

Problem Set #5

due Monday November 4, 2019

1. (35 points) **Taylor Rule** Monetary policy in developed economies has often been described by the Taylor rule, after economist John Taylor. The Taylor rule states that the monetary policy rate is given by

$$r_t = real^* + \pi_t + \phi_\pi(\pi_t - \pi^*) + \phi_y \times 100 \times \left(\frac{y_t - \bar{y}_t}{\bar{y}_t} \right) \quad (1)$$

where r_t is the policy interest rate, $real^*$ is the assumed equilibrium real interest rate, π_t is the rate of inflation measured by the implicit GDP deflator, y_t is real GDP, and \bar{y}_t is real potential GDP.¹ Please download the following data for the United States for the period 1954Q3 to 2019Q2 from FRED:

- FEDFUNDS: Effective Federal Funds Rate, Percent, Quarterly, Not Seasonally Adjusted
 - GDPC1: Real Gross Domestic Product, Billions of Chained 2012 Dollars, Quarterly, Seasonally Adjusted Annual Rate
 - GDPPOT: Real Potential Gross Domestic Product, Billions of Chained 2012 Dollars, Quarterly, Not Seasonally Adjusted
 - GDPDEF: Gross Domestic Product: Implicit Price Deflator, Index 2012=100, Percent Change from Year Ago, Quarterly, Seasonally Adjusted
- (a) (15 points) Let $real^* = 2$, $\pi^* = 2$, $\phi_\pi = 0.5$, $\phi_y = 0.5$. Calculate the federal funds rate predicted by the Taylor rule and plot it together with the actual federal funds rate. Please hand in only your graph.
 - (b) (20 points) Let's focus on the period after 2000Q1. There are two periods with large discrepancies between the forecasted and actual federal funds rate: a) 2003Q1 to 2006Q3; b) since 2010Q2. The FOMC typically views core personal consumption expenditure (PCEPILFE Personal Consumption Expenditures Excluding Food and Energy) inflation as a better measure of the medium-term inflation trend. Does this explain the difference between the two rates? If not (or not completely), what does explain these differences?

¹Potential output is the level of real GDP that can be achieved at full capacity, i.e. when all resources are fully utilized.

2. (65 points) At time t_0 the Home economy is in equilibrium with output at its full-employment level and the long-run expected exchange rate equal the spot exchange rate, $E^e = E_0^{lr} = E_0$. Output in the Foreign economy is at full-employment level. At t_0 the Home economy has money supply $M_0 = 100$, price level $P_0 = 1$, full-employment output $Y^f = 100$, the real exchange rate $q = 1$, and money demand $L = 1.05 \times Y^f - 100 \times R$, where R is the Home interest rate; the Foreign economy has money supply $M_0^* = 15$, price level $P_0^* = 0.1$, full-employment output $Y^{*f} = 100$, and money demand $L^* = 1.6 \times Y^{*f} - 200 \times R^*$, where R^* is the Foreign interest rate. Throughout this exercise please assume that output does *not* change, both in the Home and in the Foreign economy.
- (5 points) Find the equilibrium Home interest rate R .
 - (5 points) Find the equilibrium Foreign interest rate R^* .
 - (5 points) Find the equilibrium nominal exchange rate $E^e = E_0$.
 - (5 points) At time $t_1 > t_0$ the Foreign central bank announces that it will permanently increase money supply by 5% at time $t_2 > t_1$. Calculate the new expected long-run exchange rate E_1^{lr} . Calculate the spot exchange rate at time t_1 , E_1 .
 - (8 points) In a diagram *for the Home economy* with the foreign exchange rate market at the top and the money market at the bottom illustrate the short-run equilibrium at t_1 .
 - (5 points) Calculate the Foreign interest rate R^* and the spot exchange rate E_2 at time t_2 when Foreign money supply is raised.
 - (7 points) In the same diagram *for the Home economy* with the foreign exchange rate market at the top and the money market at the bottom illustrate the short-run equilibrium at t_2 .
 - (5 points) Assume that Home monetary policy remains unchanged while Foreign monetary policy is as in (d). In the same diagram *for the Home economy* with the foreign exchange rate market at the top and the money market at the bottom illustrate the adjustment to the long-run equilibrium.
 - (5 points) Suppose instead that, at time t_2 , the Home central bank permanently increases its money supply by 5%, thereby matching the policy in Foreign. Calculate the new expected long-run exchange rate E_3^{lr} , the Home interest rate R_3 and the spot exchange rate E_3 that emerge in the short run at t_2 .
 - (7 points) In a diagram *for the Home economy* with the foreign exchange rate market at the top and the money market at the bottom illustrate the short-run equilibrium at t_2 with Home monetary policy as in (i).
 - (8 points) In the same diagram *for the Home economy* with the foreign exchange rate market at the top and the money market at the bottom illustrate the adjustment to the long-run equilibrium with Home monetary policy as in (i).