“Credit channel of monetary policy transmission: Evidence from India”

AUTHORS	Debaditya Mohanti Souvik Banerjee

ARTICLE INFO	Debaditya Mohanti and Souvik Banerjee (2024). Credit channel of monetary policy transmission: Evidence from India. *Investment Management and Financial Innovations*, *21*(2), 287-299. doi:10.21511/imfi.21(2).2024.23
DOI	http://dx.doi.org/10.21511/imfi.21(2).2024.23
RELEASED ON	Monday, 27 May 2024
RECEIVED ON	Friday, 05 April 2024
ACCEPTED ON	Tuesday, 14 May 2024

JOURNAL	"Investment Management and Financial Innovations"
ISSN PRINT	1810-4967
ISSN ONLINE	1812-9358
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
50	13	0

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

Debaditya Mohanti (India), **Souvik Banerjee** (India)

CREDIT CHANNEL OF MONETARY POLICY TRANSMISSION: EVIDENCE FROM INDIA

Abstract

The present study explores the effectiveness of the credit channel of monetary policy transmission in India from the perspective of magnitude, timing, and composition puzzles. To validate, further investigation of the effectiveness of the balance sheet channel and bank lending channel using the corporate cash flows and interest rate spreads, respectively, has been done. The study employs the structural vector autoregression model using the long-time quarterly series sample period from June 1998 to June 2022. The findings show that the anomalies concerning magnitude, timing, and composition effect do not exhibit a strong presence in the Indian context. The analysis of the weighted average call money rate and coverage ratio suggests a weak presence of the balance sheet channel in India with a weak negative correlation of 0.2943 ($p < 0.05$). The overall behavior of spread analysis also shows a weak presence of the bank lending channel in India. Although some presence of the bank lending channel is seen on banks' managed liability side, the effect of external finance premium is not reflected in the lending rates with a correlation of 0.0577 ($p > 0.05$) between prime lending rate spread and weighted average call money rate spread. From the evidence, the study concludes the weak presence of the credit channel in India. Therefore, the monetary authorities might have to rely on other channels or may devise other unconventional mechanisms like Operation Twist and Long-Term Repo Operations observed during the COVID-19 pandemic to steer the real economy.

Keywords external finance premium, balance sheet channel, bank lending channel, credit channel, monetary policy transmission

JEL Classification E52, E58, G21

Received on: 5th of April, 2024
Accepted on: 14th of May, 2024
Published on: 27th of May, 2024

Debaditya Mohanti, Assistant Professor, Management Development Institute Murshidabad, India. (Corresponding author)

Souvik Banerjee, Assistant Professor, Management Development Institute Murshidabad, India.

Conflict of interest statement:
Author(s) reported no conflict of interest

INTRODUCTION

Monetary policymakers across the globe are entrusted with the responsibility of achieving the ultimate objective of price stability with economic growth. The traditional interest rate channel (or the neoclassical cost-of-capital channel) has always been the primary channel of monetary policy transmission (MPT). This channel is based on the premise that monetary authorities can leverage short-term interest rates to influence the cost of borrowing of firms and households, consequently affecting the final aggregate demand. However, Bernanke and Gertler (1995) observed some puzzling facts about the interest rate channel, termed the 'magnitude effect,' 'timing effect,' and 'composition effect' (discussed in the literature review section). They concluded that the interest rate channel alone is not sufficient to explain the monetary transmission mechanism. To decipher these puzzles, they proposed that there exists another channel that is concurrently operating, known as the 'credit channel' (or 'credit view'), which is complementary to the interest rate channel. The credit channel works on the frictions of financial markets. These frictions create a gap between the cost of external financing and internal financing. This gap is known as external finance premium (EFP). The monetary policy actions can affect the size of EFP through two mechanisms: the balance sheet channel (BSC) and the bank lending channel (BLC).

The strength of the credit channel has always been a key issue in monetary economics. The credit channel literature on advanced economies is vast; however, the evidence in the context of emerging market economies is limited and sometimes debatable, particularly in countries with large, complex financial systems (Gambacorta et al., 2014). In most studies in India, it was found that credit aggregate variables were applied to investigate the effectiveness of the credit channel of MPT. However, examining the credit channel using credit aggregates is an invalid approach (Bernanke & Gertler, 1995). The credit aggregate approach is based on an incorrect premise; it assumes that the credit aggregates, which may range from retail credit to commercial credit, are the independent exogenous factor that affects economic activity. However, changes in credit aggregates are an endogenous factor that helps drive the economy. Therefore, theoretically, credit aggregates may not have marginal forecasting power for real economic variables. Further, the dynamic responses of credit aggregates to the changes in monetary policy cannot explain the presence of the credit channel.

For instance, following the contractionary monetary policy, firms and households strive to increase borrowing, particularly at the beginning of the contractionary cycle, to smoothen the impact of adverse variations in the economy, this is despite the fact that the EFP is expanding. This leads to a situation where the credit condition in the economy is deteriorating, and on the other hand, the credit aggregates are showing an increasing trend. Therefore, it is suggested that EFP is the best way of measuring credit conditions in the economy, as credit aggregates are sluggish in responding to changes in monetary policy due to countercyclical components. Thus, the present study attempts to explore the effectiveness of the credit channel of MPT in India by considering the EFP estimates in the structural vector autoregression (SVAR) model, which is one of the critical areas of monetary economics literature (Romer et al., 1990; Ramey, 1993).

1. LITERATURE REVIEW

Some puzzling facts about the interest rate channel were observed by Bernanke and Gertler (1995). The conventional story on the MPT mechanism based on empirical evidence suggests that monetary policy shocks strongly affect the real economy, which is despite the fact that many past studies showed a weak effect of the cost-of-capital channel on various components of GDP. This puzzling impact of the monetary policy shock, the 'magnitude effect, is unexplained by the interest rate channel. The second puzzle concerns the 'timing.' The empirical work showed that some of the GDP components, like fixed investments and inventories, show a decline to a contractionary monetary policy after the inertness of the interest rates. This timing puzzle is again unexplained by the interest rate channel solely. The third puzzling fact is about the "composition effect." It is assumed that the monetary policy will have a most significant impact on the short-lived assets, as it has direct control over the short-term rates. However, studies found that residential investments, which are long-lived assets, are significantly affected by the contractionary monetary policy. On the contrary, the other long-lived assets, like business fixed investments, do not show much of a response. From these observations, it seems that only a conventional interest rate channel is unable to explain these puzzling effects of magnitude, timing, and composition. Bernanke and Gertler (1995) proposed that the "credit channel" of MPT may help in deciphering the puzzles.

The external finance premium (EFP) arise due to the information asymmetry in the financial markets, also known as the 'lemon problem,' which is based on the premise that the borrowers are in a better position to evaluate the utilization of funds than the lenders. This may lead to a problem of 'moral hazard,' and therefore, lenders' expected cost of credit appraisal gets augmented. The proponents of the credit view believe that monetary policy can affect both the market interest rates and the size of EFP in a complementary way. This complementary movement of EFP with interest rates amplifies the impact of the interest rate channel and also helps in explaining the magnitude, timing, and composition puzzles. There are two ways that monetary policy actions can impact the size of EFP: the balance sheet channel (BSC) and the

http://dx.doi.org/10.21511/imfi.21(2).2024.23

bank lending channel (BLC). The BSC impacts the balance sheets of firms and households, and the BLC influences the supply of bank credit intending to affect the price levels and economic output (Bernanke & Blinder, 1992; Kashyap & Stein, 2000; Bernanke, 2007).

The BSC is based on the premise that the borrower's financial state is one of the key determinants of EFP. If the borrower's net worth is high, which signals a strong financial state, the EFP should be low. The reason is that a healthy financial state signals a capability of internal financing and, at the same time, offers valuable collaterals to lenders. Many studies have also tried to link BSC to the endogenous procyclical behavior of firms towards investments, which is referred to as the phenomena of "financial accelerator." As the EFP increases because of the weak financial state of the borrower, the overall terms of credit will tend to become more stringent, leading to a decline in investment expenditure.

According to BSC, the monetary policy of a central bank affects the borrowers' financial state both directly and indirectly. In the direct channel, the monetary policy affects the balance sheet of a firm in two ways. Firstly, assuming a contractionary monetary policy, the interest expenditure on short-term debts will increase directly. Secondly, the contractionary policy also decreases the value of assets, as rising interest rates have a negative impact on asset prices. This declines the value of the borrower's collaterals. Thus, both reducing cash flows and low collateral value will adversely affect the borrower's financial state.

The indirect view suggests that the contractionary monetary policy reduces the firms' revenue. The rationale behind this view is that tight monetary policy reduces the purchasing power of customers because of the cost-of-capital effect and balance sheet effect at an individual level. At the same time, salaries and wages, which are considered to be a major part of a firm's cost, do not adjust in the short run. As a result, the financing gap increases, which affects a firm's net worth and creditworthiness adversely. The question that comes immediately is how to measure the firm's financial state. In the present study, the 'interest coverage ratio' is used, which is a popular summary measure of the financial health of a firm.

Another way that monetary policy can impact EFP is by changing the supply of bank credit through BLC. This is based on the idea that if the monetary authorities can disrupt the supply of bank credit, the borrowers, who are primarily dependent on the banks for financing, particularly small and medium enterprises, will search for other avenues that may incur additional costs, thereby impacting the EFP.

However, what is debatable in the bank lending mechanism is whether monetary policy can significantly impact the supply of bank credit. Bernanke and Blinder (1988) observed that the central bank, through open market operations (OMOs) sales, can siphon the bank reserves, which leads to a reduction in the banking deposits, thereby dampening the supply of credit. This effect is in addition to the IS-LM mechanism. These observations were based on the assumption that the deposits lost in the banking system cannot be replaced through other sources like the issuance of CDs or equity financing. Definitely, the assumption had merit prior to the 1990s because of stringent reserve requirements, disintermediation of the banking system, and also, the liability markets of banks were less liquid.

However, post-1990, the banking and financial sector reforms had relaxed most of the stringent restrictions, and "managed liabilities" became a prominent mechanism to replace the lost deposits. Therefore, Bernanke and Blinder's (1988) assumption seems to be inappropriate in the liberalized period. However, financial deregulations and innovations do not make the bank lending mechanism completely incapable. Kashyap and Stein (1994) suggested that a bank's managed liabilities do not face perfectly elastic demand in the open market; this increases the cost of funds to the bank and shrinks the supply of credit, thereby raising the EFP.

The credit channel of MPT has been investigated at both macro and micro levels. Most of the studies on advanced economies have found the importance of the credit channel (Garretsen & Swank, 1998; Oliner & Rudebusch, 1996; Kashyap & Stein, 2000; Iturriaga, 2000; Holtemöller, 2002; De Bondt, 2004; Hülsewig et al., 2006; Suzuki, 2008; Gambacorta & Rossi,

2010; Jacobs & Rayner, 2012; Leroy, 2014). However, there is some evidence that suggests the partial presence or absence of the credit channel (Ramey, 1993; Çavuşoğlu, 2002; Garretsen & Swank, 2003; Suzuki, 2004; Ozsuca & Akbostanci, 2012). The evidence on emerging market economies (EMEs) is inconclusive about the effectiveness of the credit channel. There are many studies that support the effectiveness of credit channels in EMSs (Gambacorta & Marques-Ibanez, 2011; Obafemi & Ifere, 2015; Ekomane & Benjamin, 2016; Caporale et al., 2016). However, studies like Ludi and Ground (2006) on South Africa, Ahmed and Islam (2004) on Bangladesh, and Simpasa et al. (2014) on Zambia did not support the strong presence of credit channels.

In the Indian context, limited studies have been carried out to investigate the credit channel of MPT. Pandit et al. (2006) found evidence supporting the existence of credit channels in India using the VAR framework. Pandit and Vashisht (2011), using the panel framework, suggested that the changes in the policy rates influence the demand for bank credit by firms in India. Khundrakpam (2011) observed that bank credit in India is affected by economic and money supply growth. Bhaumik et al. (2011) concluded that the credit channel might be more effective during the contractionary monetary policy compared to the expansionary periods. John et al. (2016) and Janak et al. (2020) investigated the impact of bank-specific and macroeconomic factors on the credit channel of MPT in India. It was observed that the bank-specific factors, particularly the asset quality of banks, deteriorate the efficacy of the credit channel of monetary policy. In totality, the evidence supported the strong presence of the credit channel in India. However, Acharya (2017), in one of the studies, concluded that the MPT in India has been less than satisfactory.

The above literature underscores the necessity to explore the effectiveness of the credit channel of MPT in India. It is also notable that a majority of Indian studies have relied on credit aggregates for testing the efficacy of the credit channel, and as discussed in the introduction section, the credit aggregate approach is invalid on certain parameters. Interestingly, it has also been observed that during the pre-COVID-19 period, credit growth declined drastically even though the RBI maintained an entrenched expansionary policy by significantly reducing the policy rate.

Against this backdrop, the study attempts to address the following questions: (i) What is the efficacy with which the monetary policy impacts the economic output, various components of output, and inflation? (ii) How significant are the balance sheet channels (BSC) and bank lending channels (BLC) in the Indian context? (iii) Do these channels support the presence of the credit channel of MPT in India? Thus, based on the research questions, the following hypotheses have been formulated:

H1: There is a credit channel in India.

H1a: Monetary policy shock strongly affects the real economy, i.e., the presence of a 'magnitude effect.'

H1b: Monetary policy shock affects some of the GDP components, like fixed investments and inventories with a lag, i.e., the presence of a 'timing effect.'

H1c: Monetary policy shock significantly affects long-lived assets. i.e., the presence of a 'composition effect.'

H2: There is a balance sheet channel in India.

H2a: There is a significant negative correlation between weighted average call money rate and coverage ratio.

H2b: Monetary policy shock declines firms' cash flows and profits.

H3: There is a bank lending channel in India.

H3a: There is a significant positive correlation between the certificate of deposit spread and weighted average call money rate.

H3b: There is a significant positive correlation between the prime lending rate spread and the weighted average call money rate spread.

http://dx.doi.org/10.21511/imfi.21(2).2024.23

2. METHOD

In this study, the structural vector autoregression (SVAR) model is applied to explore the effect of MPT. The applications of vector autoregression (VAR) pioneered by Sims (1980) is a widely implemented approach for studying the effectiveness of MPT in advanced and emerging economies. Several versions of the VAR framework include traditional vector autoregression, SVAR, and factor-augmented vector autoregression (FAVAR). However, following Bernanke and Gertler (1995), the study employed the standard SVAR model to examine the effect of monetary policy shocks on the real economy.

The SVAR model in equation (1) incorporates the vector of endogenous macroeconomic variables on its own lag for the determination of forecast errors or simply 'innovations.' The innovations are further decomposed into 'structural shocks' through an 'identification scheme,' i.e., by imposing identifying restrictions on contemporaneous responses based on economic theories.

$$A_0 x_t = A(L) x_{t-1} + \varepsilon_t, \quad (1)$$

where A_0 is an n-by-n matrix that captures the contemporaneous interactions among the variables, x_t is a column vector of n-endogenous variable at time *t*, $A(L)$ is an n-by-n matrix of polynomials in lag operator L, and ε_t is a column vector of structural shocks.

To examine the dynamic effects of a specific monetary policy shock, a reduced form model is constructed by multiplying equation (1) by A_0^{-1}, resulting in equation (2)

$$x_t = B(L) x_{t-1} + \mu_t, \quad (2)$$

where $B(L) = A_0^{-1} A(L)$, and $\mu_t = A_0^{-1} \varepsilon_t$. The behavior of μ_t is very different from ε_t, as the elements of μ_t are a linear combination of elements of ε_t. In general, the elements of μ_t are contemporaneously correlated but serially uncorrelated.

To examine the dynamic responses of endogenous variables to structural shocks, the A_0 needs to be estimated. This is done through the identification scheme and imposing restrictions on the elements of A_0. The identifying assumption to determine the monetary policy shocks is that the monetary policy variable is allowed to respond contemporaneously to other endogenous variables in the system but can only affect the other endogenous non-policy variables with a lag.

The matrix B is defined in equation (3),

$$\begin{pmatrix} \mu_{1t}^x \\ \mu_{2t}^x \\ \mu_{3t}^x \\ \mu_{4t}^x \end{pmatrix} = \begin{pmatrix} b_{11} & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ b_{31} & b_{32} & b_{33} & 0 \\ b_{41} & b_{42} & b_{43} & b_{44} \end{pmatrix} \cdot \begin{pmatrix} \varepsilon_{1t}^x \\ \varepsilon_{2t}^x \\ \varepsilon_{3t}^x \\ \varepsilon_{4t}^x \end{pmatrix}, \quad (3)$$

under this assumption, $\varepsilon_{1t}^{\ x}$ structural shocks are the most exogenous, as they are not contemporaneously affected by other innovations. However, $\varepsilon_{4t}^{\ x}$ structural shocks (in this study, the monetary policy shocks) are contemporaneously affected by other innovations.

Following Bernanke and Gertler (1995) and others, the weighted average call money rate (WACR) is employed as a proxy for monetary policy stance. Thus, the structural shock to WACR is considered as a shock to monetary policy, i.e., unanticipated monetary policy action. To examine the effectiveness of the MPT mechanism on the variability of real economic activity and inflation, the structural responses of endogenous observable macroeconomic variables to monetary policy shocks using the impulse response function (IRF) are studied in the respective SVAR models.

The macroeconomic indicators like real gross domestic product (real GDP), consumer price index (CPI, base 2010), private final consumption expenditure (PFCE, base 2011-12), gross fixed capital formation (GFCF, base 2011-12), change in stock (base 2011-12) have been considered as a measure of the output variable. As an indicator of inflation, the CPI (Base, 2010) data are employed in the model. For capturing the supply-side factors, the wholesale price index (WPI, base 2011-12) has been added to the model. All the data points have been sourced from the Database on Indian Economy (DBIE-RBI).

Further, to examine the effectiveness of BSC and BLC, the indicators, average certificate of deposit

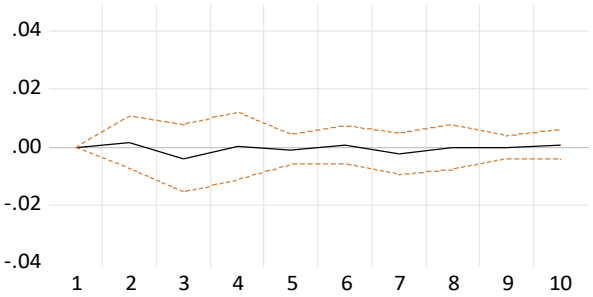
(CD) rate, lending rates, 91-day T-bill cut-off rate, interest expenses, net profit, net sales, wages, coverage ratio are used in the model 4 and 5. The corporate cash flow data points have been sourced from the CMIE database. To estimate SVAR models, the study uses a quarterly long-time series sample period from June 1998 to June 2022.

3. RESULTS

Figures 1a, 1b, and 1c show the dynamic structural responses of the real GDP, the log of CPI, and the WACR to a monetary policy shock (a positive one standard deviation shock) based on the SVAR model. For the identification scheme, the same order has been followed with an addition of the log of WPI after the log of CPI. The WPI has been added to capture the effects of supply-side factors, which may affect economic activity and the price level (Sims, 1992; Christiano et al., 1996; Sims & Zha, 2006).

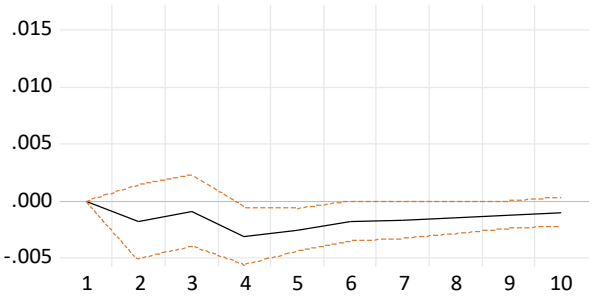
A positive monetary policy shock can be construed as an unexpected contractionary monetary policy. From Figure 1a, the estimated response of GDP showed a decline after the second quarter, with a trough at about the third quarter to the contractionary policy measures. Figure 1b shows the response of inflation, which declines immediately and then bottoms out in the fourth quarter. The WACR shows an immediate sharp decline till the second and third quarters and some upturn at about the fourth quarter before a consistent decline.

To get a better understanding of the response of the economic output to a monetary policy shock, the real GDP is divided into two parts, the final demand and the change in stock. Figures 2a and 2b show the structural responses of the final demand and the change in stock to a monetary policy shock using the first SVAR model by replacing the log of real GDP. To make the responses of final demand and change of stock comparable, normalization of these variables is done by taking the ratios of final demand and change in stock to an average GDP. A moving average of four quarters has been taken for the average GDP.



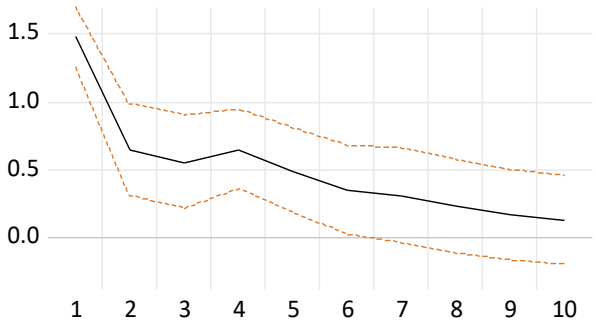
Note: The dashed lines indicate one standard error term.

Figure 1a. Response of real GDP to a monetary policy shock



Note: The dashed lines indicate one standard error term.

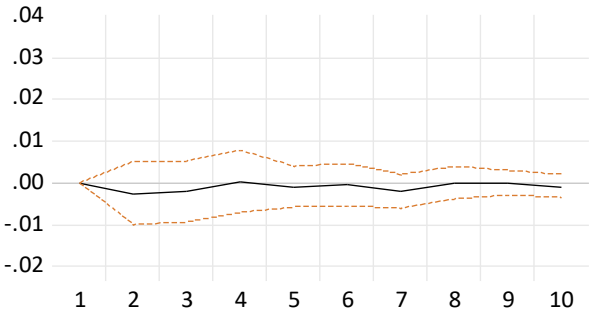
Figure 1b. Response of inflation to a monetary policy shock



Note: The dashed lines indicate one standard error term.

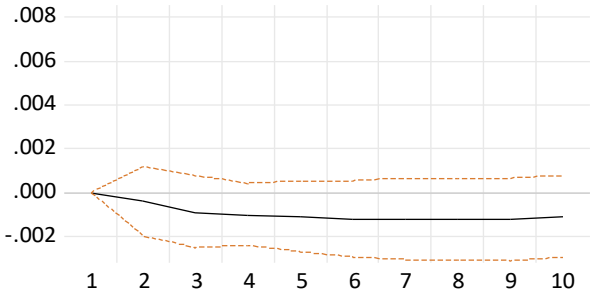
Figure 1c. Response of WACR to a monetary policy shock

http://dx.doi.org/10.21511/imfi.21(2).2024.23



Note: The dashed lines indicate one standard error term.

Figure 2a. Response of final demand to a monetary policy shock



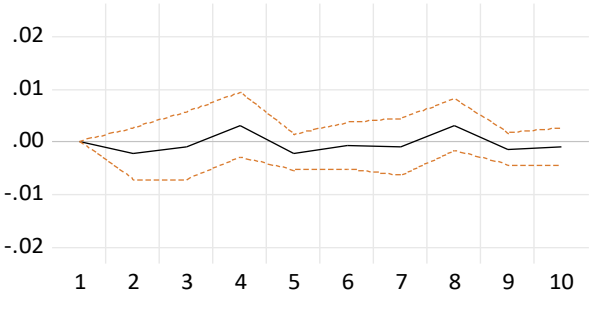
Note: The dashed lines indicate one standard error term.

Figure 2b. Response of change in stock to a monetary policy shock

In Figure 2a, the final demand shows a gradual decline to an unexpected contractionary monetary policy. However, the change in stock declines steadily over time due to a monetary policy shock, as shown in Figure 2b. This implies that the drop in real GDP in Figure 1a is due to the decline in both the final demand and the change in stock. The evidence is contrary to the results of Bernanke and Gertler (1995), where the inventories showed a positive response to a monetary policy shock initially for several months. Thus, the evidence raises a question on the timing effect anomaly.

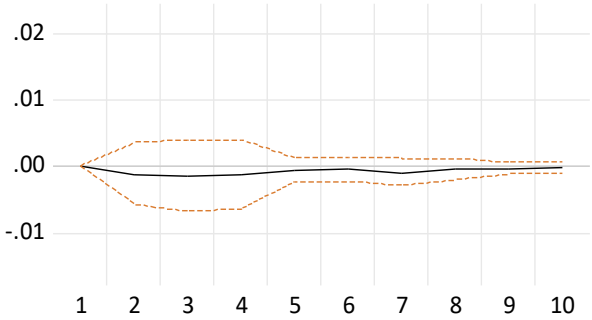
To get a closer look at the final demand, the responses of two important components of GDP, i.e., PFCE and GFCF, have been analyzed using the first base SVAR model. These components are included one at a time in the model by replacing the log of real GDP. To make the responses of these components comparable, normalization is done, as mentioned previously. The response of PFCE in Figure 3b shows a gradual decline to a monetary policy shock. The PFCE, being the most significant component of the final demand, suggests that its response accounts for the decline in the final demand as well as real GDP. Figure 3b shows the declining response of GFCF for several quarters to a contractionary monetary policy.

From the analysis shown in Figures 1 to 3, the following inferences can be drawn concerning the puzzling effects of monetary policy shocks. First, Figure 1a, which shows the response of real GDP to a monetary policy shock, depicts a weak effect of the interest rate channel on the Indian economy; this is contrary to the magnitude effect where the real economy gets strongly affected by the monetary policy shocks. Second, in Figures 1a, 2b, and 3b, prompt correspondence has been observed between interest rates and movements in output and gross fixed capital formation; also, inventories started falling immediately to a contractionary monetary policy shock. These results differ from the timing puzzle, which shows a lagged effect of fixed investments and inventories, to a contractionary monetary policy. Third, Figures 2b and 3b



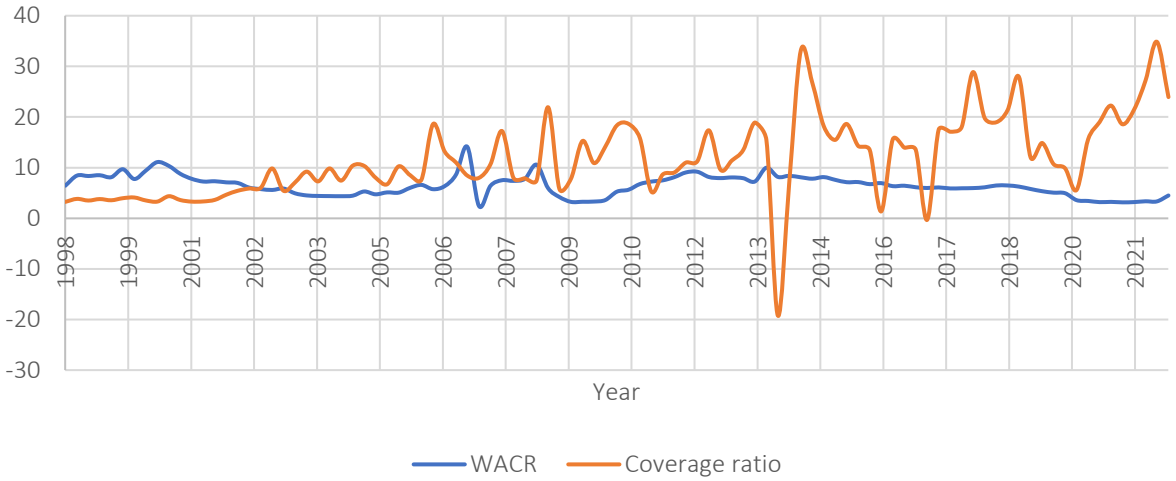
Note: The dashed lines indicate one standard error term.

Figure 3a. Response of private final consumption expenditure to a monetary policy shock



Note: The dashed lines indicate one standard error term.

Figure 3b. Response of gross fixed capital formation to a monetary policy shock



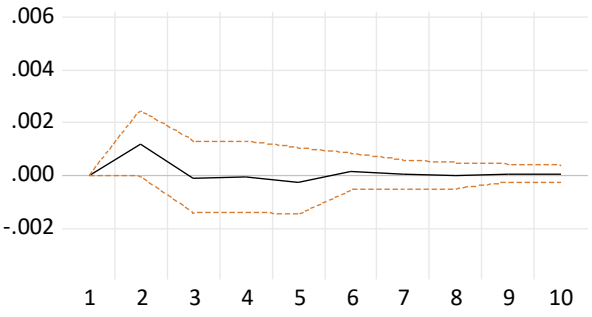
Note: The figure shows the WACR in percentage.

Figure 4. WACR and coverage ratio

show that both short-lived assets like inventories and long-lived assets like gross fixed capital formation showed an immediate and consistent decline. The findings again oppose the composition effect, where the contractionary monetary policy significantly affects long-lived assets like residential investments.

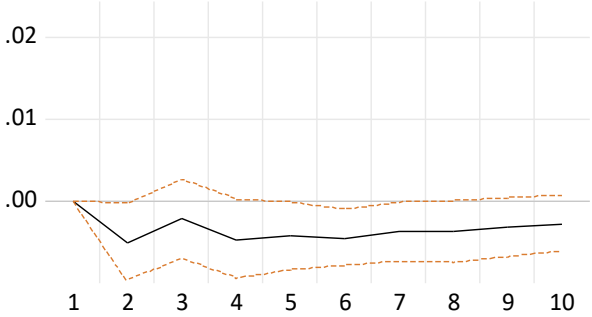
These findings can largely be explained by conventional interest rate channels, and anomalies in magnitude, timing, and composition generally explained by the credit view may not be additionally required. Thus, the above results fail to support the hypotheses *H1a*, *H1b*, and *H1c*. Does this mean that the credit channel in India is weak in terms of explaining the monetary transmission mechanism? As discussed in the methodology section, the credit channel has two routes, BSC and BLC. Therefore, before making a conclusive remark, it is important to investigate the effectiveness of BSC and BLC.

Figure 4 shows the graph of the coverage ratio and WACR. A correlation and a simple regression analysis are done to understand the relationship between these two variables better. The regression model is estimated with a convention that the causality runs from WACR to coverage ratio. A weak negative correlation of 0.2943 is found between WACR and coverage ratio, which is statistically significant at a 5 percent significance level. The regression coefficient of WACR is –1.13479, which is also statistically significant at a 5 percent significance level. The estimates of correlation and regression show a negative relationship between the coverage ratio and WACR. They can be interpreted as a positive monetary policy shock that can weaken the firm's financial state. This is consistent with the theory of the direct and indirect effect of monetary policy on the coverage ratio, which measures a firm's financial state. However, the correlation on the lower side shows the presence of a weak BSC and thus weakly supports hypothesis *H2a*.



Note: The dashed lines indicate one standard error term.

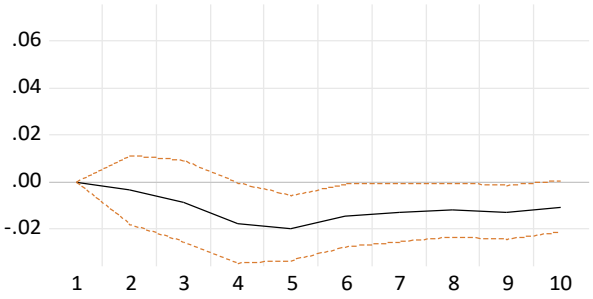
Figure 5a. Response of interest expenses to a monetary policy shock



Note: The dashed lines indicate one standard error term.

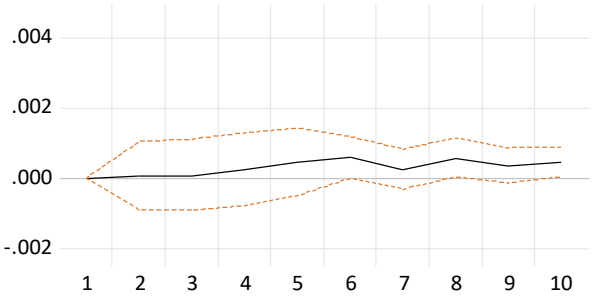
Figure 5b. Response of net profit to a monetary policy shock

http://dx.doi.org/10.21511/imfi.21(2).2024.23



Note: The dashed lines indicate one standard error term.

Figure 5c. Response of net sales to a monetary policy shock

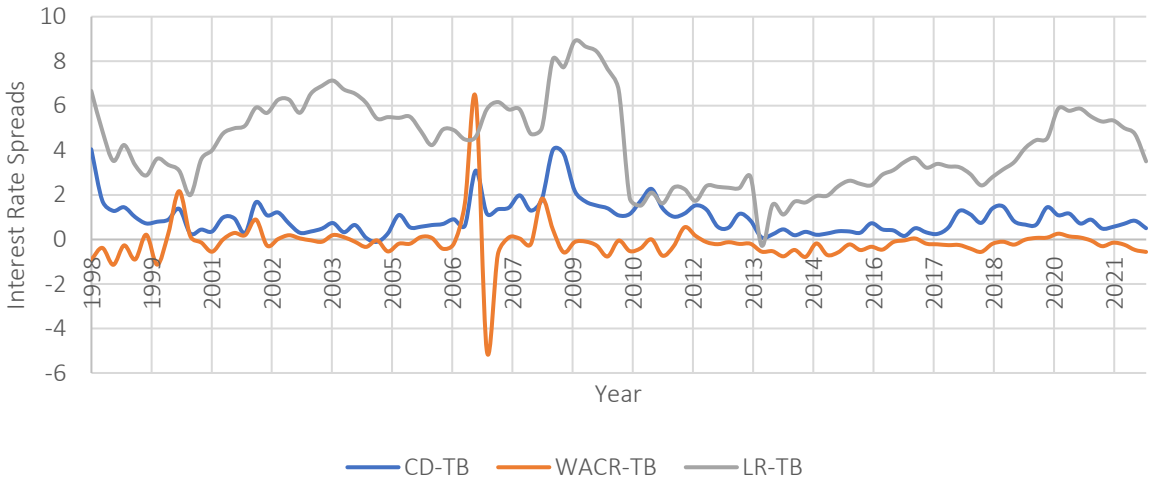


Note: The dashed lines indicate one standard error term.

Figure 5d. Response of salaries and wages to a monetary policy shock

Figures 5a, 5b, 5c, and 5d show the dynamic structural responses of various components of a firm's cash flows to a positive monetary policy shock using the similar SVAR model applied previously. To make the responses of a firm's cash flows comparable, normalization is done by taking the ratios of each cash flow to an average of gross income. A moving average of four quarters has been taken for the average gross income. The above figures give two justifications for why the firms' cash flows and profits declined due to a positive monetary policy shock. First, Figure 5a shows the response of interest expenses, which increases and peaks at about the second quarter to contractionary policy measures, thereby reducing the profits. Second, in Figures 5b and 5c, the responses of net profit and net sales show a decline to a contractionary monetary policy. Further, Figure 5d shows the responses of salaries and wages, which remain inert for about three quarters before rising. Thus, declining net sales, inert salaries and wages reduce corporate profits and cash flows, supporting hypothesis *H2b*.

To examine the presence of BLC, the spread between CD rate and T-bill rate, the spread between WACR and T-bill rate, and the spread between prime lending rate (PLR) and T-bill rate have been plotted in Figure 6. To understand the behavior of these spreads, a correlation analysis is done. The correlation between the CD spread and WACR spread is found to be 0.2189, which is statistically significant at a 5 percent significance level and thus supports hypothesis *H3a*. This suggests that during the contractionary monetary policy, the CD rates increase more than the market interest rates, which shows that the managed liabilities of the banks are not perfectly elastic, and the cost of funds increases for the banks, thereby increasing the EFP. However, the correlation between the PLR spread and the WACR spread is about 0.0577



Note: (CD-TB) denotes the spread between CD rate and T-bill rate, (WACR-TB) denotes the spread between WACR and T-bill rate, and (LR-TB) denotes the spread between the prime lending rate (PLR) and T-bill rate. The figure shows all the interest rate spreads in percentage.

Figure 6. Relationship between the interest rate spreads

and found to be insignificant at a 5 percent significant level, thereby failing to support hypothesis *H3b*. These results suggest that though some presence of BLC is seen on the banks' managed liability side, the effect of EFP is not reflected in the lending rates. Thus, the behavior of spreads shows a weak presence of BLC in India.

4. DISCUSSION

The findings of the study show that the anomalies concerning magnitude, timing, and composition that support the presence of a credit channel do not have a strong presence in the Indian context. Further, the investigation of the effectiveness of BSC and BLC in totality suggested the weak presence of the credit channel in India. Acharya (2017) observed that the MPT in India has not been effective in recent periods. So, the next question is what factors might account for the weak presence of credit channels in India?

The first reason could be the transmission of policy to bank lending rates. The Reserve Bank of India (RBI) introduced the prime lending rate (PLR) in 1994, followed by the benchmark prime lending rate (BPLR) in 2003. However, both the bank lending rate systems failed to impart effective MPT. So, in an endeavor to improvise the transmission mechanism, the base rate system and the marginal cost of funds-based lending rate (MCLR) were introduced in 2010 and 2016, respectively, but similar to previous designs, both these systems again suffer from the inertness of bank lending rates to the changes in monetary policy. The main issue with the MCLR system is the transmission of policy rates to the lending rates of existing borrowers. It was observed from January 2015 to April 2022 that the overall lending rates in India were relatively high, even though the RBI maintained an accommodative stance during this period. The main reason is that the banks can alter the spread over MCLR arbitrarily, which makes the transmission mechanism ineffective.

The second rationale could be the health of the banking system, i.e., some bank-specific factors like capital adequacy, liquidity, regulatory guidelines, and others may impair the effectiveness of the credit channel of MPT (Chen & Wu, 2014). Various research in the cross-country context found that the credit channel gets dampened if the balance sheet of the banks in the economy is weak (Tan, 2012; Imrana & Nishatb, 2013; Pham, 2015). Nag and Das (2002), Cucinelli (2015), and others observed that the stringent credit risk guidelines by the regulators weaken the effectiveness of credit channels. Many studies concluded that soaring levels of NPAs with deterioration of asset quality in the banking system hampers the efficacy of credit channel (Sensarma & Chaudhuri, 2008; Stepanyan & Guo, 2011).

In the Indian context, the Monetary Policy Committee (MPC) of RBI, in one of its reports (2017), stated that the efficacy of the MPT mechanism would be significantly enhanced if the NPAs of the banking sector were mitigated promptly and efficiently. It has been observed that the asset quality of scheduled commercial banks in India measured in gross non-performing assets ratio (GNPA ratio) aggravated in the last decade from about 3.83 percent in 2014 to 7.33 percent in 2021. Also, the return on assets (ROA) and return on equity (ROE) were mostly below the expected levels in the last decade. This suggests that the overall health of the banking system in India was below satisfying levels.

The other reason could be the impact of various macroeconomic factors. A strand of literature, particularly on advanced economies, suggests that real GDP growth has a positive association with the credit channel (Calza et al., 2003; Stepanyan & Guo, 2011). Cottarelli et al. (2005) observed that the rise in GDP per capita enhances BLC. Thus, a slow and stagnant GDP growth rate in India over the last decade might have reduced the efficacy of credit channels in India.

CONCLUSION

The objective of this study is to explore the effectiveness of credit channel monetary policy transmission in India using the estimates of the structural vector autoregression model. The study considers the external finance premium for testing the credit view as examining the credit channel using the credit aggregates is an invalid approach. To estimate models, the study uses a quarterly long-time series sample

http://dx.doi.org/10.21511/imfi.21(2).2024.23

period from June 1998 to June 2022. Based on the study's results, it is evident that the anomalies concerning magnitude, timing, and composition, which typically indicate the existence of a credit channel, are not notably pronounced within the Indian context. The analysis of the weighted average call money rate and coverage ratio suggests a weak presence of the balance sheet channel in India. Further, the overall behavior of spread analysis shows a weak presence of bank lending channels in India. Although some presence of bank lending channels is seen on the banks' managed liability side, the effect of external finance premium is not reflected in the lending rates. Thus, the investigation of the effectiveness of the balance sheet channel and the bank lending channel collectively indicates a weak presence of credit channels in India.

The findings of this study have significant implications for understanding and enhancement of the credit channel of the monetary policy transmission mechanism. The study concludes the weak presence of credit channels in India; therefore, monetary authorities might rely on other channels or may devise other unconventional mechanisms to steer the real economy. This was observed during the COVID-19 period when monetary authorities failed to maneuver the real economy using conventional tools and had to apply unconventional monetary policy tools to achieve the objectives of monetary policy.

AUTHOR CONTRIBUTIONS

Conceptualization:Debaditya Mohanti, Souvik Banerjee.
Data curation: Debaditya Mohanti, Souvik Banerjee.
Formal analysis: Debaditya Mohanti, Souvik Banerjee.
Investigation: Debaditya Mohanti, Souvik Banerjee.
Methodology: Debaditya Mohanti, Souvik Banerjee.
Software: Debaditya Mohanti, Souvik Banerjee.
Validation: Debaditya Mohanti, Souvik Banerjee.
Writing – original draft: Debaditya Mohanti, Souvik Banerjee.
Writing – review & editing: Debaditya Mohanti, Souvik Banerjee.

REFERENCES

1. Acharya, V. V. (2017). Monetary Transmission in India: Why is it important and why hasn't it worked well. *Reserve Bank of India Bulletin, 71*(12), 7-16. Retrieved from https://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/01SP111217CBEF9077A25C48329B484120A3EF9B2F.PDF
2. Ahmed, S., & Islam, M. E. (2004). The monetary transmission mechanism in Bangladesh: Bank lending and exchange rate channels. *The Bangladesh Development Studies,* 31-87. Retrieved from https://www.jstor.org/stable/40795694
3. Bernanke, B. (2007). *The financial accelerator and the credit channel (No. 296).* Board of Governors of the Federal Reserve System (US). Retrieved from https://econpapers.repec.org/paper/fipfedgsq/296.htm
4. Bernanke, B. S., & Blinder, A. S. (1988*). Credit, money, and aggregate demand* (Working Paper No. 2534). NBER. Retrieved from https://www.nber.org/system/files/working_papers/w2534/w2534.pdf
5. Bernanke, B. S., & Gertler, M. (1995). Inside the black box: the credit channel of monetary policy transmission. *Journal of Economic Perspectives, 9*(4), 27-48. Retrieved from https://ideas.repec.org/a/aea/jecper/v9y1995i4p27-48.html
6. Bernanke, B., & Blinder, A. S. (1992). The federal funds rate and the transmission of monetary policy. *American Economic Review, 82*(4), 901-921. Retrieved from https://www.jstor.org/stable/2117350
7. Bhaumik, S. K., Dang, V., & Kutan, A. M. (2011). Implications of bank ownership for the credit channel of monetary policy transmission: Evidence from India. *Journal of Banking & Finance, 35*(9), 2418-2428. https://doi.org/10.1016/j.jbankfin.2011.02.003
8. Calza, A., Gartner, C., & Sousa, J. (2003). Modelling the demand for loans to the private sector in the euro area. *Applied Economics, 35*(1), 107-117. Retrieved from https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp055.pdf
9. Caporale, G. M., Catik, A. N., Helmi, M., Menla Ali, F., & Tajik, M. (2016). *The bank lending channel in a dual banking system: evidence from Malaysia*. Retrieved from https://ideas.repec.org/p/ces/ceswps/_5807.html

10. Çavuşoğlu, A. T. (2002). Credit transmission mechanism in Turkey: an empirical investigation. *Middle East Technical University ERC Working Papers in Economics, 2*(03), 1-30. Retrieved from https://ideas.repec.org/p/met/wpaper/0203.html

11. Chen, G., & Wu, M. Y. (2014). *Bank ownership and credit growth in emerging markets during and after the 2008–09 financial crisis – a cross-regional comparison.* International Monetary Fund. Retrieved from https://ideas.repec.org/p/imf/imfwpa/2014-171.html

12. Christiano, L. J., Eichenbaum, M., & Evans, C. L. (1996). Identification and the effects of monetary policy shocks. *Financial Factors in Economic Stabilization and Growth, 36*. Retrieved from https://fraser.stlouisfed.org/files/docs/historical/frbchi/workingpapers/frbchi_workingpaper_1994-07.pdf

13. Cottarelli, C., Dell'Ariccia, G., & Vladkova-Hollar, I. (2005). Early birds, late risers, and sleeping beauties: Bank credit growth to the private sector in Central and Eastern Europe and in the Balkans. *Journal of Banking & Finance, 29*(1), 83-104. https://doi.org/10.1016/j.jbankfin.2004.06.017

14. Cucinelli, D. (2015). The impact of non-performing loans on bank lending behavior: Evidence from the Italian banking sector. *Eurasian Journal of Business and Economics, 8*(16), 59-71. Retrieved from https://pdfs.semanticscholar.org/08d2/4d1191cc1ee92b17d15c537a2d8b4fab5904.pdf

15. De Bondt, G. (2004). The balance sheet channel of monetary policy: first empirical evidence for the euro area corporate bond market. *International Journal of Finance & Economics, 9*(3), 219-228. http://dx.doi.org/10.1002/ijfe.246

16. Ekomane, J. L., & Benjamin, Y. A. M. B. (2016). The measurement of credit channel in the CEMAC zone. *Journal of Economics and Political Economy, 3*(4), 744-766. https://doi.org/10.1453/jepe.v3i4.1080

17. Gambacorta, L., & Marques-Ibanez, D. (2011). The bank lending channel: lessons from the crisis. *Economic Policy, 26*(66), 135-182. Retrieved from https://ideas.repec.org/p/bis/biswps/345.html

18. Gambacorta, L., & Rossi, C. (2010). Modelling bank lending in the euro area: a nonlinear approach. *Applied Financial Economics, 20*(14), 1099-1112. https://doi.org/10.1080/09603101003781430

19. Gambacorta, L., Yang, J., & Tsatsaronis, K. (2014). *Financial structure and growth. BIS Quarterly Review March.* Retrieved from https://econpapers.repec.org/article/bisbisqtr/1403e.htm

20. Garretsen, H., & Swank, J. (1998). The transmission of interest rate changes and the role of bank balance sheets: a VAR-analysis for the Netherlands. *Journal of Macroeconomics, 20*(2), 325-339. https://doi.org/10.1016/S0164-0704(98)00060-3

21. Garretsen, H., & Swank, J. (2003). The bank lending channel in the Netherlands: the impact of monetary policy on households and firms. *De Economist, 151*(1), 35-51. Retrieved from https://link.springer.com/article/10.1023/A:1022984614506

22. Holtemöller, O. (2002). Identifying a credit channel of monetary policy transmission and empirical evidence for Germany. *Humboldt-Universita zu Berlin February,* 1-19. Retrieved from https://www.researchgate.net/publication/228427415

23. Hülsewig, O., Mayer, E., & Wollmershäuser, T. (2006). Bank loan supply and monetary policy transmission in Germany: An assessment based on matching impulse responses. *Journal of Banking & Finance, 30*(10), 2893-2910. https://doi.org/10.1016/j.jbankfin.2005.12.001

24. Imran, K., & Nishat, M. (2013). Determinants of bank credit in Pakistan: A supply side approach. *Economic Modelling, 35,* 384-390. https://doi.org/10.1016/j.econmod.2013.07.022

25. Iturriaga, F. J. L. (2000). More on the credit channel of monetary policy transmission: an international comparison. *Applied Financial Economics, 10*(4), 423-434. https://doi.org/10.1080/09603100050031552

26. Jacobs, D., & Rayner, V. (2012). *A Proxy for Credit Frictions: The Role of Credit Supply in the Australian Economy.* Reserve Bank of Australia Research Discussion Papers. Retrieved from https://www.rba.gov.au/publications/rdp/2012/2012-02/proxy-credit-frictions.html

27. John, J., Mitra, A., Raj, J., & Rath, D. (2016). Asset quality and monetary transmission in India. *Reserve Bank of India Occasional Papers, 37*(1-2), 35-62. Retrieved from https://www.researchgate.net/profile/Arghya-Mitra/publication/324910068

28. Kashyap, A. K., & Stein, J. C. (2000). What do a million observations on banks say about the transmission of monetary policy? *American Economic Review, 90*(3), 407-428. https://doi.org/10.1257/aer.90.3.407

29. Khundrakpam, J. K. (2011). Credit channel of monetary transmission in India-how effective and long is the lag? *RBI Working Paper Series.* Retrieved from https://mpra.ub.uni-muenchen.de/50899/1/MPRA_paper_50899.pdf

30. Leroy, A. (2014). Competition and the bank lending channel in Eurozone. *Journal of International Financial Markets, Institutions and Money, 31,* 296-314. https://doi.org/10.1016/j.intfin.2014.04.003

31. Ludi, K. L., & Ground, M. (2006). *Investigating the bank lending channel in South Africa: a VAR approach*. Retrieved from https://repository.up.ac.za/bitstream/handle/2263/4469/Ludi_Investigating(2006).pdf?sequence=1

32. Nag, A. K., & Das, A. (2002). Credit growth and response to capital requirements: Evidence from Indian public sector banks. *Economic and Political Weekly,* 3361-3368. Retrieved from https://ideas.repec.org/p/wpa/wuwpio/0411003.html

33. Obafemi, F. N., & Ifere, E. O. (2015). Monetary policy trans-

http://dx.doi.org/10.21511/imfi.21(2).2024.23

mission mechanism in Nigeria: A FAVAR approach. *International Journal of Economics and Finance, 7*(8), 93-103. https://doi.org/10.5539/ijef.v7n8p229

34. Oliner Stephen, D., & Rudebusch, G. D. (1996). Is there a broad credit channel for monetary policy?'. *Federal Reserve Bank of San Francisco Review, 1,* 3-13. Retrieved from https://glennrudebusch.com/wp-content/uploads/2017/12/1996_FRBSFER_Oliner-Rudebusch_Is-There-a-Broad-Credit-Channel-for-Monetary-Policy.pdf
35. Ozsuca, E. A., & Akbostanci, E. (2012). An empirical analysis of the bank lending channel in Turkey. *Middle East Technical University ERC Working Papers in Economics*, 12(05), 1-33. Retrieved from https://erc.metu.edu.tr/en/system/files/menu/series12/1205.pdf
36. Pandit, B. L., & Vashisht, P. (2011). *Monetary policy and credit demand in India and some EMEs* (Working Paper No. 256). https://icrier.org/pdf/Working_Paper_256.pdf
37. 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. Retrieved from https://www.researchgate.net/profile/Saibal-Ghosh-2/publication/255652255
38. Pham, T. H. H. (2015). *Determinants of bank lending*. Retrieved from https://hal.science/hal-01158241/document
39. Raj, J., Rath, D. P., Mitra, P., & John, J. (2020). *Asset Quality & Credit Channel of Monetary Policy Transmission in India* (RBI Working Paper Series). Retrieved from https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=20261
40. Ramey, V. (1993). How important is the credit channel in the transmission of monetary policy? *Carnegie-Rochester Conference Series on Public Policy, North-Holland, 39* (December), 1-45. https://doi.org/10.1016/0167-2231(93)90001-D
41. Romer, C. D., Romer, D. H., Goldfeld, S. M., & Friedman, B. M. (1990). New evidence on the monetary transmission mechanism. *Brookings Papers on Economic Activity, 1,* 149-213. Retrieved from https://www.brookings.edu/wp-content/uploads/1990/01/1990a_bpea_romer_romer_goldfeld_friedman.pdf
42. Sensarma, R., & Chaudhuri, K. (2008). Non-performing assets in Indian banking: magnitude, determinants and impact of recent policy initiative. *India Development Report 2008*. Retrieved from https://uhra.herts.ac.uk/handle/2299/6383
43. Simpasa, A. M., Nandwa, B., & Nabassaga, T. (2014). *Bank Lending channel of monetary policy transmission in Zambia: Evidence from bank-level data.* African Development Bank Group. Retrieved from https://www.researchgate.net/profile/Anthony-Simpasa/publication/282576282
44. Sims, C. A. (1980). Macroeconomics and reality. *Econometrica: journal of the Econometric Society,* 1-48. https://doi.org/10.2307/1912017
45. Sims, C. A. (1992). Interpreting the macroeconomic time series facts: The effects of monetary policy. *European Economic Review, 36*(5), 975-1000. https://doi.org/10.1016/0014-2921(92)90041-T
46. Sims, C. A., & Zha, T. (2006). Does monetary policy generate recessions? *Macroeconomic Dynamics, 10*(2), 231-272. Retrieved from https://ideas.repec.org/a/cup/macdyn/v10y2006i02p231-272_05.html
47. Stepanyan, V., & Guo, K. (2011). *Determinants of bank credit in emerging market economies* (International Monetary Fund Working Paper). Retrieved from https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Determinants-of-Bank-Credit-in-Emerging-Market-Economies-24698
48. Suzuki, T. (2004). Is the lending channel of monetary policy dominant in Australia? *Economic Record, 80*(249), 145-156. Retrieved from https://ideas.repec.org/a/bla/ecorec/v80y2004i249p145-156.html
49. Suzuki, T. (2008). Credit Channel of Monetary Policy between Australia and New Zealand: An Empirical Note. *Ryukoku University Faculty of Economics, 1,* 12. Retrieved from https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=6619b4db58dc3bcb04aab3d12c58f9f8502317f1
50. Tan, M. T. B. P. (2012). *Determinants of credit growth and interest margins in the Philippines and Asia*. International Monetary Fund. Retrieved from https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Determinants-of-Credit-Growth-and-Interest-Margins-in-the-Philippines-and-Asia-25911