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Price level targeting and the delegation issue in an open economy

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HIGHLIGHTS

- REX inflation is domestic inflation purged of the effects of the real exchange rate.
- REX price level objective allows delegation mechanism to work in an open economy.
- The delegation mechanism does not work for a domestic price level or CPI objective.

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ABSTRACT

A weight-conservative central banker setting policy with discretion and stabilizing the real exchange-rate-adjusted (REX) price level and the output gap can replicate the behavior of the rate of REX inflation and the output gap under policy from a timeless perspective.

1. Introduction

Svensson (1999), Woodford (1999), and Vestin (2006) find that for policy under discretion price level targeting is superior to inflation targeting in a closed economy because price level targeting produces a better output–inflation tradeoff than inflation targeting. In addition, Vestin finds that the delegation mechanism (Rogoff, 1984) works in the canonical New Keynesian model. A suitably chosen central banker, who engages in discretionary price level targeting, can mimic the behavior of the rate of inflation and the output gap under optimal policy from a timeless perspective provided that the exogenous cost-push shock follows a white noise process.[1]

In this paper we revisit the delegation issue in an open economy. We show that a weight-conservative central banker who sets policy with discretion and stabilizes the real exchange-rate-adjusted (REX) price level along with the output gap can indeed replicate the behavior of the rate of REX inflation and the output gap under policy from a timeless perspective. The delegation mechanism breaks down under both discretionary CPI and domestic price level targeting.

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[1] If the cost-push shock is auto-correlated then discretionary price level targeting fails to achieve the optimal behavior of the target variables under commitment. It does, however, match the response of the target variables to the lag of the price level.

2. Model for a small open economy

The small open economy model consists of four equations[2]:

$$\pi_t = \beta E_t\pi_{t+1} + \kappa y_t + b(q_t - q_{t-1}) - \beta b(E_t q_{t+1} - q_t) + u_t \quad (1)$$

$$y_t = E_t y_{t+1} - a_1(R_t - E_t\pi^{CPI}_{t+1}) + a_2(q_t - E_t q_{t+1}) + a_3(y^f_t - E_t y^f_{t+1}) + v_t \quad (2)$$

$$R_t - E_t\pi_{t+1} = R^f_t - E_t\pi^f_{t+1} + E_t q_{t+1} - q_t + \varepsilon_t \quad (3)$$

$$\pi^{CPI}_t = \pi_t + \gamma\Delta q_t. \quad (4)$$

π_t = the rate of domestic inflation.
$E_t\pi^{CPI}_{t+1}$ = the expected rate of CPI inflation.
q_t = the real exchange rate.
y_t = the output gap.
R_t = the nominal rate of interest (policy instrument).
R^f_t = the foreign nominal rate of interest.
$E_t\pi^f_{t+1}$ = the expected foreign rate of inflation.
y^f_t = the foreign output gap.

Lower case variables represent logarithms. All parameters are positive. The discount factor β is less than or equal to one. γ denotes consumption openness: $0 < \gamma < 1$. We treat all foreign variables as exogenous random variables that are independent of each other. All shocks are white noise processes with constant variance.

Eq. (1) represents an open economy Phillips curve. It is derived from an optimizing framework where price-setting domestic firms respond not only to changes in marginal cost but also to foreign price and exchange rate induced changes in their competitiveness vis-à-vis foreign firms. The "competitiveness effect" results in a direct real exchange rate channel in the Phillips curve which complicates the formulation of optimal monetary policy.[3] Eq. (2) is an open economy IS curve featuring standard real interest rate and real exchange rate channels. The Uncovered Interest Rate Parity (UIP) condition is given by Eq. (3). Eq. (4) represents the relationship between CPI inflation, domestic inflation and the real exchange rate under complete exchange rate pass-through.

3. Targeting REX inflation: optimal policy under commitment from a timeless perspective[4]

Inflation targets are typically defined in terms of the CPI or domestic inflation. In this section we introduce another inflation measure which can serve as the inflation target in an open economy. This alternative measure is domestic inflation stripped of the effects of changes in the real exchange rate.[5]

Defining

$$\pi^{REX}_t = \pi_t - b(q_t - q_{t-1}) \quad (5)$$

as the domestic rate of inflation purged of the real exchange rate effect allows us to rewrite the original open-economy Phillips curve as

$$\pi^{REX}_t = \beta E_t\pi^{REX}_{t+1} + \kappa y_t + u_t. \quad (6)$$

Written in this form, Eq. (6) looks like a standard closed-economy Phillips curve. The IS and UIP condition can be rewritten in terms of the real-exchange-rate-adjusted rate of inflation as well:

$$y_t = E_t y_{t+1} - a_1(R_t - E_t\pi^{REX}_{t+1}) + (a_1(b+\gamma) - a_2) \times (E_t q_{t+1} - q_t) + a_3(y^f_t - E_t y^f_{t+1}) + v_t \quad (7)$$

$$R_t - E_t\pi^{REX}_{t+1} = R^f_t - E_t\pi^f_{t+1} + (1+b)(E_t q_{t+1} - q_t) + \varepsilon_t. \quad (8)$$

Society is concerned about fluctuations in the output gap and real-exchange-rate adjusted inflation.[6] Under optimal policy from a timeless perspective, the central bank minimizes the squared deviations from target in both target variables:

$$\min_{y_t,\pi^{REX}_t,R_t} \frac{1}{2}E_t\left[\sum_{i=0}^{\infty}\beta^i[y^2_{t+i} + \mu\pi^{REX\,2}_{t+i}]\right] \quad (9)$$

subject to

$$\pi^{REX}_t = \beta E_t\pi^{REX}_{t+1} + \kappa y_t + u_t$$

and

$$y_t = E_t y_{t+1} - a_1(R_t - E_t\pi^{REX}_{t+1}) + \frac{(a_1(b+\gamma) - a_2)}{1+b} \times (R_t - E_t\pi^{REX}_{t+1} - R^f_t + E_t\pi^f_{t+1} - \varepsilon_t) + a_3(y^f_t - E_t y^f_{t+1}) + v_t.$$

As neither the IS relation nor the UIP condition serves as a binding constraint the first-order conditions are:

$$y_{t+i} + \lambda_{1,t+i}\kappa = 0 \quad i = 0, 1, 2\ldots \quad (10)$$

$$\mu\pi^{REX}_{t+i} + \lambda_{1,t+i-1} - \lambda_{1,t+i} = 0 \quad i = 0, 1, 2\ldots \text{ and } \lambda_{1,t-1} = 0. \quad (11)$$

Eliminating the Lagrange multiplier by combining Eqs. (10) and (11) yields the target rule which, barring the definition of the rate of inflation, is the same as in the closed economy.

$$y_t - y_{t-1} + \mu\kappa\pi^{REX}_t = 0. \quad (12)$$

The dynamic form of the optimal target rule (12) relates the change in the output gap to the inflation rate. Consequently, it can be rewritten in terms of an equivalent *static* rule that links the output gap to the REX price level:

$$y_t + \mu\kappa p^{REX}_t = 0. \quad (13)$$

[2] With the exception of Eq. (1), the model conforms to the standard open economy New Keynesian framework proposed by Gali and Monacelli (2005). Eq. (1) is explained presently.

[3] In Gali and Monacelli (2005) firms set domestic prices as a mark-up over marginal cost only. The effect of competitiveness vis-à-vis foreign firms receives support from surveys (Greenslade and Parker, 2012; Parker, 2013) as well as from micro data (Bunn and Ellis, 2012a,b). The derivation of the open economy Phillips curve is explained in Froyen and Guender (2013).

[4] The formation of optimal monetary policy is described in the context of a linear–quadratic framework which is rather standard in the New Keynesian literature (Woodford (1999) for a closed economy and Gali and Monacelli (2005) for an open economy). Woodford's framework is termed as the "timeless perspective" because it abstracts from any particular initial period. This property sets policymaking under the timeless perspective apart from optimal policy under commitment in other Ramsey-type analyses. Faia and Monacelli (2008) apply an alternative Ramsey-type analysis to consider optimal monetary policy in a cashless small open economy.

[5] Similar to Ball's (1999) definition of long-run inflation. However, his definition involves the level and not the change of the real exchange rate.

[6] Ideally, the central bank maximizes the expected utility of a representative household. In this context, Kirsanova et al. (2006) show that the objective function of a central bank must include not only the output gap and domestic inflation but also the real exchange rate. By choosing REX inflation as a target variable, the central bank mitigates this concern.