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Monetary policy responses to the exchange rate: Empirical evidence from the ECB☆

İshak Demir

Department of Economics, Bilkent University, 06800 Ankara, Turkey

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ABSTRACT

The exchange rate is an important part of the transmission mechanism in the determination of monetary policy because movements in the exchange rate have significant effect on the macroeconomy. It can be difficult to measure the reaction of monetary policy to the movements of the exchange rate, due to the simultaneous response of monetary policy to the exchange rate and the possibility that both variables respond to several other variables. This study addresses these problems by using an identification method based on the heteroscedasticity in the high-frequency data. The results in this paper suggest that the ECB systematically responds to exchange rate movements but that quantitative effects are small. Such a significant but small reaction coefficient seems consistent with the hypothesis that the central banks do not target the fluctuations in the exchange rate but consider them only to the extent they impact on the expected inflation and output path.

"… *it is clearly not opportune to introduce asset prices into a monetary policy rule the central bank should commit to or in the central bank's reaction function.*" Jean-Claude Trichet (2002).

1. Introduction

There are three main channels through which the exchange rate affects the macroeconomy. Appreciation lowers real GDP because of expenditure switching, and further, it lowers inflation because the price of imported goods does not increase as rapidly with the appreciation of the currency (Taylor, 2001). Secondly, changes in the exchange rate also generate wealth effects that may have a significant impact on consumption and investment, both of which are components of aggregate demand. Because of households' inter-temporal smoothing behavior, a direct decrease in net wealth may lead to a drop in consumption. Lastly, depreciation can increase the value of collateral which may reduce agents' external financing constraints and enhance final spending in accordance with the "broad credit channel".

Because of these important impacts of the exchange rate on aggregate demand, output and inflation, which are components of policy rule, there may be a relationship between exchange rates and monetary policy rules. The main objective of this paper is to measure the response of monetary policy to the exchange rate in the Euro area and try to determine the role of the exchange rate in monetary policy.

Although the monetary policy response to exchange rates has largely been studied in the empirical literature, there are some difficulties in measuring this effect. To begin with, while monetary policy is affected by changes in exchange rate, the exchange rate also responds to the changes in the monetary policy; i.e. there is a simultaneous response of both variables to each other, so, the direction of causality is difficult to establish. Moreover, there are other unobservable common factors affecting both short term interest rates and exchange rates, such as macroeconomic news and change in the risk preference. Hence, measurement is complicated due to the endogeneity problem and the possibility of relevant variables being omitted.

There is considerable empirical literature on the exchange rate in a policy rule. However, general empirical studies ignore the endogeneity problem and eliminate numerous factors affecting interest rates and exchange rates. Most of them use the least square, two stages least square, VAR and IV approaches to estimate the response of interest rates. But these approaches cannot appropriately solve the problems mentioned above. Least square results are strongly biased; there are no obvious restrictions to identify monetary policy shocks in the VAR framework; and lastly, it is hard to find a proper instrument which affects the exchange rate without affecting interest rates. In this study, to address these problems, we apply a new identification approach developed by Rigobon (2003a), which argues that the response of monetary policy is based

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E-mail address: i.demir@mail.bbk.ac.uk.

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on the heteroscedasticity of exchange rate shocks. In particular shift in the importance of the exchange rate shocks relative to the monetary policy shocks thereby estimated changes in variance–covariance matrix between shocks make measure the responsiveness of monetary policy to exchange rate possible. Heteroscedasticity based identification is a relatively new method and this paper presents the first study to employ this approach to measure policy reactions to the exchange rate movements for ECB data.

The impact of asset prices on the conduct of monetary policy debates has increased over the last decade. Taylor (2001) argues that a monetary policy rule that reacts directly to the exchange rate, as well as to inflation and output, sometimes works worse than policy rules that do not react directly to the exchange rate. However, Bernanke and Gertler (1999, 2001) argue that monetary policy should react to asset price movements only to the extent warranted by their impact on expected inflation. On similar lines, Rigobon and Sack (2003) find that the Federal Reserve reacts significantly to changes in the stock market. Their findings suggest that policy-makers are reacting to asset price movements to the extent warranted by their implications for the economy. In the context of discussing the impact of asset prices on monetary policy, Jean-Claude Trichet, governor of the ECB from 2003 to 2011, stated that financial indicators (stock prices, housing prices, exchange rates) are also analyzed in depth and they are assessed in the context of maintaining price stability over the medium term: the ECB does not react to their signals unless price stability is endangered. Conversely, the empirical findings of this paper indicate that the ECB responds systematically to the exchange rate movements and the reaction coefficient is significantly negative but small. Since the estimated policy reaction coefficient is within reasonable range of the magnitude, it appears that the ECB reacts to exchange rate fluctuations only to offset the expected impact of exchange rate shocks on inflation and output.

The paper proceeds as follows. Section 2 briefly describes the relevant studies in the literature and the contribution of this paper. Section 3 discusses the problems of simultaneous equations and omitted variables and demonstrates why other widely used identification methods are inappropriate in this context. Also, this section describes the identification approach based on the heteroscedasticity of exchange rate shocks. Section 4 gives information about the data and contains the empirical results. It also argues the policy implications of empirical results. Section 5 concludes with a summary.

2. Background

The movements in the exchange rate in monetary policy rules are discussed in the theoretical and empirical literature. Ball (1999, 2002) argues for the role of exchange rate in inflation targeting frameworks for closed and open economies. He found that pure inflation targeting without considering the exchange rate is dangerous, because it causes large fluctuations in output. The effect of exchange rates on inflation through import prices is the fastest channel and so inflation targeting implies that it is used aggressively. However, large shifts in the exchange rate create oscillations in output. Ball found that, holding the standard deviation of output relative to potential output constant (at 1.4%), the interest-rate rule that reacts to the exchange rate as well as to output and inflation reduces the standard deviation of the inflation rate around the inflation target from 2.0% to 1.9% (Ball, 1999 p. 134) compared with a rule that reacts only to inflation and output. But this improvement is small. He suggests that policy rules in open economies should be modified to include information about the exchange rate. He uses a policy instrument — namely Monetary Condition Index (MCI), a weighted average of the interest rate and the exchange rate. Central banks should choose "long-run inflation targeting": a measure of inflation adjusted to filter out the effects of exchange rate.

Taylor (2001) examines the exchange rate as a candidate for a monetary policy rule for the ECB in the form suggested in Ball's (1999) studies. He argues that a monetary policy rule which responds directly to the exchange rate, as well as to inflation and output, sometimes works worse than policy rules without reference to the exchange rate. In his 2002 study, however, Taylor indicates that the monetary policy in open economies is different from the policy in closed economies. Central banks seem averse to significant variability in exchange rates. They should target a measure of inflation that removes the transitory effects of exchange rate fluctuations as Ball (2002) suggests and they should also contain the exchange rate in their policy rules.

On the other hand, the results of empirical studies focusing on policy rules with exchange rates are quite controversial with theoretical studies mentioned above. Clarida et al. (1998) show that monetary policy responds to the exchange rate in industrial countries, but the magnitude of the monetary policy reaction is small. Along the same lines, Osawa (2006) estimates monetary policy reaction functions to examine whether monetary policy responds to fluctuations in the exchange rate under the inflation-targeting regimes in Korea, Thailand and the Philippines using two stage least squares and ordinary least squares (OLS). He finds no evidence that monetary policy reacts to the exchange rate. Inclusion of the Asian financial crisis period overestimates the monetary policy reaction because exchange rate and interest rate are fluctuated widely during the crisis period. For the same countries, Sek (2008) apply a GMM and structural VAR to investigate the relationship between exchange rates and monetary policy. The results of these approaches are consistent with each other, i.e. the monetary policy reactions in Philippines and Korea do not response significantly to exchange rate directly. But they only find a strong reaction of policy in Thailand to exchange rate fluctuations in the pre-crisis period. The results in these empirical papers are in accord with the results in Ball (1999) and Taylor (2001).

On the other hand, Filosa (2001) finds that many central banks in emerging countries react strongly to exchange rate movements, although changes in the monetary policy regime make it difficult to assess the relative importance placed by countries on inflation control and external equilibrium. Mohanty and Klau (2005) also find a strong response of monetary policy to exchange rates for Asian countries by focusing on quarterly data between 1995 and 2002. Lastly, Frömmel and Schobert (2006) estimate a Taylor rule for six European countries. They point out that the exchange rate plays an important role in the monetary policy during the fixed exchange rate regime periods. However, this impact disappears after the introduction of flexible regimes.

Most of the empirical studies in the literature do not address the endogeneity problem and the numerous factors affecting interest rates and exchange rates simultaneously. Therefore, they cannot appropriately separate out the response of monetary policy to the exchange rate. This paper aims to come up with unbiased estimates with the heteroscedasticity based identification approach.

3. Statement of the problem and methodology[1]

In this paper, in order to overcome endogeneity between exchange rates and interest rates, we use an identification method suggested by Rigobon (2003a). This method relies on the heteroscedasticity in interest rates and exchange rates to identify the monetary policy reaction to the exchange rate. Shifts in importance of exchange rate shocks relative to monetary policy shocks change the covariance between the exchange rate and policy rate. It allows us to identify the interest rate reaction to fluctuations in exchange rate based on changes in covariance.

The data suggest that shifts in the variance of shocks affect the correlation between changes in interest rates and exchange rates. Fig. 1 shows the correlation between daily changes in the exchange rate and daily changes in the short-term interest rate. Note that the correlation varies but mostly becomes negative during periods in which the volatility of exchange rates increased.

[1] The equations used in this section are inspired by RS (2003b).