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Does Monetary Policy Influence the Profitability of Banks in New Zealand?

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Abstract: The study investigates the relationship between monetary policy and bank profitability in New Zealand using the generalized method of moments (GMM) estimator. Our sample comprises 19 banks from New Zealand over the period 2006–2018. Our results suggest that an increase in short-term rate leads to an increase in the profitability of banks, while an increase in long-term interest rates reduces bank profitability. In addition to monetary policy variables, capital adequacy ratio, non-performing loan ratio, and cost to income ratio are also important determinants of the profitability of banks in New Zealand. Capital adequacy ratio has a positive impact on bank profitability, while non-performing loan ratio and cost to income ratio have a negative impact on bank profitability.

Keywords: monetary policy; short-term interest rates; long-term interest rates; bank size

JEL Classification: G21; G28; E58

1. Introduction

In order to stimulate economic growth and achieve the desired level of inflation, central banks in many countries rely on monetary policy tools. One of the most important monetary policy instruments is the interest rate, also called policy rate or cash rate.

The interest rates in major developed countries have fallen during the last two decades. The low interest rates have created a challenging environment for financial institutions. Low interest rates have increased competition in the financial sector and have an increased risk appetite of financial institutions (Bikker and Vervliet 2018). Similar to other developed countries, there has been a considerable decline in the interest rates in New Zealand during the last two decades. In August 2019, Reserve Bank of New Zealand (RBNZ) further reduced interest rate from 1.5% to 1% and March 2020, the interest rate was further reduced from 1% to 0.25%. This reduction was made due to the COVID-19 (coronavirus) outbreak. It is important to note that the interest rate was 8.25% in March 2008, which is significantly higher than the current interest rate of 0.25% (Reserve Bank of New Zealand 2020a). The RBNZ primarily use the official cash rate (OCR) as a conventional monetary policy tool to influence the interest rate, maintain price stability, and sustain employment (Culling et al. 2019; Drought et al. 2018). In the past, the RBNZ had not used any unconventional monetary policy tools (Drought et al. 2018); however, to soften the economic impact of COVID-19, recently RBNZ decided to use unconventional monetary policy by using the large scale assets purchase program (LSAP) (Croy and Sharon 2020) and currently RBNZ is planning to purchase the assets worth NZD 60 billion (Bassetti 2020).

Given that low interest rates pose a challenge to the performance of the financial institutions, it is important to investigate the relationship between monetary policy and the profitability of banks in New Zealand. A number of studies have investigated the determinants of bank profitability (Bourke 1989; Demirguc-Kunt and Huizinga 1999; Mirzaei et al. 2013; Reserve Bank of New Zealand 2020c; Short 1979). Some studies have focused on the relationship between monetary policy and bank profitability (Bikker and Vervliet 2018; Borio et al. 2017; Madaschi and Nuevo 2017). However, to our knowledge, there is no comprehensive study that has investigated the relationship between monetary policy and bank profitability in New Zealand. The studies by Berument and Froyen (2015) and West (2003) have focused on the monetary policy in New Zealand, however, their perspective is different. Berument and Froyen (2015) investigated the impact of monetary policy on long-term interest rate under the inflation targeting regime while West (2003) explored the relationship between monetary policy and the volatility of the real exchange rate in New Zealand. This study investigates the effect of the monetary policy on the profitability of banks in New Zealand using a panel dataset of 19 banks over the period 2006–2018 through using the dynamic panel model system GMM estimator. New Zealand relies on one policy objective (inflation targeting) and one monetary policy tool (interest rate). Despite the continuous reduction in the interest rate, New Zealand has not been able to achieve the desired level of inflation. The falling interest rates can have a significant impact on the performance of banks; therefore, it is important to empirically explore the relationship between monetary policy and bank profitability in New Zealand. The New Zealand banking system consists of 26 registered banks; however, it is dominated by the Australian-owned banks (ANZ, ASB, BNZ and Westpac) which account for approximately 86% of the total lending. The majority of lending (94%) of the banks is focused on the non-financial private sector, while only 6% of lending goes for direct capital market funding and non-banking lending institutions (Reserve Bank of New Zealand 2020b). The Reserve Bank of New Zealand (RBNZ) is responsible for regulating banks, insurance companies, and non-banking deposit taking institutions and developing policies to promote and maintain sound and efficient financial system including overseeing the financial market infrastructures (Reserve Bank of New Zealand 2020c). The New Zealand banks rank number one in transparency and as a ninth (out of 140 countries) in the soundness of the banks (World Economic Forum—the global competitiveness report 2018).

This research makes significant contributions to the growing literature on the link between monetary policy and bank profitability. First, this is the first study that investigates the impact of monetary policy on bank profitability in New Zealand using a panel dataset of 19 banks over the period 2006–2018. A profitable banking sector is crucial for economic growth, and changes in interest rates have the potential to affect bank profitability. Bikker and Vervliet (2018) suggest that low interest rates reduce the profit margins of banks, which in turn puts pressure on their capital. Second, Athanasoglou et al. (2008) suggest that bank profitability is persistent. We use dynamic model (GMM estimator) to control the persistence of bank profitability, and to address endogeneity which can arise due to omitted variables and causality between dependent and explanatory variables. This research will inform policy makers about the impact of monetary policy on bank profitability and assist them in making important decisions related to changes in monetary policy instruments.

Our results show that short-term interest rate has a positive impact on the profitability of banks, but the relationship between the long-term interest rate and bank profitability is negative. In addition, we found that capital adequacy ratio, non-performing loan ratio, and cost to income ratio are also important determinants of the bank profitability in New Zealand. Capital adequacy ratio has a positive impact on bank profitability, while non-performing loan ratio and cost to income ratio have a negative impact on bank profitability.

This paper consists of six sections. Section 2 reviews the literature. Section 3 focuses on data and methods. Section 4 discusses the results and additional analysis. Section 5 focuses on the robustness tests. Section 6 concludes the paper.

2. Literature Review

During the global financial crisis (GFC), many banks all around the world faced the serious issues associated with profitability and some of the banks have not yet recovered from the crisis. Since that period, the soundness of the financial sector has been one of the major concerns (Bikker and Vervliet 2018). Central banks use monetary policy tools to achieve desired policy objectives such as inflation targeting and economic growth. However, research shows that monetary policy directly affects the profitability of banks (Zimmermann 2017). The central bank primarily controls the short-term interest rate to expand or contract the economy (Borio et al. 2017).

Monetary policy affects banks' profitability in two ways. Firstly, reducing the interest rates positively impacts the macroeconomic conditions that will support the banks by reducing their funding costs and increasing the borrowers' creditworthiness. Secondly, accommodating monetary policy may lead to contraction in the net interest income (Asia News Monitor 2017). There are some studies that have investigated the relationship between monetary policy and bank profitability. However, it is still an under-researched area (Borio et al. 2017), and hence there is no clear consensus among researchers on whether the monetary policy has a positive, negative, or no effect on the performance of banks.

A recent study conducted by Borio et al. (2017) on 109 large international banks from 14 developed economies from 1995 to 2012 suggests a positive relationship between the short-term interest rate and bank profitability (ROA). Similar results were found in the study conducted by Hancock (1985). Likewise, Berument and Froyen (2015) studied Finnish retail banks for ten years from 2004, when there was a significant change in policy rates and market interest rate; her research also revealed a positive relationship. Similarly, Demirguc-Kunt and Huizinga (1999) studied banks from 80 different countries from the period of 1988 to 1995 and they found a positive relationship between the interest rate and bank profitability.

The evidence from the US and other advanced economies revealed that low interest rates provide one-off boosts in a bank's assets valuation, which supports bank profitability. Furthermore, the low interest rate encourages banks to shift from interest income to non-interest income like fee- and trading-based incomes (Reserve Bank of New Zealand 2019b). Brei et al. (2019) studied 113 large banks in 14 different countries from the period 1994 to 2015 and concluded that, on average, each 1% decline in the policy rate resulted in a 0.93% increase in income from fees and commission. The study by Madaschi and Nuevo (2017) in Sweden and Denmark's banks revealed that the profitability of banks increased during the negative interest rates. On the other hand, Stráský and Hwang (2019) studied 50 European banks over the period 2014–2018 and found a weak negative relationship between monetary policy and banks' profitability. Aharony et al. (1986) examined the effect of monetary policy on the risk and profitability of commercial banks by using the capital market data and concluded a negative relationship between bank returns and interest rate surprises.

It is important to note that, during serious economic downturn, even ultra-low interest rates do not help to boost the economy; as a result, central banks use unconventional monetary tools such as quantitative easing (Rudebusch 2018) to boost the economy. This includes enhancing credit support (such as longer-term refinancing operations) and the direct purchase of government bonds, etc. (Galariotis et al. 2018). Lambert and Ueda (2014) suggest that the unconventional monetary policies have a medium-term bank credit risk in US, Euro and UK markets due to the long period of low interest rate that reduces the revenue. However, these policies positively affect the banks due to the near-zero policy rates which reduces their funding cost. Mamatzakis and Bermpei (2016) found a negative relationship between unconventional monetary policy and the bank's performance. Unconventional monetary policy increases the potential moral hazards and the likelihood of problem loans (Mamatzakis et al. 2016). Brei et al. (2019) suggest that the success of the unconventional monetary policy depends on the degree of financial leverage, the holding of securities and the lending rates.

The existing literature shows that there is a relationship between monetary policy and bank profitability; however, the results are inconclusive and vary across different countries. Given that, to

our knowledge, there is no comprehensive study that has explored this relationship in New Zealand (Reserve Bank of New Zealand 2019b), this study fills this gap.

3. Data and Methods

3.1. Description and Sources of Data

This study uses annual data from 19 banks in New Zealand that cover the period 2006–2018. The dataset is an unbalanced panel with 105 observations.[1] Data were collected from two sources. Data related to short-term interest rates, long-term interest rates, inflation, and the gross domestic product were collected from the website of Reserve Bank of New Zealand.[2] Data associated with other variables such as return on assets, return on equity, capital adequacy ratio, non-performing loan ratio, total assets, and loan to assets ratio were collected from the Bureau van Dijk's Bankscope database (Bankscope). The Bankscope is a comprehensive dataset that covers approximately 90% banks in the world. The dataset consists only of active banks; it does not include investment companies, insurance companies, or any other financial institutions. The Bankscope provides consolidated as well as unconsolidated statements in some cases. We have used only unconsolidated statements. In addition, we have removed the banks where annual data were not available.

Figure 1 shows the short-term interest rates (SR) and long-term interest rates (LR) in New Zealand, and average bank profitability measured with return on assets (ROA) and return on equity (ROE) for New Zealand's banks over the period 2006–2018. There is a continuous decrease in the interest rates and significant variation in ROE with the changes in SR and LR.
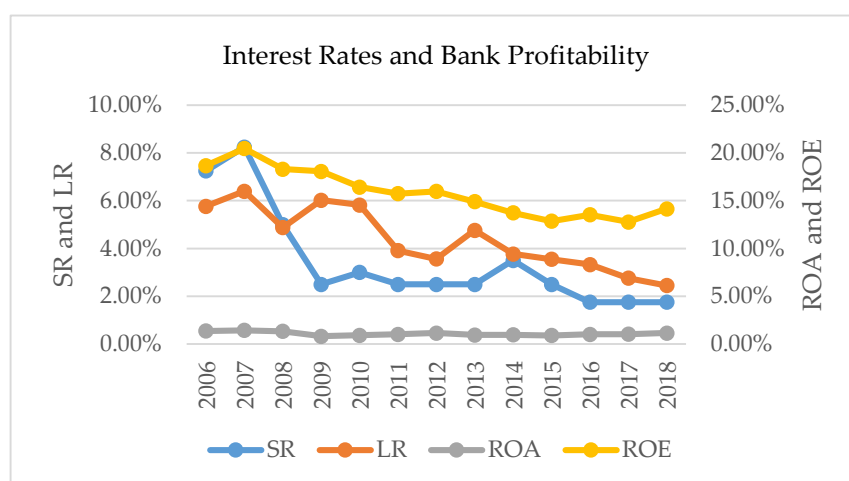

Figure 1. Interest rates and bank profitability.

3.2. Descriptive Statistics

Table 1 provides descriptive statistics of the variables used in the study. The sample consists of 19 banks from the period of 2006–2018. The dependent variables are ROA and ROE, and the remaining nine are the independent variables. The independent variables are divided into two categories: monetary policy variables and control variables. The descriptive statistics indicates that the mean of ROA is 0.01, i.e., 1% with a standard deviation of 0.01, while the mean ROE is 14% with a standard deviation of 0.21. There is relatively a large variation in ROE compared to ROA. There is substantial difference is the short-term interest rate during the study period. It can be seen that the minimum cash rate set by the Reserve Bank of New Zealand is 1.75%, while the maximum cash rate is 8.25%.

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[1]　The number of obervations are 105 bacause Bankscope does not have data of every bank for all the years from 2006 to 2018.
[2]　https://www.rbnz.govt.nz/statistics.

The average long-term interest rate for the period is 4.38% with a standard deviation of 1.26. The capital adequacy ratio has high standard deviation, i.e., 10.83. However, there is not much variation in non-performing loan ratio, with a minimum value of 1% and a maximum value of 4%. On the contrary, it can be seen that the mean cost to income ratio is 53.5% with a very high standard deviation of 21.46. The average loan to asset ratio is 77% with a minimum value of 38% and maximum value of 91%. The variation is small, with a standard deviation of 0.14. The mean inflation is 1.94% with a standard deviation of 1.07. It is important to note that, despite average GDP being 2.32%, New Zealand faced negative GDP in 2009.

Table 1. Descriptive statistics of variables over the period 2006–2018.

Variables	Notation	Measure	Expected Sign	Mean	Std. Dev.	Min	Max
Dependent Variables							
Return on Assets	ROA	Profit before tax/Total Assets (%)		0.01	0.01	−0.02	0.02
Return on Equity	ROE	Profit before tax/Total Equity (%)		0.14	0.21	−0.09	0.24
Independent Variables							
Monetary Policy Variables							
Short-term interest rate	SR	Cash rate set by Reserve Bank New Zealand (%)	+/−	3.44	2.03	1.75	8.25
Long-term interest rate	LR	10-year bond rate (%)	+/−	4.38	1.26	2.45	6.4
Control Variables							
Capital Adequacy Ratio	CAR	Tier 1 Capital + Tier 2 Capital / Risk-Weighted Assets (%)	+/−	19.82	49.84	9.81	36.33
Non-Performing Loan Ratio	NPLR	Non-performing Loans/Total Loans (%)	−	0.01	0.01	0	0.04
Cost to income ratio	COST	Operating Cost / Total Income (%)	−	53.5	21.46	29.42	78.24
Total Assets (Bank Size)	SIZE	Natural log of total assets of bank	+/−	15.61	2.1	10.88	18.53
Loan to Asset Ratio	LAR	Total Loans / Total Assets (%)	+/−	0.77	0.14	0.38	0.91
Inflation	INF	Yearly percentage change in Consumer Price Index (CPI) (%)	+	1.94	1.07	0.1	4
Gross Domestic Product	GDP	Yearly GDP growth rate (%)	+	2.32	1.42	−1.2	3.9

Notes: "+" sign refers to a positive relationship between the dependent variable and the explanatory variable. "−" sign indicates a negative relationship between the dependent variable and explanatory variable. "+/−" sign shows either a positive or a negative relationship dependent variable and the explanatory variable. Please refer to Appendix A for the correlation between explanatory variables and Variance Inflation Factor (VIF) tests. The results show that there is no multicollinearity problem.

3.3. Dependent and Independent Variables

3.3.1. Dependent Variables

Several variables are commonly used to measure the performance of the banks, such as Tobin's Q, net profit, loan to volume ratio, return on assets, and return on equity. Among all these variables, ROE and ROA are widely used to measure the performance of the banks. The banks that have higher ROA and ROE are considered to be utilising their assets and equity efficiently to generate income.

3.3.2. Independent Variables

Following the existing literature on the determinants of bank profitability into account, nine explanatory variables were used to measure the effect of monetary policy on the performance of banks in New Zealand (Athanasoglou et al. 2008; Berger 1995; Borio et al. 2017; Demirguc-Kunt and Huizinga 1999; Dietrich and Wanzenried 2014; Minh To and Tripe 2002; Somoye 2010).

Monetary Policy Variables: The Study Uses the Following Two Monetary Policy Variables

Short-term interest rate (SR): this also refers to as "Official Cash Rate" in New Zealand. It is set by the Reserve Bank of New Zealand. In the research conducted by Borio et al. (2017) in 14 advanced economies, a positive relationship was found between the short-term interest rate and the bank's profitability. However, Albertazzi and Gambacorta (2009) state that the high level of short-term interest increased the burden of borrowers and increases the probability of default, which is likely to decrease the profitability of banks.

Long-term interest rate (LR): using only the short-term interest rate may be problematic near its zero bound constraints. Therefore, using long-term interest rate as a monetary policy variable is a forward-looking method to detect inflation expectations and avoid the problem of indeterminacy (McGough et al. 2005). In order to boost economic activity, policy-makers reduce long-term rates by some policy actions such as large-scale asset purchases (LSAPs) and the maturity extension program (MEP) (Genay and Podjasek 2014). Following the literature, the long-term interest is also used as monetary policy variable (Kulish 2005; McGough et al. 2005; Rios and Shamloo 2017). In line with Athanasoglou et al. (2008), the long-term interest rate is measured by the 10-year bond rate. The bond rate is the return that the investors receive from their investment in the government bond. A lower bond rate indicates a stable economy with additional opportunities for the expansion of business, which is more likely to increase bank loans and their profitability and vice versa (Quagliariello 2007). The study conducted by Minh To and Tripe (2002) across 18 European countries from the period of 1986 to 1989 found a positive relationship between the long-term bond rate and bank profitability. However, Bikker and Vervliet (2018) found a negative relationship between long-term interest rates and bank profitability.

Control Variables: The Study Uses the Following Control Variables

Capital adequacy ratio (CAR): the CAR is the measure of the Tier 1 capital and Tier 2 capital to the risk weighted assets and is expressed as a percentage. As per the Basel Accords, all the banks must maintain a minimum percentage of CAR to absorb losses (Kumar 2018). Many studies have investigated the relationship between the CAR and banks' profitability; however, there is no consensus among researchers on the direction of the relationship. Athanasoglou et al. (2008) and Berger (1995) claims that the banks with a high CAR are more profitable than their competitors as they can absorb negative economic shocks. On the contrary, Dietrich and Wanzenried (2011) states that the higher CAR reduces the bank's profitability as it limits the lending ability of banks.

Non-performing loan (NPLR): this ratio is commonly used to determine the quality of the banks' outstanding loans, which have a lower probability of repayment. Generally, the loans are classified as non-performing loans when they are overdue by 90 days or more. In other words, this ratio is used to measure the credit quality of the bank (Somoye 2010). This ratio is a better measure to determine banks' profitability as it considers all the bad loans which are overdue by 90 days (Kumar 2018). This ratio is calculated by dividing the non-performing loan/total loan (%). Akhtar et al. (2011) and Athanasoglou et al. (2008) found a negative effect of the NPLR on banks' profitability.

Cost to income ratio (COST): this ratio is calculated by dividing the operating cost with the total income and is expressed as a percentage. The previous literature has shown a negative impact on the profitability of the banks (Dietrich and Wanzenried 2014; Mirzaei et al. 2013).

Total assets (SIZE): this simply refers to the natural log of the total assets of the bank. The previous studies show mixed findings on the relationship between bank size and profitability. Some researchers have found that larger banks benefit from their size due to economies of scale, and they are more efficient than smaller banks (Berger et al. 1993). Likewise, Hughes and Mester (2013) and Abduh and Idrees (2013) have found a positive relationship between total assets and the bank's size. However, Athanasoglou et al. (2008) have found a negative effect of size on banks' profitability in Greece.

Loan to assets ratio (LAR): this ratio is calculated by dividing the total loans by the total assets and is expressed as a percentage. The research conducted by Demirguc-Kunt and Huizinga (1999) and Hassan and Bashir (2003) revealed that the banks with a high loan to assets ratio were less profitable compared to their competitors, which might be due to the possibility of more non-performing loans which reduce the profitability of the banks as well as increasing their cost. On the other hand, Tan and Floros (2012) suggest that banks with high loan to assets ratios are more profitable than their counterparts.

Inflation (INF): there is strong empirical evidence that suggests that inflation positively affects the performance of banks (Athanasoglou et al. 2008; Demirguc-Kunt and Huizinga 1999). A recent study

by Hasanov et al. (2018) also found a positive relationship between inflation and bank profitability. Revell (1979) argues that banks can increase their profitability by effectively forecasting the inflation rate and controlling their operating costs.

Gross domestic product (GDP): GDP is an important indicator to assess the country's economy and has a significant impact on every business, including banks (Acharya 2018). During the recession, there is less demand for the loans which will decrease the profitability of the banks. On the contrary, businesses are more likely to grow during the boom, which will generally increase the demand for the loans and thereby increase profit. The study conducted by Athanasoglou et al. (2008) and Mirzaei et al. (2013) and Yao et al. (2018) found a positive relationship between the GDP and bank profitability.

3.4. Method

The existing empirical literature broadly recognizes the dynamic nature of bank profitability (Athanasoglou et al. 2008; Bikker and Vervliet 2018; Delis and Kouretas 2011). Specifically, bank profitability tends to persist over time. The level of persistence is captured by the lagged dependent variable coefficient. Bank profitability is also potentially endogenous due to omitted variables or the causality issue between dependent and independent variables. García-Herrero et al. (2009) show that it is easier for profitable banks to increase size, buy more tangible assets, and spend more funds on advertising, which in turn might make them more profitable. Furthermore, some fixed effects, specific to each bank, that may affect bank profitability are not incorporated in the model. For example, the bank's location, which could be presumed to remain constant over time, could affect bank's profitability.

With the dynamic nature of bank profitability, least squares estimation methods such as the pooled ordinary least squares (OLS) estimator and the within estimators are not adequate (Nickell 1981). Specifically, a pooled OLS estimate of the lagged dependent variables is biased upwards while the within estimate is based downwards (Stephen R. 2002). In this paper, we examine the following equation using system GMM estimator from Arellano and Bover (1995) and Blundell and Bond (1998), which is built on Arellano and Bond (1991). This dynamic panel model can potentially deal with endogeneity problems

$$
\begin{aligned}
Prof_{i,t} = &\ \alpha + \beta_1 Prof_{i,t-1} + \beta_2 MP_t + \beta_3 CAR_{i,t} + \beta_4 NPLR_{i,t} + \beta_5 COST_{i,t} + \beta_6 SIZE_{i,t} \\
&+ \beta_7 LAR_{i,t} + \beta_8 INF_t + \beta_9 GDP_t + \varepsilon_{i,t}
\end{aligned}
\tag{1}
$$

where is $Prof_{i,t}$ is bank profitability of bank i in year t. Bank profitability ($Prof_{i,t}$) is measured by ROA (return on assets) and ROE (return on equity), MP_t is refers to monetary policy indicators in year t, which are measured by short-term interest rates and long-term interest rates, $CAR_{i,t}$ is capital adequacy ratio of bank i in year t, $NPLR_{i,t}$ is non-performing loan ratio i in year t, $COST_{i,t}$ is the cost to income ratio of bank i in year t, $SIZE_{i,t}$ is the size of bank measured by total assets i in year t, $LAR_{i,t}$ is the loans to asset ratio of bank i in year t, INF_t is inflation rate in year t, and GDP_t is gross domestic product growth rate in year t.

Lagged values of the independent variable are used both in levels and in differences as instruments, along with the lagged value of other, potentially endogenous regressors. This method helps to control for the endogeneity, unobserved heterogeneity problem, and the persistence of the dependent variable.

For the robustness purpose, we also run regressions using a pooled OLS estimator[3]. However, this model disregards the fixed, individual bank-specific effects. It is presumable that there are some fixed-effects specific to each individual bank that can potentially influence banks' profitability and are not captured in the model. This is also known as unobserved heterogeneity. We, therefore, also use the firm-fixed effects estimator with AR(1) in order to be consistent with our baseline GMM estimation.

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[3] We have not reported results of pooled OLS estimator as they are largely consistent with system GMM estimator and fixed effects estimator.

In addition, since non-stationarity is a property common in time series data, we have carried out unit root analysis by applying two different tests: the Augmented Dickey and Fuller (1981) test (ADF), and the Phillips and Perron (1988) test (PP). Using a PP test is necessitated by the idea that ADF test can over-reject the null hypothesis when it is true and under reject it when it is false (DeJong et al. 1992; Harris and Sollis 2003). Moreover, PP test is adjusted to take into account the serial correlation.

4. Results and Discussions

4.1. Regression Results

Table 2 reports the regression results. The results are obtained using Equation 1. The results are estimated by applying the system GMM estimator. There are two panels: Panel A; and Panel B. In Panel A, ROA is the dependent variable, while in Panel B, ROE is the dependent variable. Each panel has three columns. In Column 1, we have used only short-term interest rate (SR) as a monetary policy variable with control variables. In Column 2, we have used only long-term interest rate (LR) as a monetary policy variable with control variables. In Colum 3, both monetary policy variables (SR and LR) are used with control variables. The model appears appropriate with stable coefficients. There is no evidence of overidentifying restrictions according to the results of Sargan test. In addition, the absence of second-order autocorrelation suggests that the estimates are consistent (see Table 2).

Table 2. Regression results using System generalized method of movements (GMM) Model.

	ROA (Panel A)			ROE (Panel B)		
Variables	(1)	(2)	(3)	(1)	(2)	(3)
SR	0.0006 ***		0.0006 ***	0.0107 ***		0.0175 ***
	(0.0001)		(0.0002)	(0.0019)		(0.0052)
LR		−0.0004 **	−0.0006 **		−0.0019	−0.0017
		(0.0001)	(0.0003)		(0.0042)	(0.0104)
Lagged ROA	0.4935 ***	0.8529 ***	1.0058 ***			
	(0.1393)	(0.1964)	(0.1748)			
Lagged ROE				0.5188 ***	0.4795 ***	−0.4033 **
				(0.0876)	(0.1246)	(0.1831)
CAR	0.0001 ***	0.0001 ***	0.0001 ***	−0.0003	0.0001	−0.0003
	(0.0000)	(0.0000)	(0.0000)	(0.0003)	(0.0004)	(0.0005)
NPLR	−0.0314	−0.0058	0.0349	−1.2205 ***	0.0477	−1.7720
	(0.0444)	(0.0558)	(0.0552)	(0.3937)	(1.5428)	(2.3244)
COST	−0.0002 ***	−0.0001	−0.0000	−0.0017 ***	−0.0012 *	−0.0028 ***
	(0.0000)	(0.0001)	(0.0001)	(0.0005)	(0.0007)	(0.0008)
SIZE	−0.0001	−0.0000	−0.0001	0.0009	0.0107 *	0.0208 *
	(0.0004)	(0.0003)	(0.0003)	(0.0046)	(0.0055)	(0.0102)
LAR	0.0082 **	0.0032	0.0041	0.0348	0.0361	0.1501 *
	(0.0033)	(0.0036)	(0.0041)	(0.0474)	(0.0418)	(0.0833)
INF	0.0002	0.0007 ***	0.0002	−0.0012	0.0006	−0.0054
	(0.0002)	(0.0002)	(0.0004)	(0.0035)	(0.0021)	(0.0036)
GDP	0.0006 *	0.0008 ***	0.0004	0.0016	0.0045	0.0116 **
	(0.0003)	(0.0002)	(0.0002)	(0.0061)	(0.0044)	(0.0050)
Constant	0.0058	0.0004	−0.0029	0.0996	−0.0719	−0.0868
	(0.0054)	(0.0069)	(0.0060)	(0.0942)	(0.1165)	(0.1759)
Observations	94	94	94	94	94	94
Number of id	13	13	13	13	13	13
AR(2) (*p*-value)	0.731	0.791	0.913	0.260	0.224	0.141
Sargan test (*p*-value)	0.122	0.474	0.474	0.470	0.328	1.000

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. ROA = Return on assets; ROE = Return on equity; SR = Short-term interest rate; LR = Long-term interest rate; Lagged ROA = Lagged return on assets; Lagged ROE = Lagged return on equity; CAR = Capital adequacy ratio; NPLR = Non-performing loan ratio; COST = Cost to income ratio; SIZE = Total assets; LAR = Loan to asset ratio; INF = Inflation; and GDP = Gross domestic product.

The results associated with SR are consistent for both profitability measures. The coefficient of SR is positive and statistically significant in all the cases, indicating that an increase in short-term interest rates leads to an increase in bank profitability. In the literature, there is an ambiguity with respect to the relationship between short-term interest rate and bank profitability. Generally, banks borrow on a short-term basis and extend loans on a long-term basis; therefore, it appears that an increase in

short-term interest rate allows banks in New Zealand to improve the lending margins, which results in an increase in bank profitability. Bikker and Vervliet (2018) suggest that low short-term interest rates increase competition, puts pressure on banks' capital, and squeeze profits. These findings, associated with a positive impact on short-term interest rate on bank profitability, are consistent with Bikker and Vervliet (2018) and Borio et al. (2017). Both of these studies found a positive relationship between short-term interest rates and bank profitability.

Long-term interest rate (LR) as a monetary policy variable is forward-looking method to detect inflation expectations. Policy makers reduce long-term rates by some policy actions such as large-scale asset purchases (LSAPs) and the maturity extension program (MEP) (Genay and Podjasek 2014). The coefficient of LR is negative and statistically significant in case of ROA, but insignificant in the case of ROE. This shows that an increase in LR leads to a reduction in bank profitability when measured with ROA. Though the result is surprising and in contrast with our finding related to short-term interest rates, it appears to be in line with the argument of Genay and Podjasek (2014). They argue that changes in the economic conditions have a larger impact on bank profitability compared to changes in interest rates. Macroeconomic conditions are more important for bank profitability than the interest rate changes. Pasiouras and Kosmidou (2007) also suggests that a lower bond rate indicates the stable economy with additional opportunities for the expansion of the business which is more likely to increase the bank loans and its profitability. This finding also gains some support from a positive relationship between GDP growth and bank profitability (as shown in Table 2). Bikker and Vervliet (2018) also found a negative relationship between long-term interest rates and bank profitability in the United States.

Bank profitability in the year (t − 1) has a positive impact on bank profitability in the year (t), which is line with general wisdom. In the literature, there is uncertainty in terms of the relationship between capital adequacy ratio and the bank profitability. Our results suggest that better capitalized banks are more profitable when the profitability is measured with ROA and the effect is insignificant in the case of ROE. The possible explanation is that better capitalized banks are considered safe and this allows them to secure low-cost deposits and charge premium on lending rates. The other possible explanation is that better capitalized banks are able to withstand negative economic shocks (Athanasoglou et al. 2008). There is some evidence to suggest a negative impact of non-performing loans and cost to income ratio on the profitability of banks, which is line with other studies (Athanasoglou et al. 2008). It is important to note that the coefficient of capital adequacy ratio is significant when profitability is measured with ROA and the coefficient is insignificant when ROE is used as a measure of profitability. On the contrary, the coefficient of non-performing loans is significant when ROE is used a profitability measure and the coefficient is insignificant when profitability is measured with ROA. This shows that the impact of some variables varies when different profitability measures are used.

In the literature, the relationship between bank size and bank profitability is ambiguous. We found weak evidence to suggest that bank size has a positive impact on bank profitability (ROE). It shows that banks in New Zealand take advantage of economies of scale, which increases their profitability. The finding is in line with Hancock (1985), Pasiouras and Kosmidou (2007) and (Abduh and Idrees 2013). There is uncertainty about the relationship between loan to asset ratio and bank profitability. We found weak evidence that the banks with a high loan to asset ratio are more profitable. This shows that more lending leads to more bank profitability in New Zealand. This finding indicates that banks in New Zealand are pursuing prudent credit policies which result in low default rates and an increase in profitability. The result is consistent with Tan and Floros (2012). Our results suggest that the inflation rate has a positive impact on the profitability of banks. The results show that banks in New Zealand are able to forecast the inflation rate, which allows them to adjust their lending rates. The results are in line with (Athanasoglou et al. 2008; Demirguc-Kunt and Huizinga 1999). We found that GDP growth has a positive influence on bank profitability in most the cases, which is line with the previous literature.

4.2. Regression Results with the Unconventional Monetary Policy Tool

A few studies suggest that unconventional monetary policy tools also affect the profitability of banks. Most of these studies suggest that unconventional monetary policy tools reduce the profitability of banks (Lambert and Ueda 2014; Mamatzakis and Bermpei 2016). In line with other studies, we use central bank assets to GDP ratio (CBA)[4] as a measure of the unconventional monetary policy tool. Table 3 reports the results. Panel A reports the results for ROA, and Panel B reports the results for ROE. We found weak evidence to suggest that CBA has a negative impact on ROA and ROE. The results are consistent with Lambert and Ueda (2014) and Mamatzakis and Bermpei (2016). Krishnamurthy and Vissing-Jorgensen (2011) suggest that unconventional monetary policy tools reduce lending rates and Christensen and Rudebusch (2016) suggest that the unconventional monetary policy tools affect the value of bank assets.

Table 3. Regression results using System GMM Model with central bank assets to GDP ratio (CBA).

Variables	ROA (Panel A)		ROE (Panel B)	
	(1)	**(2)**	**(1)**	**(2)**
SR		0.0006 *		0.0023
		(0.0004)		(0.0047)
LR		−0.0009 ***		−0.0291 ***
		(0.0003)		(0.0107)
CBA	−0.0014 **	0.0012	−0.0238 *	0.046
	(0.0007)	(0.0014)	(0.0132)	(0.0177)
			(0.0467)	(0.2923)
CAR	0.0001	0.0000	−0.0022	−0.0087
	(0.0001)	(0.0002)	(0.0035)	(0.0061)
NPLR	−0.0297	−0.0392	−1.1519	17.6412
	(0.0461)	(0.0469)	(0.7464)	(17.2384)
COST	−0.0005 ***	−0.0004 ***	−0.0063 ***	−0.0022
	(0.0001)	(0.0001)	(0.0014)	(0.0023)
SIZE	−0.0061 **	−0.0043	−0.0945 **	−0.3252
	(0.0030)	(0.0039)	(0.0438)	(0.2425)
LAR	0.0216	0.0224	−0.1004	0.9744
	(0.0149)	(0.0137)	(0.1838)	(0.9008)
INF	0.0002	0.0001	0.0029	−0.0116
	(0.0002)	(0.0003)	(0.0026)	(0.0140)
GDP	0.0004	−0.0002	0.0029	−0.0026
	(0.0003)	(0.0003)	(0.0031)	(0.0023)
Constant	−0.0003 ***	−0.0000	−0.0047 *	0.0040
		0.0006 *		0.0023
Observations	81	81	81	81
Number of id	12	12	12	12
AR(2) (*p*-value)	0.774	0.478	0.198	0.299
Sargan test (*p*-value)	0.277	0.24	1.000	1.000

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. ROA = Return on assets; ROE = Return on equity; CBA = Central Bank Assets To GDP ratio; CAR = Capital adequacy ratio; NPLR = Non-performing loan ratio; COST = Cost to income ratio; SIZE = Total assets; LAR = Loan to asset ratio; INF = Inflation; and GDP = Gross domestic product.

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5. Robustness Tests

5.1. Regression Results with Using Firm Fixed-Effect Model AR(1)

In order to check the robustness of the results, we also employed a pooled OLS estimator (not reported) and firm-fixed effects estimator. The fixed effects estimator is used to capture individual banks specific-effects and unobserved heterogeneity. The OLS estimator results are largely consistent with the system GMM estimator and fixed effects estimator; therefore, these are not reported. Table 4 shows the results obtained through fixed effects estimator with AR(1). Panel A reports the results for ROA and Panel B reports the results for ROE.

Table 4. Regression results using firm fixed-effect model AR(1)—first difference in the data.

Variables	ROA (Panel A)			ROE (Panel B)		
	(1)	(2)	(3)	(1)	(2)	(3)
SR	0.0010 **		0.0008 *	0.0027		0.0002
	(0.0004)		(0.0004)	(0.0071)		(0.0070)
LR		−0.0009 **	−0.0008 *		−0.0129 **	−0.0128 **
		(0.0004)	(0.0004)		(0.0061)	(0.0062)
CAR	0.0002	0.0002	0.0001	−0.0014	−0.0031	−0.0032
	(0.0003)	(0.0003)	(0.0003)	(0.0055)	(0.0054)	(0.0054)
NPLR	−0.0533	−0.0486	−0.0422	−1.0133	−0.8483	−0.8449
	(0.0582)	(0.0582)	(0.0571)	(0.9463)	(0.9129)	(0.9256)
COST	−0.0004 ***	−0.0004 ***	−0.0004 ***	−0.0066 ***	−0.0061 ***	−0.0061 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0017)	(0.0016)	(0.0017)
SIZE	−0.0026	−0.0058 *	−0.0047	−0.0935 *	−0.1299 **	−0.1296 **
	(0.0031)	(0.0033)	(0.0033)	(0.0515)	(0.0519)	(0.0531)
LAR	0.0205	0.0316 **	0.0266 *	0.2123	0.3196	0.3178
	(0.0146)	(0.0146)	(0.0146)	(0.2385)	(0.2307)	(0.2380)
INF	−0.0001	0.0001	0.0000	−0.0009	0.0008	0.0008
	(0.0003)	(0.0003)	(0.0003)	(0.0053)	(0.0052)	(0.0053)
GDP	−0.0002	0.0004	−0.0001	−0.0023	−0.0013	−0.0015
	(0.0004)	(0.0002)	(0.0003)	(0.0056)	(0.0038)	(0.0055)
Constant	0.0001	−0.0004	−0.0000	−0.0021	−0.0050	−0.0049
	(0.0004)	(0.0004)	(0.0004)	(0.0068)	(0.0058)	(0.0068)
Observations	81	81	81	81	81	81
R-squared	0.428	0.433	0.464	0.367	0.41	0.41
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. ROA = Return on assets; ROE = Return on equity; SR = Short-term interest rate; LR = Long-term interest rate; CAR = Capital adequacy ratio; NPLR = Non-performing loan ratio; COST = Cost to income ratio; SIZE = Total assets; LAR = Loan to asset ratio; INF = Inflation; and GDP = Gross domestic product.

Overall, the results are consistent with the results obtained through the GMM estimator. Notable exceptions are SR, which does not have any impact on ROE, while LR has a negative impact on both profitability measures (ROA and ROE). Capital adequacy ratio had a positive impact on ROA when we used a GMM estimator, while it had an insignificant effect in the case of the fixed-effect estimator.

5.2. Unit Root Tests

We conducted tests on whether the variables of our interest were stationary and to determine their orders of integration. The results of both the ADF and PP tests are reported in Table 5. The findings indicate that, except LR, COST, and INF, all the variables are stationary. However, at first difference, all series become stationery, indicating that all variables are integrated of order one I(1).

Table 5. Unit root tests.

	ADF		PP	
Variables	**Z**	***p* Value**	**Z**	***p* Value**
ROA	−2.9281	0.0017 ***	−4.6831	0.0000 ***
ROE	−3.3620	0.0004 ***	−4.3572	0.0000 ***
SR	−21.7400	0.0000 ***	−1.8549	0.0318 **
LR	3.4686	0.9997	3.9818	1.0000
CAR	−5.2699	0.0000 ***	−7.0991	0.0000 ***
NPLR	−3.7224	0.0001 ***	−1.4948	0.0675 *
COST	−1.3210	0.0932 *	−0.4200	0.3372
SIZE	−2.5764	0.0050 ***	−5.0285	0.0000 ***
LAR	−2.3044	0.0106 **	−3.0246	0.0012 ***
INF	0.7065	0.7600	−1.6607	0.0484 **
GDP	−1.6595	0.0485 **	−1.4994	0.0669 **

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. ROA = Return on assets; ROE = Return on equity; SR = Short-term interest rate; LR = Long-term interest rate; CAR = Capital adequacy ratio; NPLR = Non-performing loan ratio; COST = Cost to income ratio; SIZE = Total assets; LAR = Loan to asset ratio; INF = Inflation; and GDP = Gross domestic product.

Table 6 shows the regression results using the System GMM Model with first difference as recommended by unit root tests. Panel A reports the results for ROA and Panel B reports the results for ROE. The results are consistent with our main results in Table 2.

Table 6. Regression results using System GMM Model with first difference.

	ROA (Panel A)			ROE (Panel B)		
Variables	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
SR	0.0011 **		0.0008 **	0.0116 *		0.0056
	(0.0004)		(0.0003)	(0.0061)		(0.0051)
LR		−0.0010 ***	−0.0009 ***		−0.0201 ***	−0.0178 ***
		(0.0002)	(0.0002)		(0.0056)	(0.0056)
CAR	0.0000	−0.0000	−0.0000	−0.0026	−0.0042	−0.0017
	(0.0002)	(0.0002)	(0.0002)	(0.0040)	(0.0029)	(0.0041)
NPLR	−0.0585	−0.0674	−0.0503	−0.5496	−0.7574	−0.3762
	(0.0624)	(0.0718)	(0.0578)	(0.7046)	(0.6283)	(0.6277)
COST	−0.0004 ***	−0.0003 ***	−0.0004 **	−0.0055 ***	−0.0048 ***	−0.0042 **
	(0.0001)	(0.0001)	(0.0001)	(0.0016)	(0.0012)	(0.0018)
SIZE	−0.0032	−0.0045 *	−0.0043	−0.0334	−0.0893 **	−0.0813
	(0.0025)	(0.0025)	(0.0035)	(0.0440)	(0.0366)	(0.0591)
LAR	0.0115	0.0259 ***	0.0163 *	−0.2352	−0.0268	−0.1094
	(0.0104)	(0.0050)	(0.0075)	(0.2456)	(0.1968)	(0.2473)
INF	0.0001	−0.0000	0.0002	0.0017	0.0047	0.0063
	(0.0002)	(0.0002)	(0.0003)	(0.0026)	(0.0028)	(0.0055)
GDP	−0.0003	−0.0000	−0.0003	−0.0025	−0.0004	−0.0012
	(0.0002)	(0.0002)	(0.0003)	(0.0026)	(0.0022)	(0.0040)
Constant	0.0003	−0.0005 **	−0.0000	0.0020	−0.0075 **	−0.0037
	(0.0003)	(0.0002)	(0.0003)	(0.0028)	(0.0031)	(0.0047)
Observations	81	81	81	81	81	81
Number of id	12	12	12	12	12	12
AR(2) (*p*-value)	0.377	0.219	0.352	0.200	0.259	0.326
Sargan test (*p*-value)	0.951	0.564	0.997	0.844	0.466	0.280

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. ROA = Return on assets; ROE = Return on equity; SR = Short-term interest rate; LR = Long-term interest rate; CAR = Capital adequacy ratio; NPLR = Non-performing loan ratio; COST = Cost to income ratio; SIZE = Total assets; LAR = Loan to asset ratio; INF = Inflation; and GDP = Gross domestic product.

6. Conclusions

The study investigates the relationship between monetary policy and bank profitability in New Zealand using system GMM estimator. Our sample comprises 19 banks from New Zealand over the period 2006–2018.

We have used two variables related to monetary policy: short-term interest rate (cash rate) and long-term interest rate (10-year bond-rate). The previous literature has mixed findings on the relationship between the short-term interest rate and bank profitability. Some researchers argue that an increase in short-term interest rate increases bank profitability because most the banks borrow on short-term basis and lend on long-term basis which helps them to improve lending margins and profitability (Bikker and Vervliet 2018; Borio et al. 2017). On the other hand, some researchers suggest that banks perform better in low interest rate environments. When the interest rates are low, banks focus on consultancy services and trading activities to generate non-interest income such as fees and commissions. Brei et al. (2019) suggest that a 1% reduction in short-term interest rate leads to an increase of 0.93% in non-interest income. The decline in short-term interest rates also reduce debt-servicing burdens and encourages banks to increase their lending portfolio by aggressive lending which leads to higher profitability. Our findings suggest that short-term interest rate positively influences the profitability of banks in New Zealand. In terms of long-term interest rate, we found a negative effect of long-term interest rate on the bank profitability in New Zealand, which is little surprising. Genay and Podjasek (2014) suggest that changes in the economic conditions have a larger impact on bank profitability compared to changes in interest rate. The negative effect of long-term interest rate and bank profitability possibly exists because of other macroeconomic factors. We also conducted additional analysis using an unconventional monetary policy tool as some studies suggest that unconventional monetary policy tools have a significant impact on bank profitability (Lambert and Ueda 2014; Mamatzakis and Bermpei 2016). In line with other studies, we found some evidence to suggest that unconventional monetary policy tool has a negative impact on ROA and ROE.

In addition to monetary policy variables, there are some other factors that have a significant effect on the profitability of banks in New Zealand. Capital adequacy ratio, non-performing loan ratio, and cost to income ratio are also important determinants of the bank profitability in New Zealand. Capital adequacy ratio has a positive impact on bank profitability when profitability is measured with ROA, but the coefficient is insignificant in case of ROE. On the contrary, non-performing loans have a negative impact on bank profitability when we use ROE as a profitability measure, and the coefficient of non-performing loan ratio is insignificant in case of ROA. Cost to income ratio has a negative effect on the profitability of banks, irrespective of the profitability measure. These findings are largely consistent with previous studies; however, they resolve some uncertainty with respect to whether banks would benefit from pursuing an aggressive or conservative lending policy. In terms of inflation and GDP growth, in line with the previous literature, we found a positive impact of both variables on the profitability of banks.

Despite the continuous reduction in the interest rate, New Zealand has not been able to achieve the desired level of inflation. The results show that falling interest rates have a significant impact on the performance of banks. The findings from the study inform policy makers about the impact on monetary policy on bank profitability and assist them in making important decisions related to changes in monetary policy instruments.

Banks are an integral part of the economy and their profitability is important for economic growth. Previous research suggests a positive effect of bank profitability on economic growth (Klein and Weill 2017). Reserve Bank of New Zealand should be aware of the impact that changes in interest rates will have on bank profitability because of the possible knock-on impact this might have on the economy.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Correlation matrix for variables and VIF test results.

Variables	ROA	ROE	SR	LR	CAR	NPLR	COST	SIZE	LAR	INF	GDP	VIF
ROA	1											
ROE	0.2289 *	1										
SR	0.1331	−0.0051	1									2.97
LR	0.0233	−0.0333	0.6944 *	1								3.61
CAR	−0.3413 *	−0.0964	−0.0223	−0.035	1							1.36
NPLR	−0.0993	0.1112	−0.2327	−0.0514	0.0287	1						1.43
COST	−0.6612 *	−0.1705	0.0142	−0.0008	0.7254 *	−0.1585	1					2.52
SIZE	0.4951 *	0.1093	0.1959	0.2838 *	−0.4983 *	−0.1417	−0.5688 *	1				2.76
LAR	0.192	−0.0179	0.0806	0.0596	−0.193	0.0861	0.0423	0.3569 *	1			1.30
INF	0.1082	−0.0015	0.5231 *	0.6623 *	−0.1235	−0.0365	−0.1138	0.2971 *	0.1924	1		1.81
GDP	−0.0036	0.0331	0.0398	−0.4570 *	0.0996	−0.1247	0.1056	−0.3067 *	−0.1023	−0.4194 *	1	2.06

Notes * $p < 0.1$. ROA = Return on assets; ROE = Return on equity; SR = Short-term interest rate; LR = Long-term interest rate; CAR = Capital adequacy ratio; NPLR = Non-performing loan ratio; COST = Cost to income ratio; SIZE = Total assets; LAR = Loan to asset ratio; INF = Inflation; and GDP = Gross domestic product.

References

Abduh, Muhamad, and Yameen Idrees. 2013. Determinants of Islamic Banking Profitability in Malaysia. *Australian Journal of Basic and Applied Sciences* 7: 204–10.

Acharya, Sanjeev. 2018. Improving Corporate Governance in Nepalese Financial Institutions to Promote Growth and Performance. Doctoral thesis, The University of Waikato, Hamilton, New Zealand.

Aharony, Joseph, Anthony Saunders, and Ithzak Swary. 1986. The Effects of a Shift in Monetary Policy Regime on the Profitability and Risk of Commercial Banks. *Journal of Monetary Economics* 17: 363–77. [CrossRef]

Akhtar, Muhammad Farhan, Khizer Ali, and Shama Sadaqat. 2011. Factors Influencing the Profitability of Islamic Banks of Pakistan. *International Research Journal of Finance and Economics* 66: 1–8.

Albertazzi, Ugo, and Leonardo Gambacorta. 2009. Bank Profitability and the Business Cycle. *Journal of Financial Stability* 5: 393–409. [CrossRef]

Arellano, Manuel, and Stephen Bond. 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies* 58: 277–97. [CrossRef]

Arellano, Manuel, and Olympia Bover. 1995. Another Look at the Instrumental Variable Estimation of Error-Components Models. *Journal of Econometrics* 68: 29–51. [CrossRef]

Asia News Monitor. 2017. *Monetary Policy and Bank Profitability in a Low Interest Rate Environment*. Dublin: European Union.

Athanasoglou, Panayiotis P., Sophocles N. Brissimis, and Matthaios D. Delis. 2008. Bank-Specific, Industry-Specific and Macroeconomic Determinants of Bank Profitability. *Journal of International Financial Markets, Institutions and Money* 18: 121–36. [CrossRef]

Bassetti, Massimo. 2020. New Zealand Monetary Policy May 2020. Available online: https://www.focus-economics.com/countries/new-zealand/news/monetary-policy/rbnz-ramps-up-asset-purchasing-program-in-may (accessed on 17 May 2020).

Berger, Allen N. 1995. The Relationship between Capital and Earnings in Banking. *Journal of Money, Credit and Banking* 27: 432–56. [CrossRef]

Berger, Allen N., William C. Hunter, and Stephen G. Timme. 1993. The Efficiency of Financial Institutions: A Review and Preview of Research Past, Present and Future. *Journal of Banking and Finance* 17: 221–49. [CrossRef]

Berument, Hakan, and Richard T. Froyen. 2015. Monetary Policy and Interest Rates under Inflation Targeting in Australia and New Zealand. *New Zealand Economic Papers* 49: 171–88. [CrossRef]

Bikker, Jacob A., and Tobias M. Vervliet. 2018. Bank Profitability and Risk-Taking under Low Interest Rates. *International Journal of Finance and Economics* 23: 3–18. [CrossRef]

Blundell, Richard, and Stephen Bond. 1998. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics* 87: 115–43. [CrossRef]

Stephen R., Bond. 2002. Dynamic panel data models: a guide to micro data methods and practice. *Portuguese Rconomic Journal* 2: 141–62.

Borio, Claudio, Leonardo Gambacorta, and Boris Hofmann. 2017. The Influence of Monetary Policy on Bank Profitability. *International Finance* 20: 48–63. [CrossRef]

Bourke, Philip. 1989. Concentration and Other Determinants of Bank Profitability in Europe, North America and Australia. *Journal of Banking and Finance* 13: 65–79. [CrossRef]

Brei, Michael, Claudio Borio, and Leonardo Gambacorta. 2019. Bank Intermediation Activity in a Low Interest Rate Environment. *BIS Working Papers* 807: 1–29. [CrossRef]

Christensen, Jens H. E., and Glenn D. Rudebusch. 2016. Modeling Yields at the Zero Lower Bound: Are Shadow Rates the Solution? *Advances in Econometrics* 35: 75–125.

Croy, David, and Zollner Sharon. 2020. *RBNZ Announces Quantitative Easing*. ANZ Research. Available online: https://www.anz.co.nz/content/dam/anzconz/documents/economics-and-market-research/2020/ANZ-RBNZ-announces-QE\$-\$20200323.pdf (accessed on 18 May 2020).

Culling, Jamie, Michael Callaghan, and Adam Richardson. 2019. *Effective Monetary Stimulus: Measuring the Stance of Monetary Policy in New Zealand*. No. AN2019/05. Wellington: Reserve Bank of New Zealand.

DeJong, David N., John C. Nankervis, N. Eugene Savin, and Charles H. Whiteman. 1992. Integration versus trend stationary in time series. *Econometrica: Journal of the Econometric Society*, 423–33. [CrossRef]

Delis, Manthos D., and Georgios P. Kouretas. 2011. Interest Rates and Bank Risk-Taking. *Journal of Banking and Finance* 35: 840–55. [CrossRef]

Demirguc-Kunt, Asli, and Harry Huizinga. 1999. Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence. *The World Bank Economic Review* 13: 379–408. [CrossRef]

Dickey, David A., and Wayne A. Fuller. 1981. Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society* 49: 1057–72. [CrossRef]

Dietrich, Andreas, and Gabrielle Wanzenried. 2011. Determinants of Bank Profitability before and During the Crisis: Evidence from Switzerland. *Journal of International Financial Markets, Institutions and Money* 21: 307–27. [CrossRef]

Dietrich, Andreas, and Gabrielle Wanzenried. 2014. The Determinants of Commercial Banking Profitability in Low-, Middle-, and High-Income Countries. *Quarterly Review of Economics and Finance* 54: 337–54. [CrossRef]

Drought, Sarah, Roger Perry, and Adam Richardson. 2018. Aspects of implementing unconventional monetary policy in New Zealand. *The Reserve Bank of New Zealand Bulletin* 81: 4.

Galariotis, Emilios, Panagiota Makrichoriti, and Spyros Spyrou. 2018. The impact of conventional and unconventional monetary policy on expectations and sentiment. *Journal of Banking and Finance* 86: 1–20. [CrossRef]

García-Herrero, Alicia, Sergio Gavilá, and Daniel Santabárbara. 2009. What Explains the Low Profitability of Chinese Banks? *Journal of Banking and Finance* 33: 2080–92. [CrossRef]

Genay, Hesna, and Rich Podjasek. 2014. What Is the Impact of a Low Interest Rate Environment on Bank Profitability? *Chicago Fed Letter* 324: 1–4.

Hancock, Diana. 1985. Bank Profitability, Interest Rates, and Monetary Policy. *Journal of Money, Credit and Banking* 17: 189–202. [CrossRef]

Harris, Richard, and Robert Sollis. 2003. *Applied Time Series Modelling and Forecasting*. Hoboken: Wiley.

Hasanov, Fakhri J., Nigar Bayramli, and Nayef Al-Musehel. 2018. Bank-Specific and Macroeconomic Determinants of Bank Profitability: Evidence from an Oil-Dependent Economy. *International Journal of Financial Studies* 6: 78. [CrossRef]

Hassan, M. Kabir, and Abdel-Hameed M. Bashir. 2003. Determinants of Islamic Banking Profitability. Paper presented at the 10th ERF Annual Conference, Marrakesh, Morocco, December 16–18.

Hughes, Joseph P., and Loretta J. Mester. 2013. Who Said Large Banks Don't Experience Scale Economies? Evidence from a Risk-Return-Driven Cost Function. *Journal of Financial Intermediation* 22: 559–85. [CrossRef]

Klein, Paul-Olivier, and Laurent Weill. 2017. *Bank Profitability: Good for Growth?* Paris: Institut de France.

Krishnamurthy, Arvind, and Annette Vissing-Jorgensen. 2011. *The Effects of Quantitative Easing on Interest Rates: Channels and Implications for Policy*. No. w17555. Cambridge: National Bureau of Economic Research.

Kulish, Mariano. 2005. Should Monetary Policy Use Long-Term Rates? In *Boston College Working Papers in Economics*. Chestnut Hill: Boston College.

Kumar, Vijay. 2018. The Profitability of Banking Sectors in the Asia-Pacific Region and Their Contributions to Economic Growth. Doctoral thesis, The University of Waikato, Hamilton, New Zealand.

Lambert, Frederic, and Kenichi Ueda. 2014. *The Effects of Unconventional Monetary Policies on Bank Soundness*. No. 14–152. Washington: International Monetary Fund.

Madaschi, Christophe, and Irene Pablos Nuevo. 2017. *The Profitability of Banks in a Context of Negative Monetary Policy Rates: The Cases of Sweden and Denmark*. Edited by Eurpoean Central Bank. Germany: Eurpoean Central Bank, Available online: https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op195.en.pdf (accessed on 15 January 2020).

Mamatzakis, Emmanuel, and Theodora Bermpei. 2016. What is the effect of unconventional monetary policy on bank performance? *Journal of International Money and Finance* 67: 239–63. [CrossRef]

Mamatzakis, Emmanuel, Roman Matousek, and Anh Nguyet Vu. 2016. What is the impact of bankrupt and restructured loans on Japanese bank efficiency? *Journal of Banking and Finance* 72: S187–S202. [CrossRef]

McGough, Bruce, Glenn D. Rudebusch, and John C. Williams. 2005. Using a Long-Term Interest Rate as the Monetary Policy Instrument. *Journal of Monetary Economics* 52: 855–79. [CrossRef]

Minh To, Huong, and David Tripe. 2002. Factors Influencing the Performance of Foreign-Owned Banks in New Zealand. *Journal of International Financial Markets, Institutions and Money* 12: 341–57. [CrossRef]

Mirzaei, Ali, Tomoe Moore, and Guy Liu. 2013. Does Market Structure Matter on Banks' Profitability and Stability? Emerging vs. Advanced Economies. *Journal of Banking and Finance* 37: 2920–37. [CrossRef]

Nickell, Stephen. 1981. Biases in dynamic models with fixed effects. *Econometrica: Journal of the Econometric Society* 49: 1417–26. [CrossRef]

Pasiouras, Fotios, and Kyriaki Kosmidou. 2007. Factors Influencing the Profitability of Domestic and Foreign Commercial Banks in the European Union. *Research in International Business and Finance* 21: 222–37. [CrossRef]

Philippas, Dionisis, Stephanos Papadamou, and Iuliana Tomuleasa. 2019. The role of leverage in quantitative easing decisions: Evidence from the UK. *The North American Journal of Economics and Finance* 47: 308–24. [CrossRef]

Phillips, Peter C. B., and Pierre Perron. 1988. Testing for a unit root in time series regression. *Biometrika* 75: 335–46. [CrossRef]

Quagliariello, Mario. 2007. Banks' Riskiness over the Business Cycle: A Panel Analysis on Italian Intermediaries. *Applied Financial Economics* 17: 119–38. [CrossRef]

Reserve Bank of New Zealand. 2019b. The Impact of Very Low Interest Rates on Bank Profitability. Available online: https://www.rbnz.govt.nz/financial-stability/financial-stability-report/fsr-november-2019/the-impact-of-very-low-interest-rates-on-bank-profitability (accessed on 18 January 2020).

Reserve Bank of New Zealand. 2020a. Official Cash Rate (OCR) Decisions and Current Rate. Reserve Bank of New Zealand. Available online: https://www.rbnz.govt.nz/monetary-policy/official-cash-rate-decisions (accessed on 15 May 2020).

Reserve Bank of New Zealand. 2020b. The Banking System. Available online: https://www.rbnz.govt.nz/financial-stability/overview-of-the-new-zealand-financial-system/the-banking-system (accessed on 18 May 2020).

Reserve Bank of New Zealand. 2020c. Overview of the New Zealand Financial System. Available online: https://www.rbnz.govt.nz/financial-stability/overview-of-the-new-zealand-financial-system (accessed on 18 May 2020).

Revell, Jack. 1979. *Inflation and Financial Institutions*. London: Financial Times Limited.

Rios, Antonio Diez de los, and Maral Shamloo. 2017. Quantitative Easing and Long-Term Yields in Small Open Economies. *IMF Working Pape* 17: 1–46. [CrossRef]

Rudebusch, Glenn. 2018. A Review of the Fed's Unconventional Monetary Policy. *FRBSF Economic Letter* 27: 1–5.

Sääskilahti, Jaakko. 2015. Retail Bank Interest Margins in Low Interest Rate Environments. *Journal of Financial Services Research* 53: 37–68. [CrossRef]

Short, Brock K. 1979. The Relation between Commercial Bank Profit Rates and Banking Concentration in Canada, Western Europe, and Japan. *Journal of Banking and Finance* 3: 209–19. [CrossRef]

Smirlock, Michael. 1985. Evidence on the (Non) Relationship between Concentration and Profitability in Banking. *Journal of Money, Credit and Banking* 17: 69–83. [CrossRef]

Somoye, R. O. C. 2010. The Variation of Risks on Non-Performing Loans on Bank Performances in Nigeria. *Indian Journal of Economics and Business* 9: 87.

Stráský, Jan, and Hyunjeong Hwang. 2019. Negative Interest Rates in the Euro Area: Does It Hurt Banks? *OECD Economics Department Working Papers* 1574: 1–4.

Tan, Yong, and Christos Floros. 2012. Bank Profitability and GDP Growth in China: A Note. *Journal of Chinese Economic and Business Studies* 10: 267–73. [CrossRef]

West, Kenneth D. 2003. Monetary Policy and the Volatility of Real Exchange Rates in New Zealand. *New Zealand Economic Papers* 37: 175–96. [CrossRef]

Yao, Hongxing, Muhammad Haris, and Gulzara Tariq. 2018. Profitability Determinants of Financial Institutions: Evidence from Banks in Pakistan. *International Journal of Financial Studies* 6: 53. [CrossRef]

Zimmermann, Kaspar. 2017. Breaking Banks? Monetary Policy and Banks Profitability. Available online: https://www.bde.es/f/webbde/INF/MenuHorizontal/SobreElBanco/Conferencias/2017/papers/171005_15.30-17.00_1_ZIMMERMANN_paper.pdf (accessed on 28 February 2020).