

# **Foreign exchange reserves accumulation: the implications for the banking system's balance sheet**

Alexey Ponomarenko

*Corresponding author. Bank of Russia, E-mail: PonomarenkoAA@cbr.ru.*

Sergei Seleznev

*Bank of Russia, E-mail: SeleznevSM@cbr.ru.*

## **Introduction**

In a number of emerging market economies the public sector has in recent decades accumulated sizeable cross-border financial assets, mainly in the form of central banks' foreign exchange reserves. Nonetheless, the monetary authorities in these countries have not abandoned their independent interest rate policy (i.e. the central banks continued to steer the short-term money market interest rates). To deal with the undesirable effects of foreign exchange interventions (FXIs) on the domestic monetary conditions, they have frequently resorted to sterilization operations, which can be defined in general as a set of policies designed to mitigate the impact of reserve accumulation on domestic interest rates. Even when successful in interest rate steering, such a strategy may potentially lead to economic distortions, which have been discussed in the related literature (International Relations Committee Task Force 2006, Mohanty and Turner 2006, Cook and Yetman 2012, Filardo and Grenville 2012, Filardo and Yetman 2012, Gadanez et al. 2014, Blanchard et al. 2016). We will contribute to this strand of research by analysing one aspect (which arguably receives less attention than it deserves) of such a monetary policy strategy – the balance sheet effects of that may affect the commercial banks behaviour.

## **Research theme to be addressed**

Naturally, balance sheet analysis is present in the literature on FXIs. The common approach is to examine the outcome of FXIs for reserve money and the central's bank net domestic assets (e.g. Aizenman and Glick 2009, Ouyang and Rajan 2011, Cavoli and Rajan 2015), but it only occasionally refers to broad money or credit developments. Presumably, the reason behind such an approach is the tacit existence of a stable relationship between bank reserves and broad money aggregates – the “money multiplier”. The practical applicability of this concept, however, is

questioned in the contemporary literature (Bindseil 2004, Borio and Disyatat 2009, Carpenter and Demiralp 2012).

We will therefore adopt a different concept - the bank-lending channel as formulated by Disyatat (2011). This approach emphasizes primarily the impact of monetary policy on banks' balance sheet strength and risk perception. Specifically, we will investigate whether changes in commercial banks' balance sheets liquidity<sup>1</sup> induced by central bank's FXIs may encourage banks' risk-taking.

Another relevant strand of literature that describes the effect of FXIs on banks' balance sheets is related to money creation through external transactions (see Duc et al. 2008, Chung et al. 2015, Kuzin and Schobert 2015 and Ponomarenko 2017 for a detailed discussion).

### **Methodology and relationship with existing studies**

We need a structural model for our task of policy analysis. However, as pointed out by Borio and Zhu (2012) standard macroeconomic models are not well suited to capture the risk-taking channel of monetary policy, namely the link between monetary policy and the perception and pricing of risk by economic agents. We therefore employ an agent-based approach which we think is the most appropriate strategy for our objectives. The merits of agent-based models are discussed in detail by Turrell (2016), Caiani et al. (2016), Fagiolo and Roventini (2017). We find it more convenient (compared to e.g. conventional DSGE models) to set up a stock flow consistent agent-based model that can be useful in analysing the balance effects caused by FXIs.

We intend to set-up a model focused mostly on the description of the banking sector. There are ample examples of detailed agent-based models of the banking sector in the literature (Krug 2015, Ashraf et al. 2017 and Chan-Lau 2017 among others).

The model's parameters will be estimated using the Approximate Bayesian Computation technique as outlined in Sisson and Yan (2011). We plan to apply our model to several countries which experienced large fluctuations in central banks' foreign exchange reserves (Indonesia, Malaysia, Philippines and Thailand). Hopefully, our model will be useful in forecasting money and credit developments conditional on central bank's foreign exchange reserve policy, in particular when policy change occurs. We intend to conduct the following experiment. For each country we divide the time sample into two sub-samples: the first including the periods of active reserve accumulation and the second containing the periods with little fluctuations in foreign reserves. We estimate the model using one sub-sample and attempt to project money and credit

---

<sup>1</sup> Defined in terms of such indicators as Net Stable Funding Ratio or Liquidity Creation (Berger and Bouwman 2009).

growth on another, comparing the results with the performance of standard time series model in the same exercise.

## References

Aizenman, J. and R. Glick (2009) “Sterilization, monetary policy, and global financial integration.” *Review of International Economics* 17(4): 777–801.

Ashraf, Q., B. Gershman and P. Howitt (2017) “Banks, market organization, and macroeconomic performance: An agent-based computational analysis.” *Journal of Economic Behavior & Organization* 135: 143–180

Berger A.N. and C.H.S. Bouwman (2009) “Bank Liquidity Creation.” *Review of Financial Studies* 22(9): 3779–3837.

Bindseil, U. (2004) “The Operational Target of Monetary Policy and the Rise and Fall of Reserve Position Doctrine.” ECB Working Paper Series No. 372.

Blanchard, O., J.D. Ostry, A.R. Ghosh and M. Chamon (2016) “Capital Flows: Expansionary or Contractionary?” *American Economic Review* 106(5):565-69.

Borio, C. and P. Disyatat (2009) “Unconventional Monetary Policies: An Appraisal.” BIS Working Papers No. 292.

Borio, C. and H. Zhu (2012) “Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?” *Journal of Financial Stability* 8(4): 236–251.

Caiani, A., A. Godin, E. Caverzasi, M. Gallegati, S. Kinsella and J. Stiglitz (2016) “Agent based-stock flow consistent macroeconomics: Towards a benchmark model.” *Journal of Economic Dynamics & Control* 69: 375–408.

Carpenter, S. and S. Demiralp (2012) “Money, reserves, and the transmission of monetary policy: Does the money multiplier exist?” *Journal of Macroeconomics* 34: 59–75.

Cavoli, T. and R.S. Rajan (2015) “Capital inflows and the interest premium problem: The effects of monetary sterilisation in selected Asian economies.” *International Review of Economics and Finance* 39: 1–18.

Chan-Lau, J.A. (2017) “ABBA: An Agent-Based Model of the Banking System.” IMF Working paper No. 17/136

Chung, K., J.-E. Lee, E. Loukoianova, H. Park and H.S. Shin (2015) “Global liquidity through the lens of monetary aggregates.” *Economic Policy* April: 231–290.

Cook, D. and J. Yetman (2012) “Expanding Central Bank Balance Sheets in Emerging Asia: A Compendium of Risks and Some Evidence.” BIS Papers No. 66.

- Disyatat, P. (2011) “The bank lending channel revisited.” *Journal of Money, Credit and Banking* 43(4): 711–734.
- Duc, L.B., F. Mayerlen and P. Sola (2008) “The Monetary Presentation of the Euro Area Balance of Payments.” ECB Occasional Paper Series No. 96.
- Fagiolo, G. and A. Roventini (2017) “Macroeconomic Policy in DSGE and Agent-Based Models Redux: New Developments and Challenges Ahead.” *Journal of Artificial Societies and Social Simulation*, 20(1): 1–1.
- Filardo, A. and S. Grenville (2012) “Central Bank Balance Sheets and Foreign Exchange Rate Regimes: Understanding the Nexus in Asia.” BIS Papers No. 66.
- Filardo, A. and J. Yetman (2012) “Key Facts on Central Bank Balance Sheets in Asia and the Pacific.” BIS Papers No. 66.
- Gadanecz, B., A. Mehrotra and M.S. Mohanty (2014) “Foreign Exchange Intervention and the Banking System Balance Sheet in Emerging Market Economies.” BIS Working Papers No. 445.
- International Relations Committee Task Force (2006) “The Accumulation of Foreign Reserves.” European Central Bank Occasional Paper Series No. 43.
- Krug, S. (2015) “The interaction between monetary and macroprudential policy: Should central banks "lean against the wind" to foster macrofinancial stability?” Economics Working Paper, Christian-Albrechts-Universität Kiel, Department of Economics, No. 2015-08
- Kuzin, V. and F. Schobert (2015) “Why does bank credit not drive money in Germany (any more)?” *Economic Modelling* 48: 41–51.
- Mohanty, M.S. and Turner, P. (2006) “Foreign exchange reserve accumulation in emerging markets: what are the domestic implications?” *BIS Quarterly Review* September: 39–52.
- Ouyang, A., and R.S. Rajan (2011) “Reserve accumulation and monetary sterilization in Singapore and Taiwan.” *Applied Economics* 43(16): 2015–2031.
- Ponomarenko, A. (2017) “A note on money creation in emerging market economies.” *Journal of Financial Economic Policy* 9(1): 70-85.
- Sisson, S.A. and Y. Fan (2011) “Likelihood-free Markov chain Monte Carlo.” In Handbook of Markov Chain Monte Carlo (S. P. Brooks, A. Gelman, G. Jones and X. L. Meng, eds.) 319–341. CRC Press, Boca Raton, FL.
- Turrell, A. (2016) “Agent-Based Models: Understanding the Economy from the Bottom Up.” Bank of England Quarterly Bulletin Q4: 173–188.