Monetary policy trade-offs in an estimated open-economy DSGE model

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ABSTRACT

This paper studies the trade-offs between stabilizing CPI inflation and alternative measures of the output gap in Ramses, the Riksbank's estimated dynamic stochastic general equilibrium (DSGE) model of a small open economy. Our main finding is that the trade-off between stabilizing CPI inflation and the output gap strongly depends on which concept of potential output in the output gap between output and potential output is used in the loss function. If potential output is defined as a smooth trend this trade-off is much more pronounced compared to the case when potential output is defined as the output level that would prevail if prices and wages were flexible.

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1. Introduction

In this paper, we use an estimated open economy model to study the trade-off between stabilizing CPI inflation and the output gap, and trade-off depends on alternative definitions of the output gap. Specifically, we compare variance trade-offs under optimal monetary policy and under an estimated instrument rule. We do this analysis in Ramses, the main model used at Sveriges Riksbank for forecasting and policy analysis. Ramses is a small open-economy dynamic stochastic general equilibrium (DSGE) model estimated with Bayesian techniques and is described in Adolfson, Laséen, Lindé, and Villani, ALLV henceforth, (2007a, 2008).

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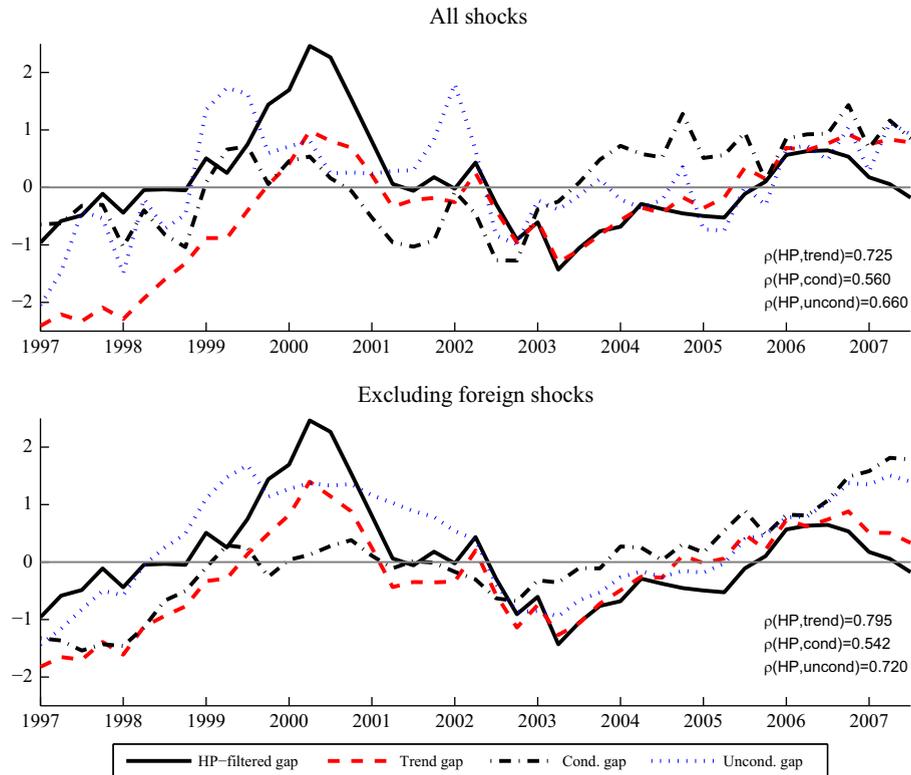   E-mail address: jesper.l.linde@frb.gov (J. Lindé).

Fig. 1. Output gaps for Sweden 1997Q1–2007Q3 using different measures of potential output.

The notion that alternative definitions of the output gap can have important implications for the conduct of monetary policy is visualized in Fig. 1, which depicts one statistical and three model-based output gaps in Sweden 1997–2007.[1] As expected, the correlation is highest between the statistical HP-filtered output gap and the model trend output gap (where the trend is the model's unit-root technology shock). Even so, the upper panel of the figure demonstrates that the correlation between the routinely used statistical HP-filtered output gap and all three model based gaps is well below unity, and that their variances are also clearly different.[2] By implication, adhering to one of these measures should have non-trivial implications for monetary policy.

We define optimal monetary policy as a central bank that minimizes an intertemporal loss function under commitment. We assume that the central bank adopts a quadratic loss function that corresponds to flexible inflation targeting and is the weighted sum of three terms: the squared inflation gap between the 4-quarter CPI inflation and the inflation target, the squared output gap (measured as the deviation between output and potential output), and the squared quarterly change in the central banks policy rate. To get an idea about how inefficient the empirically estimated rule is compared with optimal policy and about the policy preferences implied by the estimated rule, we compare the optimal policy with policy following the estimated instrument rule.

The definition of potential output is important since this latent variable is used to compute the output gap (the difference between output and potential output) in the loss function. A conventional measure of potential output is a smooth trend, such as the result of a Hodrick–Prescott (HP) filter. A second definition of potential output, promoted in the recent academic literature, is defined as the level of output that would prevail if prices and wages were flexible, see for instance Woodford (2003) and Galí (2008). This latter measure of potential output is in line with the work of Kydland and Prescott (1982), since it incorporates efficient fluctuations of output due to technology shocks.

Using an approach similar to ours, subsequent work by Justiniano et al. (2013), and Edge et al. (2008) present measures of potential output for the US economy within closed-economy frameworks. Justiniano et al. (2013) study the inflation and

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[1] We use Swedish data on seasonally adjusted GDP per capita 1980Q2–2007Q3 as our measure of output. Potential output computed with the HP-filter uses a smoothing coefficient of $\lambda = 1600$ on actual data, whereas the trend, flexible price conditional and unconditional potential output is computed via Kalman filtering techniques using the estimated model in Section 2. Exact definitions of the various concepts of potential output in the model are provided in Section 2.1.5.

[2] The correlation coefficients between the HP-filtered output gap and the estimated DSGE model's output gaps are not computed on data after 2005Q4 to avoid the well-known endpoint problems of the HP-filter (which causes the HP-filtered gap to drop notably towards the end of the sample in Fig. 1).