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Monetary Policy and Retail Interest Rates in New Zealand: Comparison of Small and Large Banks

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Abstract

Monetary policy rate has remained a major potent monetary policy tool used by monetary authorities in setting targets and direction of other rates and in driving the movement of other macroeconomic aggregates in both developed and developing countries. The paper determined the effect of monetary policy changes on retail interest rates in New Zealand. The study disaggregated data based on various categories of banks as large and small. The study used panel data for the period 2003 to June 2016. Several theories have been advanced to describe the transmission of monetary policy rates to commercial bank retail interest rates. Key among these theories include the Keynesian, New Keynesian, and Monti-Klein Model. It is upon these theories that this study was based. The study employed non-experimental research design using panel data for the period 2003 to June 2016. This study made use of secondary monthly data for the period 2003 to June 2016. The data consisted of treasury bill, interbank, lending and deposit rates. The treasury bill, lending rate, deposit rate of large and the interbank rates were collected from the Reserve Bank of New Zealand website. Lending rate for small banks was regressed against, interbank rate and Day Tbill. The value of R square was 0.346, indicating that 34.6 percent of the lending rate is caused by changes in interbank rate and Day Tbill for small banks. In a similar regression to determine the effect of monetary policy rate on lending rate of large banks in New Zealand, it was found that the value of R square was 0.471, indicating that 47.1 percent of the lending rate is caused by changes in interbank rate and Day Tbill for large banks. The effects of monetary policy rate on lending rate for large banks was high than the effect of monetary policy rate on lending rate for small banks in New Zealand. The short run model indicated that the goodness of fit for the short run model is satisfactory. The error correction parameter was -0.147 for small banks and shows how much of the gap created by a change in market interest rate is closed in one month and is expected to be negative for equilibrium to be restored. The error correction parameter value was lower an indication of lower response of retail interest rate to monetary policy change than that of large banks. Small banks thus have a slower response of market rate to policy rate as compared to large banks. Further, the error correction parameter was -0.367 for large banks and shows how much of the gap created by a change in market interest rate is closed in one month and is expected to be negative for equilibrium to be restored. The error correction parameter value was high an indication of faster response of retail interest rate to monetary policy change as compared to small banks. Larger banks thus have a faster response of market rate to policy rate as compared to small banks. Small banks had a high mean lag an indication that small banks experiences slow responsiveness of retail interest rates to monetary policy rate change as compared to large banks. The study therefore recommends policy recommendation to guide deposit and lending rates in New Zealand. The study also recommends expansion of banks asset base.

Key words*: Monetary policy, retail interest rates, New Zealand small, large banks*

1. Introduction

Two major policy instruments used by monetary authorities to influence the level and availability of credit in most developed and emerging market economies is fiscal policy and monetary policy (Cacciatore, Ghironi & Turnovsky, 2015). Of particular interest to the monetary authorities in developing economies is the issue of how monetary policy impacts on some selected macroeconomic target variables which inter alia, includes money supply, equilibrium money stock, interest rates, investment, savings and the level of Gross National Product (Afsar & Dogan, 2017). Monetary policy is a tool through which monetary authorities in a country achieve control of the economy. Monetary policy affects crucial aspects of the economy such as inflation, employment, output, consumption, asset prices, the cost of goods and investment decisions (Kendall & Ratcliffe, 2019). Central banks cannot only control macroeconomic variables such as inflation, output, and employment and exchange rates directly. Instead, central banks can also influence macroeconomic variables indirectly by increasing or decreasing short-term interest rates or changing the supply of money.

Monetary policy transmission mechanism describes the channels through which changes in monetary policy stance is transmitted to the real sector of the economy (Cacciatore, et al., 2015). There are several channels through which monetary policy impulses affect the economy. These consist of interest rate, asset price, exchange rate and credit channels (Borio & Hofmann, 2017). The expectation channel also performs an essential function in monetary policy transmission.

The interest rate, credit, and exchange rate channels are the main monetary policy transmission channels in New Zealand. The main objectives of monetary policy have traditionally been price stability, stimulation of economic growth, attainment of full employment, stabilizing long-term interest rates and real exchange rates, and smoothing of business cycles (Borio, *et al.*, 2017). However, while some of the monetary policy objectives are complementary to each other, others are inconsistent. The objective of price stability is often in conflict with the objective of stable interest rates (Khan, 2010). There is also a weak link between monetary stance and output but a strong link between monetary stance and price stability, hence, there seems to be little leeway of balancing the two competing goals.

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Different countries pursue different monetary policy objectives. The central banks in Europe, New Zealand, South Africa, Brazil and Japan pursue an inflation targeting framework (Noyer, 2016). The European Central Bank (ECB) has been pursuing a monetary policy objective that aims at ensuring political independence and price stability (Micossi, 2015). The effectiveness of monetary authorities' policies is largely dependent on the speed and magnitude at which the commercial banks adjust their different retail interest rates following a change in the policy interest rates. Micossi (2015), finds that in the long run, official rate and retail interest rate move together in the United Kingdom. Labonte (2015) noted that in the United States of America (USA) the link between policy actions and long-term rates seem uncertain, however, there are substantial facts that monetary policy has a predictable effect on short-term interest rates.

In New Zealand, the Reserve Bank uses monetary policy to control inflation and keep it within a specific target band. Monetary policy is encountered by ordinary New Zealanders in several ways (Cacciatore, *et al.*, 2015). New Zealanders directly encounter the main instrument of monetary policy, the Official Cash Rate (OCR), when they borrow money at retail interest rates through mortgages, credit cards or personal loans, or when they save money in bank accounts that earn interest (Kendall & Ratcliffe, 2019). Retail rates of interest are directly related to the OCR set by the Reserve Bank. Other ways that New Zealanders encounter monetary policy are through its effect on inflation and economic activity.

Reserve Bank of New Zealand decides whether current monetary policy is set appropriately to ensure that the Bank's price stability objective is met, and if not, how policy should be adjusted (Connolly & Kohler, 2014). This follows a comprehensive decision process that includes a review of a wide range of economic and financial data, economic projections and information from the Bank's business contacts (Kendall & Ratcliffe, 2019). A decision to adjust policy settings can be implemented by changing the level of the OCR directly, or by signalling to financial markets a future course for monetary policy that differs from the prevailing market view.

1.2 Statement of the Problem

The main aim of the Reserve Bank of New Zealand is to ensure price stability, promote liquidity, solvency and an effective financial system that is market driven. The Reserve Bank of New Zealand applies short-term interest rates and reserve money to influence the direction of monetary policy in New Zealand (Kendall & Ratcliffe, 2019). High-interest rates have been a major macroeconomic policy concern in New Zealand. One of the monetary policy tools the government has been using to signal the stance of monetary policy in New Zealand.

A change of the monetary policy rate is expected to lead to a change in retail interest rates through the transmission mechanism. However, changes in monetary policy rate did not result in a complete monetary policy transmission to retail interest rate during different intervention periods. New Zealand government directly encounter the main instrument of monetary policy, the Official Cash Rate (OCR), when they borrow money at retail interest rates through mortgages, credit cards or personal loans, or when they save money in bank accounts that earn interest (Kendall & Ratcliffe, 2019). Retail rates of interest are directly related to the OCR set by the Reserve Bank. Other ways that New Zealand government encounter monetary policy are through its effect on inflation and economic activity.

Objectives

i. What is the effect of monetary policy rate changes on retail interest rates in New Zealand?
ii. What is the speed of adjustment of retail interest rates to monetary policy changes in New Zealand?
iii. What is the effect of bank size on retail interest rates stickiness in New Zealand?

2. Literature Review

2.1 Theoretical Literature

2.1.1 Keynesian Theory

The Keynesian theory stems from the work of John Maynard Keynes who published his propositions "The General Theory of Employment, Interest, and Money" in 1936 (Keynes, 1936). The theory states that market interest rates are determined by demand and supply of money balances (Prates & Cintra, 2017). The theory revolves around the liquidity preference theory and explains why people individually express demand for money. The Keynesian theory states that people demand money for transaction, precautionary and speculative purposes. The transaction and precautionary demand increase with income while speculative demand is inversely related to interest rates (Lavoie, 2004). The Keynesians argue that to influence the demand for money, the price of money should be controlled directly or indirectly by inducing changes through real income. Theoretically, a change in interest rate, other things being equal affects individual's preference for holding cash. Keynesian theory treats money as exogenous.

The Keynesian theory identifies two channels of monetary policy transmission mechanism. These are the interest rate and the exchange rate channels (Prates & Cintra, 2017). According to the interest rate channel, changes in policy interest rate is transmitted to short-term interest rates and subsequently to retail bank interest rates leading to changes in aggregate demand and output (Tily, 2012). The Keynesian theory also operates through the exchange rate effects on net exports (Mishkin, 2010).

The Keynesian model of analyzing monetary policy effects on the economy is criticized in that it focuses on only one relative asset price, the interest rate or in the case of Taylor's model, two interest rates, and exchange rate (Terra & Arestis, 2017). Instead, the monetarists hold that it is vital to look at how monetary policy affects the universe of relative prices and real wealth (Mishkin, 1995). Secondly, empirical studies have had difficulty in identifying quantitatively the interest rate channel through the cost of capital. The lack of support for this channel has provided stimulus for a search of other transmission channels (Tily, 2012). Finally, the Keynesian theory does not adequately explain the role of commercial banks in monetary policy transmission under imperfect market conditions and, therefore, considered incomplete (Mishkin, 2010). However, the theory is relevant to the current study as it explains the transmission of short-term interest

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rates to retail interest rates. This is done through the interest rate and exchange rate channels. The theory also explains how the interest rate is determined by demand and supply of money balances.

2.1.2 Monti-Klein Model

The model for analyzing monetary policy interest rate transmission to retail interest rates was first developed by Monti (1971) and Klein (1971) according to Chiumia and Palamuleni (2016). The Monti – Klein model considers a profit-maximizing bank and the connection between policy interest rate and retail interest rate (Klein, 1971). The theory assumes that commercial banks have a direct clearing relationship with the central bank (Mbowe, 2015). The bank balance sheet, is on the asset side comprised of reserves which is R and loans which is L and on the liabilities side, are deposits which is D and settlement balance with the central bank which is S, so that:

$$R + L = D + S \qquad (1)$$

The level of equity is assumed to be zero (Matthews & Thompson, 2008). The interbank market rate is set by the Central bank or is determined by the equilibrium rate on international capital markets (Freixas & Rochet, 2008). Assuming that commercial banks make loans at a rate i_L, where i_L is lending rate and pays deposit interest rate at a rate i_D, where i_D is the deposit rate, clearing with other commercial banks is carried out through the central bank. Therefore, if a commercial bank has a negative settlement balance S at the central bank, it pays a penalty, i_p which is equivalent to the policy rate. At the same time, the bank incurs costs of managing deposits and loans with a cost function of the commercial bank given as mL. In addition, banks are required to keep a proportion σ of their deposits as non-interest bearing reserves (Mbowe, 2015). Where mL is the cost function of commercial banks, i_p is the penalty which is equal to the policy rate, S is negative settlement balance and σ is the proportion of deposits kept as non-interest bearing reserves.

The original Monti-Klein model (1971) was developed for a monopolistic bank. However, in order to better explain the banking industry, a modification can be made for it to include the oligopolistic situation (Freixas and Rochet, 2008).

The profit function of each bank in the economy is given by:

$$\pi(D, L) = i_L L - i_D(R + L - S) - i_p\sigma(S - R) - mL \qquad (2)$$

Where $\pi(D, L)$ is the bank's profit function. The bank's profit in equation 2 is the sum of intermediation margins on loans and deposits less management cost.

The model is criticized because it assumes that decisions about loans and deposits are made together which may not be the case. The Monti Klein model (1971), however, plays an important role by showing how the interbank market rate is transmitted to retail bank interest rates (Freixas and Rochet, 2008). As reported by Freixas and Rochet (2008), Hannah and Berger (1991) note that the model is able to show that stickiness in interest rates increases with market concentration. The Monti-Klein model (1971) incorporates policy rate, retail rates, loans, and deposits. It also shows how policy rate is transmitted to retail rate. The model thus provides a theoretical framework for the current study.

3. Methodology

The study investigated the effect of monetary policy changes on retail interest rates in New Zealand. It applied a non-experimental research design using panel data for the period 2003 to June 2016. The relationship between monetary policy interest rate and retail bank interest rates was based on the original Monti-Klein model of profit maximization theory of the bank. This approach was adopted by among others Makambi *et al.*, (2013), Mbowe (2015) and Chiumia and Palamuleni (2016). This study followed this approach. The framework assumes that commercial banks have a direct clearing relationship with Reserve Bank of New Zealand. A commercial bank is assumed to maximize profit which is π subject to commercial bank balance sheet. The balance sheet is on the asset side comprised of reserves which is R and loans which is L and, on the liability side, are deposits which is D and settlement balance with the Central Bank which is S, so that:

$$R + L = D + S \qquad (3)$$

The total assets equal to the total liabilities in equation 3.1 and it follows that deposits is derived by:

$$D = R + L - S \qquad (4)$$

Assuming that commercial banks make loans at a rate i_L where i_L is the interest rate on loans and pays deposit interest rate at a rate i_D where i_D is the interest rate on deposits. Then the net interest income is given as interest earned on loans less interest earned on deposits as shown by:

$$Net\ interest\ income = i_L L - i_D(R + L - S) \qquad (5)$$

Clearing with other commercial banks is carried out through the Reserve Bank of New Zealand and if a commercial bank balance falls below the required reserve, it pays a penalty i_p which is equivalent to the policy rate. The liquidity penalty is equivalent to the policy rate multiplied by the difference between required reserve and settlement balance. In addition, banks are expected to keep a proportion σ of their deposits as non-interest bearing reserves. Therefore the total penalty is given by:

$$i_p \sigma(S - R) \qquad (6)$$

Where σ is the proportion of deposits kept at the Reserve Bank as non-interest bearing reserves and i_p is the penalty which is equal to the policy rate. At the same time, the bank incurs costs of supervising deposits and loans. Assuming that the cost function of the commercial bank is given as:

$$Cost\ function = mL \qquad (7)$$

Where m is the markup over the lending rate or markdown over the deposit rate.

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The Monti-Klein model which assumes a downward sloping demand function for loans and an upward sloping deposit function, the profit function may be expressed as the net interest income from loans and deposits less supervision costs. Therefore, profit function given by $\pi(D, L)$ is derived by combining equations 5, 6, and 7 as follows:

$$\pi(D, L) = i_L L - i_D(R + L - S) - i_p\sigma(S - R) - mL \quad (8)$$

Based on the profit function in equation 3.6, the bank faces two choice variables: the volume of loans granted and the quantity of precautionary reserve they chose to hold. Differentiating equation 8 with respect to L and R yields:

$$i_L - i_D = m \quad (9)$$

$$i_D = \sigma i_p \quad (10)$$

When equation 9 and 10 are combined, they yield a linear relationship between retail interest rates and monetary policy rates as shown in equation 11.

$$i_L = m + \sigma i_p \quad (11)$$

The monetary policy rate is normally transmitted to short-term money market interest rates and then to the retail rates. The transmission is fast and complete as long as there is perfect competition and full information.

Equation 11 can be rewritten with $i_L = BR_t$ to represents bank retail rate at time t and $i_p = MPR_t$ to represent monetary policy rate at time$t$. Then equation 11 can be presented as:

$$BR_t = \beta_0 + \beta_1 MPR_t \quad (12)$$

Model Specification

To investigate how monetary policy variables affect retail interest rates and based on equation 12, a panel data regression model was specified as:

$$BR_{it} = \beta_0 + \beta_1 MPR_{it} + \varepsilon_{it} \quad (13)$$

Where MPR_{it} represent the monetary policy rate exogenously determined by Reserve Bank of New Zealand and i denotes different banks, t denote time period 1994 to 2016. The policy rates include the treasury bill rate and interbank rate. The BR_{it} denotes the endogenously determined lending rates or deposit rates; ε_{it} is the stochastic error term; while β_0 and β_1 are long-run parameters. The constant term β_0 denotes fixed mark-up/markdown on retail interest rates. It is expected that β_1 lies between zero and one. If $\beta_1$is close to zero, the degree of long-run pass-through is slow, while a value of 1 for β_1 implies a complete pass-through. It is also possible that β_1 may record a higher value than 1, in which case it is over pass-through. This occurs when banks charge higher interest rates in an attempt to offset the higher risks resulting from asymmetric information, rather than reducing the supply of loans (De Bondt, 2005).

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Johansen Maximum Likelihood test was done to establish the presence of cointegration (Aziakpono & Wilson, 2013). If cointegration was established, then the relationship could be expressed as an Error Correction Mechanism (ECM) (Gujarati, 2004). This was done by lagging equation 3.11 for one period and rearranged as follows:

$$\varepsilon_{it-1} = \quad BR_{it-1} - \beta_0 - \beta_1 MPR_{it-1} \ldots\ldots 14$$

Equation 13 was differenced to avoid spurious regression. The inclusion of equation 14 into the differenced equation 13 resulted in equation 3.13. The ECM took the following form as suggested by Charoenseang and Manakit (2007):

$$\Delta BR_{it} = \gamma_0 + \gamma_1 \Delta MPR_{it} + \gamma_2 \varepsilon_{it-1} + u_{it} \ldots\ldots 15$$

Where $\Delta BR_{it} = BR_{it} - BR_{it-1}$, $\Delta MPR_{it} = MPR_{it} - MPR_{it-1}$, ε_{it-1} which is the one period lagged value from the cointegrating relationship 3.11, Δ is the first difference operator and u_{it} is the error term. Equation 3.13 states that the first difference in the market interest rates, BR_{it}, depends on a constant γ_0 , the change in MPR_{it} , and on the equilibrium error term ε_{it-1} . The term γ_1 is the degree of pass-through in the short run and the term γ_2 captures the adjustment towards equilibrium and a significant γ_2 is consistent with the series being cointegrated. The error correction parameter γ_2 is the speed of adjustment and shows how much of the gap created by a change in market interest rate is closed in one month and is expected to be negative for equilibrium to be restored. A high value of γ_2 indicates a faster response of retail interest rate to monetary policy change and vice versa.

The average number of months required to reach the long run value was calculated by mean lag (ML) (Doornik & Hendry, 1994). Therefore, to estimate the interest rate stickiness, a mean lag (ML) was estimated based on the ECM equation 15 as follows:

$$ML = (1 - \gamma_1)/\gamma_2 \ldots\ldots 16$$

Equation 16 represents the mean lag, or the degree of rigidity, for a symmetric error correction model. A high ML represents a high rigidity or slow adjustment of market interest rates in response to changes in monetary policy interest rate. The opposite is the case where ML was low. However, as noted by Scholnick (1996), this specification assumes that adjustment is symmetric, meaning that adjustment is the same when the market interest rate is above or below its equilibrium level. The presence of asymmetry is tested using the Wald test (Ogundipe and Alege, 2013). A value of mean lag less than one month was considered a fast adjustment of lending rate while a mean lag of over one month for deposit rates was a slow adjustment (Aziakpono & Wilson, 2013).

This study made use of secondary monthly data for the period 2003 to June 2016. The data consisted of treasury bill, interbank, lending and deposit rates. The treasury bill and the interbank rates were collected from the Reserve Bank of New Zealand website. The lending rate and deposit rate of large and small banks were obtained from Reserve Bank of New Zealand website. Where data was not available average for lending and deposit rates of large and small banks was used.

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To address the first objective which is to determine the effect of monetary policy rate on retail interest rate of large and small banks in New Zealand, equation 13 was estimated using panel data regression analysis and estimates derived. The coefficient of the explanatory variables showed the direction of change whether positive or negative. The equation 13 also showed the short-run effect of monetary policy rate on retail rates where a value of one for γ_1 implies a complete pass-through, while a value of γ_1 close to zero implies slow pass-through. A value close to one for γ_1 shows a fast pass-through. The second objective of the study was to determine the speed of adjustment of retail interest rates to monetary policy changes for large and small banks in New Zealand. To address the second objective an error correction model was estimated as shown in equation 13. The error correction parameter γ_2 in equation 13, measures the speed of adjustment and shows how much of the gap created by a change in market interest rate was closed in one month and was expected to be negative for equilibrium to be restored. A high value of γ_2 indicates a faster response of market rate to policy rate. A low γ_2 indicates a slow speed of adjustment.

The third objective was to determine the effect of bank size on retail interest rate stickiness in New Zealand. To address the third objective, a mean lag was estimated. The mean lag measured the average number of months required to reach the long run value. The estimation was done using equation 16. The coefficient interpreted was ML . A high mean lag shows slow responsiveness of retail interest rates to monetary policy rate change. The opposite is true when ML is low (Aziakpono & Wilson, 2013).

4. Results and Discussion

4.1 Descriptive Statistics

Descriptive statistics gives a presentation of the mean, maximum and minimum values of variables applied together with their standard deviations in this study. Table 1 shows the descriptive statistics for the variables applied in the study. Descriptive analysis for all the variables was obtained using Stata software.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std.dev	Min	Max
Lending rate	324	16.16	2.11	10.27	20.94
Interbank rate	324	6.95	4.63	0.43	28.90
91-DayTbill	324	7.58	3.65	0.83	21.65
Deposit rate	324	5.89	2.47	0.84	13.07

Lending rate measured as average lending rates (1 to 5 years) of commercial banks as given by Reserve Bank of New Zealand data at time t had a mean of 16.16 and a standard deviation of 2.11. Interbank rate measured as average rate of interest at which banks borrow from each other at time t had a mean of 0.43 with a standard deviation of 4.63. 91-DayTbill measured as average of a 90-day Treasury bill rate at time t had a mean of 0.83 with a standard deviation of 3.65.

Finally, deposit rate measured as average rate of interest on bank deposits of more than three months at time t had a mean of 0.84 and a standard deviation of 2.47.

4.2 Effect of monetary policy rate on retail interest rate of large and small banks in New Zealand

Lending rate was regressed against deposit rate, interbank rate and Day Tbill. The regression analysis was conducted at 5% significance level. The regression results are shown in Table 2.

4.2.1 Effect of monetary policy rate on lending rate of small banks in New Zealand

In Table 2, R squared, is the coefficient of determination indicates the deviations in the response variable that is as a result of changes in the predictor variables.

Table 2: Effect of monetary policy rate on lending rate of small banks in New Zealand

Source	SS	df	MS		
				Number of obs	161
				F(2, 159)	42.117
Model	270.678	2	135.339	Prob > F	0.000
Residual	510.936	159	3.213	R-squared	.346
				Adj R-squared	.338
Total	781.614	161		Root MSE	1.7926052

Lending rates1-5years	Coef.	Std. Err.	t	P>t
Interbank rate	.291	.059	4.98	.019
91-DayTbill	.386	.075	5.15	.000
_cons	14.844	.334	44.44	.000

From the outcome in Table 2, the value of R square was 0.346, indicating that 34.6 percent of the lending rate is caused by changes in interbank rate and Day Tbill for small banks. The significance value is 0.000 which is less than p=0.05. This implies that the model was statistically significant in predicting how deposit rate, interbank rate and 91-Day Tbill affect lending rate. The F value of 42.117 indicates that the data used was linear and therefore can be used for regression analysis. From the above results, it is clear that interbank rate has a positive and statistically significant relationship with lending rate (r = .291, p =.019). Further, regression results showed that 91-Day Tbill has positive and statistically significant relationship with lending rate (r = .386, p = .000). On the estimated regression model above, the constant = 14.844shows that if selected dependent variables (interbank and 91-DayTbill) are rated zero, lending rate for small banks will be 14.844. A unit increase in interbank rate would lead to an increase in lending rate of small banks by .291 units. A unit increase in 91-DayTbill would lead to a unit increase in in lending rate of small banks by .386 units.

Further, a similar regression was conducted to determine the effect of monetary policy rate on lending rate of large banks in New Zealand. There was need to compare effect of monetary policy rate on lending rate of large banks and small banks in New Zealand. From the outcome in Table 3, the value of R square was 0.471, indicating that 47.1 percent of the lending rate is caused by changes in interbank rate and Day Tbill for large banks. The significance value is 0.000 which is less than p=0.05. This implies that the model was statistically significant in predicting how deposit rate, interbank rate and 91-Day Tbill affect lending rate for large banks in New Zealand.

Table 3: Effect of monetary policy rate on lending rate of large banks in New Zealand

Source	SS	df	MS		
				Number of obs	161
				F(2, 159)	70.815
Model	253.533	2	126.767	Prob > F	0.000
Residual	284.626	159	1.790	R-squared	.471
				Adj R-squared	.464
Total	284.626	161		Root MSE	1.3379471

Lending rates1-5years	Coef.	Std. Err.	t	P>t
Interbank rate	.381	.035	10.886	.000
91-DayTbill	.474	.028	16.929	.008
_cons	16.109	.246	65.484	.000

The F value of 70.815 indicates that the data used was linear and therefore can be used for regression analysis. From the above results, it is clear that interbank rate has a positive and statistically significant relationship with lending rate (r = .381, p =.008). Further, regression results showed that 91-Day Tbill has positive and statistically significant relationship with lending rate (r = .474, p = .000).

On the estimated regression model above, the constant = 16.109 shows that if selected dependent variables (interbank and 91-DayTbill) are rated zero, lending rate for large banks will be 16.109. A unit increase in interbank rate would lead to an increase in lending rate for large banks by .381 units. A unit increase in 91-DayTbill would lead to a unit increase in in lending rate for large banks by .474 units. It is clear from the regression results that the effect of monetary policy rate on lending rate of large banks in New Zealand is higher than the effect of monetary policy rate on lending rate for small banks.

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4.2.2 Effect of monetary policy rate on deposit rate of small banks in New Zealand

A panel regression regression was conducted to determine the effect of monetary policy rate on deposit rate of small banks in New Zealand. There was need to compare effect of monetary policy rate on deposit rate of large banks and small banks in New Zealand.

Table 4: Effect of monetary policy rate on deposit rate of small banks in New Zealand

Source	SS	df	MS		
				Number of obs	161
				F(2, 159)	168.978
Model	454.210	2	227.105	Prob > F	0.000
Residual	213.694	159	1.344	R-squared	.680
				Adj R-squared	.676
Total	667.905	161		Root MSE	1.1593059

Deposit rates	Coef.	Std. Err.	t	P>t
Interbank rate	.119	.021	5.739	.000
91-DayTbill	.389	.026	14.778	.000
_cons	3.809	.225	16.899	.000

In Table 4, R squared, is the coefficient of determination indicates the deviations in the response variable that is as a result of changes in the predictor variables. From the outcome in Table 4, the value of R square was .680, indicating that 68.0 percent of the deposit rate is caused by changes in interbank rate and Day Tbill for small banks. The significance value is 0.000 which is less than p=0.05. This implies that the model was statistically significant in predicting how deposit rate, interbank rate and 91-Day Tbill affect deposit rate for small banks in New Zealand. The F value of 168.978 indicates that the data used was linear and therefore can be used for regression analysis. From the above results, it is clear that interbank rate has a positive and statistically significant relationship with deposit rate (r = .119, p =.000). Further, regression results showed that 91-Day Tbill has positive and statistically significant relationship with deposit rate (r = .389, p = .000). On the estimated regression model above, the constant = 3.809 shows that if selected dependent variables (interbank and 91-DayTbill) are rate2d zero, deposit rate for small banks will be 3.809. A unit increase in interbank rate would lead to an increase in deposit rate of small banks by .119 units. A unit increase in 91-DayTbill would lead to a unit increase in in deposit rate of small banks by .389 units.

Further, a similar regression was conducted to determine the effect of monetary policy rate on deposit rates of large banks in New Zealand. There was need to compare effect of monetary policy rate on deposit rate of large banks and small banks in New Zealand. From the outcome in Table 5, the value of R square was .689, indicating that 68.9 percent of the deposit rate is caused by changes in interbank rate and Day Tbill for large banks. The significance value is 0.000 which is less than p=0.05. This implies that the model was statistically significant in predicting how

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deposit rate, interbank rate and 91-Day Tbill affect deposit rate for large banks in New Zealand. The F value of 175.746 indicates that the data used was linear and therefore can be used for regression analysis. From the above results, it is clear that interbank rate has a positive and statistically significant relationship with deposit rate (r = .168, p =.008). Further, regression results showed that 91-Day Tbill has positive and statistically significant relationship with deposit rate (r = .411, p = .000).

Table 5: Effect of monetary policy rate on deposit rate of large banks in New Zealand

Source	SS	df	MS		
				Number of obs	161
				F(2, 159)	175.746
Model	252.102	2	126.051	Prob > F	0.000
Residual	114.040	159	.717	R-squared	.689
				Adj R-squared	.685
Total	366.142	161		Root MSE	.8468963

Deposit rates	Coef.	Std. Err.	t	P>t
Interbank rate	.168	.015	11.074	.000
91-DayTbill	.411	.039	10.538	.000
_cons	5.435	.465	11.688	.000

On the estimated regression model above, the constant = 5.435 shows that if selected dependent variables (interbank and 91-DayTbill) are rated zero, deposit rate for large banks will be 5.435. A unit increase in interbank rate would lead to an increase in deposit rate for large banks by .168 units. A unit increase in 91-DayTbill would lead to a unit increase in in deposit rate for large banks by .411 units. It is clear from the regression results that the effect of monetary policy rate on deposit rates for large banks in New Zealand is higher than the effect of monetary policy rate on deposit rate for small banks.

4.3 Short Run Results/Error Correction Model

The second objective of the study was to determine the speed of adjustment of retail interest rates to monetary policy changes for large and small banks in New Zealand. To address the second objective an error correction model was estimated. Error Correction Model for small banks and large banks were conducted.

4.3.1 Error Correction Model for lending rates

Since the variables in the model linking lending rate to deposit rate, 91-Day Tbill rate and interbank rate are cointegrated, then an error-correction model can be specified to link the short-run and the long-run relationships. Residuals from the co integrating regression are used to generate an error correction term (lagged residuals) which is then inserted into the short-run model. The specific lagged residuals are lagres3, lagres2 and lagres1. The estimates of the error-correction model are given in Table 6.

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Table 6: Error Correction Model for lending rates

Small banks				
Dependent Variable: dlending rate				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001	0.005	0.104	0.918
Ddeposit rate	4.396	0.139	2.848	0.001
D91-DayTbill	0.364	0.161	2.261	0.000
DInterbank	0.285	0.107	2.664	0.000
LAG of error	-0.147	0.165	-3.574	0.001
R-squared	0.389	Mean dependent var		0.010
Adjusted R-squared	0.298	S.D. dependent var		0.029
Large banks				
Dependent Variable: dlending rate				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.022	0.034	0.64706	0.918
Ddeposit rate	5.0270265	.1769211	28.42	0.35
D91-DayTbill	.4802221	.1483027	3.238	1.31
DInterbank	.2938586	.1351543	2.1742	0.000
LAG of error	-0.367	0.165	-1.6181	0.001
R-squared	0.4443	Mean dependent var		0.023
Adjusted R-squared	0.3648	S.D. dependent var		0.042

The short run in Table 6 indicated that the goodness of fit (r squared) for the short run models was 38.9. The error correction parameter was -0.147 for small banks and shows how much of the gap created by a change in market interest rate is closed in one month and is expected to be negative for equilibrium to be restored. The error correction parameter value was lower an indication of lower response of retail interest rate to monetary policy change than that of large banks. Small banks thus have a slower response of market rate to policy rate as compared to large banks. Further, ERC results showed that the goodness of fit (r squared) for the short run models for large banks was 44.43. The error correction parameter was -0.367 for large banks and shows how much of the gap created by a change in market interest rate is closed in one month and is expected to be negative for equilibrium to be restored. The error correction parameter value was high an indication of faster response of retail interest rate to monetary policy change as compared to small banks. Larger banks thus have a faster response of market rate to policy rate as compared to small banks.

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4.3.2 Error Correction Models for deposit rates

Since the variables in the model linking deposit rate to lending rate, 91-Day Tbill rate and interbank rate are cointegrated, then an error-correction model can be specified to link the short-run relationships. Residuals from the co integrating regression are used to generate an error correction term (lagged residuals) which is then inserted into the short-run model. The specific lagged residuals are lagres3, lagres2 and lagres1. The estimates of the error-correction model are given in Table 7.

Table 7: Error Correction Models for deposit rates

Small Banks				
Dependent Variable: ddeposit rate				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002	0.005	0.353	0.726
Dlending rate	0.047	0.109	0.433	0.668
D91-DayTbill	0.409	0.124	3.304	0.002
DInterbank	0.017	0.008	2.285	0.028
LAG of error	-0.201	0.085	-2.376	0.022
R-squared	0.462	Mean dependent var		0.008
Adjusted R-squared	0.381	S.D. dependent var		0.031
Large banks				
Dependent Variable: ddeposit rate				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004	0.009	0.473	0.639
Dlending rate	0.089	0.171	0.519	0.607
D91-DayTbill	0.025	0.221	0.112	0.912
DInterbank	0.004	0.013	0.298	0.767
LAG of error	-0.590	0.165	-3.574	0.001
R-squared	0.422	Mean dependent var		0.015
Adjusted R-squared	0.336	S.D. dependent var		0.050

The short run in Table 7 indicated that the goodness of fit (r squared) for the short run models for small banks was 46.2. The error correction parameter was -0.201 for small banks and shows how much of the gap created by a change in market interest rate is closed in one month and is expected to be negative for equilibrium to be restored. Further, ERC results showed that the goodness of fit (r squared) for the short run models for large banks was 42.2. The error correction parameter was -0.590 for large banks and shows how much of the gap created by a change in market interest rate is closed in one month and is expected to be negative for

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equilibrium to be restored. The error correction parameter value was lower an indication of lower response of retail interest rate to monetary policy change than that of large banks. Small banks thus have a slower response of market rate to policy rate as compared to large banks. Further, the error correction parameter value for large banks was high an indication of faster response of retail interest rate to monetary policy change as compared to small banks. Larger banks thus have a faster response of market rate to policy rate as compared to small banks.

4.4 The effect of Bank Size on Interest Stickiness in New Zealand

4.4.1 Small banks and Stickiness of lending rates in New Zealand

$ML = (1 - \gamma_1)/\gamma_2$………………………………………………………………...………17

$\gamma_{1=}$4.396+0.364+0.285/3=1.682

Y_1= 1.682

(1-1.682)/-0.147=4.6394 months

The mean lag measured the average number of months required to reach the long run value. The coefficient interpreted was 4.6394 months. A high mean lag shows slow responsiveness of retail interest rates to monetary policy rate change. Small banks had a high mean lag an indication that small banks experiences slow responsiveness of retail interest rates to monetary policy rate change as compared to large banks.

4.4.2 Large banks and Stickiness of lending rates in New Zealand

$ML = (1 - \gamma_1)/\gamma_2$………………………………………………………………...……18

$\gamma_{1=}$5.0270265+.4802221+.2938586/3=1.934

Y_1= 1.934

(1-1.934)/-0.367=2.545 months

The mean lag measured the average number of months required to reach the long run value. The coefficient interpreted was 2.545 months. A low mean lag shows slow responsiveness of retail interest rates to monetary policy rate change. Large banks had a low mean lag an indication that large banks experiences higher responsiveness of retail interest rates to monetary policy rate change as compared to small banks.

4.4.3 Small banks and Stickiness of deposit rates in New Zealand

$ML = (1 - \gamma_1)/\gamma_2$……………………………………………………………………...…19

$\gamma_{1=}$0.002+0.047+0.409/3=0.153

Y_1= 0.153

(1-0.153)/ -0.201=4.214 months

The mean lag measured the average number of months required to reach the long run value. The coefficient interpreted was 4.214 months. A low mean lag shows slow responsiveness of retail interest rates to monetary policy rate change. Small banks had a high mean lag an indication that

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small banks experiences lower responsiveness of deposit rates to monetary policy rate change as compared to large banks.

4.4.4 Large banks and Stickiness of deposit rates in New Zealand

$ML = (1 - \gamma_1)/\gamma_2$……………………………………………………………...………20

$\gamma_{1=}$0.004+0.089+0.025/3=0.039

Y_1= 0.039

(1-0.039)/ -0.590=1.629 months

The mean lag measured the average number of months required to reach the long run value. The coefficient interpreted was 1.629 months. A low mean lag shows slow responsiveness of retail interest rates to monetary policy rate change. Large banks had a low mean lag an indication that large banks experiences high responsiveness of deposit rates to monetary policy rate change as compared to small banks.

5. Conclusion

From the study findings, the study concludes that 91-Day Tbill and interbank rate influences lending rates of small and large banks in New Zealand at different magnitudes. The study found that 91-Day Tbill and interbank rate has a positive and statistically significant relationship with lending rate in New Zealand. The study therefore concludes that 91-Day Tbill and interbank rate influences lending rate in New Zealand of small and large banks in New Zealand.

From the study findings, the study concludes that 91-Day Tbill and interbank rate influences deposit rates of small and large banks in New Zealand at different magnitudes. The study found that 91-Day Tbill and interbank rate has a positive and statistically significant relationship with deposit rates in New Zealand. The study therefore concludes that 91-Day Tbill and interbank rate influences deposit rates in New Zealand of small and large banks in New Zealand.

While determining the speed of adjustment of retail interest rates to monetary policy changes for large and small banks in New Zealand, the study showed that the short run model indicated that the goodness of fit for the short run model is satisfactory. Small banks have a slower response of market rate to policy rate as compared to large banks. This result implies that there is a gradual adjustment (convergence) to the long run equilibrium. The study concluded that bank size determines error correction parameter.

Finally, while determining the effect of bank size on retail interest rate stickiness in New Zealand, it was found that small banks had a high mean lag an indication that small banks experiences slow responsiveness of retail interest rates to monetary policy rate change as compared to large banks while large banks had a low mean lag an indication that large banks experiences higher responsiveness of retail interest rates to monetary policy rate change as compared to small banks. It was concluded that bank size determines mean lag hence responsiveness of retail interest rates to monetary policy rate change.

6. Policy Implication

Monetary policy mandated to maintain stability in the general level of prices and contribute to achieving maximum sustainable employment has proved a success both here and globally over recent decades. An outcome of the low inflation rates and other structural factors has been unprecedented low nominal interest rates. These circumstances have led to an increasing use of alternative monetary policy levers rather than just central banks' official interest rates.

The study found that 91-Day Tbill and interbank rate influences deposit rates of small and large banks in New Zealand. The study recommends that policy makers should pursue expansionary monetary policies by reducing the interest rate in order to promote borrowing. For instance, a reduction in the Treasury bill rates may effectively increase borrowing.

The study found that 91-Day Tbill and interbank rate influences deposit rates of small and large banks in New Zealand. The study therefore recommends policy recommendation to guide depositing rates in New Zealand. The deposit rates show asymmetric responses to changes in official rates.

It was also established that small banks have a slower response of market rate to policy rate as compared to large banks. This result implies that there is a gradual adjustment (convergence) to the long run equilibrium. The study recommends expansion of banks asset base.

Finally, while determining the effect of bank size on retail interest rate stickiness in New Zealand, it was found that small banks had a high mean lag an indication that small banks experiences slow responsiveness of retail interest rates to monetary policy rate change as compared to large banks that had a low mean lag an indication that large banks experiences higher responsiveness of retail interest rates to monetary policy rate change as compared to small banks. The study recommends expansion of banks asset base.

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