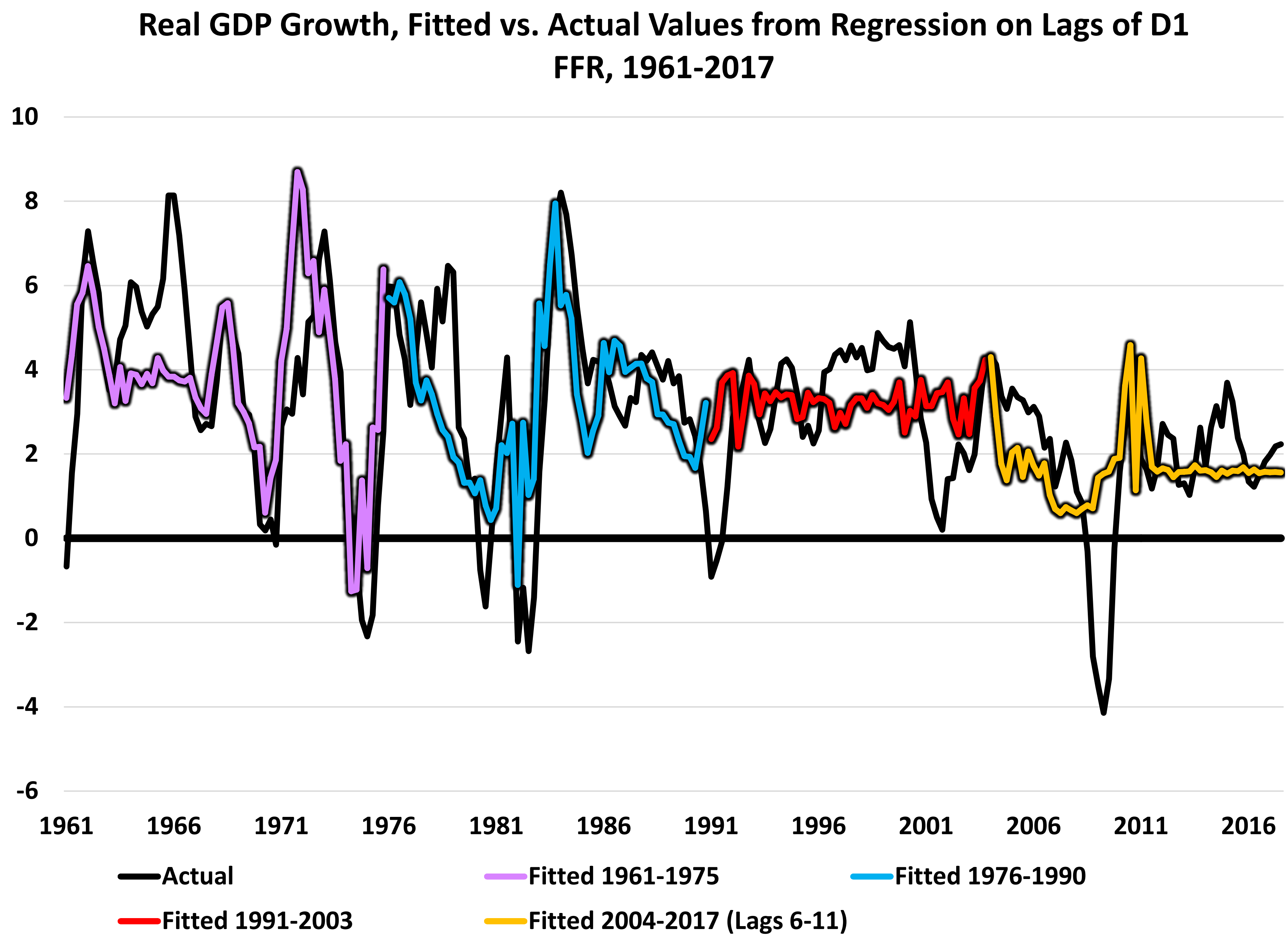
Taylor Rule

- Raises iFF when U<U* and when π > π*
- Phillips Curve framework, π reacts with long lags to U-U*
- Advantage over π targeting is that policy responds to U<U* before excess π happens
- Continues to raise iFF until U returns to U* but U is likely to overshoot with U>U*
- Combination with π- π* allows for unobserved decline in U* (as in 2017?)

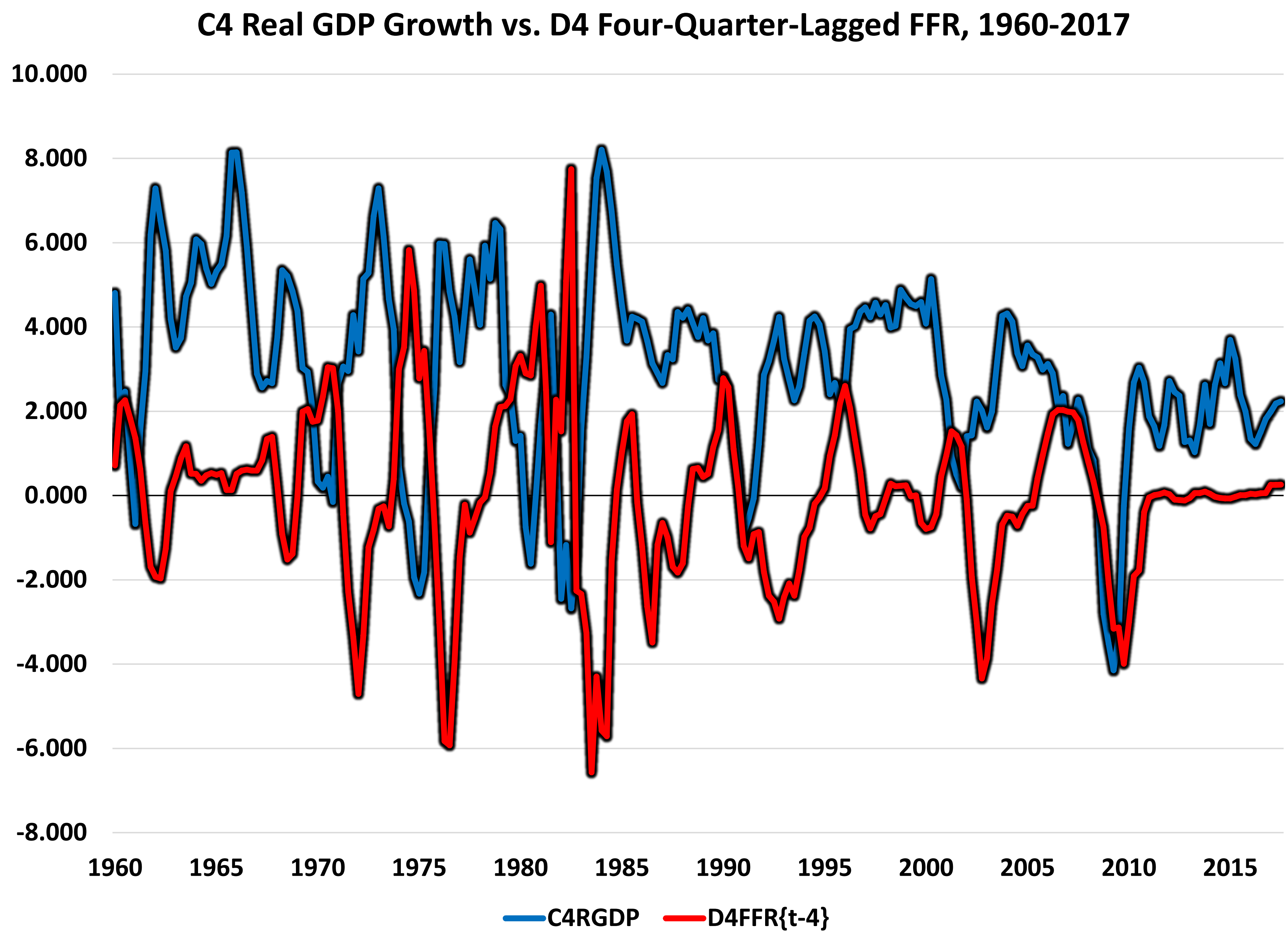
Is Potency of Monetary Policy Response Overstated?

- Changes in iFF are supposed to control the economy by changing real aggregate spending
- What then is the response of Δ y to ΔiFF?
- Run regressions of Δy on lags of ΔiFF, omit lags 1 and 2 because of positive correlation
- 1961-75, 1975-90, 1990-2003 lags 3-8
- 2004-17 lags 6-11


Response of Real GDP Growth to Changes in the Federal Funds Rate,
Sums of Regression Coefficients, 1961-2017
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
3
4
5
6
7
8
9
10
11
1991-2003
1976-1990
2004-2017 (Lags 6-11)
1961-1975



Real GDP Growth, Fitted vs. Actual Values from Regression on Lags of D1 FFR, 1961-2017
10
8
6
4
2
0
-2
-4
-6
1961
1966
1971
1976
1981
1986
1991
1996
2001
2006
2011
2016
Actual
Fitted 1961-1975
Fitted 1976-1990
Fitted 1991-2003
Fitted 2004-2017 (Lags 6-11)


C4 Real GDP Growth vs. D4 Four-Quarter-Lagged FFR, 1960-2017
10.000
8.000
6.000
4.000
2.000
0.000
-2.000
-4.000
-6.000
-8.000
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
C4RGDP
D4FFR{t-4}

Quantifying the Effects of Alternative Targeting Strategies

- Consider only demand shock to Δy
- Policy responds to deviations of actual outcomes from target
- Δx-Δx^*, $\pi - \pi^*$, p-p*, $0.5(-(U-U^*)+\pi - \pi^*)$
- Policy response is immediate, but its impact on Δy is hump-shaped, quarters 4 though 10

We utilize the following equations and identities.

$$x_t = \text{log of nominal GDP at time t} \tag{1}$$

$$y_t = \text{log of real GDP at time t} \tag{2}$$

$$y_t^* = \text{log of natural level of real GDP at time t} \tag{3}$$

$$p_t = \text{the GDP price level} \tag{4}$$

$$u_t = \text{unemployment rate at time t} \tag{5}$$

$$u_t^* = \text{NAIRU at time t} \tag{6}$$

$$\pi_t = \Delta p_t = \text{GDP inflation} \tag{7}$$

Equation (8) represent the Phillips Curve Equation with long lags (through lag 12) in inflation and five lags of the unemployment deviations. Equation (9) is the Okun's Law relationship.

$$\pi_t = \sum_{i \in I} \sigma_i \pi_{t-i} + \sum_{j \in J} \beta_j (u - u^*)_{t-j} \tag{8}$$

$$\Delta (u - u^*)_t = \gamma \Delta (y - y^*)_t \tag{9}$$

Here, the Fed targets the gap for variable z, but is only able to do so beginning with the fourth-through-tenth lags of the gap. The sum of the coefficients on the lags equals unity.

$$Policy_t = \frac{1}{4}(-0.25(z-z^*)_{t-4} - 0.5(z-z^*)_{t-5} - 0.75(z-z^*)_{t-6} \\ -1(z-z^*)_{t-7} - 0.75(z-z^*)_{t-8} - 0.5(z-z^*)_{t-9} - 0.25(z-z^*)_{t-10}) \tag{10}$$

$$\Delta(y\_y^*)_t = Shock_t + Policy_t \tag{11}$$

In Equation (11), the output gap is affected by contemporaneous demand shocks and policy.

Using the identity of the growth rates of nominal GDP, real GDP, and GDP inflation, we have the following system.

$$x_t = y_t + p_t \tag{12}$$

$$\Delta x_t = \Delta y_t + \pi_t \tag{13}$$

$$\pi_t = \sum_{i \in I} \sigma_i \pi_{t-i} + \sum_{j \in J} \beta_j (u - u^*)_{t-j} \tag{14}$$

$$\Delta(u - u^*)_t = \gamma \Delta(y - y^*)_t \tag{15}$$

$$\begin{aligned} \Delta(y\_y^*)_t = Shock_t + \frac{1}{4}(&-0.25(z - z^*)_{t-4} - 0.5(z - z^*)_{t-5} - 0.75(z - z^*)_{t-6} \\ &-1(z - z^*)_{t-7} - 0.75(z - z^*)_{t-8} - 0.5(z - z^*)_{t-9} - 0.25(z - z^*)_{t-10}) \end{aligned} \tag{16}$$

The model here has the Fed target nominal GDP, while real GDP responds to both shocks and the Fed policy working through nominal GDP targeting. Equations 13-15 are the same, but (16) becomes

$$\Delta(y\_y^*)_t = Shock_t + \frac{1}{4}(-0.25\Delta(x-x^*)_{t-4} - 0.5\Delta(x-x^*)_{t-5} - 0.75\Delta(x-x^*)_{t-6}$$
$$-1\Delta(x-x^*)_{t-7} - 0.75\Delta(x-x^*)_{t-8} - 0.5\Delta(x-x^*)_{t-9} - 0.25\Delta(x-x^*)_{t-10}) \tag{17}$$

The idea here is like that of nominal GDP targeting. The Fed is able to target inflation with a policy shock, presumable the FFR, which affects the output gap. (16) is now

$$\Delta(y\_y^*)_t = Shock_t + \frac{1}{4}(-0.25(\pi - \pi^*)_{t-4} - 0.5(\pi - \pi^*)_{t-5} - 0.75(\pi - \pi^*)_{t-6}$$
$$-1(\pi - \pi^*)_{t-7} - 0.75(\pi - \pi^*)_{t-8} - 0.5(\pi - \pi^*)_{t-9} - 0.25(\pi - \pi^*)_{t-10}) \tag{18}$$

We introduce a price level target, where the Fed targets the deviation of the price level from its natural level. Equations 13-15 remain as above. Both the price level and its natural level are determined as their first lag plus inflation.

$$p_t = p_{t-1} + \pi_t \tag{19}$$

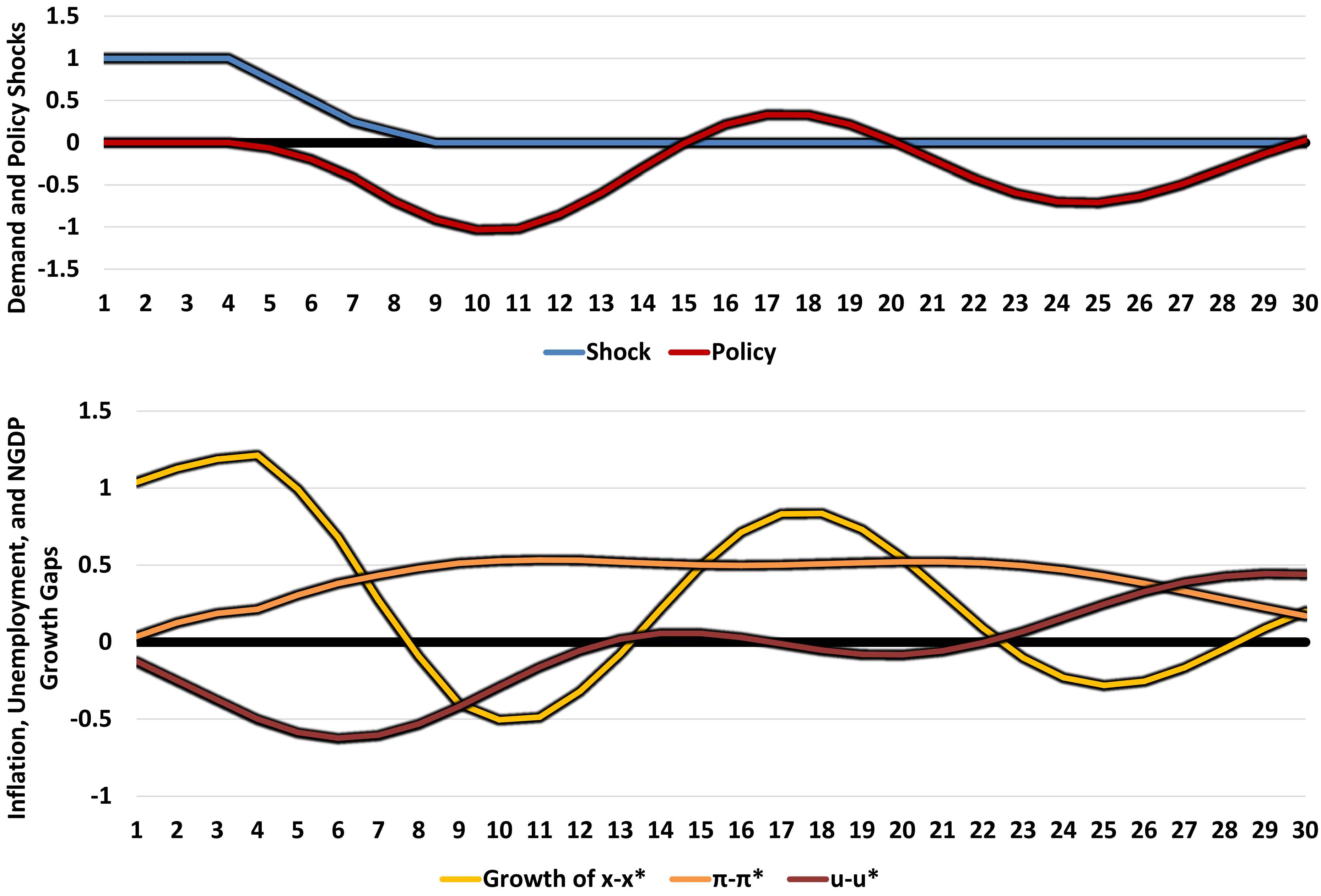
$$p_t^* = p_{t-1}^* + \pi_t^* \tag{20}$$

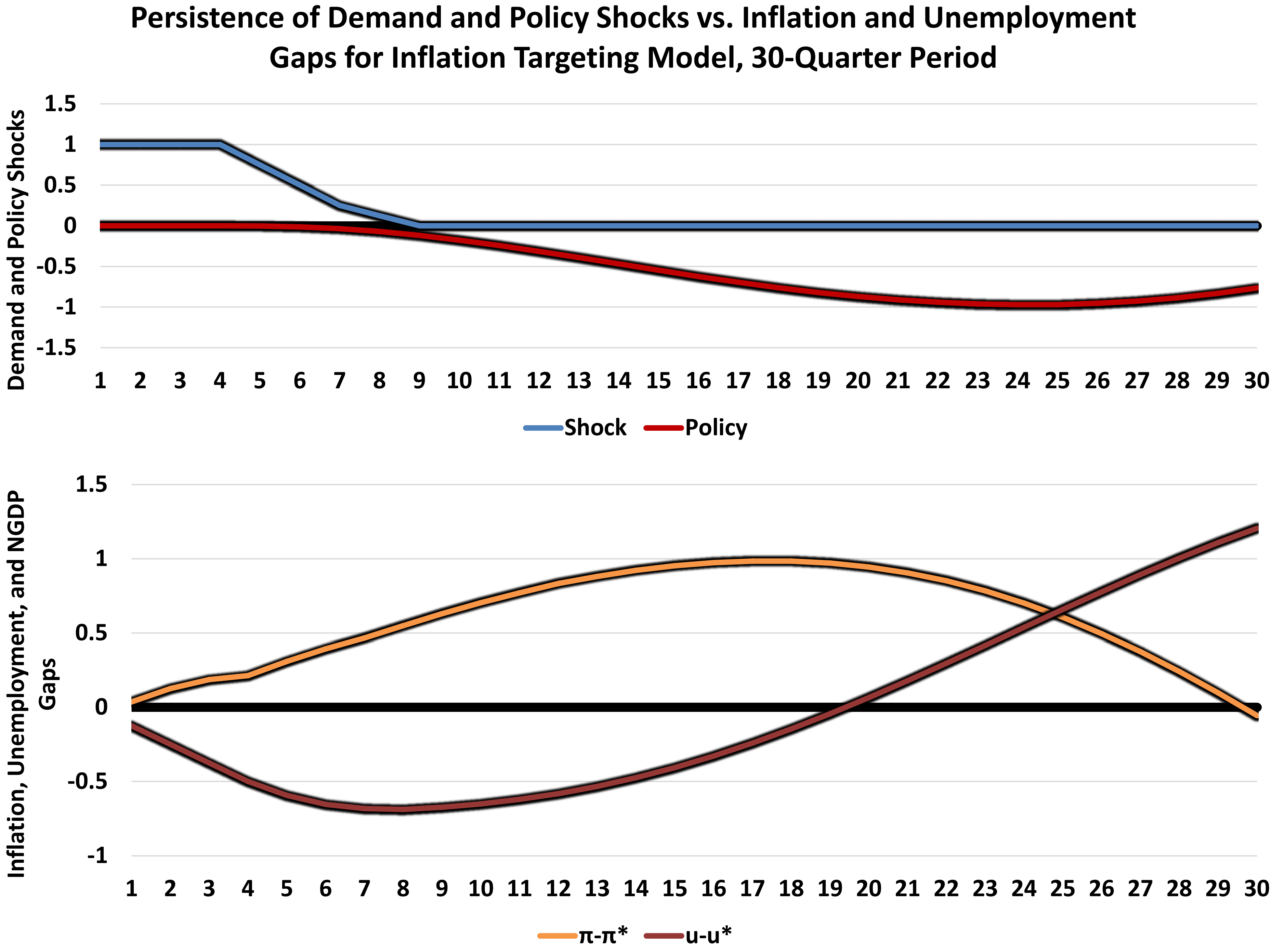
$$\begin{aligned}\Delta(y\_y^*)_t = Shock_t + \frac{1}{4}(&-0.25(p-p^*)_{t-4} - 0.5(p-p^*)_{t-5} - 0.75(p-p^*)_{t-6} \\ &-1(p-p^*)_{t-7} - 0.75(p-p^*)_{t-8} - 0.5(p-p^*)_{t-9} - 0.25(p-p^*)_{t-10})\end{aligned} \tag{21}$$

In this simple iteration of the Taylor Rule, policy depends on the inflation gap less the unemployment gap, so that

$$\begin{aligned}\Delta(y\_y^*)_t = Shock_t + \frac{1}{4}(&-0.25[(\pi - \pi^*) - (u - u^*)]_{t-4} \\ &-0.5[(\pi - \pi^*) - (u - u^*)]_{t-5} - 0.75[(\pi - \pi^*) - (u - u^*)]_{t-6} \\ &-1[(\pi - \pi^*) - (u - u^*)]_{t-7} - 0.75[(\pi - \pi^*) - (u - u^*)]_{t-8} \\ &-0.5[(\pi - \pi^*) - (u - u^*)]_{t-9} - 0.25[(\pi - \pi^*) - (u - u^*)]_{t-10})\end{aligned} \tag{22}$$

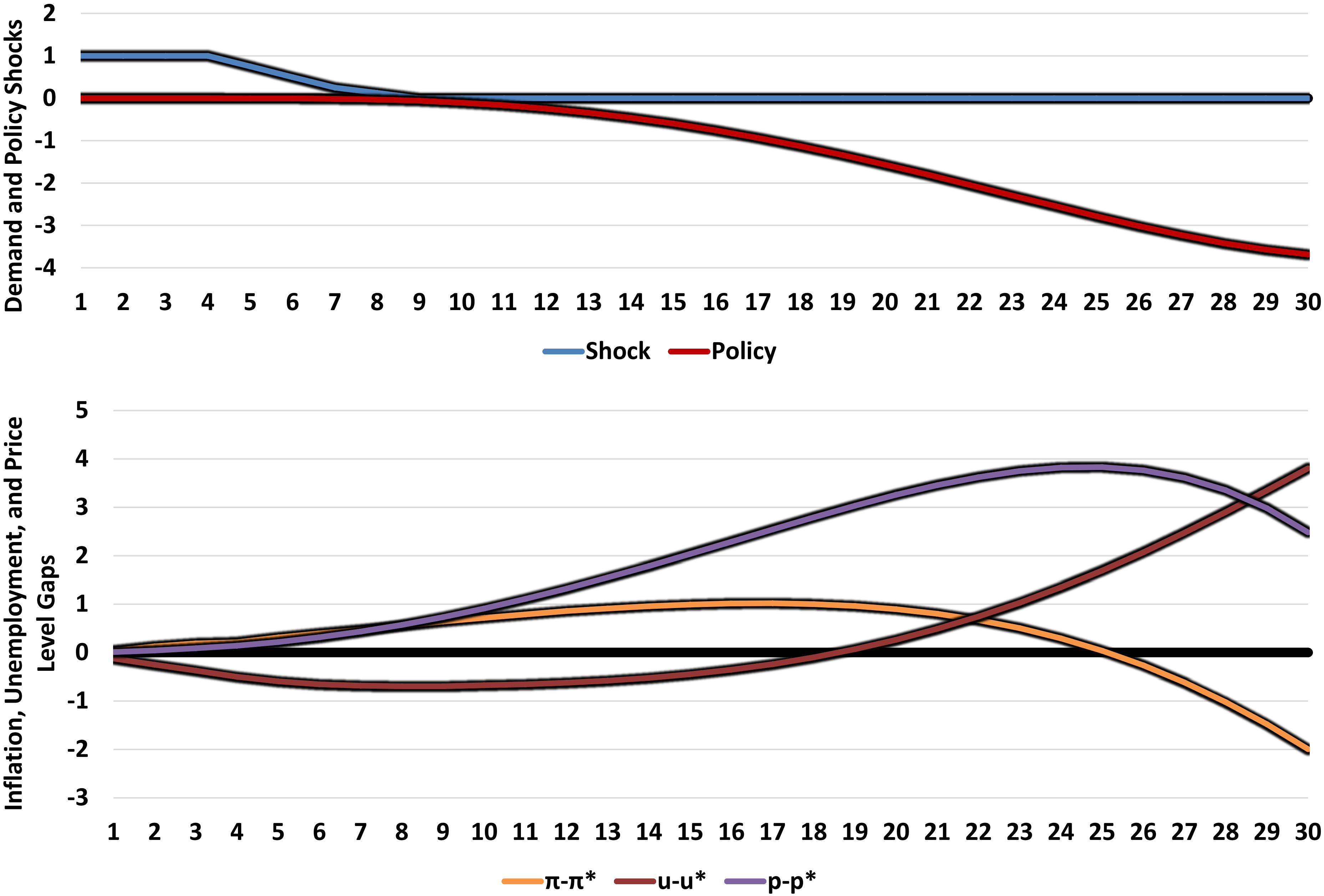
Persistence of Demand and Policy Shocks vs. Inflation and Unemployment Gaps for Nominal GDP Growth Targeting Model, 30-Quarter Period

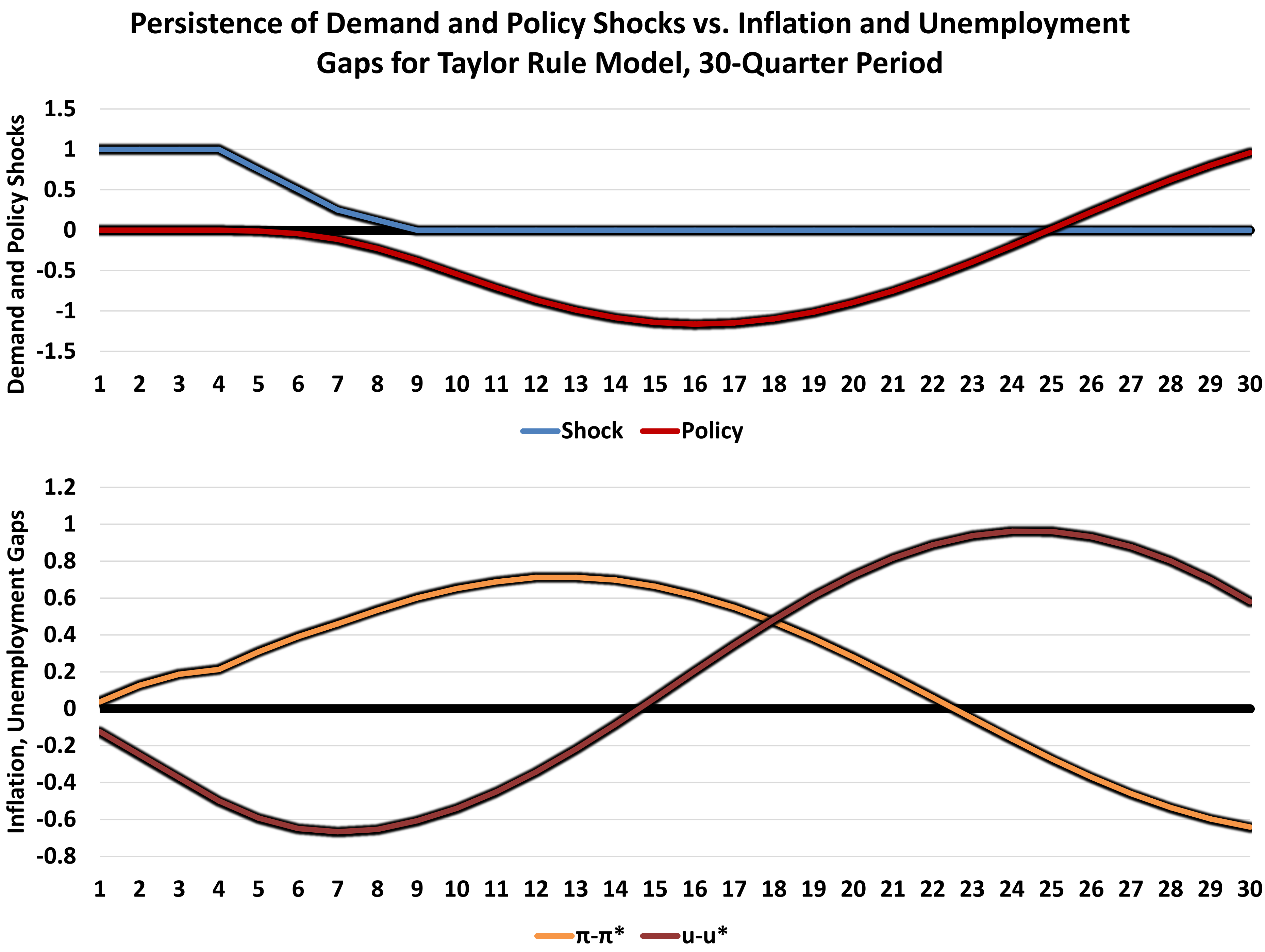




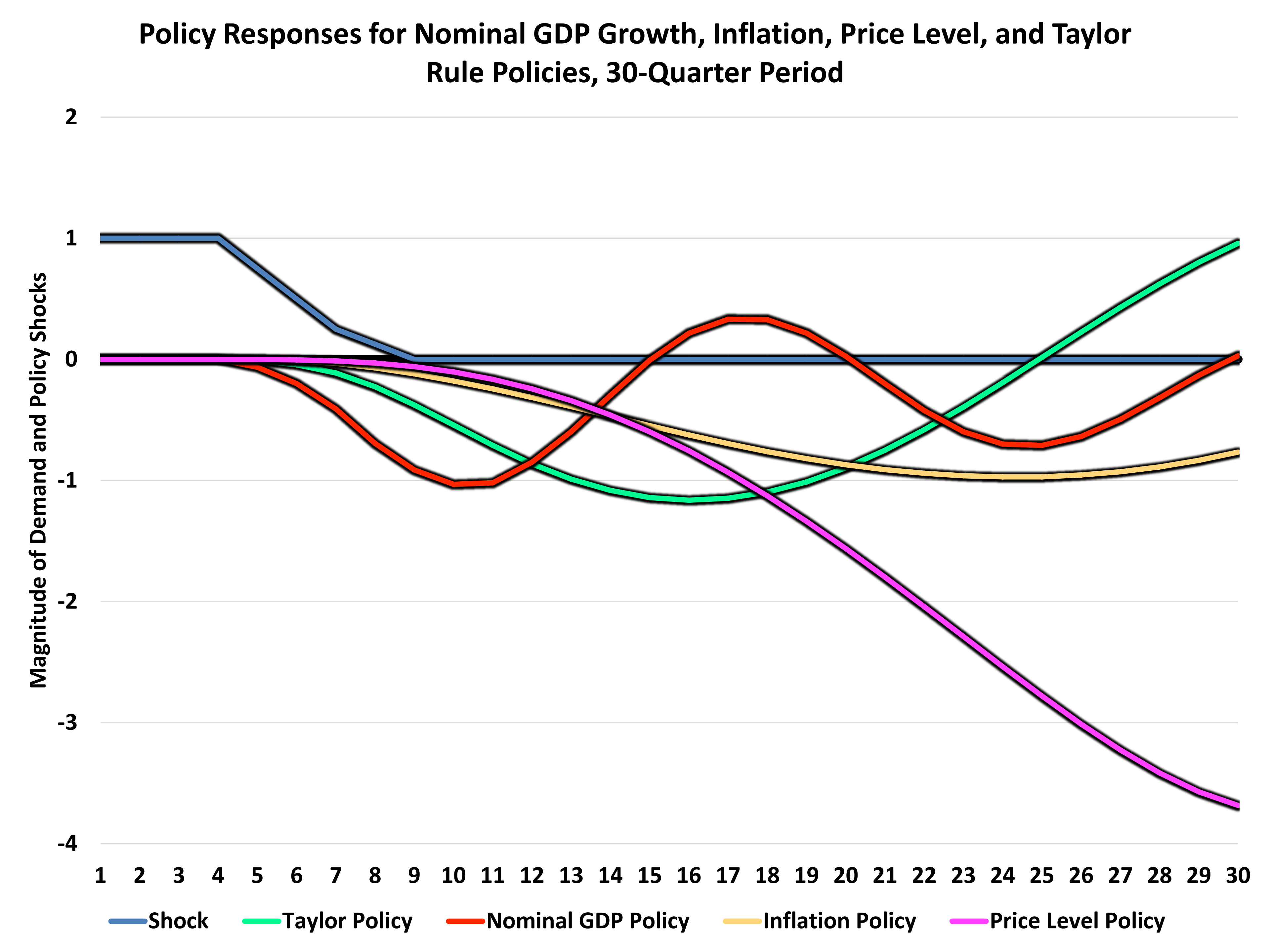
Persistence of Demand and Policy Shocks vs. Inflation and Unemployment Gaps for Inflation Targeting Model, 30-Quarter Period
Demand and Policy Shocks
1.5
1
0.5
0
-0.5
-1
-1.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Shock
Policy
Inflation, Unemployment, and NGDP Gaps
1.5
1
0.5
0
-0.5
-1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
π-π*
u-u*

Persistence of Demand and Policy Shocks vs. Inflation and Unemployment Gaps for Price Level Targeting Model, 30-Quarter Period

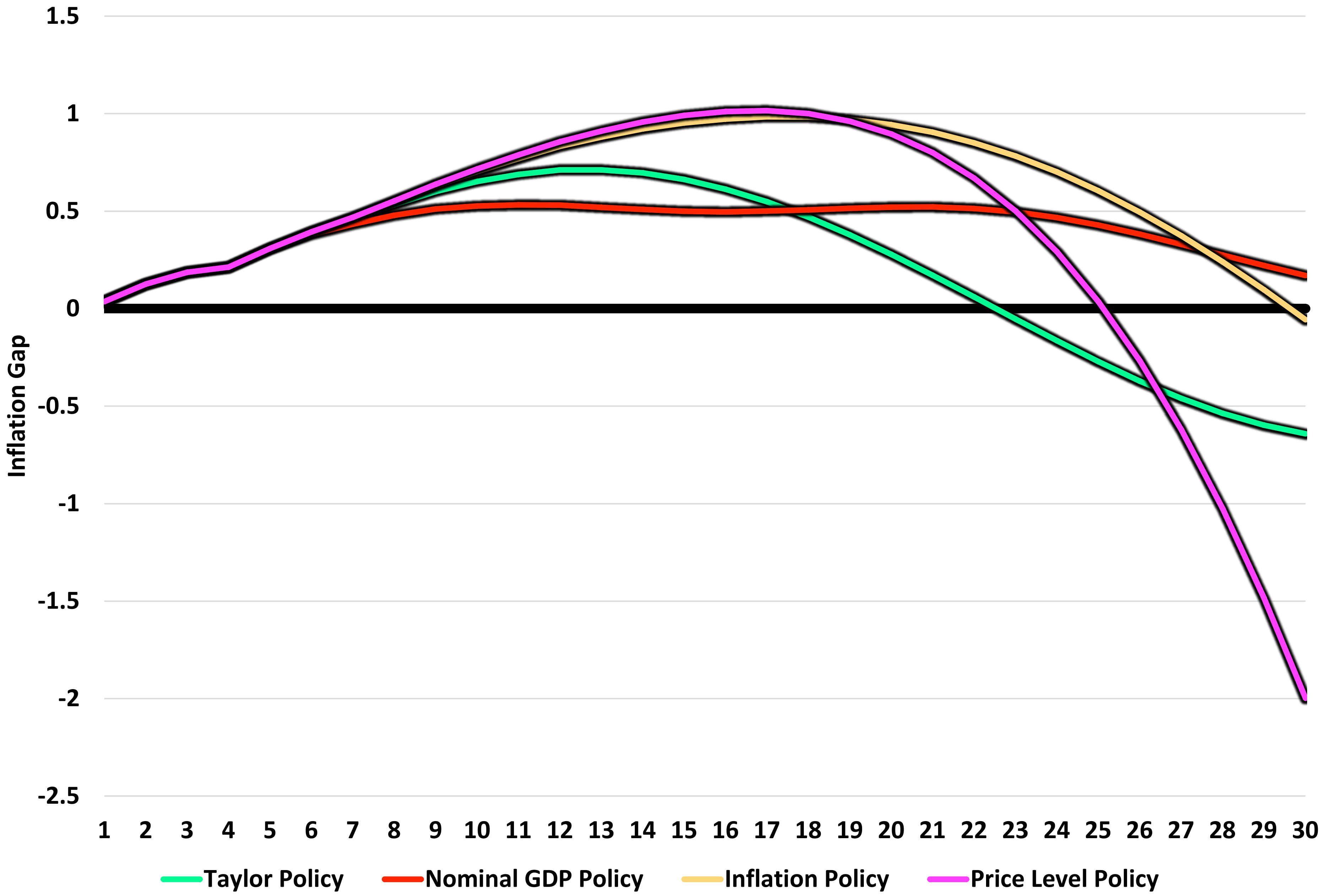


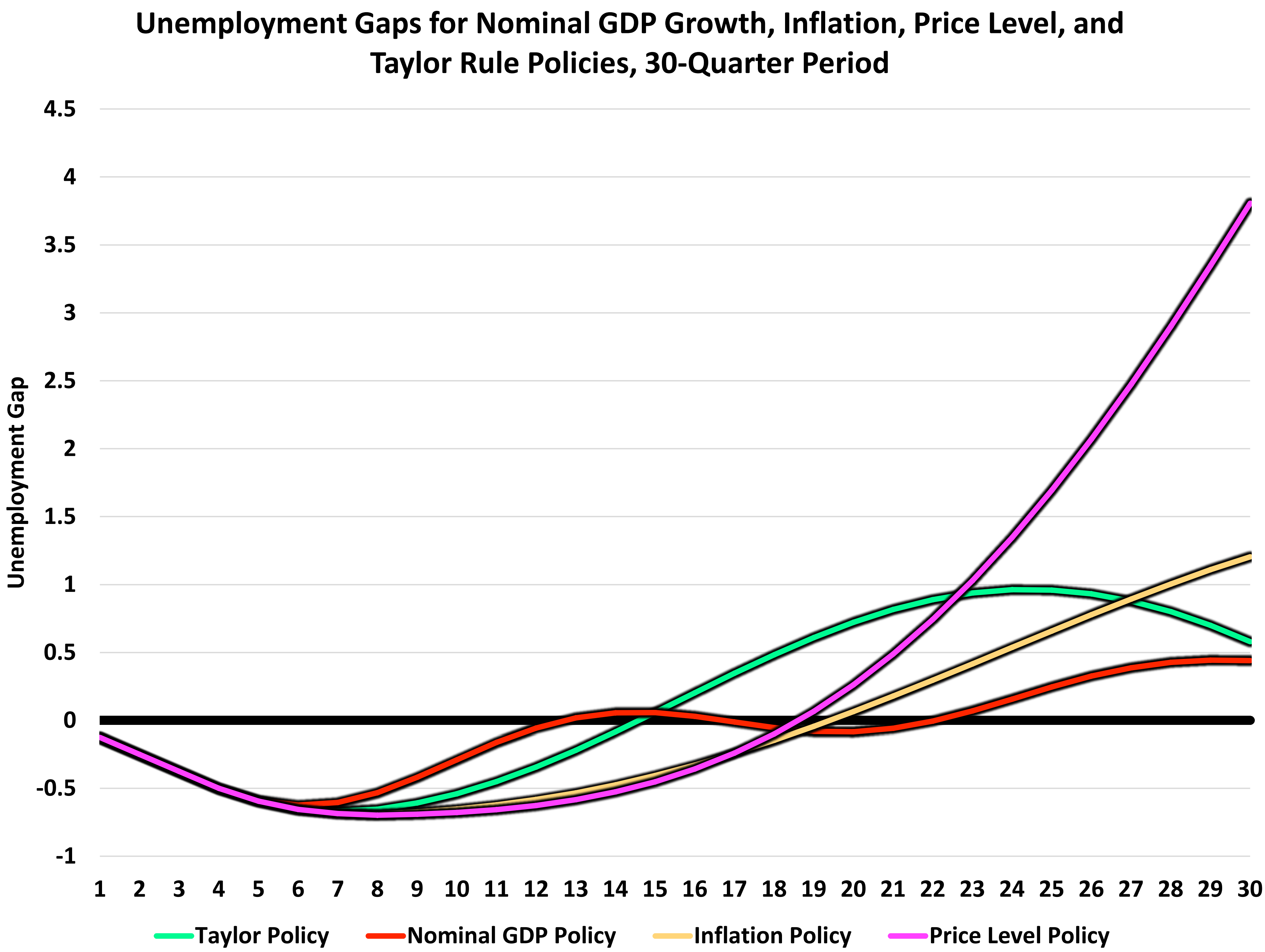


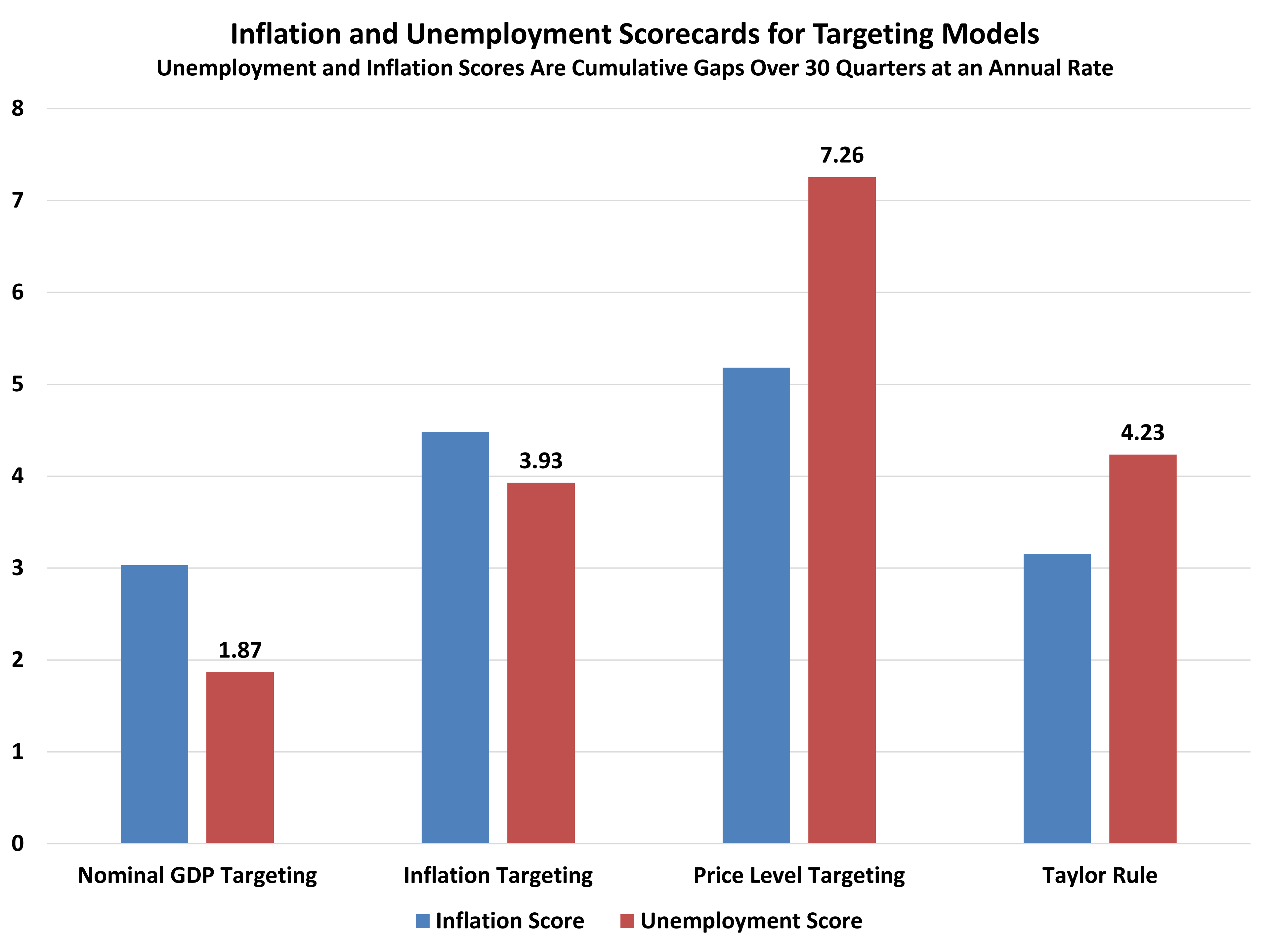
Persistence of Demand and Policy Shocks vs. Inflation and Unemployment Gaps for Taylor Rule Model, 30-Quarter Period
Demand and Policy Shocks
1.5
1
0.5
0
-0.5
-1
-1.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Shock
Policy
Inflation, Unemployment Gaps
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
π-π*
u-u*


Policy Responses for Nominal GDP Growth, Inflation, Price Level, and Taylor Rule Policies, 30-Quarter Period
Magnitude of Demand and Policy Shocks
2
1
0
-1
-2
-3
-4
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Shock
Taylor Policy
Nominal GDP Policy
Inflation Policy
Price Level Policy

Inflation Gaps for Nominal GDP Growth, Inflation, Price Level, and Taylor Rule Policies, 30-Quarter Period




Unemployment Gaps for Nominal GDP Growth, Inflation, Price Level, and
Taylor Rule Policies, 30-Quarter Period
Unemployment Gap
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Taylor Policy
Nominal GDP Policy
Inflation Policy
Price Level Policy


Inflation and Unemployment Scorecards for Targeting Models
Unemployment and Inflation Scores Are Cumulative Gaps Over 30 Quarters at an Annual Rate
8
7
6
5
4
3
2
1
0
1.87
3.93
7.26
4.23
Nominal GDP Targeting
Inflation Targeting
Price Level Targeting
Taylor Rule
Inflation Score
Unemployment Score

Conclusion About Targeting

- Nominal GDP targeting and Taylor rule are superior
- Why? Because they operate directly on the causes of inflation before the inflation occurs
- Differences? Nom GDP requires alternating policy stance that may not be practicable
- Taylor Rule causes overshooting of U rate
- Different supply shock response – Taylor rule ignores inflation because is based on core inflation, whereas nominal GDP growth is based on headline inflation