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Monetary policy and the fisher effect

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Abstract

Historical estimates of the informational content in the yield curve may not be relevant after a change in monetary policy. This study uses a small dynamic rational expectations model with staggered price setting to study how monetary policy affects the relation between nominal interest rates, inflation expectations, and real interest rates. The benchmark parameters, including the Fed's loss function parameters, are estimated by maximum likelihood on quarterly US data. The policy experiments include stronger inflation targeting and more active monetary policy.

Keywords: Inflation expectations; Inflation targeting; Optimal policy

1. Introduction

The most common way of measuring the Fisher effect is by the slope coefficient in an OLS regression of inflation or inflation expectations (the distinction does not matter if expectations are rational) on nominal interest rates, $\pi^e = a + bi + \varepsilon_t$. A value of b slightly less than unity is a common result on US data.[1] This equation can also be used as an (optimal if normally distributed variables) indicator rule for inflation expectations, $\hat{\pi}^e = a + bi$. From the Fisher equation, $i = \hat{\pi}^e + r$ where r is the (risk-adjusted) real interest rate, it follows that the indicator rule for the real interest rates is $\hat{r} = (1 - b)i$ plus a constant.

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[1] Mishkin (1992) finds that the b coefficient is around .7 in regressions of 3-month ex post inflation on nominal interest rates (monthly data 1953–1990). Söderlind (1998) finds similar numbers for 1-year inflation based on both ex post data and several surveys of inflation expectations, with an R^2 around .7 (semiannual data 1953–1995).

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This study investigates how monetary policy affect these indicator rules and their fit. This is done by first estimating a small macromodel of the US economy and then analyzing the effects on the equilibrium time series process of changing the objectives of the policymaker. For sake of brevity, the attention is focused on 1-year interest and inflation rates, but similar results hold for longer maturities.

2. A model of monetary policy

This is a modified version of the model in Fuhrer and Moore (1995). The main features of the model are: (i) inflation is persistent, (ii) monetary policy can affect output via the real interest rate and then inflation via a forward looking "Phillips effect," (iii) monetary policy tries to strike a balance between output and inflation stability while avoiding large movements in the nominal interest rates.

The IS curve for detrended log output, y_t, is

$$y_t = \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \alpha_r r_{t-1} + \varepsilon_{yt},$$

where ε_{yt} is an output shock. The long ex ante real interest rate, r_t, obeys an approximate risk neutral arbitrage condition for a 10-year real coupon bond.

$$r_t = \frac{1}{41}\sum_{s=0}^{\infty}\left(\frac{40}{41}\right)^s E_t(i_{t+s} - \pi_{t+1+s}),$$

where i_t is the annualized one quarter nominal interest rate (the policy instrument), and π_t is the annualized one quarter inflation rate, $\pi_t = 4(p_t - p_{t-1})$. Wage contracts negotiated in t specify a flat nominal wage, w_t, for three quarters (Fuhrer & Moore, 1995 use four). A fraction θ_1/θ_0 of these contracts "survive" until $t+1$, and a fraction $(1-\theta_0-\theta_1)/\theta_0$ until $t+2$. The log price level is the average of the wage contracts still in effect.

$$p_t = \theta_0 w_t + \theta_1 w_{t-1} + (1-\theta_0-\theta_1)w_{t-2}.$$

Nominal wage contracts are set so the current real contract wage equals the average real contract price index, υ_t, expected to hold over the contract period, adjusted for demand pressure and wage/inflation shocks, ε_{pt},

$$\begin{aligned} w_t = p_t &+ \theta_0(\upsilon_t + gy_t) + \theta_1 E_t(\upsilon_{t+1} + gy_{t+1}) \\ &+ (1-\theta_0-\theta_1)E_t(\upsilon_{t+2} + gy_{t+2}) + \varepsilon_{pt}, \end{aligned}$$

$$\upsilon_t = \theta_0(w_t - p_t) + \theta_1(w_{t-1} - p_{t-1}) + (1-\theta_0-\theta_1)(w_{t-2} - p_{t-2}).$$

Fuhrer and Moore (1995) close the model by specifying the Fed's reaction function. To discuss monetary policy in terms of policy objectives, I instead let