MARKET INTEREST RATE FLUCTUATIONS; IMPACT ON COMMERCIAL BANKS' PROFITABILITY IN SOUTH AFRICA

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Abstract- Commercial banks are the most important financial intermediary, meeting the basic needs of both lenders and borrowers. In doing this, banks are conscious of the spread between interest income from assets and interest expenses on liabilities, which is called net interest income (interest spread). Interest spread is a major part of banks' profit and is highly exposed to interest rate risk. Interest rate risk is a major concern, as it can cause harm, if not failure to a financial institution.
The objectives of this study are, one, to investigate the impact of interest rate risk on the profitability and net-worth of commercial banks in South Africa from 2001 to 2013; and secondlyexamine if economic factors that determine interest rate could have direct effect on banks' profit and net-worth. The analysis is carried out in a panel framework with the Generalized Method of Moments (GMM) for both big and small banks, measured according to banks' asset size as at 2013.
The results show that profits of South Africa's commercial banks are not significantly affected by the changes in repo rate; rather, net-worth is significantly affected during the observed period. Also the economic factors that determine changes in repo rates affect banks' profit and net-worth in South Africa, but uncertainty in the economy has the highest effect compared to other factors considered in the study. The study also found that fluctuations in interest rate affect big and small banks in South Africa differently, which could be attributed to the huge disparity between the banks in terms of asset size. It could be advised that to maximize profit as well as owners' equity, South African commercial banks (big and small) may concentrate more on forecasting and controlling the determinants of the interest rates, rather than the interest rate itself.

I. INTRODUCTION

The financial system is based on the interconnectedness of financial markets, financial institutions, governments, businesses, and households. There are many functions of the financial system, but the basic is transforming and transferring loanable funds from lenders to borrowers—financial intermediation. Historically, banksobviouslyplay the role of intermediation in the financial sector, originating, distributing, servicing, and transforming funds, and meeting the vital needs of lenders and borrowers, which is one of the major roles in operations of an economy[1], [2].Conversely, there has been evidence that financial development leads to economic development, as the efficiency of financial intermediation could affect economic growth{see [3], [4],[5]}.

The importance of financial intermediaries and their roles in the financial sector have been found in the theory of financial intermediation. This theory focuses on how efficient an intermediary is, based on the ability to minimize transaction costs, information asymmetry, and the risks involved in the financial operations[6], [7], [8].Commercial banks offer more intermediating services than other financial institutions by accepting deposits from the public (lenders) transforming it into loan and grant it as credits toborrowers. Due to this act of fund transformation, loans and deposits are the major components of the commercial banks' balance sheet—assets and liabilities.
Complying and meeting up with demand from different classes of lenders and borrowers (businesses, landowners, industrial firms and individuals) have typically increased banks' risk taking and reduced liquidity, especially in mortgage lending, due to its maturity nature (long-term).More importantly, the difference between the interest earned from loans and interest paid on deposit(interest spread) is a major indicator of banks' efficiency as it makes up a larger part of commercial banks' profit.Based on that, banks' profit is largely exposed to interest rate risk due to unexpected changes in interest rates.

This study investigates how banks' profit (proxiedas net interest margin)[1] and net worth are affected by the unexpected fluctuations in interest rate. Also to examine whether macroeconomic factors driving interest rate fluctuations also affect banks' profit. Several studies[9]-[13] empirically and theoretically have reviewed and summarized factors that affect banks' interest spread and margin, with findings that banks' interest margins are determined by a variety of factors, including macroeconomic indicators.Demirgüç-Kunt and Huizinga [11]applied a data set of 80 countries (including all OECD countries) between 1988 to 1995 to test for the determinats of banks'net interest margin. They found that various indicators affect banks net interts magin, including macroeconomic factors, banks specific characteristics as well as some legal and institutional factors.

[1]Net interest margin is measured as interest spread divided the bank's average earning asset.

This study is unique in its objective by intending to find out if interte rate fluctuaions could differntly affect banks in the same country due to the large disparity between banks in Souht Africa in terms of asset size. This objective is motivated by the fact the South Africa has 17 operational commercial banks as at 2013, but 5 of the 17have a very high competitive advantge over the rest, in terms of asset size. For instance, the first bank ranked highest has balance sheet asset size of R1005 670 million ($83 805million), while the seventh ranked bank is with asset size of R63 705 million ($5 308 million) as at 2013.

Interest Rates

Interest rates literally measure the cost of borrowing and the return from lending money. The gap between the cost and return in addition to other bank internal factors determine banks' net interest margin. The major concern in interest rate is that most at times its trend is unknown. Is it expected to move below or above today's level? How will the movement be, static or dynamic? How long will the movement take? All these concerns, if not well addressed, may mislead both lenders and borrowers. Interest rate could be long or short, but for the purpose of this study which focuses on the interest that affects banks' profit, the short term interest rate (market interest rate) is concentrated on. Market interest rate is most commonly offered on by banks, it could be inform of repurchase rate offered by reserve banks, deposit and lending rates offered by banks on deposits and loans respectively. This rate is mostly determined by supply and demand for credit, just as posit by loanable fund theory [14], [15]. Though, many other factors also determine market interest rate, for instance competition in the loanable market, inflation, investors' expectations, and monetary policy by the government.

Interest Rate and profit

The risk associated with changes in interest rate is a major concern to banks. Interest rate risk affects decision making, performance, and growth of any particular financial institution. According to Flannery [12], interest rate changes affect bank's revenue in two ways. An increase in interest rate increases revenue a bank will generate from newly issue assets. Because assets mature over time, any proceeds are reinvested at the new higher interest rate, and earning assets will eventually be rolled over to bear the new high rate. Also because many banks'loans(especially long term businesses and mortgage loans) are issued on variable rate financing called floating rate, existing assets rates can easily be adjusted to the current market rate. This will give the banks the opportunity to benefit from the rising interest rate.Secondly, most customers prefer bank borrowing to borrowing from open market during high interest rate period. Based on that, banks with high loan portfolio compared to marketable securities would make more revenue at high interest rate.

Similar to revenue, high interest rate affects bank cost based on the composition and maturity of liability portfolio. But liability maturities are more complicated compared to asset maturity,for instance, certificate of deposit and subordinated debentures have defined interest costs and maturities compared to retail deposits. Though regulation has a cap on the maximum rate to be paid on retail deposits, banks have always been below the cap, but heat up their implied rate to compete with other banks when interest rate rises, thereby, incurring additional cost in the process. Despite the complication, liability cost will follow market rate depending on banks' portfolio composition (long or short term liabilities)

The net effect (net interest margin) of banks' revenue and costs due to rise in interest rate largely depends on the balance between banks' asset and liability maturity periods, which is based on bank managers' incentive to take risk as well as shareholders' ability to accept risk. A perfect balanced asset and liability maturity means that assets are only financed with liability of same maturity. This scenario leaves the bank's profit unaffected by interest rate fluctuations, but this is farfetched inpractice. The issue is that the extent of hedging interest rate depends on the managers' ability to forecast future interest rate movements. If managers expect interest rate to rise and wishes to make best profit out of it, the bank will finance asset with liability ofhigher maturity over the asset maturity period. If rate eventually rises, interest revenue will rise faster than cost;because the shorter maturity asset will be rolled over at higher rate. This will enable the bank to earn noble profit before the liability will be rolled over. The danger lies if interest rate falls (conflicting expectation),the reverse becomes the case as asset with shorter maturity will be rolled over at lower interest rate, while the liability roll over period is pending.

Effect of Interest Rate Risk on Net Worth

The interest rate shock that results in losses in the market value of assets directly affects the net worth (owners' equity).Molyneux and Thornton [16]examined the determinants of banks profitability in eighteen European countries from 1986 to 1989. Their result indicated a positive association between return on equity and the level of interest rates. But similar to the effect of interest rate changes on profit, the extent of the effect of increased interest rate on equity largely depends on the banks' portfolio structure and loan customer behavior towards rising interest rate.

Normallyif interest rate changes, asset and liability values are affected equally if asset/liability position is perfectly balance [12]. But where asset maturity is longer than that of liability, a rise in interest rate will

increase liability value (L) more than asset value (A). This scenario definitely affects equity/net worth (E) as per balance sheet: E = A –L.This argument is in line withSaha, Subramanian [17], who estimated the impact of interest rate volatility in Indian banks using 116 observation during the period of 2002-2004. They found that the banking industry is exposed to risk as excessive rise in interest rate negatively affects the present value of assetsrelative to that of liabilities, due to maturity mismatch, thereby wearing down banks' net worth. This argument supported the proposed Pillar I of Basel II, which demands a capital charge to cover for interest rate risk in the banking book, should the loses in Economic Value of Equity (EVE) becomes severe enough. EVE represents that difference between the present values of asset and liability.

II. RESEARCH OBJECTIVES

This study investigated the impact of market interest rates fluctuations on both the profitability and net worth of commercial banks. It went further to separately investigate such impacts on big and small banks as there is huge difference between the big and small banks in South Africa, based on asset size.

Problem Statement

Net interest income is a major part of banks' profit, this is basically why the financial intermediaries try to offer lowest returns to savers and lend funds to borrowers at the highest possible interest rates. López-Espinosa, Moreno [18] applied data from 15 developing and developed countries between 1999 and 2008 to examine the determinants of banks' net interest margin. Their results reveal that the volatility in interest rate in the 2000s explains much of the net interest margin differences across countries, as well as NIM reduction in developed countries. Many other studies have also reveal that maturity mismatch of banks assets and liabilities (while performing asset transformation function), and unexpected change in interest rate, potentially expose the banks to interest rate risk[19]-[21]. Basically, this is a major concern for banks that hold a large proportion of their portfolio in long-term fixed-rate loans relative to short term liabilities.

Excessive exposure to interest rate risk can cause harm, if not failure, to a financial institution, by interacting with other risks. For instance, as interest rate rises, credit risk increases (corporations and consumers will likely default in repayment), which can lead to liquidity risk (as banks may depend on loan repayment for liquidity management purposes), this leads to solvency risk, thereby affecting the profit and equity or capital positions of banks.

Thus this study aims at assessing the effect of interest rate sensitivity on the profitability (the net interest margin) and net worth of commercial banks in South Africa. Mostly to find out if interest fluctuation in South African affect big and small banks differently due to huge disparity between them in terms of asset size. The study also assesses which of the determinants of interest rate has more effect on interest rate and thus on profits and net worth of commercial banks.

III. METHODOLOGY

Research Design

The main estimation technique in this study is the generalized method of moments (GMM). GMM naturally accounts for both estimation and sampling errors and accommodates unbalanced panels and multiple endogenous variables[22]-[25]. In the presence of heteroskedasticity, which is one of the major problems in empirical analysis of cross sectional and panel data, GMM applies conditions that generate efficient and reliable estimation [26]-[28].

Population and sample

The population of this study is all operational banks in South Africa. But for the purpose of an effective research, this study balanced the need for representative data sample with availability of data. Non-probability sampling is applied, using purposive sampling method, because this study intends to use samples with available and reliable data to ensure reliable research findings.A sample of fourteen commercial banks and one investment bank in South Africa for the period of ten years (from 2001 to 2013) is used. The reason for including an investment bank is due toits high level of commercial banking activity.

South Africa relatively has only four large operating banks, which will not be a reasonable sample to generalize a finding, on that note, other smaller banks were included in the study as they are equally affected by interest rate fluctuations. To account for the disparity between the larger and the smaller banks, the sampled banks were divided into two sets (big and small) based on their total assets as at the year-end 2013. The big banks are the banks with assets size of over R100 billion, they include Standard bank, FirstRand bank ABSA, Nedbank, and Investec; while the remaining ten banks are ranked as small, with assets size of below R100 billion. Table1 below lists the sampled banks, their specialization, asset size, percentage of asset size to the sampled total assets, and the their country ranks as at the year 2013.

Table1: 15 sampled banks, specialization, total asset, percentage of total asset to the banking industry's total asset, and country ranks as at 2013.

Bank Name	Specialization	Total Asset as at 2013[2]	Net Income	% of Total Asset[3]	Country Rank
Std Bank	Commercial Bank	1,005,670.00	10,277.00	27.36	1
FirstRand	"	779,575.00	10,978.00	21.21	2
ABSA	"	789,371.00	8,735.00	21.48	3
Nedbank	"	699,155.00	7,168.00	19.02	4
Investec	Investment Bank	279,274.00	1,878.00	7.60	5
Afrcan Bank	Commercial Bank	63,705.00	-4,535.00	1.73	7
PSG	"	25,857.30	1,516.10	0.70	8
Grindrod	"	9,339.80	93.90	0.25	10
Mercantile	"	7,566.80	139.00	0.21	14
Sasfin	"	3,479.10	65.60	0.09	15
Albraka	"	4,410.80	28.90	0.12	18
HBZ	"	3,573.40	44.60	0.10	20
Bank of Athens	"	2,214.70	-9.95	0.06	22
Habib	"	1,056.80	14.60	0.03	25
GSB	"	912.90	5.60	0.02	26

The data

The data for the study largely come from the income statement and balance sheet of the sampled banks from Bank Scope databasecompiled by Fitch IBCA. A thirteen-year data set from financial year-end 2001 to 2013 was collected from the sampled banks' annual reports. The bank specific variables includenet interest margin, net worth or owners' equity, loan loss provision, capital ratio, liquidity ratio, total assets, gross loan.Macro-economic variables were collected from the South African Reserve Bank (SARB) database, which includeGross Domestic Product (GDP), Consumer Price Index (CPI), repurchase rate (repo rate), money supply rate (M3), prime lending rate, and deposit rate. The institutional variables include the six Worldwide Governance Indicators (WGI) developed by [29]. The variables include political stability, voice and accountability, government effectiveness, government regulatory quality, rule of law, and control of corruption. Each institutional factor is scored from -2.5 (weak) to 2.5 (strong) government performance.

Hypothesis testing

To determine the effect of macro-economic factors on market interest rate, the repo rate is used to represent the market interest rate, which is the dependent variable. Factors that determine the market interest rate are limited to consumer price index, money supply and uncertainty in the economy, which are the independent variables. Institutional variables which can as well influence the movement of interest rate are included as control variables. To avoid multicollinearity, deposit and lending rates were dropped, as repo rate is the benchmark for adjustable deposits and prime lending rates in South Africa.

To determine the effect of market interest rate/it's determinants on profit and net worth of commercial banks, the NIM and net worth were regressed interchangeably on the repo rate and the macro-economic factors. Other bank specific variables (liquidity ratio, non-performing loan, capital ratio, and level of competition), which also influence bank's level profitability are included as control variables. Using the generalised methods of moment, the fitness of the model is tested using the J-statistics, which is relatively high in all the models.

All the variables were represented in five models (testing five hypothesis), and are interpreted individually. The definition and measurement of the variables are also detailed below.The networth was logged due to its high value compared to other variables. Each hypothesis is tested on the overall 15 sampled banks, also separately on

the 5 big and 10 small banks respectively. The essence of the categorization is to find out if interest rate fluctuations could affect the banks differently due to the huge disparity in asset size.

H0$_1$: Fluctuations in macroeconomic factors do not determine the fluctuations in interest rate (repo rate) in South Africa during the observed period (2001 to 2013).

$MI_{it} = \alpha + \beta_1 CPI_{it} + \beta_2 Ms_{it} + \beta_3 Uncty_{it} + \beta_4 CofC + \beta_5 GE + \beta_6 Psav + \beta_7 RQ + \beta_8 RofL + \beta_9 VA + \varepsilon_{it}$……..……1

H0$_2$: Changes in interest rates do not affect commercial banks' profit (net interest margin).

$P_{it} = \alpha + \beta_1 MI_{it} + \beta_2 LqtyR_{it} + \beta_3 CapR_{it} + \beta_4 Comp + \beta_5 Npl + \beta_6 CofC + \beta_7 GE + \beta_8 Psav + \beta_9 RQ + \beta_{10} RofL + \beta_{11} VA + \varepsilon_{it}$……..…2

H0$_3$: Changes in interest rates do not affect commercial banks' net worth.

$NW_{it} = \alpha + \beta_1 MI_{it} + \beta_2 LqtyR_{it} + \beta_3 CapR_{it} + \beta_4 Comp + \beta_5 Npl + \beta_6 CofC + \beta_7 GE + \beta_8 Psav + \beta_9 RQ + \beta_{10} RofL + \beta_{11} VA + \varepsilon_{it}$……...…3

H0$_4$: The factors that determine of interest rates do not affect commercial banks' profits.

$P_{it} = \alpha + \beta_1 CPI_{it} + \beta_2 Ms_{it} + \beta_3 Uncty_{it} + \beta_4 LqtyR_{it} + \beta_5 CapR_{it} + \beta_6 Comp + \beta_7 Npl + \beta_8 CofC + \beta_9 GE + \beta_{10} Psav + \beta_{11} RQ + \beta_{12} RofL + \beta_{13} VA + \varepsilon_{it}$……...…..…4

H05: The factors that determine interest rates do not affect commercial banks' net worth.

$P_{it} = \alpha + \beta_1 CPI_{it} + \beta_2 Ms_{it} + \beta_3 Uncty_{it} + \beta_4 LqtyR_{it} + \beta_5 CapR_{it} + \beta_6 Comp + \beta_7 Npl + \beta_8 CofC + \beta_9 GE + \beta_{10} Psav + \beta_{11} RQ + \beta_{12} RofL + \beta_{13} VA + \varepsilon_{it}$……...…..…5

MI is the market interest rate at time *t*; for the purpose of the study the South African repo rate is used, measured as the average repo rate.

CPI is the percentage changes in consumer price index of South Africa at time *t*. It measures the inflation rate.

Ms is the money supply rate at time *t*. For the purpose of the study M_3 is used to measure the money supply rate.

Uncty is uncertainty in the economy at time *t*. It is measured as the standard deviation of gross domestic product (GDP) for the current year and two previous years.

P is the profit (net interest margin) of bank *i* at time t. It is measured as

$NIM = Interest\ Income - Interest\ Expenses \div Average\ Earning\ Assets.$

NW is the net worth of bank *i* at time *t*.

LqtyR is the liquidity ratio of bank *i* at time *t*.

CapR is the capital ratio of bank *i* at time *t*.

Comp is the level of competition among banks; it is measured as the average total asset of three big banks (in terms of asset size as at the year 2013) divided by the assets of bank *i*at time *t*.The higher the value, the less competitive a bank is.

Npl is the non-performing loan of bank *i*at time *t*; it is measured as the loan loss provision divided by the total loan. High value of nonperforming indicates that banks issue more unsecured loans.

CofC is control of corruption at time *t*, which captures the perception of how public power is exercised for private gain.

GE is government effectiveness at time *t*; it determines the quality of public and civil services and level of independence from political pressures

PSAV is political stability and absence of violence, which measures government level of instability due to unconstitutional or violent events.

RQ is government regulatory quality at time *t*, measuring the ability of the government to formulate and implement sound regulatory policies

RofL is rule of law at time *t*; it measures the quality and accuracy of contract enforcement, property rights, police services and court order implementation.

VA is voice and accountability at time *t*; it measures the extent of citizens' participation in government selection and changes as well as freedom of expression.

α is the intercept while β is the slope, which measures the influence of the explanatory or independent variables on the dependent variable inthe different models. The LqtyR, CapR,and Npl are set of bank specific factors that affect profit and/or net worth. While CofC, GE, PSAV, RQ, RofL,and VAare institutional factors that could affect both interest rate fluctuations and banks' performance. All things being equal, the higher the scores of these institutional factors, the better the economy should be.

IV RESULTS

Correlation

Table 2 below shows correlation among the interest rate and its determinants. Market interest rate (MI) represented by repo rate is highly correlated with prime rate (PRIM) and deposit rate (DEP). This could be attributed to the fact that repo rate is the benchmark used by the banks to determine prime lending and deposit rates. To avoid multicollinearity due to high correlation between repo, prime, and deposit rates, repo rate is chosen among the three rates to represent market interest rate.

Table 2: correlation among the regressed variables

	MI	PRIM	DEP	CPI	MS	UNCTY
MI	1.					
PRIM	0.730	1.				
DEP	0.963	0.660	1.			
CPI	0.486	0.149	0.620	1.		
MS	0.525	0.117	0.398	0.095	1.	
UNCTY	-0.309	0.089	-0.173	0.292	-0.632	1.

Regression results

Table 3: Summary of the panel generalized method of moments regression analysis of the macroeconomic factors that determine the market interest rate (hypothesis one).

Independent Variable	Regression results
Consumer price Index	-0.306* (0.063)
Money supply	-0.164* (0.035)
Uncertainty	2.40* (0.241)
Control of corruption	-13.207* (1.412)
Govt. effectiveness	11.361* (2.441)
Political stability	24.287* (2.002)
Regulatory quality	52.975* (3.818)
Rule of law	-35.295* (2.542)
Voice and accountability	-29.968* (3.199)
R-squared	0.874
Adjusted R-squared	0.868

* Significant at 1 percent level

The dependent variable is market interest rate, denoted with repurchase rate.Standard errors are in parentheses.

Table 4: Summary of the panel generalized method of moment's regression analysis on the effect of market interest rate on commercial banks' profit and net worth (hypotheses two and three).

Independent Variables	A On bank's profit			B On bank's net worth		
	All Banks	Big banks	Small banks	All Banks	Big banks	Small banks
Market interest rate	0.109	0.755	0.449	0.153**	0.210***	0.067*
	(0.285)	(0.827)	(0.428)	(0.068)	(0.115)	(0.021)
Liquidity ratio	-0.010	-0.015	-0.014	-0.008	-0.003	0.001
	(0.011)	(0.102)	(0.014)	(0.006)	(0.031)	(0.001)
Capital ratio	0.081	0.184	0.019	0.214*	0.164***	0.022*
	(0.085)	(0.564)	(0.106)	(0.040)	(0.094)	(0.005)
Competition	0.004*	-0.977	-0.001	-0.004*	-0.451**	-0.001*
	(0.001)	(1.346)	(0.002)	(0.001)	(0.206)	(0.000)
Non-performing loan	1.487*	-3.072	1.351*	-0.458**	-0.626	0.034***
	(0.341)	(4.323)	(0.399)	(0.198)	(0.690)	(0.020)
Control of corruption	3.102	1.719	6.428		-0.237	-1.045*
	(4.333)	(4.097)	(6.556)		(0.940)	(0.322)
Govt. effectiveness	-7.758	-1.668	-14.99		3.184	1.855***
	(14.202)	(10.818)	(21.244)		(2.721)	(1.044)
Political stability	3.081	-3.786	3.710		1.463**	0.861*
	(4.180)	(7.045)	(6.149)		(0.651)	(0.302)
Regulatory quality	1.104	-14.83	-3.415		-6.869**	-2.947*
	(7.176)	(13.950)	(10.812)		(3.230)	(0.531)
Rule of law	-2.787	15.712	-1.026		6.807***	2.474*
	(12.047)	(17.576)	(17.684)		(3.998)	(0.869)
Voice and accountability	6.592	8.592	18.219		5.285**	4.116*
	(10.695)	(10.716)	(16.432)		(2.303)	(0.808)
R-squared	0.42	-0.83	0.37	-1.86	-0.93	0.85
Adjusted R-squared	0.38	-1.37	0.31	-1.94	-1.33	0.83

* Significant at 1 percent level
**Significant at 5 percent level
*** Significant at 10 percent level

The dependent variable is banks' profit denoted with net interest margin and banks' net worth as the case maybe. Standard errors are in parentheses.

Table 5: Summary of the panel generalized method of moment's regression analysis on the effect of determinants of market interest rate on commercial banks' profit and net worth (hypotheses four and five).

Independent Variables	A On banks' profit			B On banks' net worth		
	All Banks	Big banks	Small banks	All Banks	Big banks	Small banks
Consumer price Index	-0.063 (0.387)	-0.147 (0.070)**	0.023 (0.201)	0.048 (0.035)	-0.087* (0.030)	-0.046*** (0.026)
Money supply	-0.048 (0.216)	0.062*** (0.037)	0.203** (0.099)	0.078* (0.016)	0.049* (0.016)	0.033** (0.014)
Uncertainty	0.427 (1.467)	0.820* (0.319)	0.886 (0.664)	0.622* (0.109)	0.564* (0.137)	0.356* (0.098)
Liquidity ratio	-0.009 (0.011)	-0.066* (0.023)	-0.015 (0.013)	-0.010* (0.003)	-0.001 (0.010)	0.000 (0.001)
Capital ratio	0.078 (0.086)	0.014 (0.068)	0.109 (0.081)	0.118* (0.017)	0.082* (0.029)	0.021* (0.005)
Competition	0.004* (0.001)	0.041 (0.203)	0.001 (0.002)	-0.003* (0.000)	-0.228* 0.087)	-0.001* (0.000)
Non-performing loan	1.486* (0.347)	-0.285 (0.378)	1.269* (0.381)	-0.063 (0.085)	0.019 (0.162)	0.045* (0.018)
Control of corruption	1.189 (8.735)	-7.036* (1.776)			-4.147* (0.762)	-2.875* (0.579)
Govt. effectiveness	-6.764 (15.444)	5.049** (2.416)			2.762* (1.037)	1.986*** (1.038)
Political stability	7.704 (12.319)	3.851 (2.427)			2.737* (1.041)	1.573*** (0.823)
Regulatory quality	10.779 (23.431)	8.432 (5.067)			4.209*** (2.175)	1.302 (1.565)
Rule of law	-8.442 (15.387)	-1.302 (3.126)			(-1.713 (1.342)	-0.708 (1.025)
Voice and accountability	1.325 (19.893)	-3.832 (4.364)			0.380 (1.873)	1.333 (1.328)
R-squared	0.42	0.55	0.35	-0.26	0.63	0.87
Adjusted R-squared	0.37	0.42	0.31	-0.31	0.52	0.86

* Significant at 1 percent level
**Significant at 5 percent level
*** Significant at 10 percent level

The dependent variable is banks' profit denoted with net interest margin and banks' net worth as the case maybe. Standard errors are in parentheses.

V. DISCUSSION OF FINDINGS

Effect of macroeconomic factors on repo rate

From table 3, the result shows that inflation rate (consumer price index), money supply and uncertainty in the economy intensely determine changes in repo rate. A percentage change in the consumer price index, money supply and uncertainty, significantly affect repo rate by -0.31%, -0.16%, and 2.40% respectively, all at 1% significant level. Also these economic factors account for 86% (adjusted R^2) variation in repo rate fluctuations. This result refutes the stated null hypothesis that macroeconomic factors do not determine repo rate fluctuations. Hence, macroeconomic factors are good predictors of interest rate fluctuations in South Africa.

The result indicates that consumer price indexand money supply have inverse relationships with the repo rate. The dominant concept is that that there is a one for one relationship between expected inflation and nominal interest rate[30], [31]. But to avoid hyperinflation/deflation, the Federal Reserve does not consistently follow the inflation rate to measure the repo rate, but has the right to use repo rate to tighten credit in order to retard inflationary pressure [32]. This finding confirms that it is not at all cases the Federal Reserve had to increase interest rate to combat inflation, for instance, the European Central bank once has to cut down interest rate due to excessive low inflation (Bloomberg news,July 2015).

Using money supply as a monetary policy instrument, if the Federal Reserve adopts expansionary monetary policy (increase in money supply), repo rate is reduced (as confirmed by the result). This action will reduce the prime lending rate of commercial banks, leading to increase in demand for credit, in turn increases investment.From uncertainty perspective, economic uncertainty makes investors to expect an increase in interest rate, such expectations hikes investor's demand for interest bearing assets, which eventually increases the interest rate. This result also shows that among the three macroeconomic factors, uncertainty in the economy has the highest effect on interest rate fluctuations.

Effect of repo rate on profit and net worth of commercial banks

The result in table 4(column A) denotes that changes in repo rate do not significantly affect the profit of commercial banks. This result supports null hypothesis two, which states that changes in interest rates do not affect commercial banks' profit. Though a percentage change in repo rate increases the profit of all, big, and small South African commercial banks by 0.11%, 0.76%, and 0.45% respectively, but the effect is not statistically significant.

The incremental effect on profit due to changes in repo rate is consistent with Demirgüç-Kunt and Huizinga [11], who found that interest rates are associated with higher interest margins and profitability, especially in developing countries. The effect on big banks is higher (0.76% compared to 0.45% on small banks), which is in agreement with Demirgüç-Kunt and Huizinga's findings, that bank size (measured as asset size) significantly impacts positive change in banks' profit margins. The nonsignificant effect of the increment is against the popular notion that banks make irrational huge profit during high interest rate regime. This finding confirms Flannery [12]'s evidence, which also does not support such general concept that high interest rate leads to exceptional high profit for bank.One could deduce from this result that while carrying out asset transformation and intermediation functions, South African commercial banks are conscious of maturity mismatch of their assets and liabilities and unexpected changes in interest rates.

From the same Table 4, column B, theresult shows that changes in repo rate significantly affect the net worth of commercial banks. A percentage change in repo rate increases all banks', big banks' and small banks' net worth by 0.15%, 0.21%, and 0.067%, at 5%, 10% and 1% significant level respectively. The effect is relatively high with big banks, which could be attributed to the competitive advantage of asset size over the small banks. This resultnegates null hypothesis three, which states thatchanges in interest rates do not affect commercial banks' net worth.According to literature, rising interest rate depletes the banks' net worth, especially if asset maturity is longer than that of liability [17]. South African banks are exempted from such risk, as revealed in this result.Instead rise in interest rate increases the net worth of South African banks. It could be inferred that South African banks have relatively balanced portfolio structure, which absorbs the interest rate shocks during rising and falling of interest rate.

Effect of macroeconomic factors on profit and net worth

All the macroeconomic factors (consumer price index, money supply and uncertainty) used in this study significantly determine the fluctuation in interest rate in South Africa(see table3). To find the direct effect of these factors on profit of commercial banks, Table 5column A, shows that a percentage change in consumer price index and money supply reduces banks' profit by 0.06% and 0.05% respectively, while uncertainty increases profit by 0.43%. Though, none of the effects is statistically significant. Regressing the same factors separately on big and small banks, a percentage change in

consumer price index also has a reduction (-0.15%) effect on big banks' profit, while money supply contrarily increases profit by 0.06%, uncertainty increases big banks' profit by 0.82%. All the effects are statistically significant at 5%, 10%, and 1% levels respectively. From small banks' perspective, a percentage change in consumer price index, money supply, and uncertainty increase small banks' profit by 0.02%, 0.20%, and 0.89% respectively, but only money supply is statistically significant.

This finding rejects the null hypothesis four that macroeconomic factors do not affect commercial banks' profit, and supportsDemirgüç-Kunt and Huizinga [11] that banks' profitability and interest margin are affected by variety of factors, including macroeconomic and institutional factors. Also the finding is in line with Genay and Podjasek [13], that normally changes in interest rate affect banks' profit but the effect of macroeconomic factors mater most. The contrary effect of money supply (increase in profit for all banks/decrease in profit for big/small independently) could be attributed to reduction in number of sampled banks and number of observations. But this result partially contradicts Athanasoglou, Delis [33], who found that inflation rate is positively and statistically associated with banks' profit. While the result of this study shows that inflation significantly decreases big banks' profit, while that of small banks is increased though not significant. The result shows that macroeconomic factors could affect banks in the same country differently. It could be inferred that the few big banks might be taking excessive risk to retain the market share, and sometimes ignore or forget to forecast and hedge inflation.

Regressingthe effect of macroeconomic factors on banks' net worth, table 5column B shows that a percentage change in consumer price index, money supply and uncertainty increases all banks' net worth by 0.05%, 0.08 and 0.62%, respectively; the effects of money supply and uncertainty are statistically significant. From big banks' perspective, consumer price index reduces banks' net worth by 0.09%, while money supply and uncertainty increase net worth by 0.05% and 0.56%, respectively; all the effects are statistically significant. The same trend applies to small banks. Consumer price index reduces net worth by 0.05%, while money supply and uncertainty increase net worth by 0.03% and 0.36%, which are all statistically significant. These findings disprove the null of hypothesis five that macroeconomic factors do not affect commercial banks net worth.

Bank specific internal factors, institutional factors, banks profit and net worth

Table 4 and 5 reveal that among the bank specific variables included in the analysis, competition among banks proxiedas average total asset of three big banks divided by individual banks' assets has the most significant effect on both banks' profit and net worth. This could imply that as the banks struggle to maintain market share, especially the "big 5" (Standard bank, FirstRand, ABSA, Nedbank, and Investec), profit and net worth are negatively affected. The next influencing bank specific variable is nonperforming loans, which negatively affects both the profit and net worth of big banks. It could be deduced that in the fight to capture the market and maintain the market share, big banks issue more unsecured loans compared to small banks. This finding is in line with [34]-[37], that bank-specific factors also significantly affect the net interest margin of the banking sector. Therefore, banks should as well monitor internal factors along the hedging of interest rate and economic factors that determine the interest rate.

Fromthe institutional factors perspective, the level of government effectiveness favours investors as the net worth of commercial banks increases at any percentage change in government effectiveness. Also both profit and net worth increase at a percentage change in political stability and absence of violence. This finding infers that the level of government effectiveness and political environment of South Africa maximizes owner's equity.

CONCLUSION AND RECOMMENDATION

Because changes in repo rate increase banks' profit (though not significant), also significantly increase banks' net worth, it could be inferred that while carrying out asset transformation and intermediation functions, South African commercial banks are conscious of maturity mismatch of their assets and liabilities and unexpected changes in interest rates

From the result it could be concluded that in as much as the changes in repo rate benefit commercial banks profit and net worth, commercial banks should as well hedge against the economic factors (especially consumer price index) that determine changes in repo rate. The reason is that the effect of consumer price index significantly reduces both big and small banks' net worth, as well as big banks' profit.

Because South African bank's net worth is significantly increased by changes in interest rate contrary to literature that rising interest rate depletes the banks' net worth, especially if asset maturity is longer than that of liability, this study could conclude that South African commercial banks relatively avoids security mismatch while carrying out asset transformation function. Based on that, along with the fact that government effectiveness and political stability in South Africa favour owners' equity, this study recommends that investment with South African commercial banks could be viable.

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