BANK LENDING CHANNEL FOR MONETARY POLICY TRANSMISSION IN MALAYSIA: AN ARDL APPROACH

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Abstract
The relevance of bank lending channel for the transmission process of monetary policy in Malaysia is investigated using the autoregressive-distributed lag (ARDL) model. The newly developed bounds test (Pesaran, et al. 2001) is employed to determine the specification of this model. Deposits tend to fall following contractionary monetary policy shocks, but banks are able to cushion their loan customers from the reduction in deposits through adjustments in liquid financial instruments. As such, these monetary shocks did not depress growth in loans. Although a shift is witnessed in the country's interest rate regime as a policy response to the recent East Asian currency crisis, evidence was not found to support the effectiveness of the bank lending channel for the transmission of monetary policy.

JEL classification: C22; E52; G21
Keywords: Bank deposits; Bank loans; Bounds test; Generalised Impulses; Interest rates

1. Introduction

Monetary policy can affect the level of economic activity by altering the availability of bank loans through changes in short-term interest rates. Hernando and Martinez-Pages (2001), for example, argued that a contractionary monetary policy translates into a reduction in deposits, and this exerts a downward pressure on the amount of loanable funds. To the extent that this drop in loanable funds cannot be offset by banks, there will be a reduction in bank loan supply. Some firms and consumers who are dependent on bank financing may not have access to alternative sources of funds. They will not be able to offset the reduced availability of these loans, and may have to change their investment and spending decisions. If this is the case, disruptions in bank credit directly affects economic activity and bank lending has a special role to play in the monetary transmission mechanism. This role is known as the bank lending channel.

The view that bank lending plays a key role in the transmission of monetary policy actions has been part of policy debates for over 40 years (Morris and Sellon 1995). Surveys on recent studies on the role of the bank lending channel in the transmission of monetary policy can be found in Bernanke (1993), Hubbard (1994), Bernanke and Gertler (1995) and Kashyap and Stein (1997). The results on whether bank lending is constrained

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by restrictive monetary policy are mixed. Some studies that introduced heterogeneity among the characterisitics of the banks found that different types of banks have demonstrated divergent reactions to interest rate changes (see, e.g., Bondt 2000, Kakes and Sturm 2001).

Kashyap and Stein (1997) showed that small banks in the U.S. tend to reduce their lending more than large banks following a restrictive monetary policy stance. Hulsewig, et al.'s (2001) findings indicate empirical evidence in accordance with a reaction of bank lending to monetary shocks. The results of Hernando and Martinez-Pages (2001) are mostly against the existence of a bank lending channel in Spain for banks either of different sizes or of different degrees of capitalisation. The less liquid banks, however, had a stronger response to monetary policy changes, but they attributed this to a loan-portfolio composition effect. Corporate loans are reported to reduce as a result of contractionary monetary policy after a lapse of a longer period compared to an almost instantaneous reaction for the household loans by Garretsen and Swank (2003). They concluded that the bank lending channel is not very important since the reduction in loans is not accompanied by a fall in consumer expenditure.

The response of bank deposits and loans to changes in interest rate is analysed in this study with the aim of examining the relevance of the bank lending channel for transmission of monetary policy in Malaysia. This provides an interesting case as the monetary policy stance of the country changed significantly shortly after the outbreak of the recent East Asian currency crisis.

The government introduced a series of capital controls since 1 September 1998 as part of its policy response to the crisis. In order to curb the speculative pressure on ringgit (RM), the exchange rate was pegged to the US dollar. This policy action allowed the authority to regain monetary policy autonomy so that interest rates could be lowered (Doraisami 2004). Under the fixed exchange rate regime, the results of Chong and Goh (2005) suggest that money supply is endogenised and cannot be used as a monetary instrument to effectively affect the level of economic activity. Interest rates remain the active monetary tool and continue to play an even more important role.

This episode adds a twist to the statistical dimension of this paper. The lowering of interest rates not only led to a different policy regime, it has also caused a significant change to the time-series properties of these series. This change complicates the modelling issues as standard cointegration techniques are not suitable. This paper adopts the newly developed autoregressive-distributed lag (ARDL) bounds testing procedure to determine the specification of the model used for analysis.

The remaining sections of this paper are organised as follows. In the next section, the data for this study are described and their time-series properties are investigated. Section 3 explains the baseline model adopted for the analysis and reports the results. Further analysis on the impulse responses of bank deposits and loans to monetary policy shocks is conducted and the findings are discussed in Section 4. Section 5 concludes the paper.

2. Data and Time-series Properties

The analysis in this study is based on monthly data extracted from the Monthly Statistical Bulletin published by Bank Negara Malaysia (the central bank of Malaysia). The time period under consideration starts with January 1990 and ends with March 2004. This period of study is divided into two sub-periods to take into account the implementation of capital controls in Malaysia since 1 September 1998. The first sub-period is from January 1990 to August 1998 and the second sub-period is from September 1998 to March 2004.

This study is based on aggregate data as detailed data at the individual bank level are not available. This approach is common for a large number of studies on the European countries that face similar data problem. Among others, empirical studies that are dependent on aggregate data include Tsatsaronis (1995), Dale and Haldane (1995), Barran, et al. (1997), Garretsen and Swank (1998), Bondt (1999) and Kakes (2000).

The banking sector in Malaysia comprises commercial banks, finance companies, merchant banks and discount houses. This study focuses on the largest component of loan providers and deposit takers, viz, the commercial banks. Some 74% of the total outstanding deposits were held by the commercial banks, and 75% of the total outstanding loans were advanced by the commercial banks in 2003.

Monetary policy operates mainly through changes in the short-term interest rates. The one- and three-month interbank money market interest rates are used as the policy variable in the analysis. Such series are considered to be an adequate indicator for the monetary policy stance (see, e.g., Borio 1997, Hulsewig, et al. 2001). The real sector of the economy is represented by the consumer price index and by industrial production index as indicator of real economy activity.[1] The time series employed in this study and the notations used to represent the variables are as follows:

loan	total commercial bank loans (RM million)
dep	total commercial bank deposits (RM million)
iip	industrial production index
cpi	consumer price index
ir	interest rate (%)

The logarithms of the variables are used for the analysis except for the interest rate series.

[1]The GDP data are not used as the output indicator because the series are not available on a monthly basis. The use of industrial production index as a proxy to output is common in the literature (see, e.g., Garretsen and Swank (2003) and Morris and Sellon (1995)). The correlation between quarterly GDP and the industrial production index for the period of analysis is 0.984.

Table 1. Summary statistics

	ir_t – 1-month(%)	ir_t – 3-month(%)	$\Delta loan_t$	Δdep_t
Sub-Period 1				
Mean	7.1146	7.2527	0.0140	0.0139
Median	7.1900	7.2600	0.0140	0.0124
Maximum	10.9800	11.0700	0.0379	0.0681
Minimum	4.2300	4.4100	-0.0181	-0.0273
Standard deviation	1.4413	1.4225	0.0105	0.0186
Sub-Period 2				
Mean	3.2807	3.4455	0.0034	0.0063
Median	2.9700	3.1300	0.0033	0.0055
Maximum	7.1900	7.7500	0.0345	0.0308
Minimum	2.6900	2.8400	-0.0189	-0.0181
Standard deviation	1.0671	1.1523	0.0072	0.0095

Figure 1. Annual Growth in Commercial Bank Loans and Deposits

Figure 2. Interbank Money Market Interest Rates

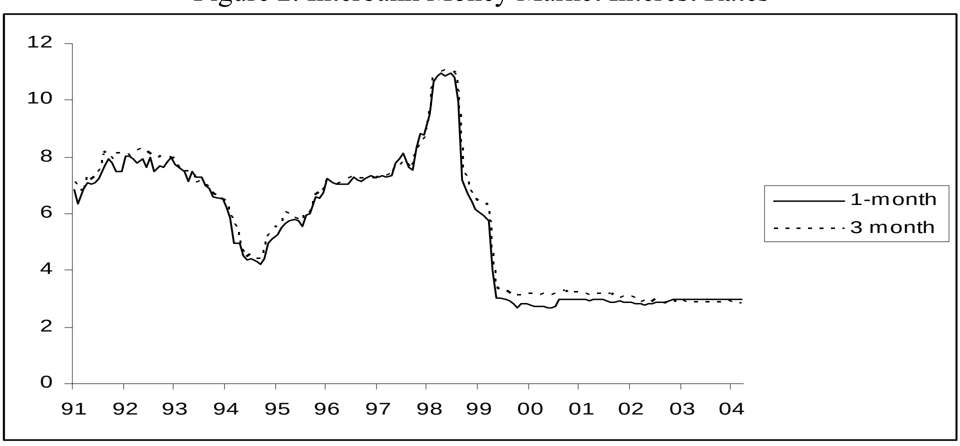

Figure 1 shows that the annual growth rate of the total loans and deposits of the commercial banks suffered a sharp decline due to the currency crisis. Although the figures rebounded some three years later, the growth rates were not as high as in the mid-1990s when the economy had impressive output growth. The summary statistics reported in Table 1 also indicate that the average growth rates of the total loans and deposits are lower in the second sub-period.

The interest rates are lower in the second sub-period (see Table 1). They experienced a sharp drop after the implementation of the capital control measures (see Figure 2). Since the middle of 1999, the interest rates were consistently below 4% and dropped further to less than 3% in the last two years. The pursuit of monetary policy stance with low interest rate by the authority is clear. They maintained that "the low and stable interest rate and pegged exchange rate regime provided an environment of stability and predictability contributing to the strengthening of consumption and investment" (Malaysia 2001: 129).

The stationarity properties of these series are established using the Phillips-Perron unit root test. The advantage of this test is that it allows for a wide class of autocorrelated and mildly heterogeneous series. The results of the test for the levels and first differences of the variables are documented in Table 2. The null hypothesis of a unit root is rejected at 5% significance level in the case of the deposits and industrial production index for the first sub-period. Unit roots are not found in both the interest rate series for the second sub-period. The results suggest different interest rate regimes in the two sub-periods. The low interest rate policy pursued in the second sub-period has resulted in shocks that are transitory in nature, therefore rendering the interest rates stationary. All the remaining variables are integrated of order one. The results indicate a mixture of I(0) and I(1) series.

Table 2. The Results of the Phillips-Perron Unit Root Test

	Variable	Sub-Period 1	Sub-Period 2
Levels	$loan_t$	-1.238 (0.897) [7]	-2.814 (0.198) [1]
	dep_t	-3.499 (0.045) [7]	-1.581 (0.790) [3]
	cpi_t	-2.593 (0.284) [1]	-3.239 (0.086) [1]
	iip_t	-5.253 (0.000) [4]	-2.194 (0.485) [5]
	ir_t – 1-month	-1.334 (0.874) [6]	-7.036 (0.000) [3]
	ir_t – 3-month	-1.346 (0.871) [6]	-6.706 (0.000) [3]
First differences	$loan_t$	-7.445 (0.000) [6]	-8.272 (0.000) [1]
	dep_t	-9.431 (0.000) [10]	-7.421 (0.000) [7]
	cpi_t	-8.633 (0.000) [2]	-8.530 (0.000) [2]
	iip_t	-40.147 (0.000) [101]	-12.946 (0.000) [4]
	ir_t – 1-month	-8.215 (0.000) [5]	-5.569 (0.000) [3]
	ir_t – 3-month	-7.089 (0.000) [5]	-4.845 (0.001) [6]

Notes: The model with a constant and time trend is used for computation of the test statistics. The figures in parentheses are MacKinnon (1996) one-sided p-values. The figures in brackets are the lag lengths obtained through the Newey-West (1994) selection method using Bartlett kernel based estimators.

3. The ARDL Model and Results

A dynamic reduced form ARDL specification is used as the baseline model for analysing the impact of monetary policy on deposits and loans of the commercial banks. Let $z_t = (dep_t, cpi_t, iip_t, ir_t)'$ and $x_t = (cpi_t, iip_t, ir_t)'$. The variables in levels and first differences are initially included in the model. Further tests are conducted later to determine if the variables in levels are necessary. The ARDL model for the deposit equation is as follows:

$$\Delta dep_t = \mu + \delta\, dep_{t-1} + \beta' x_{t-1} + \gamma' \Delta x_t + \sum_{i=1}^{p} \alpha_i' \Delta z_{t-i} + u_{1t} \quad (1)$$

where μ and δ are scalar parameters, β and γ are both parameter vectors of dimension of 3 x 1, and α_i is a parameter vector of dimension 4 x 1, for i = 1, …, p with p representing the number of lags of all the elements in Δz_t to be included in the equation.

For the loans equation, the variable vector is redefined to be $z_t = (loan_t, cpi_t, iip_t, ir_t)'$ whereas x_t and the parameters are as defined before. A similar ARDL specification is used for the loan equation:

$$\Delta loan_t = \mu + \delta\, loan_{t-1} + \beta' x_{t-1} + \gamma' \Delta x_t + \sum_{i=1}^{p} \alpha_i' \Delta z_{t-i} + u_{2t} \quad (2)$$

In both the equations, the interest rate represents the monetary policy indicator and the industrial production and prices are included to control for credit demand effects. Each equation is estimated for the first and second sub-period. For each sub-period, both the equations are estimated twice, one for the one-month interest rate, and the other for the three-month interest rate.

In order to estimate equations (1) and (2), it must be established if level relationships exist between $loan_t$ and x_t, and, dep_t and x_t, or is it sufficient to just include the first differences of the variables in the model. This is to avoid spurious results if I(1) variables that are not cointegrated enter the equation. At the same time, omitting these variables if cointegration exists will lead to exclusion of level relationships. The null hypothesis H_0: $\delta = 0$ and $\beta = 0'$ is tested against an alternative where at least one of the coefficients is not zero. However, a standard F-test cannot be applied because Pesaran, et al. (2001) demonstrated that the asymptotic distribution of the test statistic is non-standard under the null hypothesis that there exists no level relationship. They proposed a bounds test based on the F-statistic that can be applied even if the regressors are a mixture of I(0) and I(1) processes, which is the case in this study as reported in the previous section. This mixture of processes precludes the application of standard cointegration analysis that requires all the regressors (x_t) entering the determination of the dependent variable of interest ($loan_t$ and dep_t) to be all integrated of order one or more.

The test proposed by Pesaran, et al. (2001) uses two asymptotic critical-value bounds where the lower critical value assumes that the regressors are I(0) and the upper critical value assumes that they are purely I(1). If the test statistic exceeds the upper critical value, evidence of level relationship is supported. The null hypothesis of no level relationship is not rejected if the test statistic falls below the lower critical value. The test, however, is inconclusive if the test statistic falls within the bound.

3.1. Bounds test of level relationships. The results of the bounds F-test are reported in Table 3.

Table 3. The Results of the Bounds F-test for Level Relationships

		Sub-Period 1	Sub-Period 2
Deposits	ir_t – 1-month	3.4499	4.3882**
	ir_t – 3-month	2.8965	4.6001**
Loans	ir_t – 1-month	0.9800	0.5615
	ir_t – 3-month	0.4216	0.6295

Notes: ** Significant at 5%. The critical bounds are [2.72, 3.77], [3.23, 4.35] and [4.29, 5.61] for the 10%, 5% and 1% significance level, respectively.

All the test regressions are adequately handled by setting p = 3. The selection of lag length is based on statistical information criteria and diagnostic tests. The Schwarz information criterion is prone to selection of p = 1, while the Akaike information criterion suggests lag length of 3 or less. At low lag lengths, however, the errors are serially correlated. Taking model parsimony into account, p = 3 is by far the most satisfactory choice. The null hypothesis of no level relationship is not rejected for the deposit equations in the first sub-period. On the other hand, level relationships are found between dep_t and x_t in the second sub-period with one-month interest rate and also with three-month interest rate at 5% significance level. Level relationships are not found for the estimated loans equations, both in the first and second sub-periods. The results remain the same whether one-month or three-month interest rate is used. In other words, it is necessary to impose the restrictions of $\delta = 0$ and $\beta = 0$' in estimating equation (1) for the first sub-period, and equation (2) for both sub-periods. Only in the second sub-period, these restrictions are removed in estimating equation (1). The estimated models are reported in the Appendix.

3.2. Responses of deposits and loans. In this section, the responses of the deposits and loans to interest rate changes are analysed. If bank lending channel exists, a necessary condition is that both the bank deposits and loans must fall following a contractionary monetary policy (Hernando and Martinez-Pages 2001). The short- and long-run elasticities of deposits and loans with respect to inflation, economic activity and interest rate are computed from the estimated models described in the previous section (see Appendix). The elasticities obtained from the deposit equations are given in Table 4.

It is clear that all the signs are as expected. The elasticities of deposits with respect to both industrial production and prices are positive and significant. This evidence is particularly strong for the second sub-period in the reaction to price changes, where the growth in deposits is elastic with respect to inflation. The response of deposit growth to industrial production, however, is inelastic for both sub-periods. After a monetary policy tightening, deposits are depressed significantly in the short run for the first sub-period, but in both short and long run for the second sub-period. It is worth noting that the responses of deposits to interest rate changes are highly inelastic. The effects of a monetary contraction are stronger in the second sub-period because economic agents are less likely to anticipate interest rate increases in the pursuit of low interest rate policy by the authority.

Table 4. The Short- and Long-run Elasticities of Deposits with respect to Inflation, Economic Activity and Interest Rate

		Sub-Period 1		Sub-Period 2	
		Short-run	Long-run	Short-run	Long-run
1-Month Interest Rate	Inflation	0.6769 (0.5348)	-0.2540 (0.8036)	1.4947*** (0.3979)	3.5867*** (1.1890)
	Industrial production	0.0005*** (0.0002)	0.0017*** (0.0006)	0.0004*** (0.0001)	0.0006** (0.0002)
	Interest rate	-0.0098** (0.0048)	0.0005 (0.0115)	-0.0090** (0.0038)	-0.0230*** (0.0062)
3-Month Interest Rate	Inflation	0.9023* (0.5317)	-0.4456 (0.8134)	1.4707*** (0.3893)	3.6293*** (1.2368)
	Industrial production	0.0004** (0.0002)	0.0017*** (0.0006)	0.0004*** (0.0001)	0.0006** (0.0002)
	Interest rate	-0.0144** (0.0059)	-0.0001 (0.0115)	-0.0101** (0.0041)	-0.0242*** (0.0053)

Notes: *, **, *** represents significance at the 10%, 5% and 1%, respectively. Figures in parentheses are standard errors. The elasticities are computed from the estimated deposit equations reported in Table A1.

Unanticipated interest rate increases lead to increased costs of borrowing. Savings and reserves are used to finance consumption and investments, thus causing a fall in deposits. This exerts a downward pressure on the amount of loanable funds, and therefore, the evidence with respect to the first necessary step of monetary transmission through the bank lending channel is present. For the bank lending channel to be operative, the fall in deposits should cause loans to contract.

Table 5 reports the elasticities computed from the loan equations. Although bank lending does not respond to inflation significantly in the short run, the erosion of purchasing power reduces the loan growth in the long run. The long-run growth in loans is in fact elastic to inflation. The elasticities of loans with respect to industrial production are positive for the first sub-period. Negative elasticities are found for the second sub-period. This indicates the lack of confidence on the part of the commercial banks to expand lending even though signs of recovery are seen after the economic downturn that resulted from the currency crisis.

Table 5. The Short- and Long-run Elasticities of Loans with respect to Inflation, Economic Activity and Interest Rate

		Sub-Period 1		Sub-Period 2	
		Short-run	Long-run	Short-run	Long-run
1-Month Interest Rate	Inflation	-0.3676 (0.2609)	-1.7790*** (0.4888)	-0.1903 (0.3775)	-1.5802* (0.8375)
	Industrial production	0.0002** (0.0001)	0.0005 (0.0004)	-0.0002*** (0.0001)	-0.0003* (0.0002)
	Interest rate	0.0036 (0.0027)	0.0123* (0.0064)	0.0047*** (0.0012)	0.0072*** (0.0017)
3-Month Interest Rate	Inflation	-0.3918 (0.2367)	-1.6151*** (0.5333)	-0.2129 (0.3842)	-1.6142* (0.8778)
	Industrial production	0.0003** (0.0001)	0.0007* (0.0004)	-0.0002*** (0.0001)	-0.0004** (0.0002)
	Interest rate	0.0041 (0.0035)	0.0104* (0.0058)	0.0044*** (0.0016)	0.0075** (0.0017)

Notes: *, **, *** represents significance at the 10%, 5% and 1%, respectively. Figures in parentheses are standard errors. The elasticities are computed from the estimated loan equations reported in Table A2.

As regards the impact of monetary policy, the elasticities are positive and significant. This is true in the long run for the first sub-period, and in both short and long run for the second sub-period. The evidence here contravenes the necessary condition for existence of the bank lending channel where a loan reduction is expected. The results are consistent with the findings of Tee and Goh (2006). Their study suggests that when unanticipated interest rate changes are positive, banks push for loan expansion given that profit margins are higher. Negative interest rate shocks are policy actions to boost activities in times of sluggish economic growth, during which risks of lending are high and profit margins are low, thereby deterring the willingness of the banking sector to expand lending.

4. Impulse Response Functions

The monetary policy transmitted through interest rate changes is seen to affect deposits and loans. A further analysis is conducted using the impulse response functions to trace the effect of a one-time shock to interest rates on the current and future movements in deposits and loans. These functions are generated using vector autoregressions (VAR) that allow for a dynamic structure of up to three lags. The exogenous variables that enter the deposit as well as loan models are all the elements of Δx_t. The conventional approach uses inverse of the Cholesky factor of the residual covariance matrix to orthogonalise the impulses according to a causal ordering of the variables in the VAR system. A major drawback is that responses can be sensitive to the VAR ordering.

Pesaran and Shin (1998) proposed the generalised impulses constructed from an orthogonal set of innovations that does not depend on the ordering of the variables. Their generalised impulse response functions are used in this study. The responses of deposits are plotted in Figure 3 and those of loans are plotted in Figure 4 in the Annex.

The 90% confidence bands computed based on the asymptotic standard errors are included in these figures. In the first sub-period, the deposit growth is depressed significantly one month after a contractionary monetary policy shock and the effect dampens to zero in the next period. The results are similar for both the one- and three-month interest rates.

The effect of the shock is rather short-lived and this explains why only the short-run interest rate elasticity is significant in the first sub-period but not the long-run elasticity (as reported in the previous section). In the second sub-period, the impact of such shock is felt after four months. The effect remains significant in the fourth and fifth month after the shock. The impact of the interest rate shock is more long-lived than that of the first sub-period. Innovations in interest rates, however, do not produce a negative impact on the loan growth in both sub-periods. On the contrary, the loan growth is significantly positive four months after the shock in the second sub-period. The findings of this analysis provides support to the earlier results that monetary policy tightening suppresses the growth in deposits but not loans.

5. Conclusion

This study examines whether commercial bank lending plays an important role in the monetary transmission mechanism in Malaysia. It does not appear that the bank lending channel provides the authority an additional leverage for the conduct of monetary policy. Restrictive monetary policy stance is found to cause the commercial bank deposits to fall significantly. The resulting reduction in loanable funds, however, does not lead to a drop in bank loans. On the contrary, evidence indicates that loan growth is positively related to interest rate increases.

The results remain the same for the period after the East Asian currency crisis where a low interest policy is pursued to stimulate economic activity. Although the interest rate regime has changed, bank lending channel was not found to be effective for the transmission of monetary policy. A necessary condition for the bank lending channel to be operative is that banks do not offset the monetary policy shock by substituting capital market funds for deposit funds (Gertler and Gilchrist 1993). With the ongoing development in the financial sector, banks have access to growing non-deposit sources of funds that allow them to offset any potential monetary policy-induced fall in deposits.

This is in line with the propositions of Romer and Romer (1990). In addition, Garretsen and Swank (2003) argued that banks may be reluctant to reduce loans in response to a monetary policy shock in order to maintain good long-term relationships with their clients, particularly the corporate clients. Through adjustments in liquid financial instruments, banks can avoid the real economic effects of monetary policy shocks, at least in the short run.

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Appendix

Table A1: The Estimated Deposit Equations

Regressors	Sub-Period 1				Sub-Period 2			
	1-Month Interest Rate		3-Month Interest Rate		1-Month Interest Rate		3-Month Interest Rate	
constant	0.0123***	(0.0036)	0.0128***	(0.0033)	-0.4366	(0.5434)	-0.3537	(0.5517)
Δdep_{t-1}	-0.0249	(0.1175)	-0.0145	(0.1177)	-0.1582	(0.1182)	-0.1608	(0.1196)
Δdep_{t-2}	-0.0277	(0.0892)	-0.0537	(0.0836)	-0.0352	(0.1362)	-0.0558	(0.1436)
Δdep_{t-3}	0.0488	(0.0780)	0.0739	(0.0752)	-0.2565*	(0.1485)	-0.2622*	(0.1505)
Δcpi_{t}	0.6769	(0.5348)	0.9023*	(0.5317)	1.4947***	(0.3979)	1.4704***	(0.3893)
Δcpi_{t-1}	1.5307***	(0.5762)	1.4790**	(0.6309)	1.3284	(0.4952)	1.4465***	(0.5242)
Δcpi_{t-2}	-1.3655**	(0.5409)	-1.3131**	(0.5919)	0.6149	(0.6134)	0.5857	(0.6234)
Δcpi_{t-3}	-1.0960**	(0.4703)	-1.5138***	(0.5352)	0.1487	(0.5779)	0.1267	(0.6248)
Δiip_{t}	0.0005***	(0.0002)	0.0004**	(0.0002)	0.0004***	(0.0001)	0.0004***	(0.0001)
Δiip_{t-1}	0.0006**	(0.0002)	0.0006**	(0.0002)	0.0002**	(0.0001)	0.0002**	(0.0001)
Δiip_{t-2}	0.0003	(0.0003)	0.0003	(0.0003)	0.0000	(0.0001)	0.0000	(0.0001)
Δiip_{t-3}	0.0003*	(0.0002)	0.0004*	(0.0002)	-0.0001	(0.0001)	-0.0001	(0.0001)
Δir_{t}	-0.0098**	(0.0047)	-0.0144**	(0.0059)	-0.0090**	(0.0038)	-0.0101**	(0.0041)
Δir_{t-1}	-0.0018	(0.0048)	0.0017	(0.0051)	-0.0012	(0.0028)	-0.0012	(0.0037)
Δir_{t-2}	0.0081	(0.0082)	-0.0003	(0.0080)	-0.0026*	(0.0014)	-0.0020	(0.0020)
Δir_{t-3}	0.0040	(0.0052)	0.0128*	(0.0064)	-0.0102***	(0.0017)	-0.0109***	(0.0018)
dep_{t-1}	-	-	-	-	-0.0619	0.0877	-0.0517	0.0893
cpi_{t-1}	-	-	-	-	0.1466	0.2792	0.1078	0.2819
iip_{t-1}	-	-	-	-	0.0757**	0.0316	0.0744**	0.0325
ir_{t-1}	-	-	-	-	-0.0004	0.0015	-0.0004	0.0014
Diagnostic Tests	Test Stat.	P-Value	Test Stat.	P-Value	Test Stat.	P-Value	Test Stat.	P-Value
Normality	2.0365	0.3612	4.5190	0.1044	0.4472	0.7996	0.7601	0.6838
Serial Correl.	1.9844	0.5756	5.2699	0.1531	0.5661	0.9042	0.7346	0.8650
Heterosced.	22.9376	0.8178	23.5583	0.7916	28.1879	0.8508	32.6171	0.6746
Specification	0.0983	0.7546	0.0018	0.9660	0.0962	0.7578	0.0060	0.9387

Notes: *, **, *** represents significance at 10%, 5% and 1%, respectively. The figures in parentheses are Newey-West heteroscedasticity and autocorrelation consistent standard-errors. The diagnostic tests are the LM test for serial correlation of 3 lags (Serial Correl.), the White test of heteroscedasticity with no cross terms (Heterosced.) and the Ramsey RESET test with one fitted term (Specification).

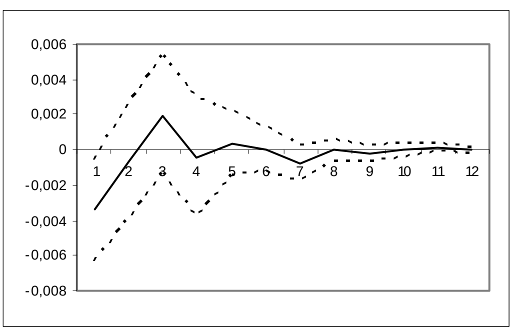
Table A2: The Estimated Loan Equations

Regressors	Sub-Period 1				Sub-Period 2			
	1-Month Interest Rate		3-Month Interest Rate		1-Month Interest Rate		3-Month Interest Rate	
constant	0.0129***	(0.0021)	0.0121***	(0.0021)	0.0080***	(0.0024)	0.0082***	(0.0025)
$\Delta loan_{t-1}$	0.1465*	(0.0857)	0.1574*	(0.0804)	-0.1669*	(0.0860)	-0.1859**	(0.0851)
$\Delta loan_{t-2}$	0.0934	(0.0912)	0.0885	(0.0862)	-0.1428	(0.1041)	-0.1519	(0.1080)
$\Delta loan_{t-3}$	0.1584*	(0.0852)	0.1595**	(0.0762)	0.0586	(0.1144)	0.0760	(0.1181)
Δcpi_{t}	-0.3676	(0.2609)	-0.3918	(0.2367)	-0.1903	(0.3775)	-0.2129	(0.3842)
Δcpi_{t-1}	-0.5140	(0.3192)	-0.6064*	(0.3132)	-0.888***	(0.2691)	-0.928***	(0.2473)
Δcpi_{t-2}	0.0130	(0.2510)	0.1183	(0.2818)	-0.4999	(0.3682)	-0.4516	(0.3710)
Δcpi_{t-3}	-0.9104**	(0.3532)	-0.7352*	(0.3713)	-0.0020	(0.3593)	-0.0209	(0.3975)
Δiip_{t}	0.0002**	(0.0001)	0.0003**	(0.0001)	-0.0002***	(0.0001)	-0.0002***	(0.0001)
Δiip_{t-1}	0.0002	(0.0001)	0.0002	(0.0001)	-0.0002**	(0.0001)	-0.0002**	(0.0001)
Δiip_{t-2}	0.0001	(0.0001)	0.0002	(0.0001)	0.0000	(0.0001)	0.0000	(0.0001)
Δiip_{t-3}	0.0000	(0.0001)	0.0000	(0.0001)	0.0001	(0.0001)	0.0001	(0.0001)
Δir_{t}	0.0036	(0.0027)	0.0041	(0.0035)	0.0047***	(0.0012)	0.0044***	(0.0016)
Δir_{t-1}	0.0017	(0.0032)	0.0053	(0.0037)	-0.0020	(0.0017)	-0.0014	(0.0016)
Δir_{t-2}	0.0036	(0.0036)	0.0036	(0.0033)	0.0000	(0.0018)	-0.0011	(0.0016)
Δir_{t-3}	0.0035	(0.0025)	-0.0025	(0.0029)	0.0045***	(0.0008)	0.0055***	(0.0009)
Diagnostic Tests	Statistic	P-Value	Statistic	P-Value	Statistic	P-Value	Statistic	P-Value
Normality	0.8592	0.6508	1.2973	0.5228	107.15***	0.0000	112.69**	0.0000
Serial Correl.	3.7145	0.2940	2.0749	0.5570	4.8397	0.1839	5.0561	0.1677
Heterosced.	21.429	0.8740	26.551	0.6467	12.725	0.9976	16.270	0.9803
Specification	5.9441	0.0169	2.8302	0.0963	0.3264	0.5703	0.4035	0.5282

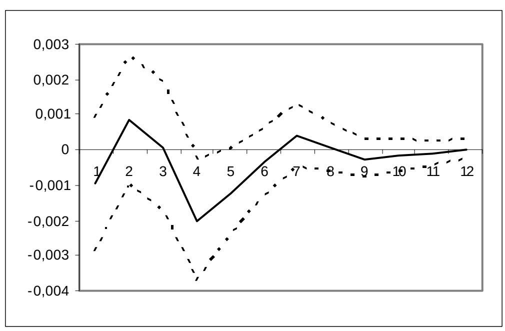
Notes:*, **, *** represents significance at 10%, 5% and 1%, respectively. The figures in parentheses are Newey-West heteroscedasticity and autocorrelation consistent standard-errors. The diagnostic tests are the LM test for serial correlation of 3 lags (Serial Correl.), the White test of heteroscedasticity with no cross terms (Heterosced.) and the Ramsey RESET test with one fitted term (Specification).

Figure 3. Generalised Impulse Response of Commercial Bank Deposits to Interest Rate Shocks

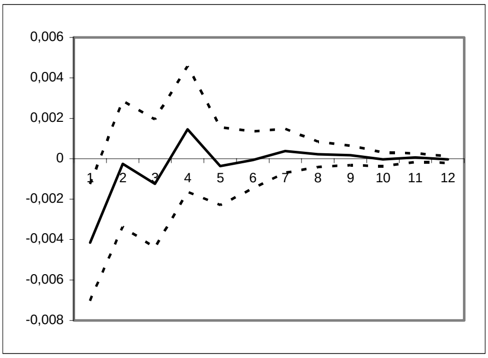
Sub-Period 1: 1-month interest rate



Sub-Period 2: 1-month interest rate



Sub-Period 1: 3-month interest rate



Sub-Period 2: 3-month interest rate

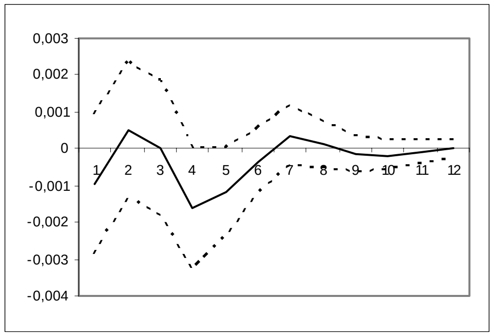
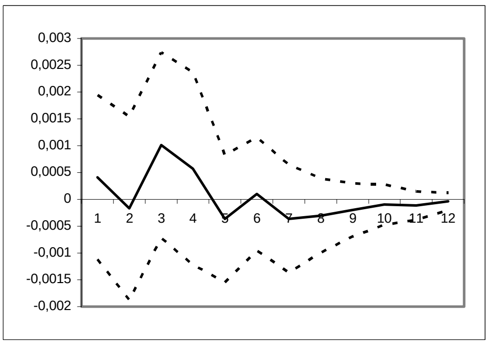
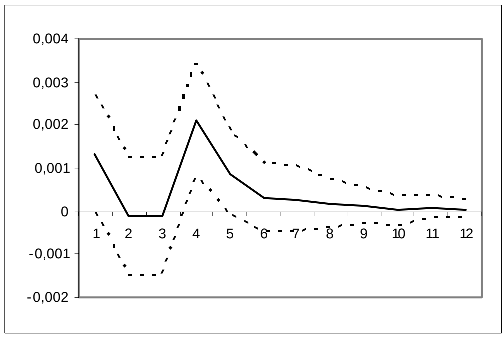


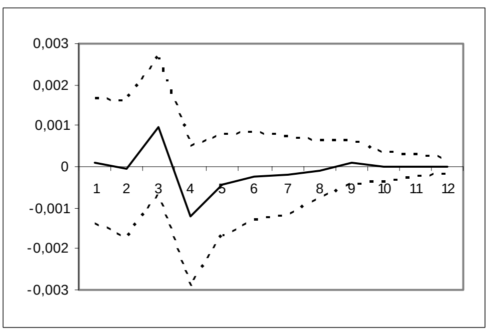
Figure 4. Generalised Impulse Response of Commercial Bank Loans to Interest Rate Shocks Sub-Period 1: 1-month interest rate



Sub-Period 2: 1-month interest rate



Sub-Period 1: 3-month interest rate



Sub-Period 2: 3-month interest rate