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## Examining the Nexus Between Income Diversification, Profitability and Risk of South African Banks: A Dynamic Panel Data Analysis

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### Abstract

*The study examines how bank profitability and risk are impacted by income and asset diversification in South Africa's developing banking industry. The researchers employ a dynamic panel model with System GMM estimate on a panel data of 23 banks between 2011 and 2022 to account for the persistence of bank performance and risk. The findings indicate that income and asset diversification both considerably improve risk-adjusted profitability as indicated by risk adjusted return on assets (RROA) and risk adjusted return on equity (RROE) and while also lowering bank risk as indicated by the standard deviation of returns ( $\sigma(\text{ROA})$  and  $\sigma(\text{ROE})$ ). These findings show how diversification is strategically valuable for enhancing resilience and financial success in an unpredictable economic climate. The report advocates for risk-sensitive innovation and diverse development methods and provides useful insights for regulators, policymakers, and bank management.*

Keywords: Bank Performance, Income Diversification, Asset Diversification, System GMM

JEL Classification: G01, G20, G21

### 1. Introduction

The banking sector has undergone significant changes in the last two decades across both developed and emerging nations marked by enhanced liberalization and deregulation of scope of diversification (Abbas et al., 2024). It has witnessed substantial changes including fierce competition, consolidation, and structural changes, as a result of technology advancement, deregulation, and financial liberalization (Park et al., 2019). Unlike the traditional banking theory, which focuses on accepting and lending deposits as the source of bank income, there has been an increase in non-lending activities within banks to enhance income (Wu, 2024). Banks are increasingly using non-interest sources to supplement their earnings as a result of the growing pressure on interest income. The contraction of interest margins has intensified market competition making it imperative for the banks to diversify their revenue and assets to ensure sustainable financial operations (Fu and Liang, 2025). Non-interest revenue is starting to make up a sizable portion of bank profits in both developed and developing nations, and this trend is becoming more and more well-known worldwide (Alzoubi, 2025). Fees, trading revenue, and commissions have become common sources of a bank's non-interest income (Singh and Singh, 2024). There are various benefits to diversifying a bank's sources of income. It results in lower risk exposure (Delpachitra and Lester, 2013; Sharma and Anand, 2018), cost savings through economies of scale (Meslier et al., 2014), improved competitive positioning in new markets (Amidu and Wolfe, 2013), and increased profitability (Chiorazzo et al., 2008). Diversification is not without its difficulties, though. It results in drawbacks such as higher risk (Lepetit et al., 2008), inefficient resource allocation (Rajan et al., 2000), and knowledge asymmetry (Harris et al., 1982). Additionally, according to DeYoung and Roland (2001), non-lending operations could erode bank-customer links and result in decreased revenue. Additionally, non-interest income is typically more erratic than conventional interest income. Due to investments in technology and human capital, diversifying into non-interest operations may raise fixed costs,

which could lead to increases in operating expenses and volatility in profitability. Although revenue and asset diversity in banks is becoming more and more important, opinions on how they affect bank performance are divided (Luu et al., 2020). This study makes multiple contributions to the body of existing literature. First, despite the fact that bank performance and diversification have received a lot of scholarly attention, little is known about emerging African economies, especially South Africa. This research gives important insights by examining the South African banking industry, through the prism of diversification, which has not been extensively researched in the past. Second, the majority of previous research has focused on the factors that influence bank risk and profitability, frequently ignoring the precise connection between profitability, risk and bank diversification. Finally, while most previous studies have used fixed effects panel data techniques, this study uses a system Generalized Method of Moments (GMM) regression methodology with a dynamic panel data model. Thus, earlier research in the emerging economies banking setting (Nisar et al., 2018; Lee et al., 2014; Ahamed, 2017; Berger et al., 2010) is extended and supplemented by this study. The remainder of the paper is organized as follows. Section 2 outlines theoretical background highlighting the disagreement in the prior research. Section 3 presents the research methodology detailing the data collection, variable operationalization and empirical models used in the current research. Section 4 details the data analysis and highlight key findings. Section 5 finally gives the implications of the study and concludes the paper.

## 2. Theoretical Background

This study's main hypothesis is based on portfolio theory, which was first put forth by Harry Markowitz. In his groundbreaking 1952 book on Portfolio Selection, which subsequently developed into the Foundations of Portfolio Theory, Markowitz first proposed the idea (Markowitz, 1991). The main tenet of portfolio theory is that by spreading their investments among a variety of assets that together minimize variance and maximize expected return, investors may maximize their gains. However, as Markowitz pointed out in 1952, diversification alone cannot completely minimize risk because of the inter-correlation across securities. For conservative investors, modern portfolio theory offers a strategic framework that helps them create portfolios that optimize projected returns given a particular degree of risk. According to this idea, diverse banks can take advantage of economies of scale in the banking industry, which will enhance performance while lowering risk (Nisar et al., 2018).

There is disagreement in the body of research on how income and asset diversification in banks affects their risk and profitability. Advocates contend that banks gain from diversification by exploiting economies of scale and utilizing managerial skills (Iskandar-Datta and McLaughlin, 2007). Diversification has been shown to improve bank performance, according to studies by Baele et al. (2007), Sanya and Wolfe (2011), Nguyen et al. (2012), Pennathur et al. (2012), and Meslier et al. (2014). In their analysis of 29 Asia-Pacific nations, Lee et al. (2014) similarly discovered a positive relationship between bank performance and diversification.

However, detractors point out possible drawbacks. Maudos and Solís (2009) discovered that net interest margins in Mexican banks were negatively correlated with non-interest revenue. Likewise, Batten and Vo (2016) noted that Vietnamese banks faced more risk when they switched to non-interest revenue streams. In a study on Indonesian banks, Hidayat et al. (2012) found that the effect of product diversification on risk differs depending on the size of the bank. After studying 88 Chinese banks between 1996 and 2006, Berger et al. (2009) came to the conclusion that diversification resulted in lower profits and higher costs. Similarly, Zhou (2014) examined 62 Chinese banks between 1997 and 2012 and found no significant correlation between income diversification and bank risk. Additionally, diversity can increase profit volatility (DeYoung and Roland, 2001; Stiroh, 2004; Acharya et al., 2006; Stiroh and Rumble, 2006) and decrease managerial focus and competitive advantage (Klein and Saldenberg, 2010).

The majority of this empirical data comes from industrialized nations, which leaves rising markets in BRICS like South Africa with less knowledge. It is clear from the research above that there is still disagreement over how revenue diversification affects bank profitability and risk-taking. Therefore, more research on this matter is needed. In the context of South Africa, this study aims to investigate how revenue and asset diversification affects banks risk profile and profitability.

## 3. Research Methodology

The data and the sample are discussed in this section. Additionally, it describes the variables and the empirical estimation methodology that were employed in this study.

### 3.1 Data and Sample

Using panel data from South African banks, this study investigated how bank diversity affected bank risk-taking and bank performance. The time frame covered by the data set is 2011–2022. The Bank Focus database provided the secondary data for the bank-level financial indicators, while the World Bank's World Development Indicators (WDI) provided the data for the macroeconomic variables. The sample is limited to banks that have been continuously operating during the study period and have time series observations for at least three years. The researcher eliminated extreme values from each variable's bank year observations in order to account for measurement uncertainties. There were finally 23 banks and 134 bank observations of South African banks in the final data collection.

3.2 Description of Variables

Table 1 gives the details about the variables used in the research and their operationalization.

**Table 1: Description of Variables**

Classification	Variable	Operationalization	Prior Literature
<b>Dependent Variable</b>			
Bank Performance Measures	Risk adjusted return on assets (RROA)	(ROA / σROA)	Alkhouri and Arouri (2019)
Bank Risk Measures	Risk adjusted return on equity (RROE)	(ROE / σROE)	Alkhouri and Arouri (2019)
	Standard deviation of return on assets	σ(ROA)	Zhou (2014); Pennathur et al. (2012)
	Standard Deviation of Return on equity	σ(ROE)	Moudud-Ul-Huq et al. (2018)
<b>Independent Variable</b>			
Bank Diversification	Income Diversification (ID)	$\frac{\text{Non-interest income}}{\text{Total Income}}$	Stiroh (2004), Stiroh and Rumble (2006)
<b>Control Variables</b>			
Bank-specific	Size	Log (Total Assets)	Stiroh and Rumble, (2006); Baele et al., (2007); Sanya and Wolfe (2011)
	Equity Ratio	$\frac{\text{Equity Capital}}{\text{Total assets}}$	Chiorazzo et al., (2008); Meslier et al., (2014)
	Credit Risk	$\frac{\text{Loan Loss Provisions}}{\text{Total assets}}$	Mergaerts and Vander , (2016)
	Asset Growth	Annual growth rate of total assets	Stiroh, (2004); Demirgüç-Kunt and Huizinga, (2010); Pennathur et al., (2012)
	Loan Ratio	$\frac{\text{Total loans}}{\text{Total assets}}$	Stiroh and Rumble, (2006); Chiorazzo et al., (2008)
Macroeconomic Control Variables	GDP Growth rate	$\frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}$	Pasiouras and Kosmidou, (2007); Petria et al., (2015); Rani and Zergaw, (2017);
	Annual Inflation rate	Consumer PriceIndex (CPI)	Anbar and Alper, (2011); Chowdhury and Rasid (2016); Jara-Bertin et al. (2014)

3.3 Empirical Models

The researcher has used the following empirical models:

- To investigate the impact of income diversification on bank performance in South Africa.

$$RROA_{it} = \alpha + \beta_1 ID_{it} + \sum_{j=2}^J \beta_j X_{it}^j + \sum_{l=2}^L \beta_l X_{it}^l + \varepsilon_{it} \quad (1)$$

$$RROE_{it} = \alpha + \beta_1 ID_{it} + \sum_{j=2}^J \beta_j X_{it}^j + \sum_{l=2}^L \beta_l X_{it}^l + \varepsilon_{it} \quad (2)$$

Where  $RROA_{it}$  in equation (1) and  $RROE_{it}$  in equation (2) is the the risk adjusted return on asset and the risk adjusted return on equity respectively of bank i at time t, with  $i=1, \dots, N$ ,  $t=1, \dots, T$ ,  $\alpha$  is a constant,  $ID_{it}$  is a measure of income diversification of bank i at time t,  $X_{it}^j$  are the bank specific control variables and  $X_{it}^l$  are the macroeconomic indicators that are to be controlled,  $\varepsilon_{it}$  is the error term.

Since bank performance measured by risk adjusted return on assets or the risk adjusted return on equity may have a tendency to persist over the time period due to information asymmetry, lack of perfect competitive conditions and sensitivity to macroeconomic shocks (Berger et al., 2000). Therefore, the researcher used a dynamic panel data model by including a lagged dependent variable among the independent variables. Therefore, the dynamic model is represented by:

$$RROA_{it} = \alpha + \delta RROA_{it-1} + \beta_1 ID_{it} + \sum_{j=2}^J \beta_j X_{it}^j + \sum_{l=2}^L \beta_l X_{it}^l + \varepsilon_{it} \quad (3)$$

$$RROE_{it} = \alpha + \delta RROE_{it-1} + \beta_1 ID_{it} + \sum_{j=2}^J \beta_j X_{it}^j + \sum_{l=2}^L \beta_l X_{it}^l + \varepsilon_{it} \quad (4)$$

Where  $RROA_{it}$  in equation (3) and  $RROE_{it}$  in equation (4) is the risk adjusted return on asset and the risk adjusted return on equity respectively of bank  $i$  at time  $t$ , with  $i=1, \dots, N$ ,  $t=1, \dots, T$ ,  $\alpha$  is a constant,  $RROA_{it-1}$  is the one period lagged Risk Adjusted Return on Assets (dependent variable) in equation 3 and  $RROE_{it-1}$  is the one period lagged Risk Adjusted Return on Equity (dependent variable) in equation 4.  $\delta$  is the speed of adjustment to equilibrium,  $ID_{it}$  is a measure of income diversification of bank  $i$  at time  $t$ ,  $X_{it}^j$  are the bank specific control variables and  $X_{it}^l$  are the macroeconomic indicators that are to be controlled,  $\varepsilon_{it}$  is the error term.

2. To examine the impact of income diversification on bank risk in South Africa.

$$\sigma(ROA)_{it} = \alpha + \beta_1 ID_{it} + \sum_{j=2}^J \beta_j X_{it}^j + \sum_{l=2}^L \beta_l X_{it}^l + \varepsilon_{it} \quad (5)$$

$$\sigma(ROE)_{it} = \alpha + \beta_1 ID_{it} + \sum_{j=2}^J \beta_j X_{it}^j + \sum_{l=2}^L \beta_l X_{it}^l + \varepsilon_{it} \quad (6)$$

Where  $\sigma(ROA)_{it}$  in equation (5) and  $\sigma(ROE)_{it}$  in equation (6) is the standard deviation of return on asset or the standard deviation of return on equity respectively of bank  $i$  at time  $t$ , with  $i=1, \dots, N$ ,  $t=1, \dots, T$ ,  $\alpha$  is a constant,  $ID_{it}$  is a measure of income diversification of bank  $i$  at time  $t$ ,  $X_{it}^j$  are the bank specific control variables and  $X_{it}^l$  are the macroeconomic indicators that are to be controlled,  $\varepsilon_{it}$  is the error term. Since bank risk measured by standard deviation of return on assets or the standard deviation of return on equity may have a tendency to persist over the time period due to information asymmetry, lack of perfect competitive conditions and sensitivity to macroeconomic shocks (Berger et al. 2000). Therefore, the researcher will be using a dynamic panel data model by including a lagged dependent variable among the independent variables. Therefore, the dynamic model is represented by

$$\sigma(ROA)_{it} = \alpha + \delta \sigma(ROA)_{it-1} + \beta_1 ID_{it} + \sum_{j=2}^J \beta_j X_{it}^j + \sum_{l=2}^L \beta_l X_{it}^l + \varepsilon_{it} \quad (7)$$

$$\sigma(ROE)_{it} = \alpha + \delta \sigma(ROE)_{it-1} + \beta_1 ID_{it} + \sum_{j=2}^J \beta_j X_{it}^j + \sum_{l=2}^L \beta_l X_{it}^l + \varepsilon_{it} \quad (8)$$

Where  $\sigma(ROA)_{it}$  in equation (7) and  $\sigma(ROE)_{it}$  in equation (8) is the standard deviation of return on asset or the standard deviation of return on equity respectively of bank  $i$  at time  $t$ , with  $i=1, \dots, N$ ,  $t=1, \dots, T$ ,  $\alpha$  is a constant,  $\sigma(ROA)_{it-1}$  is the one period lagged standard deviation of return on assets (dependent variable) in equation (7) and  $\sigma(ROE)_{it-1}$  is the one period lagged standard deviation of return on equity (dependent variable) in equation (8).  $\delta$  is the speed of adjustment to equilibrium,  $ID_{it}$  is a measure of income diversification of bank  $i$  at time  $t$ ,  $X_{it}^j$  are the bank specific control variables and  $X_{it}^l$  are the macroeconomic indicators that are to be controlled,  $\varepsilon_{it}$  is the error term.

#### 4. Data Analysis and Findings

The main findings of the current research study and the data analysis discussion are included in this part. An overview of the descriptive statistics for the several variables used in this investigation is provided in Table 2.

Table 2: Descriptive statistics

Variables	Mean	SD	Min	Max	Obs
<b>Dependent variable: Performance Measure</b>					
RROA	2.898	0.947	- 2.998	5.737	134
RROE	2.674	1.121	- 2.216	4.946	134
<b>Dependent variable: Bank Risk Measure</b>					
$\sigma(ROA)$	1.786	0.674	0.989	3.261	134

$\sigma(\text{ROE})$	1.283	0.412	0.862	2..961	134
<b>Independent variable : Income Diversification Measure</b>					
ID	0.438	1.045	0.076	0.697	134
<b>Control variables</b>					
SZ	13.227	2.687	7.563	20.839	134
ER	0.465	0.116	0.159	0.726	134
CR	0.528	1.210	0.121	0.896	134
AG	0.302	0.348	0.091	0.493	134
LR	0.589	1.312	0.216	0.862	134
GGDP	4.792	1.361	3.780	7.113	134
IF	5.218	2.216	4.590	8.278	134

**Table 3: Pearson Correlation Matrix**

Variables	RROA	RROE	SD (ROA)	SD (ROE)	ID	AD	SZ	ER	CR	AG	LR	GGDP	IF
RROA	1												
RROE	0.52*	1											
SD(ROA)	0.47*	0.35*	1										
SD(ROE)	0.28*	0.56	0.43*	1									
ID	0.37*	0.41*	-0.22*	-0.59*	1								
AD	0.51*	0.23*	0.48	0.32*	0.59*	1							
SZ	0.45	0.24*	0.37*	0.52*	0.36*	0.63*	1						
ER	0.31*	-0.48*	-0.39*	0.51*	0.43	0.31*	0.56*	1					
CR	0.56	0.31*	0.43*	0.19	0.51*	0.26*	0.39*	0.16*	1				
AG	0.42	0.28*	0.39*	0.41	0.32*	0.29	0.22	-0.42*	0.31*	1			
LR	0.27*	0.39	0.46	0.31*	-0.19	0.25*	0.39*	0.55*	0.17*	0.34	1		
GGDP	0.37	0.22*	0.41	0.36*	0.19	0.41*	0.39*	0.53	-0.31	0.46	0.24*	1	
IF	0.51	0.39	0.24*	0.54	0.33*	0.48*	0.39	0.53	0.33	-0.41	0.32*	0.52	1

\*Significant at 5% level

The table 3 above displays the Pearson correlation coefficient between various variables used in the study. This table highlights the correlation between various dependent, independent and control variables for South Africa. The correlation coefficient between asset diversification (AD) and size (SZ) is the highest at 0.63 and is significant at 5% level of significance. The lowest correlation coefficient of 0.16 is between credit risk (CR) and Equity Ratio (ER). This correlation is also significant at 5% level of significance. Overall, all the correlation coefficients between the independent variables is less than 0.8 which indicates the absence of multicollinearity amongst the independent variables (Hair et. al., 2010). Furthermore, according to Kennedy (2008), multicollinearity between the variables becomes a challenge when the correlation between two variables is greater than 0.70

**Table 4 : Effect of Income Diversification on Bank Profitability and Risk**

Dependent Variable Model	RROA	RROE	$\sigma(\text{ROA})$	$\sigma(\text{ROE})$
RROA (-1)	.221*** (3.367)			
RROE (-1)		0.048** (2.131)		
$\sigma(\text{ROA})(-1)$			.279** (1.892)	
$\sigma(\text{ROE})(-1)$				.316***

				(3.541)
ID	.37** (2.015)	0.069*** (3.712)	-.061*** (2.987)	-.037** (2.183)
SZ	.065** (1.971)	0.041** (2.006)	.032** (2.011)	.019** (1.879)
ER	.037* (0.937)	0.082** (1.892)	.044*** (3.123)	.069** (2.397)
CR	.049** (1.889)	.112** (1.915)	.061* (1.013)	.114* (.915)
AG	.041* (1.114)	0.137** (2.386)	.031** (1.829)	.066*** (2.761)
LR	.026** (2.061)	.071** (1.849)	.076*** (3.711)	.046** (2.219)
GGDP	.031* (0.891)	.066*** (2.912)	.046* (1.522)	.022* (1.112)
IF	.049*** (2.935)	.039** (2.301)	.038** (1.025)	.071 (.030)
Constant	6.91	4.23	7.22	9.21
Adj. R squared	24.958	23.441	28.963	23.881
J-statistic	.291	.119	.215	.189
AR(1)	.033	.021	.012	.047
AR(2)	.185	.216	.151	.264
No. of observations	134	134	134	134

Note : The table shows the system GMM estimation results of the equation (3), (4), (7) and (8) with RROA, RROE,  $\sigma(\text{ROA})$  and  $\sigma(\text{ROE})$  as the dependent variables respectively.

The system GMM dynamic panel model's findings about the impact of revenue diversification on South African banks' profitability and risk are compiled in table 4 above. The association between bank profitability and income diversification has been investigated using two distinct estimate models. The results highlight that income diversification in South African banks significantly enhances their profitability, as measured by the risk adjusted return on assets (RROA) and risk adjusted return on equity (RROE). More specifically, the risk-adjusted return on assets (bank profitability) will rise by 0.037% if income diversification is enhanced by 1%. The results also confirm the persistence of bank profitability measured over time as evidenced by the significance of coefficient of lagged dependent variable (RROA (-1)) at the 1% level of significance with a magnitude of 0.221. The findings also reveal that bank profitability as measured by the risk-adjusted return on equity (RROE) is significantly enhanced by income diversification. Consequently, South African banks have become more profitable as a result of diversifying their revenue streams. A 1% improvement in the revenue diversity of South African banks will result in a 0.069% rise in risk-adjusted return on equity, or bank profitability. At the 5% level of significance, the lagged coefficient of dependent variable (RROE (-1)) is 0.146 and significant. The findings support the persistence of bank profitability. Stated differently, the current risk adjusted return on equity (RROE) is significantly positively impacted by the bank's historical performance as indicated by its risk adjusted return on equity (RROE(-1)).

The column 4 and 5 in the above table summarizes the results of the system GMM dynamic panel model for the effect of income diversification on bank risk with standard deviation of return on assets ( $\sigma(\text{ROA})$ ) and standard deviation of return on equity ( $\sigma(\text{ROE})$ ) as the dependent variables. The coefficient of the lag of the dependent variable ( $\sigma(\text{ROA})(-1)$ ) is 0.279 and is significant at 5% level of significance. The results confirm the persistence of bank risk over time. The coefficient of income diversification (ID) is -0.061 which is significant at 1% level of significance. The results indicate that income diversification has a significant negative impact on bank profitability measured by standard deviation of return on assets. If the income diversification of the South African banks is increased by 1%, it will lead to a decrease in standard deviation of return on assets (bank risk) for these banks by 0.061%. The findings also reveal that bank risk as measured by the standard deviation of the return on equity ( $\sigma(\text{ROE})$ ) is reduced by income diversification in South African banks. The coefficient of income diversification (ID) is -0.037 which is significant at 5% level of significance. The results indicate that income diversification has a significant negative impact on standard deviation of return on equity ( $\sigma(\text{ROE})$ ). Therefore, diversification of the income sources of South African banks has resulted in reduced risk for these banks. If there is 1% increase in income diversification of the South African banks, it will lead to a decrease in standard deviation of return on equity ( $\sigma(\text{ROE})$ ) (bank risk) for these banks by 0.037%.

All the four estimation models are validated by strong diagnostic tests, including Hansen's J-statistic and autocorrelation diagnostics, which confirm model robustness. Hansen's J-statistic confirms the validity of overidentifying restrictions and absence of second-order autocorrelation indicates the absence of serial correlation or model misspecification, thereby ensuring the reliability and robustness of the estimated models. Overall, South African banks have become more profitable as a result of diversifying their revenue streams and have reduced their risk.

**Table 5: Effect of Asset Diversification on Bank Profitability and Risk**

Dependent Variable Model	RROA	RROE	$\sigma(\text{ROA})$	$\sigma(\text{ROE})$
RROA (-1)	.212*** (3.016)			
RROE (-1)		.299*** (2.847)		
$\sigma(\text{ROA})(-1)$			.023*** (2.997)	
$\sigma(\text{ROE})(-1)$				.071*** (4.934)

AD	.041** (2.368)	.027** (1.921)	-.042** (2.278)	-.022** (1.889)
SZ	.062** (1.892)	.051** (1.776)	.022** (1.822)	.071** (1.862)
ER	.024*** (2.892)	.111** (1.891)	.065*** (2.923)	.041* (.991)
CR	.108** (1.712)	.066* (.915)	.005* (.938)	.044** (2.651)
AG	.049* (0.919)	.214** (1.861)	.049** (1.832)	.061* (.998)
LR	.121** (2.261)	.041*** (3.989)	.011*** (3.615)	.077** (2.389)
GGDP	.078* (1.321)	.011* (1.017)	.031* (1.102)	.019** (1.957)
IF	.042** (2.235)	.025* (1.010)	.066** (1.935)	.025* (.991)
Constant	3.84	5.91	6.87	8.47
Adj. R squared	12.693	14.442	16.292	13.995
J-statistic	.211	.198	.193	.248
AR(1)	.016	.041	.031	.018
AR(2)	.097	.133	.159	.112
No. of observations	134	134	134	134

The system GMM dynamic panel model's findings about the impact of asset diversification on South African banks' profitability and risk are compiled in table 5 above. Two different estimation models have been used to examine the relationship between asset diversification and bank profitability. The results indicate that asset diversification has a significant positive impact on risk adjusted return on assets. The coefficient of asset diversification (AD) is 0.041 which is significant at 5% level of significance. Therefore, diversification of the asset sources of South African banks has resulted in enhanced profitability of these banks. If the asset diversification of the South African banks is increased by 1%, it will lead to an increase in risk adjusted return on assets (bank profitability) for these banks by 0.041%. Furthermore, the results confirm the persistence of bank profitability over time. The coefficient of the lag of the dependent variable (RROA (-1)) is 0.212 and is significant at 1% level of significance.

The third column in the above table shows the results with risk adjusted return on equity (RROE) as the dependent variable. The coefficient of the lag of the dependent variable (RROE (-1)) is 0.299 and is significant at 5% level of significance. The results confirm the persistence of bank profitability over time. In other words, the past performance of the bank measured by risk adjusted return on equity((RROE(-1)) has a significant positive impact on the current risk adjusted return on equity (RROE). The coefficient of asset diversification (AD) is 0.027 which is significant at 5% level of significance. The results indicate that asset diversification has a significant positive impact on risk adjusted return on equity. If there is 1% increase in asset diversification of the South African banks, it will lead to an increase in risk adjusted return on equity (bank profitability) for these banks by 0.027%.

The column 4 and 5 in the above table summarizes the results of the system GMM dynamic panel model for the effect of asset diversification on bank risk for South Africa. The coefficient of the lag of the dependent variable ( $\sigma(\text{ROA})(-1)$ ) is 0.023 and is significant at 1% level of significance. The results confirm the persistence of bank risk over time. The coefficient of asset diversification (AD) is -0.042 which is significant at 5% level of significance. The results indicate that asset diversification has a significant negative impact on standard deviation of return on assets. Therefore, diversification of the asset base of South African banks has resulted in reduced risk of these banks. If the asset diversification of the South African banks is increased by 1%, it will lead to a decrease in standard deviation of return on assets (bank risk) for these banks by 0.042%.

The findings also highlight that asset diversification has a significant negative impact on standard deviation of return on equity ( $\sigma(\text{ROE})$ ). The coefficient of asset diversification (AD) is -0.022 which is significant at 5% level of significance. If there is 1% increase in asset diversification of the South African banks, it will lead to a decrease in standard deviation of return on equity ( $\sigma(\text{ROE})$ ) (bank risk) for these banks by 0.022%. The coefficient of the lag of the dependent variable ( $\sigma(\text{ROE})(-1)$ ) is 0.071 and is significant at 1% level of significance. The results confirm the persistence of bank risk over time.

All the four estimation models are validated by strong diagnostic tests, including Hansen's J-statistic and autocorrelation diagnostics, which confirm model robustness. Hansen's J-statistic confirms the validity of overidentifying restrictions and absence of second-order auto correlation indicates the absence of serial correlation or model misspecification, thereby ensuring the reliability and robustness of the estimated models. Overall, South African banks have become more profitable as a result of diversifying their assets and have reduced their risk.

## 5. Conclusion and Implications

The empirical insights from the current research has far reaching implications for bank management, policymakers and regulators in the context of emerging markets such as South Africa. Both revenue diversification and asset diversification prove to be significantly improving risk adjusted profitability while concurrently reducing the risk for the banks. The results highlight the strategic benefit of bank diversification as a means to a sustainable and stable performance amongst the South African banks.

For the management of the banks, the research findings indicate that increasing the weightage of sources of non-interest income such as various fee based services, wealth management services, insurance services, etc. and diversifying the bank's asset bases can lead to significant implications for the bank's financial performance. This will bring in much needed sustainability and financial resilience in an environment marked by uncertainty, increased protectionism and volatility. The recent initiatives by banks in the field of digital financial services, developmental and green financial projects have provided them with the stability of revenue along with operational flexibility in the ever changing financial landscape. Furthermore, asset diversification serves as a perfect tool for managing the risk of concentration. Therefore, banks have diversified their loan portfolios across various sectors and managed the risks of sector-specific downturns.

In the time of enhanced income and asset diversification of the South African banks, the policymakers and financial regulators must become more cautious and come up with novel ways of supervising banks. The South African Reserve Bank (SARB) should therefore be more prudent in promoting diversification. The requirements for risk based supervisory models, multi tiered capital requirements and systematic risk management has become more relevant. Since bank diversification offers strong financial benefits, the central bank should work towards promoting financial innovation while simultaneously ensuring sound risk management for the banks.

To conclude, the significant favourable influence of revenue and asset diversification on bank profitability while concurrently reducing risk confirms it to be one of the proactive strategies for long lasting value creation. The present economic uncertainties make bank diversification a much needed strategic choice to ensure financial sustainability of banks. The findings of the study could be generalized to other emerging economies that are at a similar growth level. Future research could focus on

investigating the effects of bank diversification across various bank ownership structures, varied bank sizes and regulatory environments to have a more granular analysis of bank diversification in South Africa and other emerging economies.

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