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EXCHANGE RATE RISK AND BUSINESS CYCLE DYNAMICS

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Hayk Kamalyan, PhD
Manoogian Simone College of Business and Economics
American University of Armenia

Vahagn Davtyan
Central Bank of Armenia

Key Findings

- Exchange rate volatility is an important source of short-run fluctuations
- The impact of exchange rate volatility shock is contractionary
- For some countries, elevated exchange rate volatility has a stagflationary effect, while for the others, the effect is stagnationary

Acknowledgement: The views expressed are those of the authors. They do not necessarily reflect those of the Central Bank of Armenia and should not be reported as such.

This work aims to study the effects of exchange rate risk/volatility on business cycle dynamics and consider the implications of using exchange rate uncertainty as an unconventional policy tool. The volatility of the nominal exchange rates has significantly increased after the fall of the Bretton Woods agreements. As a result, exchange rate risk has become an important concern for policymakers and academics. The matter is particularly relevant for emerging market economies as they are prone to higher exchange rate uncertainty. [1] Accordingly, the analysis in the current paper is carried out for a group of large emerging countries: Argentina, Brazil, Chile, India, Russia, and Turkey. In addition, we also consider the issue for Armenia given the anecdotal evidence of the importance of exchange rate volatility for the Armenian economy.

This research is related to the growing literature that looks at the impact of uncertainty on macroeconomic behavior. Recent contributions include, among others, Fernandez-Villaverde et al. (2015), Born and Pfeifer (2014), Benigno et al. (2011), Mumtaz and Surico (2013), and Mumtaz and Zanetti (2013). The difference from these studies is that the current paper focuses on the effects of exchange rate volatility shocks. Another distinctive feature of our study is that we take volatility observed in the exchange rate data as a causal driving force and analyze its role in short-run economic fluctuations. Furthermore, to the best of our knowledge, our work is the first to consider exchange rate risk as an unorthodox policy tool. Our preliminary findings are as follows. The impact of heightened exchange rate volatility on the economy is significant. Next, for some countries, the volatility shocks are stagflationary, while the shocks generate positive co-variation between output and prices for the others.

The first part of the project presents an empirical assessment of the effects of exchange rate risk on the economy. To that end, we estimate the time-varying volatility of the exchange rate shocks[2] via Sequential Importance Resampling particle filter. [3] Table 1 reports the estimation results for the selected countries. Note that the persistence of the exchange rate shock (first-order shock) is effectively zero for all economies. This is not surprising given the fact that we extracted the structural innovations from a sign-restricted VAR model, where the residuals are free from serial correlation by

[1] Throughout the text, “uncertainty”, “volatility”, and “risk” will be used interchangeably.
[2] The identification of exchange rate shocks is achieved via sign restrictions based on a wide variety of open economy structural models. We also control for external sector variables in the estimation process.
[3] See Born and Pfeifer (2014) for detailed explanation of the estimation procedure.

construction. We can further observe that the measures of exchange rate volatility have considerable persistence. Also, the estimated values of standard deviations show substantial evidence of exchange rate uncertainty for all countries. The latter once again proves the relevance of studying the macroeconomic effects of time-varying exchange rate risk.

The historical estimates of the exchange rate volatility are next used in structural VAR models to evaluate the role of volatility shocks in short-run fluctuations. We adopt a recursive identification structure, where the volatility series are "the most exogenous" variables. Figure 1 displays the impulse response functions to a positive one-standard-deviation volatility shock. The figure shows that the economic activity shrinks in all economies, although the overall effects of increased volatility vary from country to country. At the same time, increased future uncertainty depreciates the nominal exchange rate in all economies. In fact, the transmission mechanism of volatility shocks is different from those of interest rate and exchange rate shocks. The figure also shows that for Argentina, Brazil, and Chile, the shock generates positive co-movement between output and prices. Meanwhile, for India, Russia, and Turkey, volatility shocks imply negative conditional co-variance between output and prices. As for the Armenian economy, elevated exchange rate risk causes a drop in inflation and output.

Preliminary Results

The main takeaways from our results are as follows. First, we confirm our hypothesis that exchange rate-related volatility has a statistically and, more importantly, economically significant impact on macroeconomic aggregates. Second, the effectiveness of using exchange rate uncertainty as an unconventional policy tool depends on the structural characteristics of a given economy. Moreover, its design is contingent on the given trade-off between real and nominal stability.

The next step of our research is to rationalize the empirical findings in an open economy DSGE model with exchange rate volatility shocks. The model will be further employed to fully assess the practical implications of using exchange rate volatility as a policy tool for short-run stabilization.

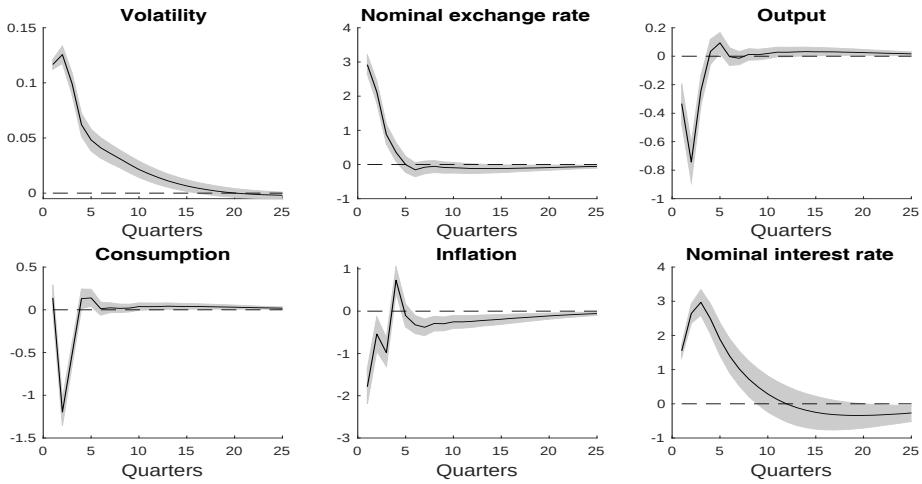
Table 1: Parameter Estimates of the Shock Processes

	Argentina	Brazil	Chile	India	Russia	Turkey	Armenia
ρ_x	-0.02 [-0.21 .018]	-0.15 [-0.35 0.16]	-0.03 [-0.24 0.17]	-0.03 [-0.22 0.17]	-0.27 [-0.46 -0.08]	0.04 [-0.17 0.27]	-0.18 [-0.37 0.01]
ρ_σ	0.89 [0.62 0.99]	0.87 [0.62 0.99]	0.79 [0.48 0.99]	0.86 [0.56 0.99]	0.81 [0.52 0.99]	0.81 [0.55 0.99]	0.93 [0.70 0.99]
η_σ	0.42 [0.30 0.55]	0.39 [0.28 0.51]	0.37 [0.26 0.50]	0.37 [0.27 0.50]	0.39 [0.28 0.51]	0.40 [0.28 0.53]	0.34 [0.25 0.46]
σ	-4.92 [-5.91 -3.88]	-5.05 [-5.94 -4.30]	-4.85 [-5.39 -4.22]	-4.55 [-5.22 -3.43]	5.03 [-5.92 -4.37]	-4.93 [-5.59 -4.26]	-4.88 [-5.71 -3.97]

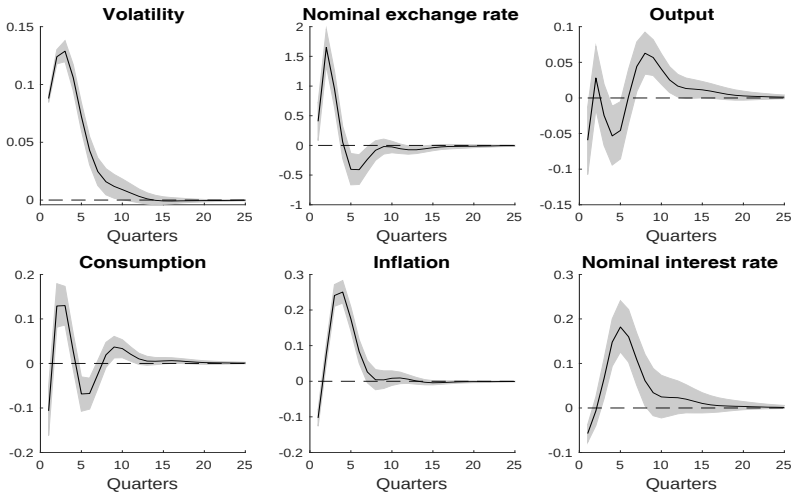
Notes: $\boldsymbol{\rho_x}$ is the persistence of the exchange rate shock process, $\boldsymbol{\rho_\sigma}$ and $\boldsymbol{\sigma}$ are the persistence and the unconditional mean of the log of the volatility process. $\boldsymbol{\eta_\sigma}$ is the standard deviation of the volatility shock. For each parameter, we report the posterior mean and, in brackets, a 90% probability interval.

Figure 1: Empirical Impulse Responses to Exchange Rate Volatility Shock

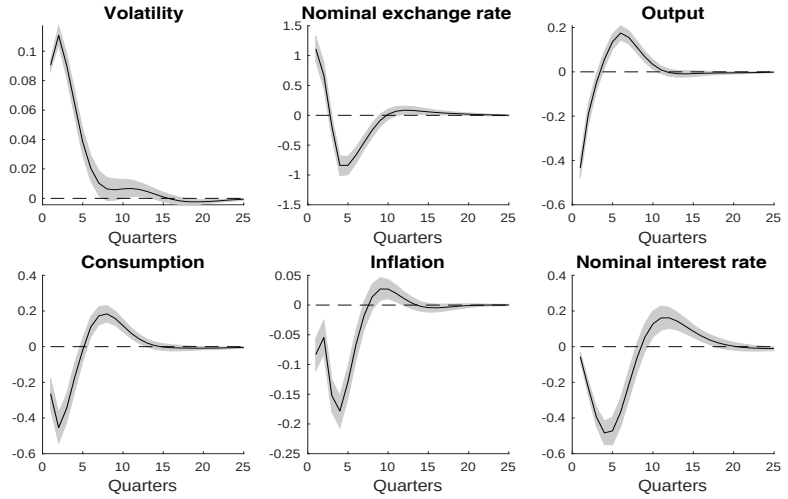
Argentina



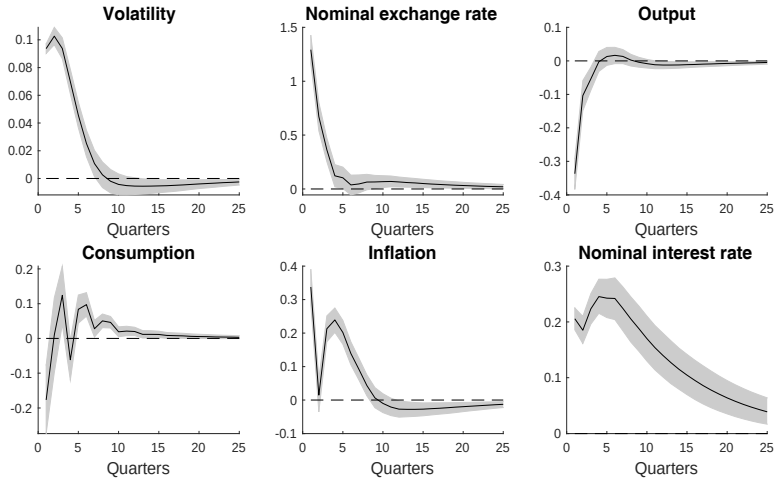
Brazil



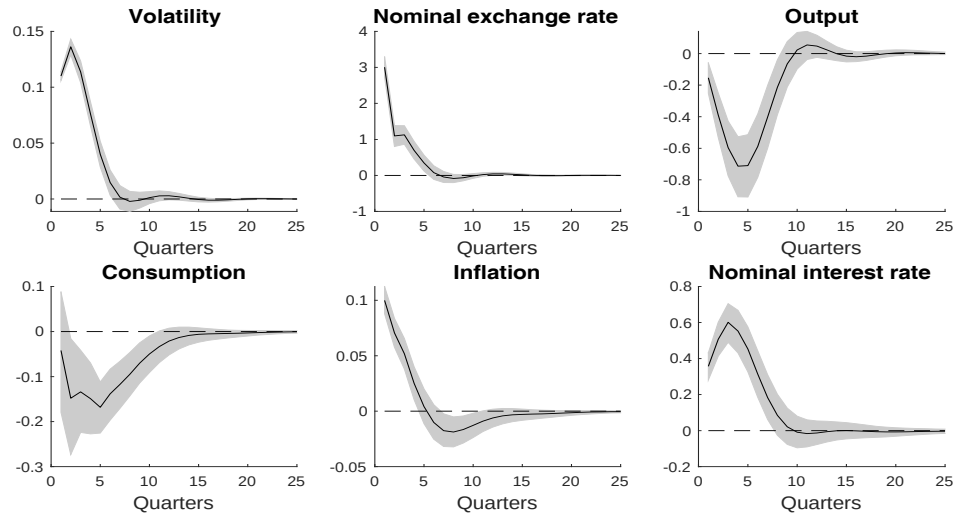
Chile



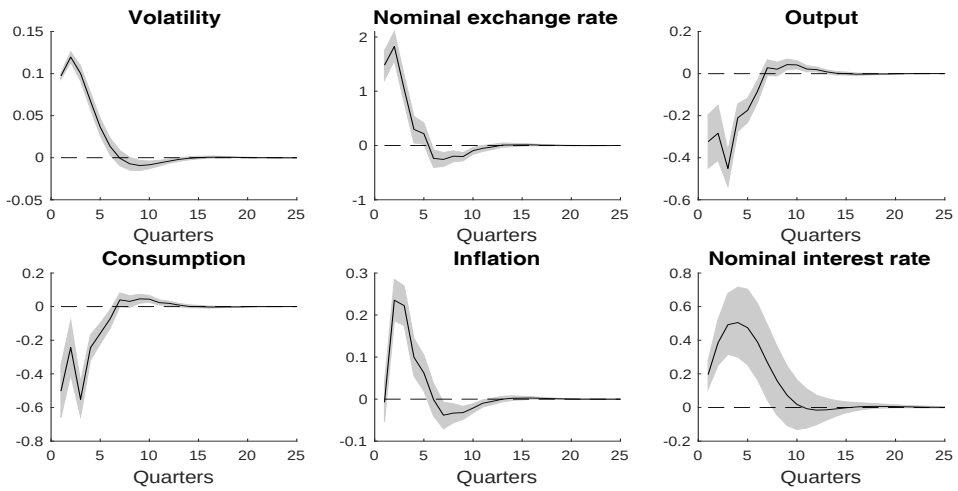
India



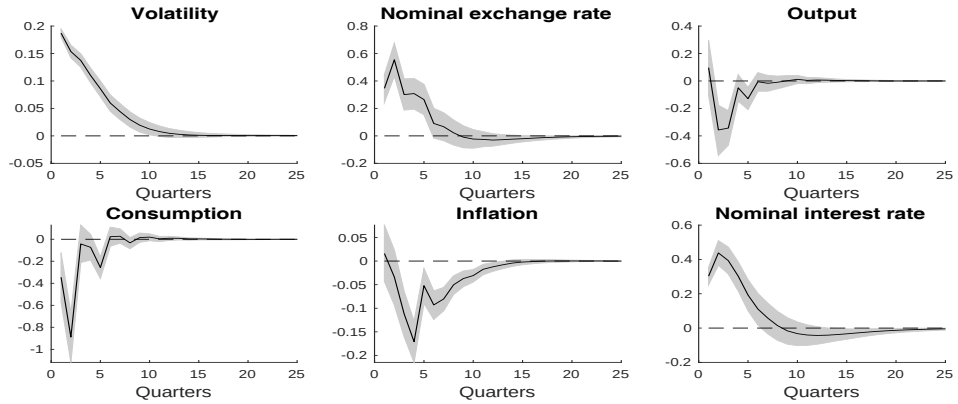
Russia



Turkey



Armenia



Notes: The responses are in percent deviations. Inflation and the interest rate are in annualized percent deviations. The confidence intervals are bootstrapped, 90 percent bands.

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