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The Case of the Disappearing Phillips Curve

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Any opinions expressed here are my own and do not necessarily reflect those of the FOMC.

Introduction

INTRODUCTION

- The slope of estimated Phillips curves in G-7 economies was negative in the 1980s but has been drifting toward zero in the inflation targeting era since 1995.
- This is an empirical phenomenon often referred to as a "flattening Phillips curve."
- Monetary authorities have generally improved policy during the inflation targeting era—inflation has generally been lower, less volatile and closer to stated inflation targets.
- I will argue that the improved monetary policy has led to the flatter empirical Phillips curve.
- I will draw out the implications for monetary policy after making my core argument.

Empirical Evidence of a Flatter Phillips Curve

EMPIRICAL EVIDENCE ON THE PHILLIPS CURVE

- In the past 30 years, the empirical Phillips curve has flattened in advanced economies.
- The following chart shows the coefficient on a measure of resource slack (unemployment) in a regression of price inflation on resource utilization.
  - The analysis is contained in the latest BIS annual report.
  - The data are for a panel of G-7 economies.
  - The coefficient is estimated for rolling 15-year samples, from the 1980s to the present.
  - The point estimate is a weighted average across economies.

FLATTENING OF THE PHILLIPS CURVE IN G-7 ECONOMIES

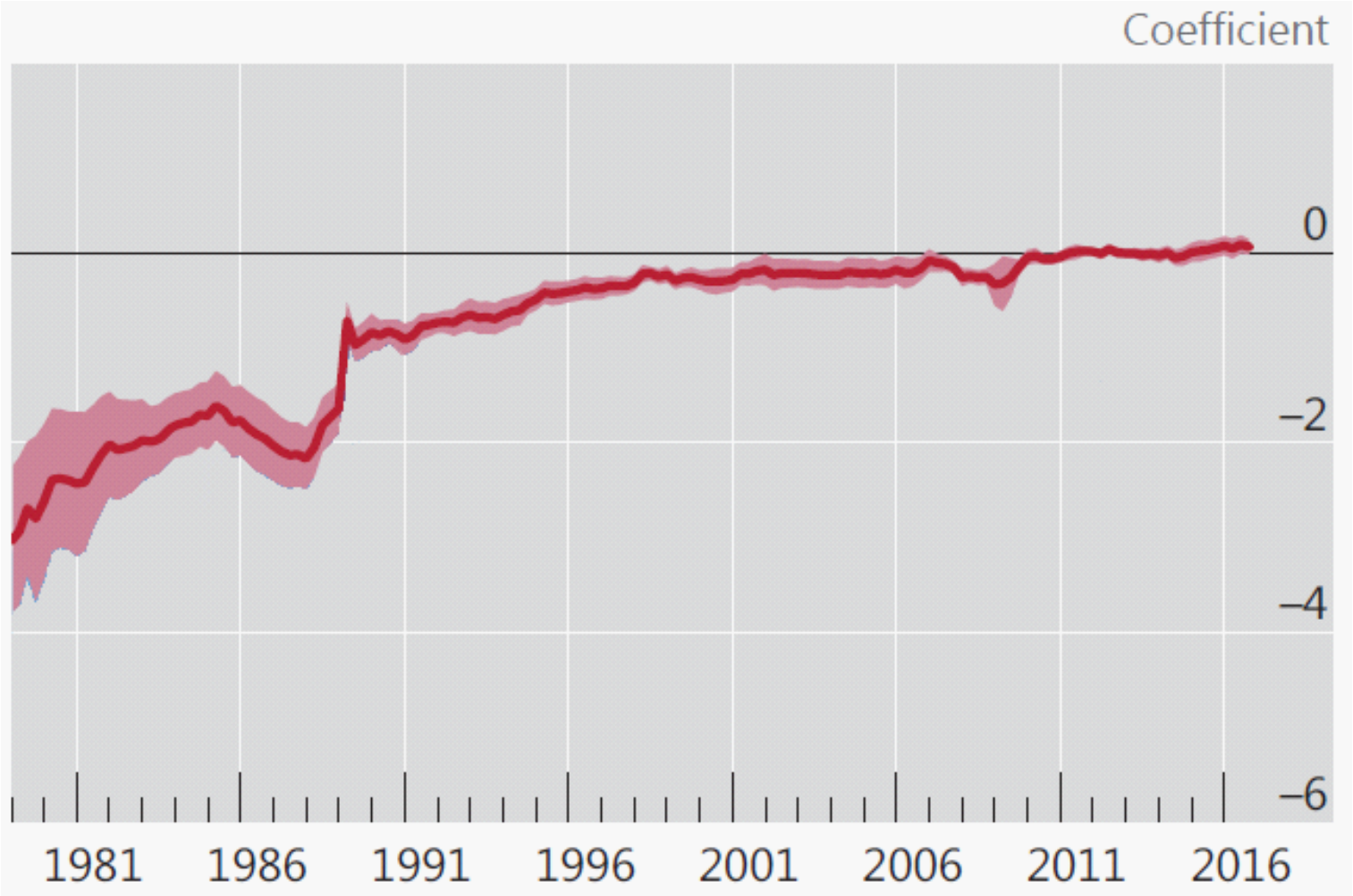

FIGURE: Source: Bank for International Settlements (2017).

A Simple Model

A SIMPLE AND STANDARD MODEL

- I will use a simple and standard model to state the argument.
- This model is a version of more complicated models that underlie much of the analysis in modern central banking.

THE STANDARD NEW KEYNESIAN MODEL

- Dynamic IS equation:

$$y_t = E_t\left(y_{t+1}\right) - \frac{1}{\sigma}\left[i_t - \left(\rho + \epsilon_t\right) - E_t\left(\pi_{t+1}\right)\right] \tag{1}$$

- A structural, New Keynesian Phillips curve:

$$\pi_t = \kappa y_t + \beta E_t\left(\pi_{t+1}\right) + u_t \tag{2}$$

- Monetary policy conducted using a Taylor-type monetary policy rule:

$$i_t = \rho + \varphi_\pi \pi_t + \varphi_y y_t \tag{3}$$

- Notation:
  - y, π, i, $\rho + \epsilon$: the output gap, inflation gap, short-term nominal interest rate and natural real rate of interest, respectively.
  - ϵ, u: the natural rate shock and the cost push shock, respectively.
  - σ, κ, β: structural parameters, all positive.
  - φ_π, φ_y: policy parameters, with $\varphi_\pi > 1$ and $\varphi_y > 0$.

MODEL EQUILIBRIUM

- The equilibrium has the output gap and the inflation gap evolving as linear functions of the shocks:

$$y_t = \frac{\epsilon_t - \varphi_\pi u_t}{\sigma + \varphi_y + \kappa\varphi_\pi}, \tag{4}$$

$$\pi_t = \frac{\kappa\epsilon_t + \left(\sigma + \varphi_y\right) u_t}{\sigma + \varphi_y + \kappa\varphi_\pi}. \tag{5}$$

Monetary Policy

CONSTRAINED OPTIMAL MONETARY POLICY

- We look for optimal monetary policy within the set of Taylor-type rules in the model.
- Fix φ_y to any positive value, and then choose the optimal value of φ_π by minimizing a quadratic:

$$\varphi_\pi = \arg\min (1-\beta) \sum_{t=0}^{\infty} \beta^t \left(\alpha \pi_t^2 + y_t^2 \right), \tag{6}$$

  where $\alpha > 0$ represents the relative weight on the desirability of inflation stabilization compared to output stabilization.
- Regardless of the value of α, the solution to this problem is to set a large coefficient on the inflation gap, technically, $\varphi_\pi \to \infty$.

INTERPRETATION AS BETTER INFLATION TARGETING

- Interpretation of the solution: *"The policymaker should promise to react aggressively to deviations of inflation from target in conducting monetary policy."*
- The idea that policymakers put more weight on inflation deviations during the post-1995 period could be related, in part, to quantitative easing and other unconventional policy measures during years when inflation has been below target.

Empirical Phillips Curves from Model Data

THE PHILLIPS CURVE SLOPE IN THEORY

- Now let's regress the inflation gap on the output gap inside the model and call the estimated coefficient "the slope of the empirical Phillips curve."
- The slope can be calculated exactly as

$$\gamma = \frac{Cov\left(\pi_t, y_t\right)}{Var\left(y_t\right)} = \frac{\kappa\sigma_\epsilon^2 - \varphi_\pi\left(\sigma + \varphi_y\right)\sigma_u^2}{\sigma_\epsilon^2 + \varphi_\pi^2\sigma_u^2}. \tag{7}$$

  - σ_ϵ^2, σ_u^2: variance of the natural rate shock and cost push shock, respectively.
- **Main result:** Under the optimal monetary policy defined above, the empirical Phillips curve becomes flat, that is,

$$\lim_{\varphi_\pi \to \infty} \gamma = 0. \tag{8}$$

Empirical Relevance

EMPIRICAL RELEVANCE

- Would this Lucas critique effect be large enough to importantly affect estimated Phillips curve coefficients?
- I consider a similar model, estimated by Lubik and Schorfheide (2004, *American Economic Review*).
- I use mean estimates for post-1982 data from their Table 3, p. 206 to generate artificial data and regress inflation on the output gap.
- I use Okun's law with a coefficient of -2.3 to translate the Phillips curve slope in terms of unemployment.
- The following chart suggests that, at these parameter values, the slope of the estimated Phillips curve would attenuate significantly as φ_π increases.

EMPIRICAL RELEVANCE

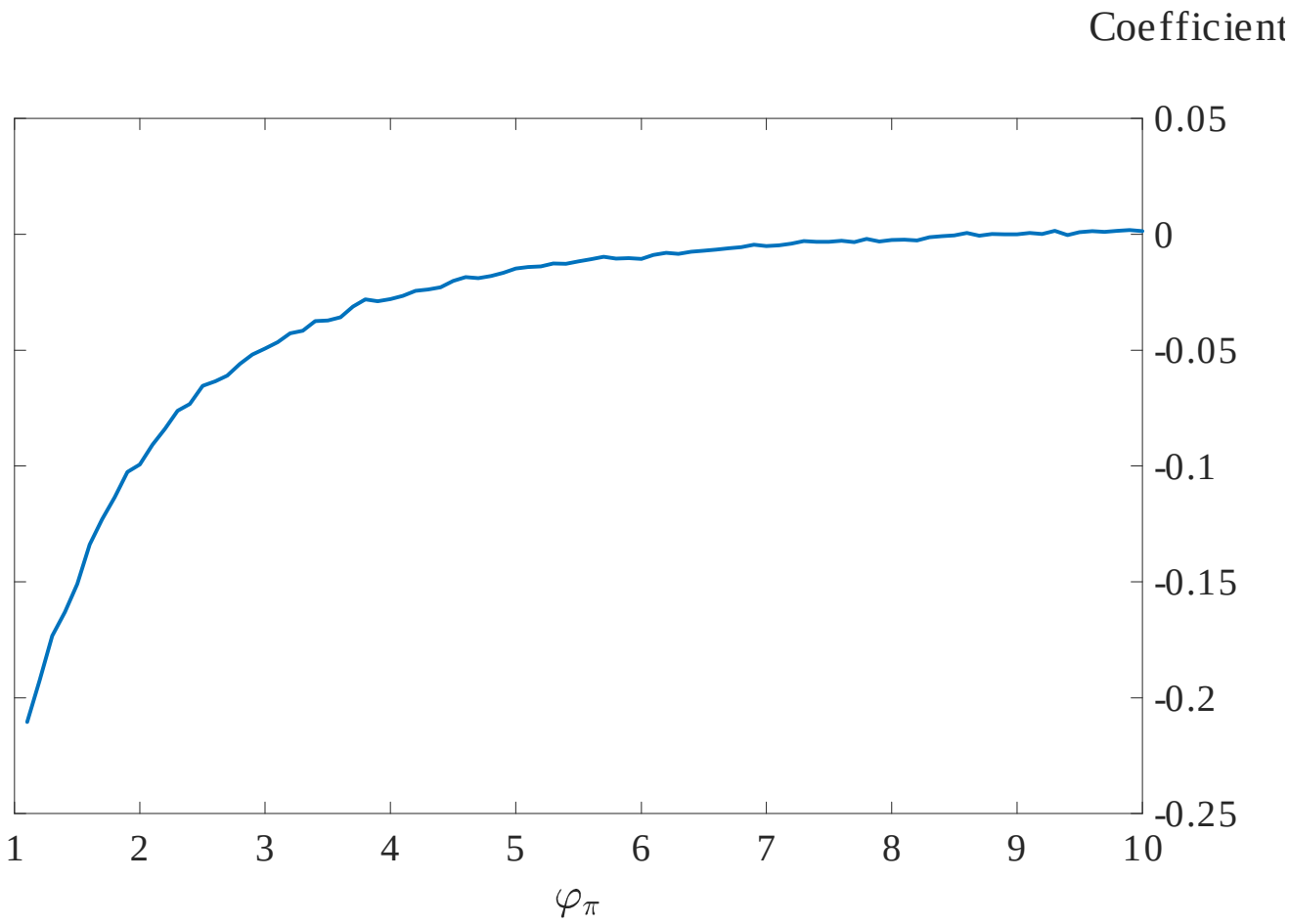

FIGURE: Phillips curve slope as a function of the interest rate response to inflation.

Implications for Today's Monetary Policymakers

IMPLICATIONS FOR TODAY'S MONETARY POLICYMAKERS

- Ultimately, successful monetary policy can push the empirical Phillips curve slope all the way to zero.
- The model economy in this talk still has a structural Phillips curve; it is only the empirical Phillips curve that is "disappearing."
- Today's G-7 monetary policymakers are unlikely to glean a reliable signal for monetary policy based on empirical Phillips curve slope estimates—they have to look elsewhere.