



Transfer Money Policy through Credit Channels in Vietnam

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ABSTRACT

Study and examines the impact of monetary policy transmission through credit channels in Vietnam based on the research model of Sun et al. (2010). To estimate this model system, the author uses VECM method with secondary data taken from reliable sources on the situation of Vietnam consumer price index, credit growth of the economy, deposits of customers, industrial production in Vietnam, growth of M2 money supply, rediscount interest rate; VN Index from January 2008 to December 2017. The research results show that both in the short and long-term, the rediscount rate has a negative impact on the credit growth of the economy. When the State Bank of Vietnam implements an expansionary monetary policy with a discounted interest rate tool, it will have an impact on increasing the total credit supply of the economy. However, an increase in economic credit will increase economic output (represented by Vietnam's industrial production value) in the short term; or the impact of monetary policy transmission via credit channel in Vietnam shows that there exists a short-term credit channel but does not exist in the long term.

Keywords: Monetary Policy, Credit Channels, VECM Method

JEL Classifications: E5, E52, E51

1. INTRODUCTION

Monetary policy transmission is one of the important research issues in the study of monetary policy that researchers are interested in the world for long time by two reasons. First, grasping the level of monetary policy impact on the economy plays an important role in evaluating the governance direction of the Central Bank. The effectiveness of an easing monetary policy is not guaranteed even if the central bank lowers the operating interest rate when the impact of monetary policy on the economy is not as expected. Secondly, before making any choice and using any monetary policy tool, the central bank needs to accurately assess the time and extent of its impact on the system of credit institutions and the economy. To do this, the central bank needs to understand the mechanism of monetary policy transmission to the financial situation of the credit system as well as macro variables in the economy such as output and inflation. Currently, economists have very different views on this issue, because in

the conditions or the level of development of different financial markets, the impact of monetary policy on the economy through the channels is not the same.

Through open market instruments, compulsory reserve instruments, interest rate instruments, etc., monetary policy affects the economy through various channels such as interest rates, exchange rates, credit, asset prices ... (Chatelain et al., 2003). There are many views that interest rate channel is the main transmission channel (Baglioni, 2007). However, from Bernanke and Blinder point of view (Bernanke, 1990), monetary policy appears to be ineffective in reducing medium and long-term interest rates, especially real interest rates (playing an important role in decisions intend to invest in long-term assets. Meanwhile, the credit channel may represent a group of factors that amplify and spread the impact of monetary policy on Macro variables in developing countries (Disyatat and Vongsinsirikul, 2003). Therefore, the assessment of the transmission impact of monetary policy through credit channel

also plays an important role in evaluating the management of monetary policy in the economy. Theories show that the macro objectives of the economy including price stability, economic growth promotion, creating jobs to reduce unemployment rates are greatly influenced by the volume and credit structure supplied on the market. Through the mechanism of impact on commercial banks because policy instruments will change the list of credit, interest rates, borrowing conditions ... of commercial banks, it is possible to adjust the expansion or narrowing of credit structure by economic sector or by region. On the one hand the expansion or narrowing of credit affects the amount of money supplied and interest rates on the market and therefore affects the prices in the economy. On the other hand, the expansion or narrowing of credit, the reduction or increase of interest rates, the change in credit structure will affect the scale of investment and thus affect the output, employment and economic structure.

2. THEORETICAL BASIS AND EMPIRICAL EVIDENCE

2.1. Theoretical Basis

In theory, Bernanke and Blinder (1988) demonstrate the change of bank credit supply before currency through LM shift. The study argues that when the central bank tightens monetary policy by selling securities on the open market, it will reduce the reserve and deposits of the credit system, the LM shift to the left leads to money supply in a declining economy. Since the issuance of debt and the stock instruments to offset the reduction of deposits is not easy, the ability of credit institutions to provide loans decreases when the Central Bank tightens monetary policy, supply credit is declining. In previous studies: Bernanke and Gertler (1995); Gertler and Gilchrist (1993); Kashyap and Stein (1994) have developed more details based on more detailed studies conducted by Bernanke and Blinder (1988) in order to provide theoretical models that explain changes in credit supply in the monetary regulation mechanism and thereby affect the economy's output. Studies show that the important and popular impact of monetary policy through commercial bank credit channel is shown in two aspects: through bank credit activities and through the adjustment of the balance sheet of customers.

Firstly, affecting bank credit supply

$M \downarrow (\uparrow) \rightarrow \text{Bank reserves} \downarrow (\uparrow) \rightarrow \text{credit} \downarrow (\uparrow) \rightarrow I \downarrow (\uparrow) \rightarrow Y \downarrow (\uparrow)$

According to Bernanke and Gertler (1995), when the central bank tightened monetary policy, commercial banks 'funds were reduced, commercial banks had to cut credit supply and vice versa. The tightening of monetary policy reduces deposits along with the decrease in assets of commercial banks.

Secondly, the process of adjusting customer balance sheet:

Bernanke and Blinder analyze the impact of monetary policy on bank credit through account balance or net asset value of customers. The implementation of the central bank's monetary policy will change the net asset value on the balance sheet of

enterprises, which leads to the opposite choice and moral risks and affects the bank's decision on the amount of credit supply. It is possible to generalize the influence of monetary policy on the changes in net assets of enterprises in three directions:

- Through net asset value.
 $M \uparrow \rightarrow \text{Net asset value} \uparrow \rightarrow \text{Opposite selection} \downarrow$ and moral hazard $\downarrow \rightarrow \text{credit} \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$.
- Affecting the market value of assets used as collateral for loans. Decreasing interest rates due to the expansion of monetary policy will increase the market value of collateral assets, reduce interest rate risks for enterprises, and improve the financial status of enterprises, businesses can access capital of banks more easily and therefore the amount of credit increases will increase aggregate demand.
- Through cash flow value.
 $M \uparrow \rightarrow \uparrow \text{cash inflow} \rightarrow \downarrow \text{opposite choice and} \downarrow \text{moral hazard} \downarrow \rightarrow \text{credit} \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$.

For M is the money supply, i is interest rate, P* is the net asset value, I is the investment, Y is the total output, P is the unintended price. The impact of monetary policy through credit channel through these two impacts will be greater if two conditions are met: (1) The Central bank can greatly affect the credit provision of commercial banks: In this case, when central banks tighten money supply, commercial banks have no assets, cannot or have difficulties in issuing debt instruments or capital in the market to raise capital to compensate for the decline in the money supply for loans to customers as a perfect replacement. When monetary policy tightens, if banks are unable to fully meet the demand for funds only by using asset reductions to raise capital through issuing debt instruments or capital in the market. In this case, cutting bank credit is a measure to replace the storage of funds when monetary policy tightens, and reduces bank asset types (including loan's profits). (2) Customers with other financial resources to replace bank loans, businesses (and individuals) have perfect replacements for loans at banks. In other words, they can make up for these loans by borrowing directly from saving people who have idle capital on the capital markets. In this case, customers appear to be sensitive about prices before the main currency shock and quickly switch to alternative forms of capital mobilization, reducing the demand for loans in the market, the credit channel will be dropped.

2.2. Empirical Evidence

In terms of research methods, in general, most studies on the impact of monetary policy through credit channel use the approach of model VAR, SVAR, VECM, GMM with national production variables, inflation index, credit interest rate, credit channel, actual effective exchange rate, foreign exchange reserves and stock market index. Studies on policy transmission channels frequently use VAR, SVAR, VECM models because the relationship between variables does not go one way, but in many cases, the opposite direction can also occur. For empirical research on monetary policy transmission in Vietnam, the use of these models is entirely consistent with the general research trend. However, with quantitative research, it is necessary to update to have more reliable results, while domestic studies do not explain the model structure clearly.

In terms of research results, research in the world has two results: Afrin (2017); Aleem (2010); Ippolito et al. (2018); Lindner et al. (2019); Mahathanaseth and Tauer (2019); Orzechowski (2016); Matousek and Solomon (2018); Salachas et al. (2015) affirmed the impact of monetary policy on changes in credit supply of intermediary financial institutions. Research by Favero and Bagliano (1998); Lungu (2008); Simpasa et al. (2014) show interest rates important in the transmission of monetary policy shock to the main macroeconomic variables. The bank's credit line is not an important channel due to the presence of direct credit in the priority area. Experimental studies in Vietnam confirm this effect by reliable quantitative research methods. However, the magnitude and trend are different due to the trend-based studies based on different assumptions.

3. METHODS AND RESEARCH DATA

3.1. Research Methods

3.1.1. Research models

In empirical research, choosing the right model is one of the most difficult jobs. The theory of function form does not give a simple answer to this problem. By examining relevant studies, we see empirical studies on the relationship between bank debt and housing prices often using self-regression vector models (VAR) and error correction model (ECM) because these models are suitable for time series data. Therefore, this study uses the ECM developed by Hofmann (2004). Specifically, the ECM has the form:

To consider the impact of transmission of monetary policy through credit channels in Vietnam, studied modeling VECM based on your research model of Sun et al. (2010), master model as follows:

$$\begin{aligned} \Delta MT_t &= A_0^1 + \alpha_1 (MT_t - \beta V_t) + \sum_{i=1}^p (c_{1i} \Delta MT_{t-i} + c_{2i} \Delta V_{t-i}) + u_t^{MT} \\ \Delta V_t &= A_0^2 + \alpha_2 (MT_t - \beta V_t) + \sum_{i=1}^p (d_{1i} \Delta MT_{t-i} + d_{2i} \Delta V_{t-i}) + u_t^V \end{aligned} \tag{1}$$

Inside, MT_t is the vector indices measure monetary policy in Vietnam, including interest rates interbank Vietnam's growth rate of monetary supply $M2$, V_t is the vector of variables total deposits from customers at banks, total customer bank credit stock index, industrial output, consumer price index, u_t^{MT} represent monetary policy shocks, u_t^V are the macro shocks of the economy.

3.1.2. Method of estimation

To estimate the model system (1), the author uses the VECM method. This is essentially the VAR method that has been corrected by the ECM method. The VECM method is only used when the string strain is tested to have integration phenomenon that is in the long term, they will balance, from which we overcome the disadvantages of the VAR method, that the VAR method they consider to be in short-term missed loss of long-term factors.

According to Engle and Granger (1987); Johansen (1988) the estimation of ECM models can be conducted in two steps:

- Step1: Verification of technical co-integration (Johansen, 1988)
Test results if there exists at least one co-integration relationship between the variables, that means there is a long-term equilibrium relationship between the relevant variables, then continue to step two.

Co-integrated regression equation (expressing a long-term equilibrium relationship between variables),

$$Y_t = \alpha + \sum_{i=1}^m \beta_i x_t + ECT_t$$

The ECT co-integration vector is measured by the residual changes from the above regression equation as follows:

$$ECT_t = Y_t - \alpha - \sum_{i=1}^m \beta_i x_t$$

Inside:

- Y_t : Is the dependent variable
- X_t : Are independent variables in the model
- ECT_t : Is the remainder in the model
- α, β_i : Is the coefficient of the equivalent matrix in size
- m : Is the number of independent variables.

- Step 2: estimate the ECM model
If the results conclude that there exists a co-integration relationship between the variables in the model or the long equilibrium relationship in existence, the ECM model is estimated as follows:

$$\Delta Y_t = c - \sum_{i=1}^p \beta_i \Delta Y_{t-i} + \sum_{j=1}^m \sum_{i=1}^k \gamma_{ji} \Delta x_{t-i} + \theta_t ECT_{t-i} + \varepsilon_t$$

Inside:

- ΔY_t is the first difference of the dependent variable
- ΔY_{t-i} is the first difference of the dependent variable with the latency of t-i
- Δx_{t-i} is the first difference of independent variable with the delay of t-i
- ECT_{t-i} is the residual obtained from the regression equation integrated with the t-i delay
- $c, \beta_i, \gamma_{ji}, \theta_t$, are the coefficients of equivalent matrices of size
- ε_t is the remainder in the regression equation
- p, k are the corresponding delays
- m is the number of independent variables in the equation.

3.2. Tests and Estimates

The processing of variables in the time series model can be summarized briefly, this study will do as follows:

- Test the stop of the time series of variables in the model by Unit Root Test unit testing
- Determine the integration order of the variables to have a stop data sequence

- Select the optimal delay of the model based on the VAR self-regression vector model and inspection standards such as Akaike Information Criterion, Hannan – Quinn criteria, SC (or BIC), Final Prediction Error (FPE) criteria)
- Perform co-integration tests (Integrations test) based on the Johansen Integrations test method to determine whether there is a long-term relationship between the variables in the model
- After co-integration testing, the study will determine the long-term relationship between the variables in the model and thereby determine the short-term relationship based on the ECM.

3.3. Research Data

Research based on secondary data sources. Specifically, time series data about:

- CPI: Changes in Vietnam’s consumer price index are taken from the General Statistics Office Website
- CRE: The credit growth of the economy is taken from the website of the State Bank of Vietnam
- DEP: Customer deposit growth is taken from the website of the State Bank of Vietnam
- IPI: Changes in Vietnam industrial production index taken from the General Statistics Office website
- M2: Growth rate of M2 money supply is taken from the website of the State Bank of Vietnam

Table 1: Inspection stationary standard variables ADF standard

Turn	Original string		Differential level 1	
	ADF	P-value	ADF	P-value
CPI _t	-4.243061	0.0009	-10.35168	0.0000
CRE _t	-2.171983	0.2177	-10.58164	0.0000
DEP _t	-9.022687	0.0000	-14.56641	0.0000
IPI _t	-4.092894	0.0015	-14.34594	0.0000
M2 _t	-8.826715	0.0000	-13.16455	0.0000
R _t	-1.734072	0.4116	-14.77411	0.0000
VNI _t	-2.828839	0.0573	-14.23031	0.0000

Source: Author’s synthesis and calculation. ADF: Augmented Dickey–Fuller

Table 2: Select the optimal delay for the model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1186.109	NA	3.50e-18	-20.32947	-20.16331	-20.26202
1	1459.980	509.9665	7.25e-20*	-24.20656*	-22.87724*	-23.66693*
2	1499.745	69.24522	8.58e-20	-24.04733	-21.55485	-23.03552
3	1534.827	56.85740	1.12e-19	-23.80736	-20.15174	-22.32339
4	1596.238	92.11680*	9.40e-20	-24.02135	-19.20257	-22.06520

Source: Author’s synthesis and calculation. According to the results there are 3 criteria that propose a delay of 1, that is: (1) The final predictive error (Final Prediction Error FPE); (2) Akaike information criteria (AIC, Akaike Information Criterion); (3) criteria for Schwarz information, (4) Hannan – Quinn information criterion (HQ: Hanan-Quinn information criterion). Therefore, latency 1 will be selected to estimate the VECM model. *Cointegrated inspection

Table 3: The test results are integrated relational contact

Assume H ₀	Eigenvalue	Trace statistics	Critical value at 5%	P-value
None *	0.535879	251.3442	125.6154	0.0000
At most 1*	0.363743	160.7662	95.75366	0.0000
At most 2*	0.325262	107.4122	69.81889	0.0000
At most 3*	0.267926	60.98737	47.85613	0.0018
At most 4	0.117780	24.18630	29.79707	0.1927
At most 5	0.052217	9.399236	15.49471	0.3297
At most 6*	0.025689	3.070953	3.841466	0.0797

Source: Author’s synthesis and calculation

- R: Rediscount interest rate is taken from the website of the State Bank of Vietnam
- VNI: Change the VN Index from the Café F.

Research data were collected monthly from January 2008 to December 2017.

4. EXPERIMENTAL RESEARCH OF VIETNAM

4.1. Testing on Unit Tests

Table 1 shows the results of unit root tests for variables in the Augmented Dickey–Fuller (ADF) standard.

The result of unit root test according to ADF standard shows that some variables in the original string are non-stop. However, when taking first differences 1, The CPI_t, CRE_t, DEP_t, IPI_t, M2_t, R_t, VNI_t are stopped at the 1%. Therefore, the variables will be used in the first difference format. The variables are rewritten in the form of the following symbol: D (CPI): Variable to change the consumer price index of Vietnam, D (CRE): Turning the credit growth of the economy; D (DEP): Variable customer deposit growth, D (IPI): Changes in Vietnam industrial production index, D (M2): Turn the growth rate of money supply M2; D (R): Rediscount interest rate variable; D (VNI): Changes the VN Index.

4.2. Select the Optimal Delay in the Model

There are many methods to select the latency for the VECM model. The study presented the lag Order Selection Criteria method to find the appropriate delay for VECM model. The results are presented in Table 2.

After determining the optimal delay in the model is 1. Next author will examine the existence of long-term equilibrium relationship between the variables in the model. To do this, the author examined the existence of a co-integration relationship between the variables in the model according to the Johansen method.

The P-value in Table 3 shows that there are 4 co-integration relationships between the variables in the model at the 5% significance level. Thus, there is evidence of existence of a long- term equilibrium relationship between changing consumer price index, changing total customer deposits changing M2 money supply, changing the discount interest rate, changes in stock price index, growth of bank loans, economic growth.

4.4. Results of Estimating VECM Model

After finding evidence of the existence of a long-term equilibrium relationship between the variables in the model, next the author conducted the estimation of VECM model with 4 integrated relations and the optimal delay is 1.

The estimated results of VECM model show a long- term equilibrium relationship between the variables in the model. Then, in order to check the existence of the monetary policy transmission effect through credit channels in Vietnam, the author extracted the equation separately with the dependent variable D(CRE) and D (IPI). The result of estimating the equation with the dependent variable is D(CRE) as follows in Table 4.

The estimated results of the VECM model show that the regression coefficients C(14) of the integrated equations have negative values(-0.559002) and have $P < 5\%$ significance level so this regression coefficient is statistically significant. Thus, in the long term there exists an impact between the credit growth of the economy, the discount rate, M2 money supply and the stock price index.

On the other hand, the regression coefficient C (22) of the rediscount interest rate variable is -0.001049 which has a negative value and has a $P = 0.0584$ which $< 10\%$ significance level. Thus, in the short term when the State Bank implements an expansionary monetary policy through the increase of interest rate rediscount tools, there will be an impact on reducing the credit growth of the economy.

Thus, the research results show that both in the short and long term, the discount rate has a negative impact on the credit growth of the economy.

The testing of the stability of the model, the normal distribution, the autocorrelation, the variance of variance have been tested by the author. The results of these tests show that the obtained model satisfies the conditions.

Next, the equation estimation result with dependent variable D(IPI) is as follows in Table 5.

The estimation of the VECM model shows that the regression coefficient C(40) of the cointegrated equation is negative (-0.078868) and has a $P < 5\%$ significance level so this coefficient regression is statistically significant. Thus, in the long term there exists an impact between Vietnam's industrial production growth, discount interest rates, M2 money supply and stock price index. Thus, credit growth does not affect the value of Vietnam's industrial production in the long term.

On the other hand, the regression coefficients C (42) of the rediscount interest rate variable is 3.573246 which has a negative

Table 4: Results of model estimation with the dependent variable D (CRE)

D (CRE)=C (13)*(CPI(-1)-2.03553642157*M2(-1)-0.00138718142687*R(-1)-0.0125293684797*VNI (-1) -0.885237040621)+C (14)* (CRE(-1)+4.26415634818*M2(-1)-0.0015628109786*R(-1)-0.0193848917262*VNI(-1)+0.0411811962408)+C (15)*(DEP(-1)-1.05727 913538*M2(-1)+0.000272746476616*R(-1)+0.00655589317034*VNI(-1)-0.0419905569899)+C (16)*(IPI(-1)-201.634801835*M2(-1) -0.0151154281568*R(-1)-0.394748036738*VNI(-1)+4.49923136054)+C (17)*D (CPI(-1))+C (18)*D (CRE(-1))+C (19)*D (DEP(-1)) +C (20)*D (IPI(-1))+C (21)*D (M2(-1))+C (22) *D (R(-1))+C (23)*D (VNI(-1))+C (24)				
	Coefficient	Std. error	t-statistic	Prob.
C(13)	-0.034643	0.174095	-0.198988	0.8427
C(14)	-0.559002	0.104411	-5.353853	0.0000
C(15)	-0.072414	0.185203	-0.391000	0.6966
C(16)	-0.011134	0.002641	-4.215883	0.0001
C(17)	0.023371	0.218294	0.107062	0.9149
C(18)	-0.154947	0.098824	-1.567907	0.1199
C(19)	0.102004	0.118339	0.861964	0.3907
C(20)	0.002664	0.008291	0.321365	0.7486
C(21)	-0.027614	0.122682	-0.225086	0.8223
C(22)	-0.001049	0.000548	-1.913332	0.0584
C(23)	-0.013809	0.009016	-1.531698	0.1286
C(24)	-0.000218	0.001038	-0.210411	0.8338
R-squared	0.396079	Mean dependent var		-4.30E-05
Adjusted R-squared	0.333408	S.D. dependent var		0.013771
S.E. of regression	0.011243	Akaike info criterion		-6.041955
Sum squared resid	0.013400	Schwarz criterion		-5.760191
Log likelihood	368.4754	Hannan-Quinn criter.		-5.927550
F-statistic	6.319969	Durbin-Watson stat		1.979370
Prob. (F-statistic)			0.000000	

Source: Author's synthesis and calculation

value and has a $P = 0.0026 < 1\%$ significance level indicating in the short term when the economy credit increase will lead to increase the value of Vietnam's industrial production, increase economic output.

Thus, the estimated results by VECM model to check the impact of monetary transmission via credit channel in Vietnam show that there is a short-term credit channel but does not exist in the long term.

4.5. Testing Granger Causality

To clarify the direction of impact as well as the transmission between variables in the model. The author continues to perform Granger causality test with an optimal delay of 3. The test results are as follows in Table 6.

Granger causality test results from rediscount rate to credit growth with $P = 0.0557$ are $< 10\%$ significance level. Thus, the discount rate has an impact on credit growth. However, the Granger causality test results from a credit growth to a discount rate with a $P = 0.6392$ are $> 10\%$ significance level. Thus, credit growth has no opposite effect on the discount rate.

In addition, the Granger causality test results from credit growth to economic growth with $P = 0.0020$ are smaller than the 1% significance level. Thus, credit growth has an impact on economic growth. However, the results of causality test also showed that there was no opposite effect from economic growth to credit growth.

Thus, there is no causal relationship between rediscount interest rates and the credit growth of the economy, between these two

variables, there is only one-way relationship from the discount interest rate to the credit growth economy.

5. CONCLUSIONS AND POLICY IMPLICATIONS

Monetary policy has always been one of the one of the key policies in promoting economic growth. To be effective for the economy, the impact of monetary policy is often through transmission channels such as interest rate channel, exchange rate channel, asset price channel, credit channel ... The purpose of this research is to consider the effectiveness of transmission of monetary policy through credit channel in Vietnam from January 2008 to December 2017. By using the VECM model, the research results show that both in the short and long term, the discount interest rate has a negative impact on the credit growth of the economy. Thus, when the State Bank implements an expansionary monetary policy through the increase of interest rate rediscounting tools, it will have an impact on reducing the credit growth of the economy. However, an increase in the credit of the economy will increase the value of Vietnam's industrial production, increase the economic output in the short-term. Therefore, the impact of monetary policy transmission via credit channel in Vietnam shows that there is a short-term credit channel but does not exist in the long term. However, Granger causality test results show that credit growth has no opposite effect on discount interest rates.

In addition, the Granger causality test results from credit growth to economic growth show that credit growth has an impact on economic growth. However, the results of causality test also showed that there was no opposite effect from economic growth to credit growth.

Table 5: Results estimate the model with the dependent variable is D (IPI)

	Coefficient	Std. error	t-statistic	Prob.
$D(IPI) = C(37) * (CPI(-1) - 2.03553642157 * M2(-1) - 0.00138718142687 * R(-1) - 0.0125293684797 * VNI(-1) - 0.885237040621) + C(38) * (CRE(-1) + 4.26415634818 * M2(-1) - 0.0015628109786 * R(-1) - 0.0193848917262 * VNI(-1) + 0.0411811962408) + C(39) * (DEP(-1) - 1.05727913538 * M2(-1) + 0.000272746476616 * R(-1) + 0.00655589317034 * VNI(-1) - 0.0419905569899) + C(40) * (IPI(-1) - 201.634801835 * M2(-1) - 0.0151154281568 * R(-1) - 0.394748036738 * VNI(-1) + 4.49923136054) + C(41) * D(CPI(-1)) + C(42) * D(CRE(-1)) + C(43) * D(DEP(-1)) + C(44) * D(IPI(-1)) + C(45) * D(M2(-1)) + C(46) * D(R(-1)) + C(47) * D(VNI(-1)) + C(48)$				
C(37)	1.035963	2.039043	0.508063	0.6125
C(38)	-3.535940	1.222886	-2.891471	0.0047
C(39)	3.235736	2.169142	1.491712	0.1387
C(40)	-0.078868	0.030931	-2.549840	0.0122
C(41)	0.160316	2.556701	0.062704	0.9501
C(42)	3.573246	1.157448	3.087177	0.0026
C(43)	-0.388218	1.386015	-0.280097	0.7799
C(44)	-0.251948	0.097104	-2.594629	0.0108
C(45)	1.570978	1.436883	1.093323	0.2767
C(46)	-0.008789	0.006419	-1.369291	0.1738
C(47)	0.053047	0.105594	0.502367	0.6165
C(48)	0.004515	0.012162	0.371230	0.7112
R-squared	0.287709	Mean dependent var.		0.004439
Adjusted R-squared	0.213792	S.D. dependent var.		0.148512
S.E. of regression	0.131683	Akaike info criterion		-1.120690
Sum squared resid	1.838091	Schwarz criterion		-0.838926
Log likelihood	78.12073	Hannan-Quinn criter.		-1.006286
F-statistic	3.892318	Durbin-Watson stat.		1.970629
Prob. (F-statistic)			0.000098	

Source: Author's synthesis and calculation

REFERENCES

Table 6: The test results of granger causality

Excluded	Chi-sq.	df	Prob.
Dependent variable: D (CPI)			
D(CRE)	0.257986	1	0.6115
D(DEP)	0.018944	1	0.8905
D(IPI)	1.512484	1	0.2188
D(M2)	0.581833	1	0.4456
D(R)	3.579396	1	0.0585
D(VNI)	0.677396	1	0.4105
All	6.704472	6	0.3490
Dependent variable: D(CRE)			
D(CPI)	0.011462	1	0.9147
D(DEP)	0.742982	1	0.3887
D(IPI)	0.103276	1	0.7479
D(M2)	0.050664	1	0.8219
D(R)	3.660839	1	0.0557
D(VNI)	2.346098	1	0.1256
All	7.850678	6	0.2492
Dependent variable: D(DEP)			
D(CPI)	4.809251	1	0.0283
D(CRE)	1.088107	1	0.2969
D(IPI)	0.678857	1	0.4100
D(M2)	6.199496	1	0.0128
D(R)	0.031884	1	0.8583
D(VNI)	0.047127	1	0.8281
All	10.99792	6	0.0884
Dependent variable: D(IPI)			
D(CPI)	0.003932	1	0.9500
D(CRE)	9.530660	1	0.0020
D(DEP)	0.078454	1	0.7794
D(M2)	1.195356	1	0.2743
D(R)	1.874958	1	0.1709
D(VNI)	0.252373	1	0.6154
All	16.26135	6	0.0124
Dependent variable: D(M2)			
D(CPI)	3.960314	1	0.0466
D(CRE)	1.895524	1	0.1686
D(DEP)	3.499712	1	0.0614
D(IPI)	1.720715	1	0.1896
D(R)	0.262690	1	0.6083
D(VNI)	0.097966	1	0.7543
All	10.33198	6	0.1114
Dependent variable: D(R)			
D(CPI)	0.305554	1	0.5804
D(CRE)	0.219839	1	0.6392
D(DEP)	0.127149	1	0.7214
D(IPI)	0.174081	1	0.6765
D(M2)	0.011758	1	0.9137
D(VNI)	1.24E-07	1	0.9997
All	2.122184	6	0.9081
Dependent variable: D(VNI)			
D(CPI)	0.651387	1	0.4196
D(CRE)	0.720868	1	0.3959
D(DEP)	0.133255	1	0.7151
D(IPI)	0.000406	1	0.9839
D(M2)	0.495604	1	0.4814
D(R)	0.237599	1	0.6259
All	1.990512	6	0.9206

Source: Author's synthesis and calculation

- Afrin, S. (2017), Monetary policy transmission in Bangladesh: Exploring the lending channel. *Journal of Asian Economics*, 49, 60-80.
- Aleem, A. (2010), Transmission mechanism of monetary policy in India. *Journal of Asian Economics*, 21(2), 186-197.
- Baglioni, A. (2007), Monetary policy transmission under different banking structures: The role of capital and heterogeneity. *International Review of Economics and Finance*, 16(1), 78-100.
- Bernanke, B. (1990), The Federal Funds Rate and the Channels of Monetary Transmission. National Bureau of Economic Research. Working Paper No. 3487.
- Bernanke, B.S., Blinder, A.S. (1988), Credit, Money, and Aggregate Demand. Working Paper Series 2534.
- 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.
- Chatelain, J.B., Generale, A., Vermeulen, P., Ehrmann, M., Martínez-Pagés, J., Worms, A. (2003), Monetary policy transmission in the euro area: New evidence from micro data on firms and banks. *Journal of the European Economic Association*, 1, 731-742.
- Disyatat, P., Vongsinsirikul, P. (2003), Monetary policy and the transmission mechanism in Thailand. *Journal of Asian Economics*, 14(3), 389-418.
- Engle, R.F., Granger, C.W.J. (1987), Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, 55(2), 251-270.
- Favero, C.A., Baglioni, F.C. (1998), Information from financial markets and VAR measures of monetary policy. *SSRN Electronic Journal*, DOI: 10.2139/ssrn.131446.
- Gertler, M., Gilchrist, S. (1993), The cyclical behavior of short-term business lending. Implications for financial propagation mechanisms. *European Economic Review*, 37(2-3), 623-631.
- Hofmann, B. (2004), The determinants of bank credit in industrialized countries: Do property prices matter? *International Finance*, 7(2), 203-234.
- Ippolito, F., Ozdagli, A.K., Perez-Orive, A. (2018), The transmission of monetary policy through bank lending: The floating rate channel. *Journal of Monetary Economics*, 95, 49-71.
- Johansen, S. (1988), Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12(2-3), 231-254.
- Kashyap, A.K., Stein, J.C. (1994), The Impact of Monetary Policy on Bank Balance Sheets. Working Paper 4821.
- Lindner, P., Loeffler, A., Segalla, E., Valitova, G., Vogel, U. (2019), International monetary policy spillovers through the bank funding channel. *Journal of International Money and Finance*, 90, 161-174.
- Lungu, M. (2008), Is There a bank lending channel in Southern African banking systems? *African Development Review*, 19(3), 432-468.
- Mahathanaseth, I., Tauer, L.W. (2019), Monetary policy transmission through the bank lending channel in Thailand. *Journal of Asian Economics*, 60, 14-32.
- Matousek, R., Solomon, H. (2018), Bank lending channel and monetary policy in Nigeria. *Research in International Business and Finance*, 45, 467-474.
- Orzechowski, P.E. (2016), Bank capital, loan activity, and monetary policy: Evidence from the FDIC's historical statistics on banking. *Journal of Economics and Finance*, 41(2), 392-407.
- Salachas, E.N., Laopodis, N.T., Kouretas, G.P. (2015), An examination of the bank lending channel and monetary policy during the pre and post-crisis period. *SSRN Electronic Journal*, DOI: 10.2139/ssrn.2614993.
- Simpasa, A., Nandwa, B., Nabassaga, T. (2014), Bank Lending Channel of Monetary Policy Transmission in Zambia: Evidence from Bank-Level Data. Working Paper Series, 211. Tunis: African Development Bank. p1-41.
- Sun, L., Ford, J.L., Dickinson, D.G. (2010), Bank loans and the effects of monetary policy in China: VAR/VECM approach. *China Economic Review*, 21(1), 65-97.