ESSAYS ON MONETARY POLICY, BANK LIQUIDITY AND STOCK MARKET

A THESIS

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Extended Abstract

Monetary policy is a means to inject liquidity into the economy through the financial system. The implementation of monetary policy through the banking system is crucial in understanding the effectiveness of monetary policy transmission. The Reserve Bank of India (RBI) adopts an expansionary monetary policy to increase the balance sheet liquidity creation by enabling banks to generate more loans to the customers. Extant literature has primarily emphasized on the bank lending channel while analyzing the effects of the monetary policy on banking. A central bank controls the interest rates, thereby governing the aggregate credit generated in the economy. Decisions taken by commercial banks in response to the prevalent monetary policy plays an important role in the effective transmission of the monetary policy.

Various shocks may affect aggregate credit lending and liquidity holdings of banks, altering the effective transmission of the monetary policy. These shocks may be attributable to changes in inflation, exchange rates, output growth, and global inflation. The central bank's ultimate objective while conducting open market operations and setting the policy repo rate is to regulate the cost and amount of credit generated in the economy, thereby, influencing the aggregate output in the economy.

Monetary policy analysis revolves around regulating the monetary policy instrument such as the monetary base or policy interest rate. A liquidity management framework for banks arises from the trade-off between holding illiquid loans (or assets) that are high in yield compared to liquid loans (or assets) that are low in yield. This trade-off is influenced by monetary policy, giving rise to the bank lending channel of monetary policy transmission. The first study is about the “credit channel of monetary policy transmission” by focusing on the liquidity holdings of the major banks of India and the credit lending generated by the Indian banking system.

This study discusses the impact of monetary policy on liquidity generated by ten major Indian scheduled commercial banks (based on their size or total assets). The variables considered are liquidity ratios (L1 is Liquid Assets/Total Assets and L2 is Liquid Assets/Total Deposits), call money rate (CMR: as a proxy for monetary policy), bank credit, nominal effective exchange rate (NEER), change in the gross domestic product at factor cost, oil prices (a proxy for global inflation) and wholesale price index (WPI) for the years 2012-2020.

Quarterly figures are used to analyze the impact of monetary policy on bank liquidity and bank credit lending. Panel vector autoregression (PVAR) is a robust methodology that combines the traditional VAR framework with panel data framework, allowing for "unobserved individual heterogeneity". Panel VAR is estimated using a dynamic panel system via generalized method of moments (GMM), variance decomposition and impulse response functions. Monetary policy is found to be significant in affecting the credit lending in the short-run for the major Indian banks. Evidence from existing literature also suggests that open market operations are used for regulating the supply of bank loans. Monetary policy through open market operations affects other macroeconomic factors, such as exchange rate, inflation and aggregate output (Kashyap and Stein, 1994).

This study is unique in terms of using balance sheet values of major Indian banks to compute the liquidity ratios for each quarter. It identifies the influence of other variables such as changes in inflation, exchange rate, output growth, global inflation and bank credit lending to check the interlinkages between bank liquidity and monetary policy.

The results of generalized method of moments (GMM), forecast error variance decomposition and impulse response functions imply that a unit shock in call money rate reduces the bank credit lending by 0.01% in the short-run at the 1% level of significance. A unit shock in bank credit reduces the liquidity ratio L1 (liquid assets/total assets) by 4.4% in the short-run at the 1% level of significance. Similarly, a unit shock in bank credit lending reduces the bank's liquidity ratio (L2: liquid assets/total deposits) by 4.3% in the short-run at the 1% level of significance.

The second study of this dissertation focusses upon how the Federal Reserve's monetary policy stance has impacted the Indian stock market over the years 2006-2019. The central bank conducts open market operations to set policy rates, fixes reserve requirements and even injects liquidity during the times of crisis to regulate the amount of credit available in the economy. Monetary policy tools have impacted asset prices and financial markets as well. The conduct of monetary policy can be understood in two ways: "conventional monetary policy" and "unconventional monetary policy" (RBI report, 2006).

Conventional monetary policy tools are conducting open market operations, standing facilities and fixing reserve requirements. Unconventional monetary policy is what central banks resort to during crisis times, whether it is the 2008 financial crisis or the Covid-19 crisis. When the usual conventional monetary policy tools cannot suffice, unconventional monetary policy measures such as forward guidance, asset purchases, term funding facilities and extreme measures such as negative interest rates are adopted to ensure a proper functioning of the financial system. Quantitative easing policies have a direct impact on the macroeconomic factors and financial markets of the economy. The United States Fed's quantitative easing policies after the crisis of 2008, has influenced not just the US but also the various emerging market economies (Tillman 2016, Chen et al., 2014).

Past evidence suggests that the impact of monetary policy announcements on stock return seems vague in the context of India (Sasidharan 2009, Agarwal 2007, Prabu et al. 2013). As suggested in past literature, an unconventional monetary policy, such as quantitative easing influences asset prices more than the conventional monetary policy tools (Fratzscher et al. 2017, Tillman 2016). Time difference between the two economies is accounted and the daily stock returns are decomposed into overnight and daytime stock returns to provide a better insight regarding the transmission of Federal Reserve's monetary policy to the Indian stock returns.

The United States Federal Reserve's monetary policy shocks have impacted not just the US and the advanced economies, but their impact has also been observed on emerging market economies. The second essay attempts a comprehensive analysis of India's stock returns against US monetary policy shocks at various frequencies. Macroeconomic factors such as exchange rate (INR/USD), net FII flows, government bond rate as well as quantitative easing dummies are incorporated to check robustness of the results. This study examines the Federal Reserve's monetary policy spillovers over the years 2006-20. The Indian stock market is analysed by constructing US monetary policy shocks using data from financial markets through a regression-based framework. This study also attempts a detailed verification by employing the same monetary policy shocks on various S&P BSE sectoral indices. Significant results are obtained by incorporating overnight returns and by including quantitative easing as a dummy variable. The US monetary policy shocks have greater impact when daily returns are decomposed into overnight returns and daytime returns. The time lag between the two countries and the robust monetary policy shocks measures used in the study explains the significant results.

Keywords: *monetary policy, bank liquidity, stock returns, bank credit, overnight returns*

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References

Abrigo, M. R., & Love, I. (2016). Estimation of panel vector autoregression in Stata. *The Stata Journal*, *16*(3), 778-804.

Acharya, Viral V., Naqvi, Hassan, 2012. The seeds of a crisis: a theory of bank liquidity and risk-taking over the business cycle. J. Financ. Econ. 106, 349–366.

Acharya, V. V., Kumar, K. K., & Anshuman, V. R. (2015). Foreign fund flows and stock returns: Evidence from India.

Agrawal, G. (2007). Monetary Policy Announcements and Stock Price Behavior: Empirical Evidence from CNX Nifty. Decision (0304-0941), 34(2).

Al Nimer, M., Warrad, L., & Al Omari, R. (2015). The impact of liquidity on Jordanian banks profitability through return on assets. *European Journal of Business and Management*, *7*(7), 229-232.

Andersen, T. G., Bollerslev, T., Diebold, F. X., & Vega, C. (2003). Micro effects of macro announcements: Real-time price discovery in foreign exchange. *American Economic Review*, *93*(1), 38-62.

Bauer, M., A. Lakdawala, and P. Mueller (2018): \Market-Based Monetary Policy Uncertainty,"Working Paper.

Bekaert, G., Hoerova, M., & Duca, M. L. (2013). Risk, uncertainty and monetary policy. Journal of Monetary Economics, 60(7), 771-788.

Berger, A. N., & Bouwman, C. H. (2009). Bank liquidity creation. The review of financial studies, 22(9), 3779-3837.

Berger, A. N., & Bouwman, C. H. (2017). Bank liquidity creation, monetary policy, and financial crises. Journal of Financial Stability, 30, 139-155.

Bernanke, B. (2003). Monetary Policy and the Stock Market: Some Empirical Results. Remarks at the Fall 2003 Banking and Finance Lecture, Widener University, Chester, Pennsylvania, October 2.

Bernanke, Ben S., Gertler, Mark, (1995). Inside the black box: the credit channel of monetary policy transmission. J. Econ. Perspect. 9, 27–48.

Bernanke, B. S., & Kuttner, K. N. (2005). What explains the stock market's reaction to Federal Reserve policy?. The Journal of finance, 60(3), 1221-1257.

Bhaumik, S. K., & Piesse, J. (2008). Does lending behaviour of banks in emerging economies vary by ownership? Evidence from the Indian banking sector. Economic Systems, 32, 177–196.

Bhuyan, B., Patra, S., & Bhuian, R. K. (2020). Market Adaptability and Evolving Predictability of Stock Returns: An Evidence from India. *Asia-Pacific Financial Markets*, 1-15.

Bianchi, J., & Bigio, S. (2014). *Banks, liquidity management and monetary policy* (No. w20490). National Bureau of Economic Research.

BIS 77th Annual Report. (2007). *Basel, 24 June 2007*. Bank for International Settlements. https://www.bis.org/publ/arpdf/ar2007e.pdf

Bjørnland, H. C., & Leitemo, K. (2009). Identifying the interdependence between US monetary policy and the stock market. Journal of Monetary Economics, 56(2), 275-282.

Bomfim, A. N. (2003). Pre-announcement effects, news effects, and volatility: Monetary policy and the stock market. Journal of Banking & Finance, 27(1), 133-151.

Bowman, D., Londono, J. M., & Sapriza, H. (2015). US unconventional monetary policy and transmission to emerging market economies. Journal of International Money and Finance, 55, 27-59.

Carstens, A. (2019). Exchange rates and monetary policy frameworks in emerging market economies. *Speech, Bank for International Settlements*.

Chen, M. J., Griffoli, M. T. M., & Sahay, M. R. (2014). Spillovers from United States monetary policy on emerging markets: different this time? (No. 14-240). International Monetary Fund.

Christiano, Lawrence J., Eichenbaum, Martin, Evans, Charles L., 1999. Monetary policy shocks: what have we learned and to what end? In: Taylor, John B., Woodford, Michael (Eds.), Handbook of Macroeconomics, vol. 1A. Elsevier, pp.65–148.

Cochrane, John, 1998. What do VARs mean? Measuring the output effects of monetary policy. J. Monet. Econ 41, 277–300.I

Cook, T., & Hahn, T. (1989). The effect of changes in the federal funds rate target on market interest rates in the 1970s. *Journal of Monetary Economics*, *24*(3), 331-351.

Cottani, J. A., Cavallo, D. F., & Khan, M. S. (1990). Real exchange rate behavior and economic performance in LDCs. *Economic Development and cultural change*, *39*(1), 61-76.

Curcuru, S. E., Kamin, S. B., Li, C., & Rodriguez, M. (2018). International spillovers of monetary policy: Conventional policy vs. quantitative easing. *FRB International Finance Discussion Paper*, (1234).

Dahir, A. M., Mahat, F., Razak, N. H. A., & Bany-Ariffin, A. N. (2019). Capital, funding liquidity, and bank lending in emerging economies: An application of the LSDVC approach. *Borsa Istanbul Review*, *19*(2), 139-148.

Das, P. (2020). An Empirical Study on the Random Walk Hypothesis and Weak Form Market Efficiency: Evidence from National Stock Exchange of India. *CLEAR International Journal of Research in Commerce & Management*, *11*(8).

Dedola, L., Rivolta, G., & Stracca, L. (2017). If the Fed sneezes, who catches a cold?. Journal of International Economics, 108, S23-S41.

Deep, A., & Schaefer, G. K. (2004). Are banks liquidity transformers?

Deléchat, C., Arbelaez, C. H., Muthoora, M. P. S., & Vtyurina, S. (2012). *The determinants of banks' liquidity buffers in Central America* (No. 12-301). International Monetary Fund.

Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of political economy*, *91*(3), 401-419.

Donald, A., & Biao, L. (2001). Consistent model and moment selection procedures for GMM estimation with application to dynamic panel data models. Journal of Econometrics, 101(1), 123–164.

Emmons, W. R., A. K. Lakdawala, and C. J. Neely (2006): \What are the Odds? Option-based Forecasts of FOMC Target Changes," Federal Reserve Bank of St. Louis Review, 88(6), 543.

Federal Deposit Insurance Corporation. Off-Balance Sheet Activities (6/19), , Section 3.8, 3.8-3. https://www.fdic.gov/regulations/safety/manual/section3-8.pdf

Fontaine, J. S. (2016). What do Fed Funds Futures tell us about Monetary Policy Uncertainty. *Available at SSRN 1343913*.

Fratzscher, M., Lo Duca, M., & Straub, R. (2017). On the international spillovers of US quantitative easing. The Economic Journal, 128(608), 330-377.

Georgiadis, G. (2016). Determinants of global spillovers from US monetary policy. Journal of International Money and Finance, 67, 41-61.

Gilbert, T. (2011). Information aggregation around macroeconomic announcements: Revisions matter. *Journal of Financial Economics*, *101*(1), 114-131.

Gilbert, T., Scotti, C., Strasser, G., & Vega, C. (2017). Is the intrinsic value of a macroeconomic news announcement related to its asset price impact?. *Journal of Monetary Economics*, *92*, 78-95.

Gongol, T., & Vodová (2015), P. K. Liquidity Risk Management of Banks belonging to Erste Group and Societe Generale Group.

Gürkaynak, R. S., Sack, B. P., & Swanson, E. T. (2004). Do actions speak louder than words? The response of asset prices to monetary policy actions and statements.

Hamilton, J. D., and J. C. Wu (2012): \The Effectiveness of Alternative Monetary Policy Tools in a Zero Lower Bound Environment," Journal of Money, Credit and Banking, 44, 3{46.

Hanson, S. G., & Stein, J. C. (2015). Monetary policy and long-term real rates. *Journal of Financial Economics*, *115*(3), 429-448.

Igan, D., Kabundi, A., De Simone, F. N., & Tamirisa, N. (2017). Monetary policy and balance sheets. *Journal of Policy Modeling*, *39*(1), 169-184.

Imbierowicz, B., & Rauch, C. (2014). The relationship between liquidity risk and credit risk in banks. *Journal of Banking & Finance*, *40*, 242-256.

Jiang, G., and Y. Tian (2005): \Model-Free Implied Volatility and Its Information Content," Review of Financial Studies, 18, 1305{1342.

Kashyap, A. K., & Stein, J. C. (1994). Monetary policy and bank lending. In *Monetary policy* (pp. 221-261). The University of Chicago Press.

Kashyap, Anil K., Stein, Jeremy C., (1997). The role of banks in monetary policy: a survey with implications for the European Monetary Union. Econ. Perspect. Fed. Reserve Bank Chic., 3–18, September/October.

Kashyap, Anil K., Stein, Jeremy C., (2000). What do a million observations on banks say about the transmission of monetary policy? Am. Econ. Rev. 90, 407–428.

Kashyap, Anil K., Rajan, Raghuram G., Stein, Jeremy C., (2002). Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking. J.Finance 57, 33–73.

Khemraj, T. (2007). Monetary policy and excess liquidity: the case of Guyana. Social and Economic Studies, 101-127.

Khuntia, S., & Hiremath, G. S. (2019). Monetary Policy Announcements and Stock Returns: Some Further Evidence from India. Journal of Quantitative Economics, 1-27.

Kumar, H., & Jawa, R. (2017). Efficient market hypothesis and calendar effects: Empirical evidences from the Indian stock markets. *Business Analyst*, *37*(2), 145-160.

Kuttner, K. N. (2001). Monetary policy surprises and interest rates: Evidence from the Fed funds futures market. Journal of monetary economics, 47(3), 523-544.

Kuttner, K. N. (2018). Outside the box: Unconventional monetary policy in the great recession and beyond. Journal of Economic Perspectives, 32(4), 121-46.

Lakdawala, A. (2018). The growing impact of US monetary policy on emerging financial markets: Evidence from India. Available at SSRN 3274445.

Laurine, C. (2013). Zimbabwean commercial banks liquidity risk determinants after dollarisation. *Journal of Applied Finance and Banking*, *3*(6), 97.

Lee, K. C., Lim, Y. H., Lingesh, T. M., Tan, S. Y., & Teoh, Y. S. (2013). The determinants influencing liquidity of Malaysia commercial banks and its implication for relevant bodies: Evidence from 15 Malaysia commercial banks (Doctoral dissertation, UTAR).

Leombroni, M., Vedolin, A., Venter, G., & Whelan, P. (2019). Central bank communication and the yield curve. *Available at SSRN 2873091*.

Lucca, D. O. and E. Moench (2015). The pre-FOMC announcement drift. The Journal of Finance 70 (1), 329–371.

Lucchetta, M. (2007). What do data say about monetary policy, bank liquidity and bank risk taking?. *Economic notes*, *36*(2), 189-203.

Maćkowiak, B. (2007). External shocks, US monetary policy and macroeconomic fluctuations in emerging markets. Journal of monetary economics, 54(8), 2512-2520.

Madhi, D. (2017). The Macroeconomic Factors Impact on Liquidity Risk: The Albanian Banking System Case. European Journal of Economics and Business Studies, 3(1), 32-39.

Mishkin, F. S. (1995). Symposium on the monetary transmission mechanism. Journal of Economic Perspectives, 9(4), 3-10.

Mishra, A. (2013). Pre-conditions for inflation targeting in an emerging economy: The case of India. Global Economy Journal, 13(3), 89–108.

Mishra, A., & Burns, K. (2017). The effect of liquidity shocks on the bank lending channel: Evidence from India. *International Review of Economics & Finance*, *52*, 55-76.

Mohan, R., & Patra, M. (2009). Monetary policy transmission in India. *Monetary policy frameworks for emerging markets*, *153*.

Mohanty, D. (2014). Unconventional monetary policy and the Indian economy. *BIS Central Bankers' Speeches*.

Monetary Policy Transmission in India: A Peep Inside the Black Box, Jeevan Kumar Khundrakpam and Rajeev Jain, RBI Working Paper Series, June 2012.

Moore, W. (2009). How do financial crises affect commercial bank liquidity? Evidence from Latin America and the Caribbean.

Moussa, M. A. B. (2015). The determinants of bank liquidity: Case of Tunisia. International Journal of Economics and Financial Issues, 5(1), 249-259.

Niehans, J., & Hewson, J. (1976). The eurodollar market and monetary theory. Journal of Money, Credit and Banking, 8(1), 1-27.

Ozdagli, A., & Weber, M. (2017). *Monetary policy through production networks: Evidence from the stock market* (No. w23424). National Bureau of Economic Research.

Pandit, B. L., Mittal, A., Roy, M., & Ghosh, S. (2006). Transmission of monetary policy and the bank lending channel: analysis and evidence for India. *Development Research Group Study*, *25*.

Patelis, A. D. (1997). Stock return predictability and the role of monetary policy. the Journal of Finance, 52(5), 1951-1972.

Prabu, E., Bhattacharyya, I., & Ray, P. (2016). Is the stock market impervious to monetary policy announcements: Evidence from emerging India. International Review of Economics & Finance, 46, 166-179.

Prabu, A. E., Bhattacharyya, I., & Ray, P. (2020). Impact of monetary policy on the Indian stock market: Does the devil lie in the detail? *Indian Economic Review*, 1-24.

Raj, J., Rath, D. P., Mitra, P., & John, J. (2020). RBI Working Paper Series No. 14 Asset Quality and Credit Channel of Monetary Policy Transmission in India: Some Evidence from Bank-level Data.

Ray P (2013). Monetary Policy: Oxford India Short Introduction. Oxford University Press, Delhi.

Ray P, Prabu E (2013). Financial development and monetary policy transmission across financial markets: What do daily data tell for India? RBI Working Paper Series, WPS (DEPR): 04/2013.

Reinhart, Carmen M., Rogoff, Kenneth S., 2009. This Time Is Different: eight centuries of Financial Folly. Princeton University Press, Princeton.

Reserve Bank of India Report. (1999). *Committee on Banking Sector Reform*. Narasimham Committee Report. https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?ID=22

Reserve Bank of India Report. (2001). *Committee on Banking Sector Reforms.* Narasimham Committee II Report. https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?ID=251

Reserve Bank of India Report. (2006). *Report on Currency and Finance 2005-06,* Development of Financial Markets and Role of the Central Bank. RBI Report. https://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/77570.pdf

Reserve Bank of India Report. (2010). *Financial stability report.* Report on Trend and Progress of Banking in India. https://rbi.org.in/Scripts/FsReports.aspx

Reserve Bank of India Report. (2011). *Monetary and Credit Information Review,* May 2011, RBI policy report. https://www.rbi.org.in/scripts/PublicationsView.aspx?id=13361

Reserve Bank of India Report. (2014). *Addressing Impediments to Transmission of Monetary Policy. Report of The Expert Committee to Revise and Strengthen the Monetary Policy Framework*. https://m.rbi.org.in/scripts/PublicationReportDetails.aspx?UrlPage=&ID=748

Reserve Bank of India Bulletin. (2017). *Monetary Transmission in India:* Viral V. Acharya.https://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/RBIBULLETIN_F22CF32B3CF0D4CADA103BF12B803A5DC.PDF

Romer, C. D., & Romer, D. H. (2004). A new measure of monetary shocks: Derivation and implications. American Economic Review, 94(4), 1055-1084.

Rosa, C. (2011). The Validity of the Event-study Approach: Evidence from the Impact of the Fed's Monetary Policy on US and Foreign Asset Prices. Economica, 78(311), 429-439.

Sarkar, R. (2019). Testing Weak Form of Efficient Market Hypothesis (EMH): Empirical Evidence from Leading Stock Exchanges in India. *International Journal on Recent Trends in Business and Tourism (IJRTBT), 3*(3), 64-69.

Sasidharan, A. (2009). Stock Market's Reaction to Monetary Policy Announcements in India.

Savor, P., & Wilson, M. (2013). How much do investors care about macroeconomic risk? Evidence from scheduled economic announcements. *Journal of Financial and Quantitative Analysis, 48*(2), 343-375.

Saxegaard, M. (2006). Excess liquidity and the effectiveness of monetary policy: evidence from Sub-Saharan Africa (No. 6-115). International Monetary Fund.

Sheedy, K. D. (2017). Conventional and unconventional monetary policy rules. Journal of Macroeconomics, 54, 127-147.

Singh, A., & Sharma, A. K. (2016). An empirical analysis of macroeconomic and bank-specific factors affecting liquidity of Indian banks. Future Business Journal, 2(1), 40-53.

Sinha, P., & Grover, N. (2019). Estimation of liquidity created by banks in India.

Stock, J. H., & Watson, M. W. (2001). Vector autoregressions. Journal of Economic Perspectives, 15(4), 101-115.

Thomas, A., & Kumar, L. (2019). Unconventional monetary policy spillovers: Evidence from India. Journal of Public Affairs, e1940.

Thorbecke, W. (1997). On stock market returns and monetary policy. The Journal of Finance, 52(2), 635-654.

Tillmann, P. (2016). Unconventional monetary policy and the spillovers to emerging markets. Journal of International Money and Finance, 66, 136-156.

Tobin, James. 1978. Monetary policy and the economy: The transmission mechanism, *Southern Economic Journal* 44: 421-431.

Vodova, P. (2011). Liquidity of Czech commercial banks and its determinants. International Journal of mathematical models and methods in applied sciences, 5(6), 1060-1067.

Wright, J. H. (2012). What does monetary policy do to long-term interest rates at the zero-lower bound? *The Economic Journal*, *122*(564), F447–F466. https://doi.org/10.1111/j.1468-0297.2012. 02556.x.

Yeager, F. C., & Seitz, N. (1982). *Financial institution management: text and cases*. Reston Publishing Company.

Zheng, C., Cheung, A., & Cronje, T. (2016, December). Bank liquidity, bank failure risk and bank size. In *ECU Business Doctoral and Emerging Scholars Colloquium 2016* (p. 38).