THE ROLE OF BANK LENDING IN THE MONETARY TRANSMISSION PROCESS OF A DEVELOPING ECONOMY: EVIDENCE FROM MALAYSIA

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Abstract

This study attempts to provide empirical evidence on the importance of bank loan in channelling monetary policy effects to the real economy. Based on the Malaysian data, the study focuses on a sample period spanning from January 1989 to December 2006. It explores the causal relationships between bank loan and monetary policy variable using two major tests; first, the auto-regressive distributed lag (ARDL) model which is used to examine the long-run relationship among the variables and second, the vector error-correction model (VECM) which is adopted to explore the short- and long-run dynamics between the variables. To further enrich the discussion, the study includes bank deposit so as to compare the importance of bank asset (loan) and liability (deposit) in the monetary transmission process. The results of the study show that both bank loans and deposits play a crucial role in the monetary transmission process in the Malaysian case. In particular, bank loan is shown to provide an important nexus from monetary policy to output in the short run, while bank deposit is an important channel of monetary policy in the long run. The relevance of bank loans and deposits in the monetary transmission process implies the importance of ensuring the stability of the banking system as a pre-requisite to effective monetary policy implementation and economic stability in the country.

JEL classification: *E42, E51, G21*

Keywords: *monetary policy transmission; bank loan; bank deposit; ARDL model; VECM; Malaysia*

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1. INTRODUCTION

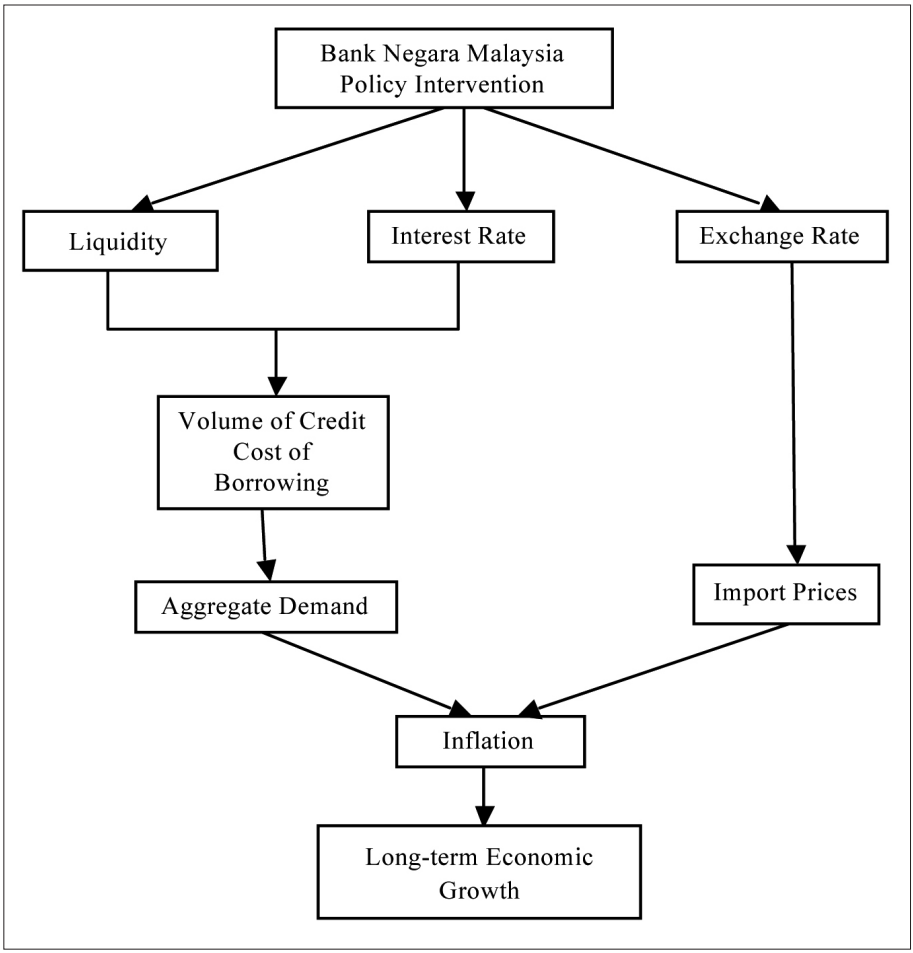
The importance of bank loan in channelling monetary policy effects to the real economy is well-documented in the literature. In essence, the bank lending channel of monetary policy transmission emphasises the special role that banks play in a financial market where information is imperfect. According to Hallsten (1999), information asymmetries create incentive problems that make it expensive or impossible for some firms to obtain financing directly from the financial market such as through issuing securities or bonds. For these firms, other forms of financing are either not available or more expensive, thus limiting their choices in raising financing. Therefore, they become "bank dependent" as their economic activities are directly related to the availability of bank loan. In a contractionary monetary policy environment, when a central bank conducts open market operations to reduce the money supply, the bank's liquidity is reduced, thereby restricting the ability of banks to supply new loan. Credit then becomes less available to the "bank-dependent" borrowers and these borrowers will cut down on production activities and aggregate output will decline.

For bank loan to be an important monetary policy channel, three basic pre-conditions need to exist in the economy (Bernanke and Blinder, 1988). First, bank loan and bonds are imperfect substitutes in their roles as financing sources in the economy. This implies that borrowers cannot substitute bank loan with other forms of financing when the availability of bank loan declines, resulting in a shortage of financing to these borrowers. The second pre-condition focuses on the ability of the central bank to control the level of bank loan supply. Theoretically, an intervention by the monetary authority using a specific monetary tool (such as through open market operations, discount window or statutory reserve ratio) will influence the level of bank loan supply accordingly, resulting in the intended impact of monetary policy filtering through the economy. However, in some circumstances, banking institutions react to preserve lending by selling their securities holdings, offsetting the decline in liquidity due to the monetary intervention. As a result, the supply of bank loan in the economy remains relatively unchanged even after the implementation of a contractionary monetary policy. Third, the economy must have imperfect price adjustment mechanisms so as to ensure non-neutrality of monetary shocks. Imperfect price adjustments are necessary so that changes in nominal reserves will not be offset by equal changes in prices. In other words, nominal rigidities which result in imperfect price adjustments ensure the real effects of monetary policy through the bank lending channel.

Apart from the basic pre-conditions, the importance of bank loan as a channel for monetary transmission depends critically on the stage of the financial development of the economy. Several studies have shown that bank lending is a significant channel for monetary policy transmission in countries with less mature financial sector development. In these countries, a significant share of total financing in the economy is sourced from intermediated funds or bank loan. Studies focusing on developing countries such as Indonesia, Malaysia, Thailand and South Korea have shown consistent findings supporting the importance of bank loan in the transmission process of monetary policy (see for example, Kaminsky and Reinhart, 1999; Azis and Thorbeck, 2002; Kim, 1999; Ibrahim, 2005; Azali, 2003; Tang, 2000 and 2002; and Vaithilingam et al., 2003). However, as the financial sector continues to develop along with the economic advancement, the importance of the bank loan in the monetary transmission process is expected to diminish. Gibson (1997) compares the strength of the bank lending channel against other monetary policy transmission channels and assesses for changes over time by allowing the regression coefficients and threshold parameters in each half of the samples to differ. Using the US data for the period 1960-1995, the study shows that the coefficients decline in magnitude and in statistical significance from the first half of the sample to the second, implying that bank lending has become relatively less important for the US economy over time. More recent studies have revealed the declining role of bank loan as a monetary transmission channel in the US economy (see for example, Morris and Sellon, 1999).

Several factors warrant a rigorous and in-depth study on the importance of bank loan in transmitting monetary policy effects in the Malaysian economy. Bank loan has been a major source of financing in the Malaysian economy. At the end 2006, 85 percent of total financing in Malaysia was in the form of bank loan. Bank loan accounted for more than 100 percent of the country's total gross domestic product (GDP) at the end of 2006, reflecting the importance of bank loans in the Malaysian economy. The important role played by bank lending in achieving the overall economic objectives is clearly acknowledged by the central bank of Malaysia – Bank Negara Malaysia "as the nation's monetary authority, the Central Bank is responsible to the Government for promoting monetary stability and a sound financial structure, and for influencing the credit situation to help achieve the nation's overall economic objectives" (Bank Negara Malaysia, 1994). More importantly, bank loan is one of the variables emphasized by Bank Negara Malaysia as a relevant variable to consider in the monetary transmission process in the economy (Figure 1).

Figure 1. Monetary Policy Transmission Mechanism in Malaysia



Source: Bank Negara Malaysia. (1999). *The Central Bank and the Financial System: A Decade of Change*, pp. 149.

Against this backdrop, this study aims to determine the importance of bank loan as a channel for monetary policy transmission in the Malaysian economy. Based on the latest data and rigorous investigation techniques, the study aims at highlighting major issues to ensure a strategic formulation and effective implementation of monetary policy in Malaysia. It is important to highlight that the importance of the banking sector in channelling monetary

policy effects has several important economic implications. If bank loan is shown to be important for monetary policy transmission, it is critical to ensure the stability of the banking sector due to its great repercussions on the economy as a whole. In such circumstances, ensuring the stability of the banking system is a crucial pre-condition towards economic stability.

The rest of this paper is organized as follows: the next section reviews relevant studies on the role played by bank lending in the process of monetary transmission. Section 3 discusses the data and empirical framework. Section 4 presents the empirical findings and analysis of the results. Lastly, section 5 concludes the paper.

2. LITERATURE REVIEW

Empirical studies on the importance of bank loan in the monetary transmission process generally focus on the relationship and impact of disturbances in the banking sector on the aggregate economic activity. To analyze this relationship, several methods of investigations are employed. This includes the Vector Auto Regression (VAR) analysis, narrative approach, spread analysis and disequilibrium model of loan market analysis. Of these empirical methods, the VAR approach has been extensively employed in the empirical studies on monetary policy transmission. A special characteristic of the VAR approach is that a relatively small number of macroeconomic variables can be used to describe the dynamics of the economy. A monetary VAR model normally comprises a monetary policy variable (interest rate) and selected macroeconomic variables, which typically include output and price indicator. These variables correspond to the variables involved in the standard IS-LM model.

There are many empirical studies on the monetary transmission mechanism using the VAR approach, including Friedman (1984); Bernanke and Blinder (1988, 1992); Gertler and Gilchrist (1993); Walsh and Wilcox (1995); Bernanke and Gertler (1995); Bernanke and Mihov (1998); Dale and Haldane (1998); Domac and Ferri (1998); Garretsen and Swank (1998); Guender (1998) and Suzuki (2001). These studies commonly measure the responses of selected macroeconomic variables (such as output, unemployment rate and inflation) and bank balance sheet variables (such as deposit, securities and loan) to innovations in the monetary policy indicator (such as interest rates). Studies that support the existence and importance of the bank lending channel, in general find that bank loan behaves in a predictable manner when a policy shock is exerted on the economy. Specifically, bank loan contracts following

a positive innovation in the monetary policy indicator and gives an impact on the overall economic activity. In this regard, the bank lending channel is said to be an active channel for monetary policy transmission.

Bernanke and Blinder (1992) investigated the importance of bank lending as a channel of monetary policy transmission in the US in the period 1957 to 1990. Using the Federal funds rate as an indicator for monetary policy, the responses of selected macroeconomic indicator such as unemployment, inflation and bank balance sheet items (loan and deposit) to innovations in the fed funds rate are analysed. The VAR analysis finds that in the short run, banks offset the decline in liquidity following a contractionary monetary policy by selling-off their securities holdings, thereby leaving the loan supply in the economy virtually unchanged. However, in the longer term, the tight monetary policy causes banks to terminate the existing loan and stop making new loan. The brunt of the tight monetary policy is especially felt by borrowers who are dependent on bank lending. Consequently, the tighter monetary policy results in a decline in aggregate output in the economy.

On the other hand, studies that do not support the importance of the bank lending channel generally find that banks offset the decline in liquidity following a tight monetary policy by adjusting their balance sheet items. Such ability to do so renders a monetary policy ineffective in influencing bank loan supply, as the level of banks' liquidity remained relatively unchanged even after the implementation of the tight monetary policy. For example, Suzuki (2001) employs the VAR to examine the bank lending channel using the Australian data. The study finds that even though bank loan contracted following a tight monetary policy, the contraction is driven by a leftward shift of the demand schedule for bank loan. The study concludes that Australian banks are able to accommodate the existing demand for loan in the wake of tight money by selling their security holdings and increase foreign currency liabilities. Studies by Morris and Sellon (1995) which use the US data in the period 1974-1990 also show that bank loan is not an important channel for monetary policy since bank loan supply does not decline in response to tight monetary policy.

Several empirical works support the importance of bank loans in propagating the monetary policy shocks in the Asian countries during the financial crisis 1997/1998 (see for example Kaminsky and Reinhart, 1999; Azis and Thorbeck, 2002; Kim, 1999). These studies measured the effects of macroeconomic shocks on the flow of bank lending in Asian countries during the crisis period. Kaminsky and Reinhart (1999) showed how the crisis in Asia spread during the second half of 1997 by using daily interest rate

and exchange rate data for Indonesia, Malaysia, the Philippines, South Korea and Thailand. The study found that the propagation of shocks across national borders during the crisis was attributed to the behaviour of foreign banks, which began to drastically curtail their lending to the affected Asian countries following the Thai devaluation, thus spreading and amplifying the crisis throughout the region. The study suggests that financial sector links between the emerging Asian countries have played an increasingly important role in the 1990s in transmitting disturbances across national boundaries.

In the Malaysian case, while studies on the credit/bank lending channel in particular are still scarce, it is encouraging to note that there is an increasing research interest on this topic. Earlier studies such as Scholnick (1996) and Tan (1997) adopted the credit-rationing model, which estimates the disequilibrium model of lending rate. Both studies support the presence of credit rationing in the Malaysian case as the lending rate adjusted very slowly and did not clear the loan market. The use of recent econometric techniques has contributed towards more detailed and enriching findings such as the studies by Tang (2000, 2002), Azali (2003), Ibrahim (2005) and Vaithilingam et al. (2003). In general, these studies are supportive of the important role played by bank loan in the transmission of monetary policy in the Malaysian case.

More recent studies seem to show contradictory findings. Of particular relevance to the context of this study is the empirical work by Goh et al. (2007) which adopts the Auto Regressive Distributed Lag (ARDL) approach to analyze the importance of the bank lending channel as a monetary transmission channel in the Malaysian case. The study however, is not supportive of the bank lending channel in transmitting monetary policy effects due to the ability of the banks to offset the decline in liquidity by adjusting their liquid financial instruments. Similarly, Tang (2006) analyzes an extensive 12-variable monetary VAR model for the Malaysian economy to determine the relative strength of the various monetary transmission channels. The study finds that, in a shorter term horizon, the interest rate channel is the most important channel of monetary transmission in Malaysia, whereas the credit channel is the most important channel of monetary transmission in the longer term horizon. The study also reveals the importance of the asset price channel in the shorter term horizon.

3. DATA AND EMPIRICAL FRAMEWORK

3.1 Data

The overnight rate (henceforth denoted as ONR) is used as the indicator for monetary policy, while the objective variables comprise bank loan (BL) and selected macroeconomic variables, namely the consumer price index (CPI) and industrial production index (IPI). The CPI and IPI are used to represent inflation and real economic activity, respectively. Given that Malaysia is a highly open economy, the conduct of monetary policy can be influenced by foreign shocks, thus we also include real effective exchange rate (RER) as a control variable. To enrich the discussion, we analyze the role of bank deposit (BD) as a possible channel of monetary policy and later make a comparison between BL and BD in the context of monetary transmission channels. All series are real (adjusted by price index with 2000 as base year) and in natural logarithm, except for the ONR.

The study uses monthly data covering the period from January 1989 to December 2006. All data derived from the various issues of Bank Negara Malaysia's *Monthly Statistical Bulletin*, except for the RER which is gathered from *International Financial Statistics* published by the International Monetary Fund.

3.2 Empirical Framework

Two major tests are undertaken to empirically explore the dynamic interrelationships between bank loan and bank deposit and the rest of the variables under consideration. First, the Auto Regressive Distributed Lag (ARDL) model is employed to empirically examine the long-run relationship among the variables, and second, the Vector Error Correction Model (VECM) is used to explore the short- and long-run dynamics among the variables. The VECM also allows the determination of the direction of causation among the variables.

3.2.1 ARDL Bound Testing Approach

In this study, the long-run dynamic relationships between the monetary policy variable and bank balance sheet items are estimated by using the ARDL bound testing approach which was initially introduced by Pesaran *et al.* (1996). The ARDL has numerous advantages. First, unlike the most widely method used for testing cointegration, the ARDL approach can be applied regardless of the stationary properties of the variables in the samples and al-

lows for inferences on long-run estimates, which is not possible under alternative cointegration procedures. In other words, this procedure can be applied irrespective of whether the series are *I*(0), *I*(1), or fractionally integrated (Pesaran and Pesaran 1997; and Bahmani-Oskooee and Wing Ng, 2002), thus avoids problems resulting from non-stationary time series data (Laurenceson and Chai, 2003). Second, the ARDL model takes sufficient numbers of lags to capture the data generating process in a general-to-specific modelling framework (Laurenceson and Chai, 2003). It estimates $(p+1)^k$ number of regressions in order to obtain optimal lag-length for each variable, where p is the maximum lag to be used, k is the number of variables in the equation.

Ideally, for the purpose of this study, we need to incorporate all the variables in the modelling, but a VAR model can be poorly estimated in a finite sample, as the addition of a variable will quickly exhaust the degree of freedom. Following Gertler and Gilchrist (1993, 1994), we estimate a series of separate VAR models including INF, IPI, and RER, policy variable (ONR), and one bank balance sheet item at a time. Thus, our models contain only five variables. The ARDL models for the bank balance sheet items used in this study can be written as follows:

$$BD_t = \delta_0 + \phi_1 ONR_t + \varphi_2 IPI_t + \gamma_3 RER_t + \mu_4 INF_t + \in_t \quad (1)$$

$$BL_t = \delta_0 + \phi_1 ONR_t + \varphi_2 IPI_t + \gamma_3 RER_t + \mu_4 INF_t + \varepsilon_t \quad (2)$$

The error correction version of ARDL framework pertaining to the variables in the Equations (1) and (2) can be reproduced as follows:

$$\Delta BD_t = \delta_0 + \sum_{i=1}^{p} \theta_i \Delta BD_{t-1} + \sum_{i=0}^{p} \phi_i \Delta ONR_{t-1} + \sum_{i=0}^{p} \varphi_i IPI_{t-1} + \sum_{i=0}^{p} \gamma_i \Delta RER_{t-1} + \sum_{i=0}^{p} \mu_i \Delta INF_{t-1}$$
$$+ \lambda_1 BD_{t-1} + \lambda_2 ONR_{t-1} + \lambda_3 IPI_{t-1} + \lambda_4 RER_{t-1} + \lambda_5 INF_{t-1} + \notin_{1t} \quad (3)$$

$$\Delta BL_t = \delta_0 + \sum_{i=1}^{p} \theta_i \Delta BL_{t-1} + \sum_{i=0}^{p} \phi_i \Delta ONR_{t-1} + \sum_{i=0}^{p} \varphi_i IPI_{t-1} + \sum_{i=0}^{p} \gamma_i \Delta RER_{t-1} + \sum_{i=0}^{p} \mu_i \Delta INF_{t-1}$$
$$+ \lambda_1 BL_{t-1} + \lambda_2 ONR_{t-1} + \lambda_3 IPI_{t-1} + \lambda_4 RER_{t-1} + \lambda_5 INF_{t-1} + \varepsilon_{1t} \quad (4)$$

In the above equations, the terms with the summation signs represent the error correction dynamics, while the second part (terms with λs) correspond to the long-run relationship. The null of no cointegration in the long-run relationship is defined by H_0: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$ is tested against the alterna-

tive of H_1: $\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq 0$, by the means of the F-test. However, the asymptotic distribution of this F-statistic is non-standard irrespective of whether the variables are *I*(0) or *I*(1). Pesaran *et al*. (1996) have tabulated two sets of appropriate critical values. One set assumes all variables are *I*(1) and another assumes that they are all *I*(0). This provides a bound covering all possible classifications of the variables into *I*(1) and *I*(0) or even fractionally integrated. If the F-statistic lies above the upper-bound level, the null hypothesis is rejected, which indicates the existence of cointegration. However, if the F-statistic falls below the bound level, the null cannot be rejected, showing that no cointegration exists. If, however, it falls within the band, the result is inconclusive. Finally, in order to determine the optimal lag-length incorporated into the model and select the ARDL model to be estimated, the study employs the Akaike Information Criteria (AIC).

3.2.2 VECM Framework

To examine the short- and long-run dynamic relationships among the variables, the study employs the VECM framework, which regresses the changes in both the dependent and independent variables on lagged deviations. The multivariate causality test based on the VECM can therefore be formulated as follows:

$$\Delta Z_t = \delta + \Gamma_i \Delta Z_{t-1} + \ldots\ldots + \Gamma_k \Delta Z_{t-k} + \Pi Z_{t-k} + \varepsilon_t \qquad (5)$$

where Z_t is an n x 1 vector of variables and δ is an n x 1 vector of constant, respectively. In our case, Z_t = *(BD, BL, ONR, IPI, RER, INF).* Γ is an *n x n* matrix (coefficients of the short run dynamics), $\Pi = \alpha\beta'$ where α is an *n x 1* column vector (the matrix of loadings) represents the speed of short run adjustment to disequilibrium and β' is an *1 x n* cointegrating row vector (the matrix of cointegrating vectors) indicates the matrix of long run coefficients such that Z_t converge in their long run equilibrium. Finally, ε_t is an *n x 1* vector of white noise error term and *k* is the order of autoregression.

A test statistic is calculated by taking the sum of the squared F-statistics of Γ and t-statistics of Π. The multivariate causality test is implemented by calculating the F-statistics (Wald-test) based on the null-hypothesis that the set of coefficients (Γ) on the lagged values of independent variables are not statically different from zero. If the null-hypothesis is not rejected, it can be concluded that the independent variables do not cause the dependent variable. On the other hand, if Π is significant (different from zero) based on the t-statistics, then both the independent and dependent variables have a stable relationship in the long-run.

Finally, from the Equation (5), two channels of causation may be observed. The first channel is the standard Granger tests, examining the joint significance of the coefficients of the lagged independent variables. Whereas, the second channel of causation is the adjustment of the dependent variable to the lagged deviations from the long run equilibrium path, represented by the error correction term (ECT). If the ECT is found to be significant, it substantiates the presence of cointegration as established in the system earlier and at the same time; it tells us that the dependent variable adjusts towards its long run level. From these tests, we can reveal four patterns of causal interactions among pairs of the variables, i.e., (i) a unidirectional causality from a variable, say x, to another variable, say y; (ii) a unidirectional causality from y to x; (iii) bidirectional causality; and (iv) independent causality between x and y.

4. EMPIRICAL RESULTS AND ANALYSIS

In estimating the short- and long-run relationships between the monetary policy variable (ONR) and the objective variables (BL, BD, IPI, CPI and RER), we need to determine first the lag-length of the first-differenced variables. Bahmani-Oskooee and Bohl (2000) have shown that the results of this first step are usually sensitive to the lag-length. To verify this, in line with Bahmani-Oskoee and Wing Ng (2002), we impose the optimal lag length of 12 on the first difference of each variable to compute the F-statistics for the joint significance of the lagged levels of variables for Equations (3) and (4). Only selected computed F-statistics for lag-lengths for all the models are reported as in Table 1.

As shown in Table 1, the computed F-statistics for both loan and deposit are significant at several orders of lags. This implies that equilibrium relationships exist between the bank balance sheet items and the rest of the variables under consideration. The existence of the cointegrating relationships among the bank balance sheet items and these variables suggest that they tend to move together towards a long-run equilibrium. These results are considered preliminary and indicate that in estimating Equations (1) and (2) we must retain the lagged level of the variables. Based on this information, we run the ARDL estimates to determine if bank loan and deposit are significantly related to the variables under consideration in the long run.

The next step involves estimating Equations (3) and (4) using the appropriate lag-length and model selection criterion based on the AIC. The results for the long run estimates based on the ARDL model are provided in Table 2.

Table 1. F-statistics for Testing the Existence of a Long-run Equation

Lag- Length	Deposit	Loan
1	6.2445***	11.4565***
3	4.8321**	7.8294***
5	5.0051**	6.0578***
7	4.4483*	3.6087
9	5.3777**	2.9743
11	4.0312	2.432

Notes: The relevant critical value bounds for the pre- and post-crisis periods are given in Table C1.iii (with unrestricted intercept and no trend; the number of regressors = 4). They are 3.74 – 5.06 at the 99% significance level; 2.86 – 4.01 at the 95% significance level; and 2.45 – 3.52 at the 99% significance level (see Table C1.iii, Pesaran *et al*., 2001). Meanwhile, the relevant critical value bounds for the entire sample period are given in Table C1.v (with unrestricted intercept and unrestricted trend; the number of regressors = 4). They are 4.40 – 5.72 at the 99% significance level; 3.47 – 4.57 at the 95% significance level; and 3.03 – 4.06 at the 99% significance level (see Table C1.v, Pesaran *et al*., 2001). *, **, and *** denote that F-statistics falls above the 90%, 95% and 99% upper bound, respectively.

Table 2. Long-run ARDL Model Estimates

	Deposit [1,1,0,0,0]	**Loan [1,0,0,1,0]**
C	-4.4052 (-0.6233)	14.1914 (0.4186)
ONR	0.0788** (2.4103)	0.0442 (0.8610)
ln*IPI*	1.9806* (1.8358)	7.9258 (1.0274)
ln*INF*	0.1594 (0.0606)	-10.6086 (-.6009)
ln*RER*	1.3481 (1.4034)	2.0268 (0.7363)
	Adj-R^2 = 0.998 D-W = 1.9772	Adj-R^2 = 0.996 D-W = 1.9936

Notes: *, ** and *** denote significantly at 10%, 5% and 1% level of significance, respectively. Figures in the parentheses and squared parentheses are the *t*-statistics values and the selected ARDL model. D-W denotes Durbin-Watson test for autocorrelation.

The results show evidence that deposit is significantly affected by the monetary policy variable (ONR) at the 5 percent significance level and output (IPI) at the 10 percent significance level. In the context of this study, we highlight the significant and positive effect of monetary policy variable – the overnight rate – on deposit in the long run. In other words, there is an active monetary transmission channel indicated by the significant effect of ONR on BD in the long run.

As for BL, the results of the long-run ARDL estimates showed that none of the variables including the monetary policy variable is significant in affecting BL during the period under review. This implies that, in the long run, BL does not provide an active channel for monetary policy effects to be filtered through the economy. Combining the findings on BD and BL, we conclude that in the long run, monetary policy shock is transmitted through BD (the money view) and not through BL (the credit view).

For further inferences, we adopt the multivariate causality analysis based on the VECM which enable us to explore both the short- and long-run dynamics of the variables in the system. Here, we regress the changes in both the dependent and independent variables on lagged deviations as in Equation (5). The estimates of the error correction representations selected by the AIC are presented in Table 3. The long-run coefficients reported for all the models are employed to generate the error correction terms. The adjusted-R^2 values of more than 0.9 for all the models suggest that such error correction models fit the data reasonably well. In addition, the computed F-statistics clearly reject the null hypothesis that all regressors have zero coefficients for both models.

Based on this test, the long-run relationship is measured by the error-correction terms (ECTs). The statistically significant ECT for BD as the dependent variable implies that BD provides an important channel for monetary policy to affect the economy in the long run. However, when BL is being considered as the dependent variable, the ECT is insignificant, implying that bank loan is insignificant in transmitting monetary policy effects in the long run. Clearly, these findings are consistent with those of the ARDL model.

The short-run analysis shows interesting findings. The significance of the individual variables in causing the dependent variable in the short run is reflected by the F-statistics stated under the variables' coefficients. The short-run causalities shed some lights on the directions of causation, thus on the monetary transmission mechanism taking place in the economy. During the period under review, while BD is one of the significant variables in the transmission of monetary policy in the long run, it is not a significant nexus of monetary policy in the short run as shown by the VECM results. In the short

Table 3. Multivariate Causality based on VECM

Dependent Variables	Independent Variables					
	ΔBD	**ΔONR**	**ΔIPI**	**ΔINF**	**ΔRER**	**ECT_{t-1}**
ΔBD	–	0.6722 (0.5117)	0.4642 (0.6293)	0.3645 (0.6950)	1.0202 (0.3623)	-0.0320** [-0.1018]
ΔONR	0.0002 (1.0178)	–	0.6411 (0.5278)	1.6793 (0.1891)	4.4109** (0.0133)	-0.0776** [-2.4692]
ΔIPI	1.0244 (0.3609)	1.9036 (0.1517)	–	5.3226*** (0.0056)	5.5692*** (0.0044)	-0.1847*** [-3.9226]
ΔINF	1.6305 (0.1984)	0.2816 (0.7549)	2.8958* (0.0575)	–	2.9442* (0.0549)	-0.0272* [-1.7075]
ΔRER	0.1243 (0.8832)	2.4229*** (0.0912)	2.4503* (0.0888)	2.1377 (0.1206)	–	-0.0363* [-1.6900]
	ΔBL	**ΔONR**	**ΔIPI**	**ΔINF**	**ΔRER**	**ECT_{t-1}**
ΔBL	–	0.9228 (0.3990)	0.1230 (0.8843)	0.1380 (0.8711)	0.8993 (0.4085)	-0.0078 [-0.8102]
ΔONR	1.5298 (0.2191)	–	0.587416 (0.5567)	1.7645 (0.1739)	4.3167** (0.0146)	-0.0964*** [-3.0218]
ΔIPI	6.6857*** (0.0015)	1.4495 (0.2371)	–	5.9129*** (0.0032)	5.535*** (0.0046)	-0.2299*** [-4.8487]
ΔINF	0.6317 (0.5327)	0.3107 (0.7332)	3.1574** (0.0446)	–	2.4478* (0.0890)	-0.0164 [0.3025]
ΔRER	0.5873 (0.5567)	2.5665* (0.0793)	2.5744* (0.0787)	2.0687 (0.1290)	–	-0.0304 [-1.4197]

Notes: *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively. ECT_{t-1} is derived by normalizing the cointegrating vectors on the dependent variables, producing residual *r*. By imposing restriction on the coefficients of each variable and conducting Wald test, we obtain *F*-statistics for each coefficient in all equations. Figures in the parentheses and squared parentheses represent *F*-statistics and probabilities for *t*-statistics, respectively.

run, the nexus of monetary policy runs from ONR to RER to INF to IPI. Interestingly, when BL is considered in the analysis, we find that it is an important variable affecting output. This result suggests that, in addition to the nexus of monetary policy which runs from ONR to RER to INF to IPI, BL provides an additional channel for the authority to influence output. Clearly, BL is a relevant variable to be influenced in the short run in the implementation of monetary policy. The results show that BL provides an additional avenue for monetary policy effects to be channelled to the real economy, thus

highlighting the importance of BL as a trigger variable that could help to enhance the effectiveness of monetary policy in the short run.

Lastly, we proceed to examine the stability of the long run coefficients together with the short-run dynamics. Following Pesaran and Pesaran (1997), we apply the CUSUM test proposed by Brown et al. (1975) (Figure 2). The tests are employed for both models. As highlighted by Bahmani-Oskooee and Ng (2002), the CUSUM test employs the cumulative sum of recursive residuals based on the first set of observations and is updated recursively and plotted against the break points. If the plot of the CUSUM statistics is found to be within the critical bounds of 5 percent level, the null hypothesis that all coefficients in the error correction models as in Equation 5 are stable cannot be rejected. On the other hand, if the lines are found to be crossed, the null hypothesis of coefficient constancy can therefore be rejected at 5 percent significance level. As shown in Figure 2, the graphical representations for CUSUM test indicate no evidence of significant structural instability for all the models.

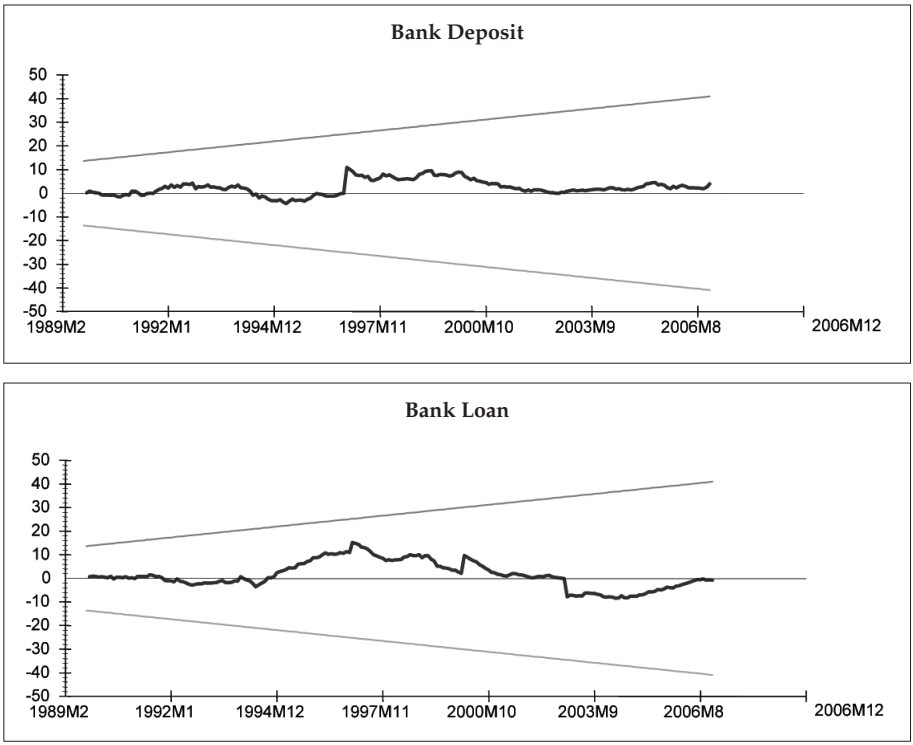
5. CONCLUSION

This study analyzes the roles played by the banking institutions in transmitting monetary policy effects to the real economy in the case of a developing country. To ensure conclusive results, the study adopts two approaches, namely the ARDL model and VECM model which enable the differentiation of short-run and long-run dimensions to be made in analyzing the monetary transmission channel. These approaches also enable the determination of the direction of causality among the variables considered.

The results of this study provide clear empirical evidence that both bank loan and deposit are important in the monetary transmission process in the Malaysian economy. Based on the empirical evidence, the study shows that there is a clear link between bank loan and deposit and real economic activity in Malaysia. In particular, bank loan is shown to be a relevant trigger variable for the central bank to influence output in the short run, while bank deposit is shown to provide an important nexus from the monetary policy indicator to output in the long run.

In view of the important role played by both bank loan and deposit in the transmission process of monetary policy, this study re-emphasises the importance of ensuring a stable banking system to help in an efficient implementation of monetary policy in the Malaysian case. Not only that a healthy and stable banking system ensures an effective implementation of monetary

Figure 2. Plots of Cumulative Sum (CUSUM) of Recursive Residuals



policy, it is indeed a pre-condition towards the overall economic stability. In fact, many Asian economies have learned their lessons well, following the 1997/1998 crisis. Ever since the crisis, these countries have been improving their financial sector supervisions and continue to take pre-emptive measures to ensure the stability and resilience of their financial systems. The financial institutions in these countries are able to weather the current US financial crisis well, as their positions remain intact all along. As a result, even though the US imbalances are expected to affect the global financial system, these emerging countries are able to withstand the shocks well (Bibow, 2008).

Furthermore, an important lesson learned from the 1997/1998 Asian financial crisis was that the fragility of the banking sector can lead to a loss of confidence which would negatively affect the real economy. In view of this, this study is supportive of the banking policies that are directed towards strengthening and increasing the resilience of the banking system as well as

preserving the integrity and stability of the country's financial sector. Indeed, ensuring financial sector stability has been the priority of monetary policy for many developing Asian countries such as Malaysia and Thailand, particularly following the 1997/1998 crisis (McCauley, 2006). Considering the important role played by the banking system in the economy, ensuring a healthy and stable banking system is a pre-condition to economic sustainability, particularly in the case of developing countries such as Malaysia.

References

Azali M., 2003, *Transmission Mechanism in a Developing Economy: Does Money or Credit Matter?*, University Putra Malaysia Press, 2nd Edition.

Azis I. and W. Thorbeck, 2002, "Macroeconomic Shocks and Bank Lending in Indonesia", In Research Project entitled: *Linking Firm and Bank Behaviour With Macroeconomic Shocks*, sponsored by the Asian Development Bank Institute, Tokyo.

Bahmani-Oskooee M. and M.T. Bohl, 2000, "German Monetary Unification and the Stability of the German M3 Money Demand Function", *Economics Letters*, **66**, pp. 203-208.

Bahmani-Oskooee, M., and R.C. Wing Ng, 2002, "Long-run Demand for Money in Hong Kong: An Application of the ARDL Model", *International Journal of Business and Economics*, **1**(2), pp. 147-155.

Bank Negara Malaysia, *Monthly Statistical Bulletin*, various issues.

—, 1994, *Money and Banking in Malaysia: 35th Anniversary Edition 1959-1994*, Fourth Edition.

—, 1999, *The Central Bank and the Financial System in Malaysia: A Decade of Change,* First Edition.

Bernanke B.S. and A.S. Blinder, 1988, "Credit, Money and Aggregate Demand," *AEA Papers and Proceedings*, **78**(2), pp. 435-39.

—, 1992, "The Federal Funds Rate and the Channels of Monetary Transmission", *American Economic Review*, **82**(4), pp. 901-921.

Bernanke B.S. and I. Mihov, 1998, "Measuring Monetary Policy", *The Quarterly Journal of Economics*, **113**(3), pp. 869-902.

Bibow J., 2008, "The International Monetary (Non-)Order and the "Global Capital Flows Paradox", The Levy Economics Institute and Skidmore College, *Working Paper*, No. 531.

Brown R.L., J. Durbin and J.M. Evans, 1975, "Techniques for Testing the Constancy of Regression Relationships over Time", *Journal of the Royal Statistic Society,* Series B (Methodological), **37**(2), pp. 149-192.

Dale S. and A.G. Haldane, 1995, "Interest Rates and the Channels of Monetary Transmission: Some Sectoral Estimates", *European Economic Review*, **39**, pp. 1611-1626.

Domac I. and G. Ferri, 1998, "The Real Impact of Financial Shocks: Evidence from Korea", World Bank, *Policy Research Working Papers,* No. 2010.

Friedman B.M., 1984, "Lessons from the 1979-82 Monetary Policy Experiment", *American Economic Review*, **74**(2), pp. 382-87.

Garretsen H. and J. Swank, 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), pp. 325-339.

Gertler M. and S. Gilchrist, 1993, "The Role of Credit Market Imperfections in the Monetary Transmission Mechanism: Arguments and Evidence", *Scandinavian Journal of Economics*, **95**(1), pp. 43-65.

—, 1994, "Monetary Policy, Business Cycles and the Behavior of Small Manufacturing Firms", *Quarterly Journal of Economics*, **109**(2), pp. 309-340.

Gibson M.S., 1997, "The Bank Lending Channel of Monetary Policy Transmission: Evidence from a Model of Bank Behavior that Incorporates Long-Term Customer Relationships", Board of Governors of the Federal Reserve System, *International Finance Discussion Papers*, No. 584.

Goh K., C. Chong and S. Yong, 2007, "Bank Lending Channel for Monetary Policy Transmission in Malaysia: An ARDL Approach", *Applied Econometrics and International Development*, **2**(7).

Guender A.V., 1998, "Is There a Bank-Lending Channel of Monetary Policy in New Zealand?", *The Economic Record*, **74**(226), pp. 243-65.

Hallsten K., 1999, "Bank Loan and the Transmission Mechanism of Monetary Policy", Sveriges Riksbank, *Working Paper Series*, No. 73.

Ibrahim M.H., 2005, "Sectoral Effects of Monetary Policy: Evidence from Malaysia", *Asian Economic Journal*, **19**(1), pp. 83-102.

Kaminsky G.L. and C.M. Reinhart, 1999, "Bank Lending and Contagion: Evidence from the Asian Crisis", In Ito T. and A. Krueger (Eds.), *Regional and Global Capital Flows: Macroeconomic Causes and Consequences*, Chicago: University of Chicago Press.

Kim H.E., 1999, "Was Credit Channel a Key Monetary Transmission Mechanism Following the Recent Financial Crisis in the Republic of Korea?", World Bank, *Policy Research Working Papers*, No. 3003.

Laurenceson J. and J.C.H. Chai, 2003, *Financial Reform and Economic Development in China, Cheltenham*, UK: Edward Elgar.

McCauley R.N., 2006, "Understanding Monetary Policy in Malaysia and Thailand: Objectives, Instruments and Independence", *BIS Papers,* No. 31.

Morris C.S. and Jr. Gordon H. Sellon, 1995, "Bank Lending and Monetary Policy: Evidence on a Credit Channel", Federal Reserve Bank of Kansas City, *Economic Review*, pp. 59-75.

Pesaran M.H., Y. Shin and R.J. Smith, 1996, "Testing for the Existence of a Long-Run Relationship", *DAE Working Paper No.9622,* Department of Applied Economics, University of Cambridge.

—, 2001, "Bounds Testing Approaches to the Analysis of Level Relationships", *Journal of Applied Econometrics*, **6,** pp. 289-326.

Pesaran M.H. and B. Pesaran, 1997, *Working with Microfit 4.0: Interactive Econometrics Analysis*, Oxford University Press.

Scholnick B., 1996, "Asymmetric Adjustment of Commercial Bank Interest Rates: Evidence from Malaysia and Singapore", *Journal of International Money and Finance*, **15**(3), pp. 485-496.

Suzuki T., 2001, "Is the Lending Channel of Monetary Policy Important in Australia?", The Australian National University, *Working Papers in Economics and Econometrics*, No. 400.

Tan E.C., 1997, "Money Demand Amid Financial Sector Developments in Malaysia", *Applied Economics*, **29**(9), pp. 1201-1215.

Tang H.C., 2006, "Relative Importance of Monetary Policy Transmission Channels in Malaysia", *CAMA WP Series*.

Tang T.C., 2000, "Commercial Bank Lending and Economic growth in Malaysia: An Empirical Studies", *Borneo Review*, **11**(1), pp. 60-71.

—, 2002, "Banks Lending and Economic Growth in Malaysia: Revisited," *Journal Analysis*, **10**(1), pp. 69-87.

Vaithilingam, S., Guru, B.K. and Shanmugam, B., 2003, "Bank Lending and Economic Growth in Malaysia", *Journal of Asia-Pacific Business,* **5**(1).

Résumé

A partir des données sur la Malaisie, l'étude se concentre sur la période Janvier 1989 - Décembre 2006 en analysant les relations de cause entre le crédit bancaire et la politique monétaire avec deux tests : le modèle ARDL (auto-regressive distributed lag) (ARDL), qui se concentre sur les relations de long terme et le modèle VECM (vector error-correction model) qui analyse la dynamique de relations sur le court et le long terme. Pour enrichir ultérieurement la discussion, l'étude inclue les dépôts pour comparer l'importance de l'actif et du passif au cours du processus de transmission monétaire. Les résultats démontrent que les crédits ainsi que les dépôts jouent un rôle crucial en Malaisie. En particulier, le crédit est lié au produit dans le court terme, tandis que les dépôts sont un canal important dans le long terme. Cette importance dans le processus de transmission monétaire implique l'importance d'assurer la stabilité du système financier comme condition fondamentale pour la réalisation de la politique monétaire et la stabilité économique d'un pays.