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Systematic Monetary Policy and the Effects of Exchange Rate Shocks

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Exchange rate shocks generally induce an endogenous response of monetary policy. However, increasing in exchange rates generally result in a higher interest rate with lower growth (expectations). It is argued that important part of this contractionary effect rising from the endogenous response of monetary policy to the shock. We take this debate as our starting point and conduct a VAR analysis with Turkish data by decomposing the total effects of a given exogenous exchange rate shock into the portion attributable directly to the shock itself and the part arising from the interest rate response to this shock. Due to endogenous response of monetary policy, rising interest rates is the main factor behind the lower growth and inflation. We find that half of the recessionary impact of an exchange rate shock results from the endogenous tightening of monetary policy.

Keywords: Exchange Rate, Monetary Policy, VAR based Simulation.
JEL Codes: E52; E58

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1 Introduction

Exchange rate stability has always been deemed as a key element of economic stability especially for emerging market economies (EMEs). However, after the global financial crisis, exchange rates started to play even more critical role in the monetary policy decisions of EMEs. This is mainly because currency appreciation threatens not only price stability but also financial stability.

Accordingly, it is clear that there are definite motives for central banks to be concerned about the impact of heightened exchange rate volatility. However, the answer to the question of “How should policymakers respond to such shocks?” is not clear yet. EMEs have employed various tools to influence the stability of exchange rates: aggresive policy rate adjustment, intervention; administrative measures and restrictions on capital inflows. Nevertheless, EMEs recently started to rely more on non-monetary policy tools. One motive for this is that responding with monetary policy recalls its wide spectrum on economy and varying impacts on macroeconomic variables of growth and inflation. Thus, our objective is to improve the understanding of the endogenous role of monetary policy in the case of an exchange rate shock and show how crucial role the monetary policy plays.

In line with our objective, we shed light for the transmission mechanism of Turkey as an EME implementing inflation targeting along with floating exchange rate regime. Turkish case is interesting as Turkey made use of many non-monetary policy tools after the global financail turmoil to ensure stability of the foreign exchange: interventions through outright FX sales, reserve option mechanism, prohibition of banks’ lending in FX to individuals, interest rate corridor interval modifications as a barrier on short-term capital inflows[1]. In order to dampen the fluctuations, Central Bank’s first choice was always to use those tools as interest rate adjustment was generally conceived as the last resort. However, in January 2014, Turkish Central Bank (CBT) was left with the only option of increasing its policy rate after utilizing all other tools, and CBT more than doubled its policy rate. On one hand, such a huge hike was inevitable to end the panic in the market. On the other, it was criticized harshly since a smaller hike could be sufficient if this decision had been taken earlier.

[1] For further information, see Aktas and Cortuk(2012)

So, how and when to take the optimal decision given the uncertainties with regard to monetary transmission? To give an accurate answer to this question, one needs to know what an exchange rate shock brings in terms of growth and inflation depending on the monetary policy stance.

Accordingly, our paper tries to separate the direct effects of exchange rate shocks from their indirect effects operating through the monetary policy response. Our findings show that systematic component of monetary policy accounts for half of the total effect of the exchange rate shock on output. In the next two sections, we provide an overview of the literature and our methodology respectively. We present the estimation results in Section 4 and conclude in Section 5.

2. Literature

The literature on monetary policy reaction functions incorporating the exchange rate is relatively limited especially for the period before the global financial crisis. Taylor (2001) reviews the literature and finds that monetary policy reaction functions including the exchange rate can result in only modest improvements in terms of output and inflation outcomes in standard small open economy macro models. Alternatively, Corsetti and Pesenti (2005) demonstrate that using monetary policy to reduce exchange rate volatility may be welfare enhancing, even it leads to increased output gap volatility. Meanwhile, Mohanty and Klau (2004) test whether central banks in EMEs react to changes in the exchange rate in a consistent and predictable manner and find that the interest rate responds strongly to the exchange rate in most EMEs.

In the aftermath of the international financial crisis, the issue has become more critical and complicated for central bankers. Both short and long-term interest rates in EMEs have become more responsive to foreign financial conditions. Rising inflation and currency appreciation pressures in many EMEs poses a particular challenge, as monetary policy now faces a more difficult trade-off between price stability and exchange rate stability. Filardo et al (2011) discussed that central banks in EMEs have been managing the value of their currencies more actively via some combination of monetary and non-monetary policy tools since the global financial crisis. Several other researches[2] address the concerns with regard to exchange rates when setting monetary policy responses. Their main conclusion is that policy

[2] e.g.Aizenman et al (2011), Garcia et al (2011)

rates are critical in addressing these challenges. Similarly; Gadanecz, Miyajima and Urban (2014) show that EME central banks can increase the effectiveness of their monetary policy by taking into account the exchange rate in their interest decision rules.

3. Methodology

To analyze the role of the endogenous monetary policy in the transmission mechanism, we perform a VAR analysis. We use five variables to model the transmission mechanism namely log of Industrial Production Index (IPI), log of Consumer Price Index (CPI), log of exchange rate, short term interest rate and country spread.[3] We use Choleski decomposition to identify the shocks by imposing lower triangular structure.

Our empirical model can be represented as a second order VAR system[4];

$$A\begin{bmatrix} ip_t \\ cpi_t \\ exc_t \\ int_t \\ embi_t \end{bmatrix} = B_1\begin{bmatrix} ip_{t-1} \\ cpi_{t-1} \\ exc_{t-1} \\ int_{t-1} \\ embi_{t-1} \end{bmatrix} + B_2\begin{bmatrix} ip_{t-2} \\ cpi_{t-2} \\ exc_{t-2} \\ int_{t-2} \\ embi_{t-2} \end{bmatrix} + \begin{bmatrix} e_t^{ip} \\ e_t^{cpi} \\ e_t^{exc} \\ e_t^{int} \\ e_t^{embi} \end{bmatrix}$$

where ip_t denotes the industrial production index, cpi_t denotes consumer prices index, exc_t denotes exchange rate, which is taken as EUR/TRY and USD/TRY basket, int_t denotes short term nominal interest rate which is taken as Banks Association of Turkey's one month rate and $embi_t$ denotes country spread which is proxied by JP Morgan's EMBI+ sovereign spread. Consumer prices, industrial production and exchange rates are taken from EDDS[5] whereas one month interest rates and EMBI Spread are obtained from Bloomberg[6]. Yet, none of the variables are stationary in levels, whereas they all become stationary in first differences. However, VAR can still be estimated in level consistently since variables are cointegrated at the 5%

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[3] As a generally accepted practice, we include the country spread variable in order to eliminate the exchange rate puzzle. For emerging markets, Blanchard (2003) and Favero and Giavazzi (2004) clearly show that a tighter monetary policy would increase the probability of default via the concerns on debt sustainability. In this case, the uncovered interest parity condition can operate in an unconventional fashion: increases in interest rates may lead to a currency depreciation.

[4] Number of lags is set to 2 as indicated by FPE, AIC and HQ.

[5] Central Bank of the Republic of Turkey Electronic Data Delivery System.

[6] Since IPI and CPI series show seasonal patterns, we filter both series by Census X12.

significance level. We estimate our VAR(2) model with montly data of 200601 - 2015:12.

According to our ordering, the standard recursive identification restriction imposed assumes that financial variables are contemporaneously affected by the macroeconomic variables, while macro variables are affected from the financial variables with a one-period lag. It is reasonable to assume that it requires time lag for macroeconomic variables to respond to financial variables.[7]

From this baseline model, we derive the impulse responses of the variables to an exchange rate shock. Such responses give the total effect of an exchange rate shock on other variables, including the indirect effect through the interest rate.

The second step is to simulate the consequences of an exchange rate shock in an counterfactual experiment. Thus, we specify an alternative path for interest rate in a manner analogous to the “shut down” approach of Sims and Zha (1995) and Bernanke, Gertler and Watson (1997). In this approach, the response of the interest rate is shut down by setting the coefficients of the exchange rate as zero in the interest rate equation. The impulse responses of the other variables are simulated under this restriction. The differences between the estimated effect of an exchange rate shock on output and inflation in the baseline model and that in the counterfactual experiment are interpreted as a measure of the contribution of the endogenous monetary policy[8].

4. Estimation Results

4.1. Model Impulse Responses

Figure 1 and 2 display the responses of all variables to one percentage increase in interest and exchange rate shocks respectively[9]. As expected; output,

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[7] Ordering between financial variables does not change our results significantly.

[8] This kind of experiment, where most equations are held fixed while some are changed, is obviously subject to the Lucas Critique since we are ignoring the fact that agents modify their expectations and behave differently under new conditions. In order to accommodate the Lucas Critique, Sims and Zha (1995) argue that since the agents are conditioned by past experiences and reluctant to initiate an arduous learning process, it takes some time for agents to learn that the apparently permanent condition may be quite otherwise. The Lucas Critique may not be a major concern in the experiment that is conducted in this section, especially for short run analysis.

[9] The central line shows the responses, the other two dashed lines show 90 % confidence intervals.

inflation and exchange rate fall and sovereign spread rises after an interest rate shock (Figure 1).[10] For the exchange rate shock, increase in exchange rate causes interest rate and inflation to rise (Figure 2). On the other hand, there is a temporary fall in output after the exchange rate shock which can be partially explained by the contractionary effect of increasing interest rates. Besides, country spread also rises contemporanously after the exchange rate shock[11].

4.2. Counterfactual Experiment Impulse Responses

Figure 3 illustrates the the counterfactual experiment in response to an exchange rate depreciation shock. Accordingly, the recessionary impact of this shock is reduced and inflationary impact is magnified as anticipated. Similarly, it can be inferred from the cumulative impulse responses in Figure 4 that roughly half of the decreasing effect on output comes from the endogenous response of monetary policy at the fifth month. After that, the exchange rate shock effect on output becomes statistically insignificant. Meanwhile, shutting down the monetary policy causes inflation to be 20% higher at the fifth month and two times higher at the end of second year.

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[10] There are lots of studies mention that increases in interest rates further increase the probability of default and thus lead to increased country spread. (Blanchard 2004 and Favero and Giavazzi 2004)

[11] This effect can be explained by the higher risk premium due to decreasing output and increasing interest rates after the exchange rate shock.

5. Conclusion and Policy Recommendations

Analyzing the role of exchange rate shock on economic activity is of fundamental importance to monetary authority if its goal is to achieve price stability and sustainable economic growth. Given the recently increasing exchange rate volatility in EMEs, it is vital for the monetary authority to understand the linkage between exchange rate with the economic activity and the role of systematic interest rate policy response in monetary transmission mechanism. This study investigated the impact of endogenous response of monetary policy on economic activity for Turkey, in the case of an exchange rate shock. Given such shock, we could quantify the impact of the endogenous response of monetary policy on output and inflation. This is crucial for an EME in choosing its tools and the balance given the shock and the priorities.

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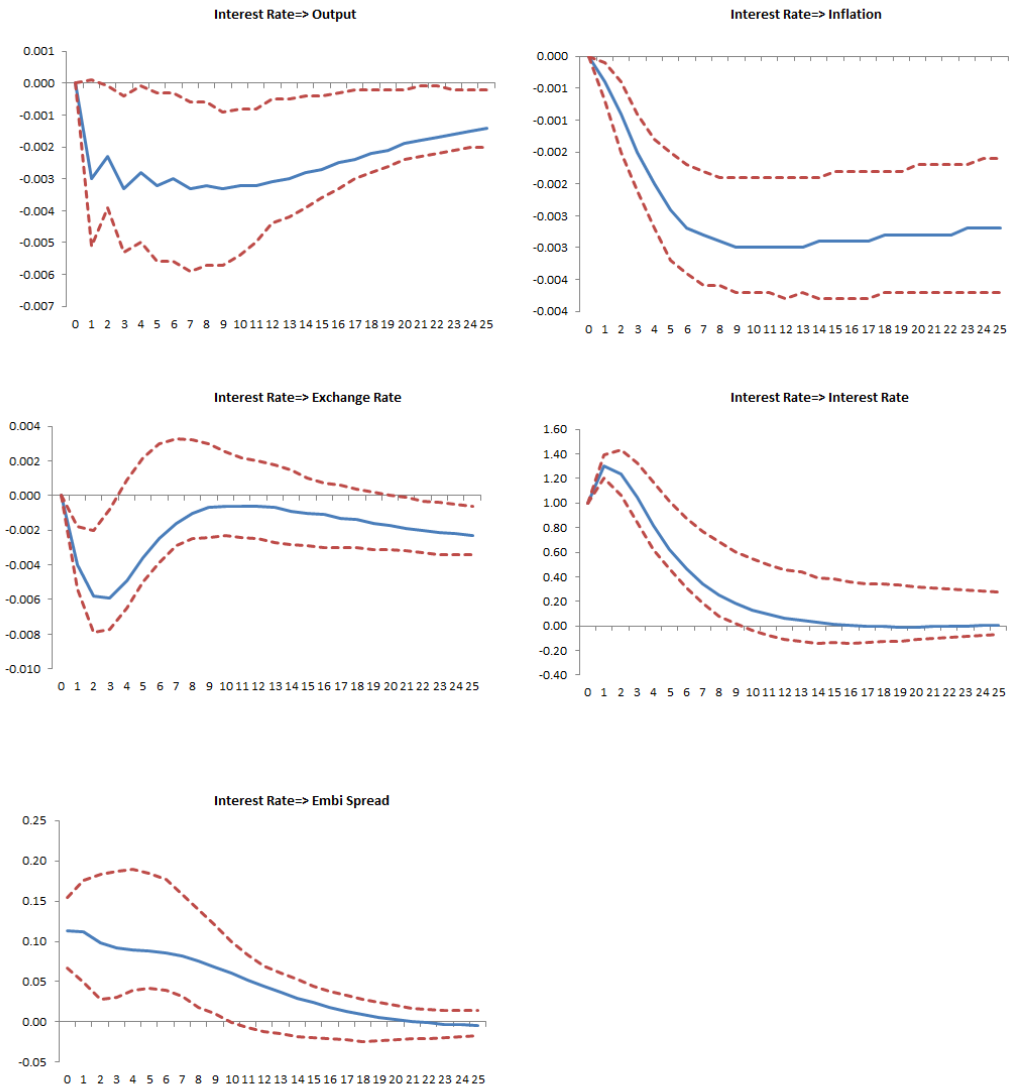
Appendix:

Figure 1: IRFs for Interest Rate Shock[12]



[12] Dashed lines represent 90% percent coinfidence intervals of the responses

Figure 2: IRFs for Exchange Rate Shock[13]

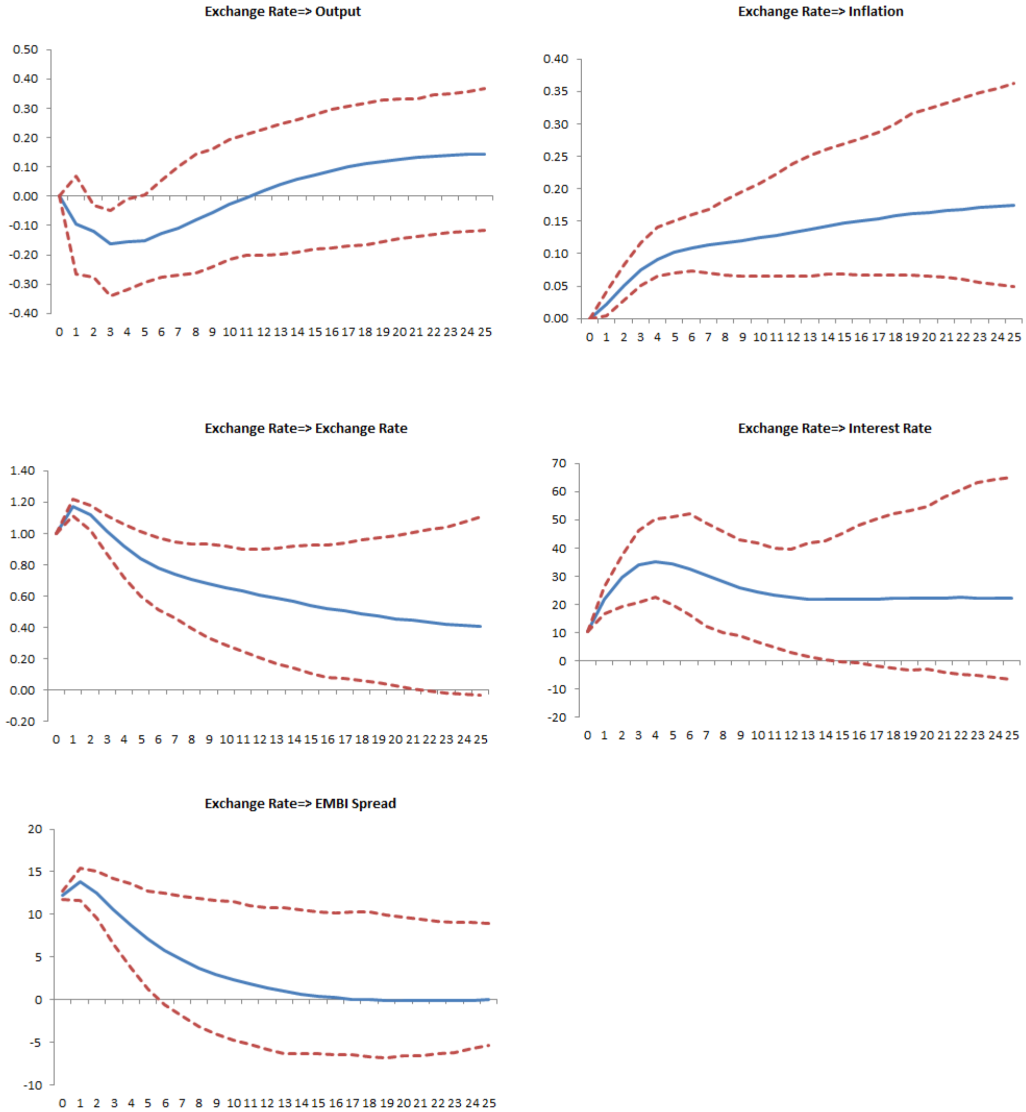


Figure 3: Counterfactual Experiment: IRFs' for Exchange Rate Shock[14]

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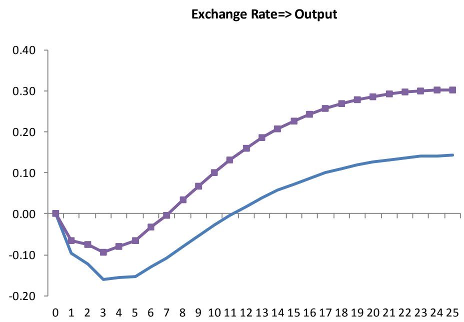
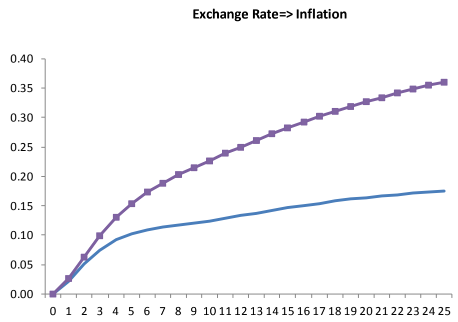
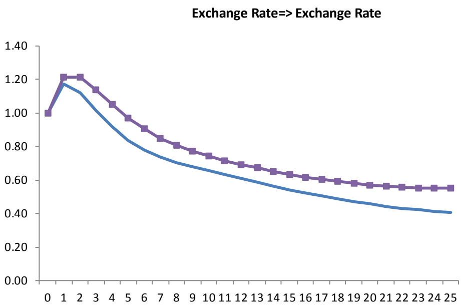
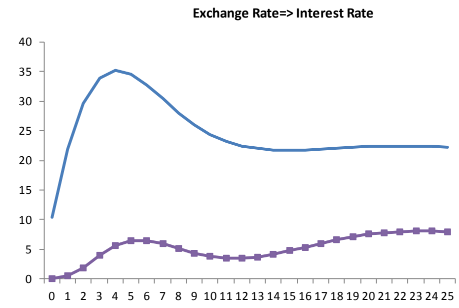
[13] Dashed lines represent 90% percent coinfidence intervals of the responses.

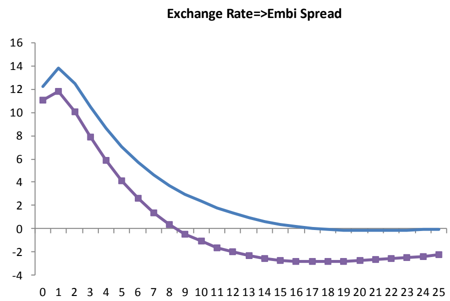
[14] Solid lines represent the responses of the benchmark model whereas the lines with squares





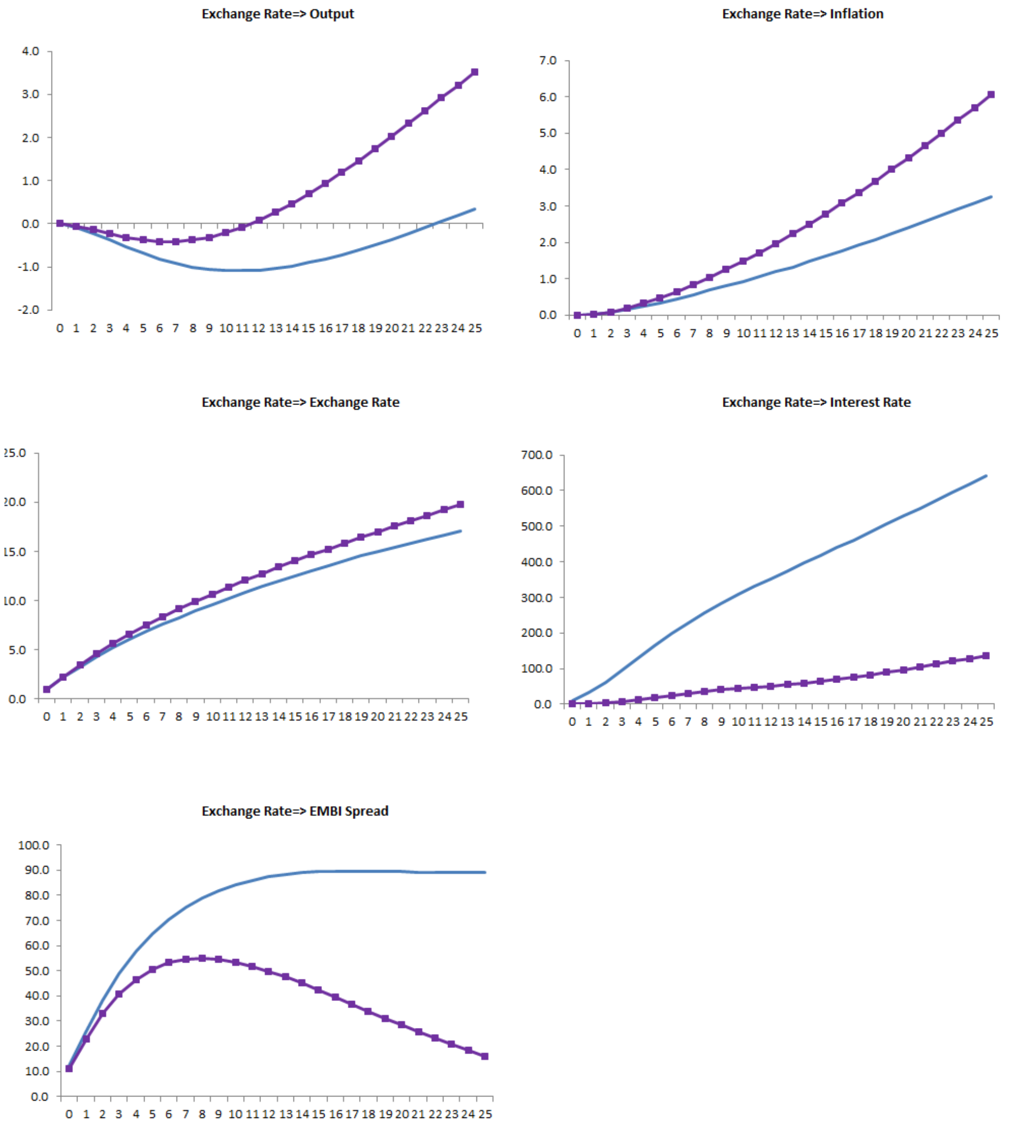






represent the simulated model responses.

Figure 4: Counterfactual Experiment**:** Cumulative IRFs' for Exchange Rate Shock[15]



[15] Solid lines represent the responses of the benchmark model whereas the lines with squares represent the simulated model responses.