Credit risk, operational risk, liquidity risk on profitability. A study on South Africa commercial banks. A PLS-SEM Analysis.

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Abstract

The aim of the research was to explore the influence of credit risk, operational risk, and liquidity risk effect on bank profitability. The study sample was from registered banks on the Johannesburg Stock Exchange (JSE) for the period 2012-2018. Smart PLS-SEM was employed to investigate the impact of the dependent variable on the independent variables. The conclusions of this research indicated that credit risk (non-performing loan ratio, capital adequacy ratio, and cost per loan) has a significant positive association with bank profitability (ROA, ROE, NIM). Similarly, liquidity risk (current ratio, acid-test ratio, cash ratio) shown a positive and significant connection with bank profitability. However, operational risk (portfolio concentration, bank leverage, lawsuit, resignation of key directors) indicated a negative affiliation with bank profitability. The bank-specific risk shown a positive and significant nexus with credit risk, operational risk, and liquidity risk. it's linked with profitability was insignificant. This investigation recommends that commercial banks take proper management of their operational risk by diversifying their investments into portfolios that will yield return, management of their internal and external operations, and decrease their leverage levels.

Keywords: credit risk, operational risk, liquidity risk, profitability, PLS-SEM

1. Introduction

South Africa is known as the emerging economic region and is one of Sub-Sahara Africa's biggest economies. It has tremendous potential emanating from the growing market position in the state-own and individual financial firms. The latest reviews of South Africa's S&P 500 credit ratings, Fitch Ratings, and Moody's have contributed to South Africa's international recognition. Noman et al, (2015) explain the bank's position as the blood arteries in the human body as a bank is the principal source of economic and financial capital for any region. Banks are key to economic development because the banking system controls much of the world's economies (Mendoza and Rivera, 2017).

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Banks are subject to many risks while conducting their business practices, such as credit risk, operating risk, interest rate risk, regulatory risk, market risk, liquidity risk, insolvency risk, and foreign exchange risk. Banking is about taking and handling the risk, rather than preventing it (Mendoza and Rivera, 2017). Among the threats faced by the banks, however, credit risk is considered to be the most critical risk because large sums of bank earnings come from credit as a result of interest paid on credit (Almekhlafi, et al., 2016). Credit risk is a risk resulting from the consumers' failure to pay back their loans or the money they owe to the bank on time and in full (Adekunle, Alalade and Agbatogun, 2015). The Basel Committee on Banking Supervision emphasized the main influences contributing to credit risk are the lenders' stringent credit standard. The nature of the loan that banks give to their clients is the criterion for assessing the security and accuracy of the bank itself, as credit product is the

bank's key asset, they would be vulnerable to bank insolvency owing to the low credit rating. Due to the influx of foreign banks increase in South Africa, the reserved bank has established a monitoring and evaluation team that check non-performing loans of banks monthly. Garr (2013) claimed that financial institutions consider credit risk management challenging and complicated, as the credit risk of financial institutions is challenging to forecast due to individual bank macro and microeconomic influences. In 2015, the South African Reserved Bank (SARB) stated that commercial banks that are not able to maintain their capital adequacy ratio with will close down or merge with other banks. This policy has helped banks in the supervision of credit risk (SARB report, 2015).

The Basel Banking Supervision Committee (BCBS) describes operating risk as to the risk of loss rising from entities, insufficient or ineffective internal processes, programs, or external actions. Power (2005) reported that until the Basel II policy changes to banking supervision, operational risk was partially a remaining category for risks and doubts and not treated seriously. Many high-ranking losses in the financial industry have been attributed to operating risk. Banks with efficient reliability will draw more customers to sustain the economic condition in the country (Iqbal and Molyneux, 2016). Operational failures have contributed to every catastrophic loss since 1990, including the 2007/8 crisis. Most often, however, fraud involves actions carried out independently by third parties, external to the institution but fraud detection systems have been used to great effect in the mitigation of operational risk (Bolancé, Ayuso and Guillén, 2012). Liquidity risk occurs when a bank is unable to match reductions in liabilities or funds capital increases, because of the growing liabilities, an illiquid bank cannot get sufficient reserves. Liquidity problem has played a crucial role in the world's financial crisis in the current scenario (Kim Cuong Ly, 2015). In the banking industry, high liquidity risk exists when clients unnecessarily withdraw the capital from the banks. Besides, liquidity analysis is calculated from the positions in the balance sheet. Calculate appropriate liquidity management strategies focused on using liquidity ratios. Banks continue to keep the positive amount of their loans as critical funds in a central bank account that is used solely to collectively satisfy inter-bank commitments as co-contributor security (Edem, 2017). It means that when currency sources outweigh currency consumption, the liquid treasury is generated and when cash usage exceeds money sources, liquidity shortages are made. This could establish a bank unable to minimize debt or raise reserves for capital expansion. Previous articles have been investigated on the risk and its management in the banking sector. There is no question that bad credit and bad loans thwart banks' financial results as depicted in the literature (Noman et al, 2015; Ruziqa, 2013; Li and Zou, 2014; Gadzo, Kportorgbi, and Gatsi, 2019). Again, as explored by previous kinds of literature have shown that operational risk is a crucial risk that banks must take proper measures to mitigate (Muriithi, 2017; Gadzo, Kportorgbi, and Gatsi, 2019; Aruwa and Musa, 2014; Samuel and Samuel, 2018). Also, the issues of illiquid funding leading to liquidity risk by banks have been reviewed in many articles (Tan, Floros and Anchor, 2017; Ishak, et al., 2016; Ndoka and Islami, 2016; Menicucci and Paolucci, 2016; Li and Zou, 2014; Ruziqa, 2013). None of the above studies combined the used of credit risk, operational risk, and liquidity risk together to investigate its influence on the profitability of banks. The innovation of this article is that it adopted the Smart PLS-SEM path analysis technique than previous studies. Nitzl (2016) asserted that structural equation model (SEM) provides consistency for evaluating these models, allowing one to use multiple predictors and criteria variables, create latent (unobservable) indicators, model errors in the calculation for observed variables, and evaluate mediation and moderation interactions in a single model. It is anticipated that the article would improve works of literature on risk to academics and regulators. Understanding banks' risk-taking activities, particularly those affected by credit risk, liquidity risk, and operating risk, will help regulators build stronger banking regulatory mechanisms in regulating and disciplining banks. The next section of this article is structured according to the following. Section 2 provides literatures and hypothesis for the testing and evaluation for commercial Banks in South Africa of the association between credit risk, operating risk, liquidity risk, and bank profitability. The data and analytical methods are then defined in section 3. The analytical findings are then discussed in section 4. Finally, the findings, policy strategy, and recommendation are outlined in Section 5.

2. Literature Reviews

2.1 Credit Risk and Bank Profitability

Credit risk is defined as a liability that results from the inability of the clients to settle their debt or the funds they were expected to pay to the bank on

time and in full. Credit risk is a risk resulting from the consumers' failure to pay back their loans or the funds they lent to the bank on time and in full (Adekunle, Alalade and Agbatogun, 2015). Among the risks faced by the banks, however, credit risk is regarded to be the most crucial risk since huge amounts of bank profit come from credit as a result of interest earned on credit (Almekhlafi, et al., 2016). Kolapo, Ayeni and Oke (2012) also claimed that the key factors contributing to credit risk are bad management, ineffective loan policy, interest rate volatility, weak capital and liquidity rates, insufficient credit appraisal, improper lending procedures, bad lending underwriting, government intervention, and ineffective central bank regulation. According to Garissa (2013), the most widely used by analysts is the non-performing loans to total loan ratio (NPLR), as non-performing loans present a significant danger to the banking system and would directly impact the bank's profitability as a consequence of the bad loans. Kayode et al., (2015) found that increased credit risk notoriety lowers bank profit margins and strongly suggested effective savings account mobilization, a vigorous credit risk motivational tactic, and adequate default deterrence. Li and Zou (2014) investigated the association between credit risk and profitability in the banking sector in Europe. The finding of the research indicated that credit risk calculated by non-performing loans ratio has an adverse influence on profitability (ROA & ROE). However, capital adequacy ratio indicated an insignificant influence on profitability. In Ghana, Samuel, Dasah and Agyei (2012) article investigation indicated a positive affiliation between credit risk administration and profitability calculated by ROE of registered banks for the dated 2005 up to 2009. Suganya and Kengatharan (2018) performed a analysis in Sri Lanka, the article found that bank capital had a favorable impact on bank profitability while operational cost-effectiveness and non-performing loans displayed an adverse profitability connection. Noman et al. (2015) investigated the affiliation between capital adequacy and the bank's profitability in Nigeria. The analysis output indicated that capital adequacy is favorably connected to the bank's profitability but insignificant to the bank's efficiency. Ndoka and Islami (2016) studied the influence of credit risk management on the profitability of the Albanian universal banks during 2005-2015. They used ROA and ROE as the proxy for profitability, NPLR as the indicator of credit risk, and CAR as the indicator of capital adequacy. They

conducted the research from 16 banks operates in Albanian and found that no significant affiliation between capital adequacy and the bank's profitability. From the above works of literature, there are missed findings on the connection between credit risk and bank profitability. This article developed the first hypothesis.

H1: Credit risk is negatively connected with the bank profitability of registered banks in South Africa.

2.2 Operational Risk and Bank Profitability

The Basel Committee for Bank Supervision poses seven types of operating risks: internal fraud resulting in losses due to the intention to ignore the internal regulation; external fraud resulting in losses due to a third party's conduct which has the aim of undermining and disregarding the bank regulations. Operational risk impacts all Financial Institutions' practices and processes in different ways. Nevertheless, management considers organizational events that are due to entities, procedures, structures, and outside incidents. However, operating threats do not impact the systems in the same way. The effect varies according to the complexity of the operations and the various groups involved. The Basel Committee (Basel II) recommends three separate methods for assessing the regulatory capital charge on operating risk; Basic indicator approach, standardized, and advanced measurement tactic. The concept of operational risk used by regulators and financial firms is "the danger of loss from insufficient or ineffective internal procedures, entities, and structures, or an external event, "Robertson indicates that the lack of due diligence that leads to the financial crisis was a type in operational danger. Notably, he sees the entire situation as "formed of operational risk"(Robertson, 2011). Suganya and Kengatharan (2018) investigation resulted that operating risk and non-performing loans ratio resulted in a negative whiles bank capital indicated a positive association. The inability to handle operating risk in banks and mortgage lenders contributed to poorly reported loans due to incorrect or inadequate creditworthiness appraisal of borrowers (Andersen et al., 2012). McNulty, Akhigbe and Bradley (2013) analysis from Jordan financial crises indicated that high legal expense predicts weak future bank performance. Legal risk is a type of operating risk, a major concern for bank regulators (Bank Advisory committee, 2006; Koch & MacDonald, 2010). Implying that a poor operational culture illustrated

by conflicts between departments and individuals is one of banking's most important threats. In Bahrain, Abu Hussain and Al-Ajmi (2012) investigated the connection of risk administration practices of Conventional and Islamic banks, the findings indicated that operational risk is positively linked to bank efficiency. Also, Aruwa and Musa (2014) in Nigeria research on deposit monetary banks from 1997-2011. The results of the article indicated an adverse connection between operational risk and performance of banks. Al-Tamimi, Miniaoui and Elkelish (2015) studied the financial risk of GCC Islamic banks from the period 2000-2012. The investigation of the study indicated that operational risk was negatively connected with performance. These precious pieces of literature confirm similar negative relation of operational risk with bank profitability (Gadzo, Kportorgbi and Gatsi, 2019; Marwan and Rohami, 2018). This article developed the second hypothesis.

H2: Operational risk has a negative connection with the profitability of registered commercial banks in South Africa.

2.3 Liquidity Risk and Financial Performance

Liquidity is a bank's capacity to raise the funds to satisfy its quick-term requirement without suffering excessive damages. The bank's failure supply liquidity may lead to an increase in a liquidity risk arising from the discrepancy between the resource and the maturity of the liability, or from an unforeseen event occurring at that period (Maaka, 2013). The banking's basic role remains constant in Banking Theory history. Risk, capital, and liability management remain the central feature of the banking business. The early warning of a great decline can be obtained from liquidity risk fluctuations. Consequently, banks need to keep the positive amount of their loans as vital funds in an account with the reserve bank that is essentially used to collectively satisfy inter-bank obligations as lender security (Edem, 2017). In the banking industry, high liquidity risk exists when clients unnecessarily withdraw the cash from the banks. This affects the possibilities of banking success antagonistically by putting back should be consumers and bank manageable purchasers. As a result, the operation of banks decreases dramatically and results in a vital income reduction (Ejoh, Okpa, and Egbe, 2014). Mamatzakis and Bermpei (2014) analyzed core factors that describe the success of the G7 and Switzerland banks. The

survey consists of 97 financial institutions. Group data review discoveries specify that liquidity risk has an adverse impact on the profitability of the banks. Nevertheless, the Z-Score proxied banking stability exerts a favorable impact. The association between liquidity risk and enterprise performance was researched by Arif and Nauman (2012). The findings of 22 banks studied in Pakistan indicated that liquidity risk was significantly negative with bank performance. Testing 7 registered banks in Ghana during the 2005-2010 period, Lartey, Antwi and Boadi, (2013) investigation indicated a poor positive impact of liquidity on the efficiency of the banks. In the year 1998-2014, Marozva (2015) used a sample of South African banks to observe the connection between liquidity risk and bank profitability. Bank success in this analysis is being proxied by the NIM. ARDL-bound findings show a negative and favorable correlation between liquidity risk and bank output. There has been miss finding on the link between liquidity risk and bank profitability, studies have shown a negative connection among the two variables (Rifqah and Hafinaz, 2019; Tan, Floros and Anchor, 2017; Menicucci and Paolucci, 2016). From the above articles, this research developed the hypothesis between the two variables.

H3: There is an adverse nexus between liquidity risk and bank profitability.

2.4 Mediating effect of Bank Specific Risk on Operational Risk, Credit Risk, Liquidity, and Profitability

Kaur and Sharma (2019) explored liquidity risk and credit risk of commercial banks in India and observed that size of bank and competitiveness had affected liquidity risk and credit risk for both public and international banks. Ruslan et al, (2019) in Indonesia, the finding of the research revealed that bank size had a significant and positive influence on bank efficiency. In Ghana, Takyi et al, (2019) studied on the impact of company size and profitability of registered institutions, the results of the article indicated that the size of the institution was negatively associated with ROA but insignificant. Kimondo, Irungu and Obanda (2016) study into 50 companies in Kenya. The size was a suggested control variable with an insignificant relation to the financial performance of the company as determined by ROE. Osuji and Odita (2012) consider AQ to be a significant determinant of the success of a company. Samuel and Samuel (2018) have found, from the Ghanaian viewpoint, a favorable

relationship between the financial performance of commercial banks and AQ. Gatsi et al (2016) argued that a company that maintains substantial investments in real assets would have lower financial loss costs than a business that depends on intangible resources. Similarly, Kasavica and Jovic (2015) research the influence of asset quality on bank profit, in Serbia and find out that asset quality had a significant and positive impact. Equity ratio measures the level of a bank's total equity with its net assets. The variable has been used by previous studies as a control variable and has proven to be significant. (Gadzo, Kportorgbi, and Gatsi, 2019).

H4a: Bank specific risk has a positive effect on profitability.

H4b: Bank specific risk has a positive influence on credit risk.

H4c: Bank specific risk has a positive influence on operational risk.

H4d: Bank specific risk has a positive influence on liquidity risk.

2.5 Research Framework Development

This article developed a framework according to the work of literature from the concept of credit risk, operational risk, liquidity risk, and profitability of banks.
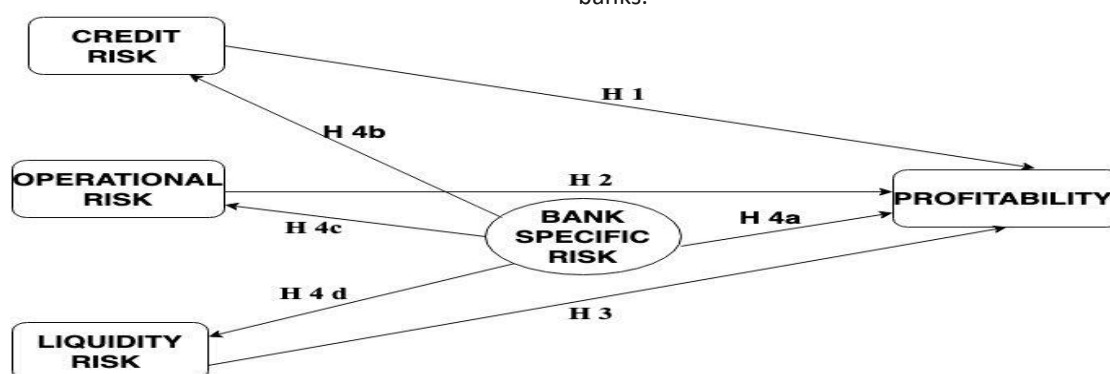

Figure 1 Framework of the study.

3. Methodology
3.1 Research design

Research methodology has been explained by many academics as a means through which research is conducted. This article is a quantitative analysis that looks at the relationship between factors, is numerically calculated and evaluated using a statistical method. Causal analysis is considered satisfactory as it seeks to clarify the interaction between variables (Team, 2014). This article attempts to find the relationship the exit between an enterprise's operational risk, credit risk, and bank-specific risk influence on the financial profitability of the banks. The researcher collected data from all registered banks on the Johannesburg Stock Exchange (JSE) from 2012 – 2018. However, banks that have been suspended, gaps in financial accounts were all removed from the list. The remaining banks accounted for 54 registered banks. Tripathy (2015) suggested on ethical grounds that if the facts were publicly accessible on the Internet, books, or other public footers. This analysis acknowledged all sources from which facts or data are derived. For the analysis model and the structural models, the smart PLS-SEM methodology (Ringle, Wende and Becker, 2015) was used to

immediately determine and test the consistency and differentiate the validity of the calculation. Applying Cronbach's Alpha and composite reliability test has checked the accuracy of all variables. The constructs 'reliability coefficient value was found to be high with a result of 0.889 which is greater than 0.7 (Hair et al., 2010). Chin, Marcolin and Newsted (2003) proposed PLS would be an efficient means of reducing error computing. Testing of the PLS model consisted of 2 stages, one calculating model was evaluated in stage 1 and the structural model in stage 2. The correlations between apparent variables and the latent variable were determined using the estimation model tested side-side test. The model developed for the analysis is depicted in Figure 1.

3.2 Regression Model development

$ROA = a0 + \beta_1 CR_{it} + \beta_2 OPR_{it} + \beta_3 LQDTY_{it} + \beta_4 BSR + \varepsilon_{it} \ ....(1)$

$ROE = a0 + \beta_1 CR_{it} + \beta_2 OPR_{it} + \beta_3 LQDTY_{it} + \beta_4 BSR + \varepsilon_{it} \ ....2)$

$NIM = a0 + \beta_1 CR_{it} + \beta_2 OPR_{it} + \beta_3 LQDTY_{it} + \beta_4 BSR + \varepsilon_{it} \ ....(3)$

Where ROA, ROE, and NIM represent financial profitability, a is the constant variable, $\beta_1, \beta_2, \beta_3$ are the beta coefficients, with OPR for operational

risk, CR for credit risk, and BSR for bank-specific risk. ε for errors.

3.3 Variable measurement

i) Financial profitability

The financial profitability was measured by three construct variables ROA, ROE, and NIM. The previous article has employed similar variables to measure profitability (Limei et al, 2019; Li & Zou, 2014; Noman et al., 2015). ROA= net income / total assets, ROE = net income / total equity, and NIM = earnings before tax / total revenue.

ii) Operational risk

The operations of the banks consist of the internal and external activities that directly or indirectly affect the financial profitability of the banks. This article adapted from other kinds of literature four (4) indicators to measure the operational risk of the banks. These variables are used by (Gadzo, Kportorgbi, and Gatsi, 2019; Abu Hussain and Al-Ajmi, 2012; Aruwa and Musa, 2014; Samuel and Samuel, 2018). *Retired or resign of a key director* (if yes – 1; no – 0), *Lawsuit losses* – this is measured by the total cost of a lawsuit by total assets, *Portfolio concentration* - bond, common stock, preferred stock, mortgage loan, real estate by total investment, and *Bank leverage* proxied by bank leverage divided by total shareholders fund.

iii) Credit risk

The credit risk of the bank is the main constraint that banks face as most of the profit of the banks is from credit granted to customers. Studies on credit risk are not something new, as the development of an economy depends on the financial resources provided by financial institutions. This article developed four indicators to measure for the proxy of credit risk against the profitability of the enterprises as similar variables have been used to test the strength of credit risk (Mendoza and Rivera, 2017; Noman et al, 2015; Limei et al, 2019; Li and Zou, 2014; Kolapo, Ayeni and Oke, 2012; Ruziqa, 2013). *Non-performing loans ratio* (*NPLR*) - analysis with the total non-performing loans against total loans; *Total Loans to Total deposit (TLTD)* - total loans divided by net deposit of the enterprise. *Capital Adequacy Ratio (CAR)* - measured by tier 1 and 2 capital divided by its risk-weighted asset; *Cost per loan (CPL)* – operating cost / total loans

iv) Liquidity risk

The management of liquidity risk is the first call for banks, as banks never know when customers will come to withdraw their deposits. Therefore, make sure there is enough cash each day to set-off withdrawal. Liquidity is the cash and liquid cash available to meet short-term debts. From previous research, this article adopted and developed three variables to measure liquidity risk of the banks (Tan, Floros and Anchor, 2017; Ishak, et al., 2016; Ndoka, Islami and Shima, 2016; Menicucci and Paolucci, 2016; Li and Zou, 2014; Ruziqa, 2013; Kolapo, et al., 2012). *Current ratio (CR)-* current assets / current liability; *Cash Ratio (CaR) -* Cash and cash equivalent / total liabilities; *Acid Test Ratio (ATR)-* Cash + accounts receivable + marketable security / current liabilities

v) Bank specific

To measure the cause and effect of risk indicators on profitability, this article introduced the effects that bank-specific risk can cause the interaction between this relationship. The bank-specific risk will help to mediate if when these are presented into the model can they cause the relationship between risk factors and profitability positively or negatively. The study used three variables according to their effects from previous studies (Gadzo, Kportorgbi, and Gatsi, 2019; Osuji and Odita, 2012; Gatsi et al, 2016; Takyi et al, 2019). *Asset quality (AQT) -* impairment cost / gross loans and advances; *Equity ratio (EQR) -* Net Equity / Total asset; *Firm Size* (SZ) - Natural log of total assets.

4 Results and discussions of data analysis

Partial Least Squares Structural Equation Model was utilized to evaluate the exploration model by using the product Smart PLS 3.0 (Ringle, Wende, and Becker, 2015). The primary reasons behind selecting PLS-SEM as a practical strategy for this analysis is that PLS-SEM offers the best examination which prompts increasingly exact evaluations.

4.1 Measurement Model Assessment (Reliability and validity analysis)

The individual Cronbach's alpha, the composite unwavering quality (CR), The normal change extricated (AVE), and the factor loadings surpassed the recommended worth (Hair, Black, Babin, and Anderson, 2010) as indicated in Table 1. How much the articles recognize among ideas or measure various develops is shown by discriminant legitimacy. Fornell-Larcker was utilized to examine the estimation model's discriminant legitimacy. *Table 2* indicated the results for discriminant legitimacy by utilizing the Fornell-Larcker condition. It was reported that the AVEs' square root on the diagonals is greater than the connections, proposing a solid relationship between the idea and their separate indicators in contrast with different ideas in the model (*Fornell & Larcker, 1981).* As per Hair

(2017), this indicate a great discriminant acceptability with the connection below 0.85.

Table 1. Factor loadings

	Proxy	Loadings	Cronbach's Alpha	Rho_A	Composite reliability	Average variance extraction
Bank specific risk			0.950	0.951	0.968	0.910
	AQT	0.943				
	EQR	0.967				
	SZ	0.951				
Credit risk			0.780	0.791	0.858	0.603
	NPLR	0.757				
	TLTD	0.725				
	CAR	0.839				
	CPL	0.779				
Liquidity risk			0.845	0.860	0.906	0.763
	ATR	0.879				
	CR	0.827				
	CaR	0.913				
Operational risk			0.775	0.801	0.847	0.682
	DIR	0.736				
	LEV	0.733				
	LSL	0.721				
	PFC	0.855				
Profitability			0.731	0.737	0.848	0.651
	ROA	0.777				
	ROE	0.855				
	NIM	0.786				

Table 2 Discriminate validity (Fornell-Larcker Criterial)

	Bank specific risk	Credit risk	Liquidity risk	Operational risk	Profitability
Bank specific risk	0.954				
Credit risk	0.682	0.776			
Liquidity risk	0.582	0.361	0.874		
Operational risk	0.621	0.596	0.606	0.763	
Profitability	0.608	0.733	0.585	0.360	0.807

**Diagonals denote the square root of the average variance extracted, and the remining entries signify the correlations.

4.2 Structural Model Assessment

The Smart PLS model *(Figure 2)* is authenticated by Endogenous Latent Variable and Goodness of fit (GoF). The proposed goodness of fit is 0.627 (RMS-Theta) which surpasses the suggested threshold values of GoF>.36 suggested by Woetzel et al., (2018). Thus, this study confirmed and concluded that the research model developed by the researcher has an on the whole or overall goodness of fit. Smart PLS software was used to observe the

structural model as confirmed in the research. Path coefficient assessment *(table 3 and figure 3)* is included in the structural model indicating the influence of the relations among the R-square value, independent, and dependent. Using a bootstrapping process with a resample of 5,000, the structural model can be assessed by computing beta (β), R2, and the corresponding t-values (Hair, 2017). A meaning points of five per cent (p<0.05) is used as a measurement. The level of significance using the extent of the identical factor estimates between the constructs is indicated in the resultant t-value. *Table 3 and figure 3* briefs the result of the structural model.
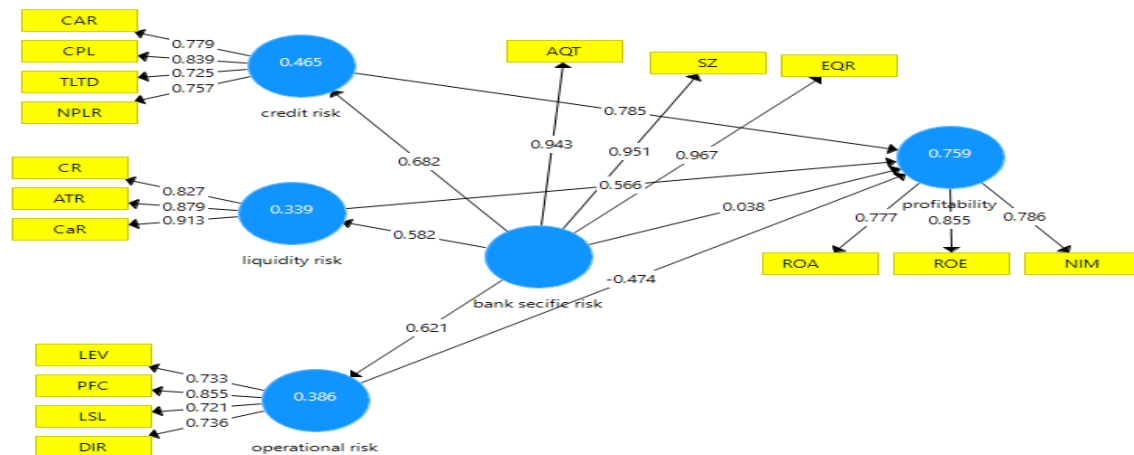

Figure 2 presenting initial PLS analysis

Table 3 Path coefficient

	Original sample (0)	Sample mean(M)	Standard deviation (STDEV)	T statistics(lO/stdevl)	Decision	P values
Bank specific risk<-credit risk	0.682	0.679	0.088	7.711	Supported	0.000
Bank specific risk<-liquidity	0.582	0.578	0.097	6.018	Supported	0.000
Bank specific risk<-operational risk	0.621	0.633	0.103	6.049	Supported	0.000
Bank specific risk<-profitability	0.038	0.054	0.133	0.283	Not supported	0.777
Credit <- profitability	0.785	0.794	0.106	7.381	Supported	0.000
Liquidity risk<-profitability	0.566	0.535	0.143	3.965	Supported	0.000
Operational risk<-profitability	-0.474	-0.473	0.141	3.353	Supported	0.001

***Path coefficient bootstrapping. T Statistic > 1.96 for 5%; p< .005

The relationship between credit risk and profitability was supported and significant with the original sample (β) = 0.785, statistics (t) = 7.381 and significant p-value 0.000, (p <0.05 indicates that

credit risk and profitability have a positive relationship and the influence of credit risk does not affect the profits of the banks. The relationship between liquidity risk and profitability was supported, and significant with the original sample (β) = 0.566, statistics (t) = 3.965, and significant p-value at 0.000, (p < 0.05 indicates that liquidity risk has a favorable effect on profits of the enterprise.

The relationship between operational risk and profitability was supported and significant with a negative β = -0.474 and statistics (t) = 3.353 indicating that a firm's operational risk has a negative significant impact on the enterprise's profits. The relationship between a bank-specific risk and profitability was not supported and insignificant with the original sample (β) = 0.038, statistics (t) = 0.777 and significant value (p)>0.05 indicates that bank-specific risk affects profitability but its effects are insignificant.

On the testing the mediating role of bank-specific risk on credit risk and bank profitability, the connection resulted in a β = 0.682, and statistics (t) = 7.711 indicating that bank-specific risk influences the link between credit risk and bank profitability in a positive effect. Again, the resultant of bank-specific risk association between liquidity indicated a β = 0.582, and statistics (t) = 6.018 meaning that the effect of bank-specific risk influence is supported by the link between credit risk and profitability. Finally, the impact of bank-specific risk connection on operational risk and profitability resulted in β = 0.621, and statistics (t) = 6.049 with a significant p-value 0.000 (p <0.05). Below is the diagram show the bootstrapping of the connection between risk variables and profitability of enterprise listed on the Johannesburg Stock Exchange.
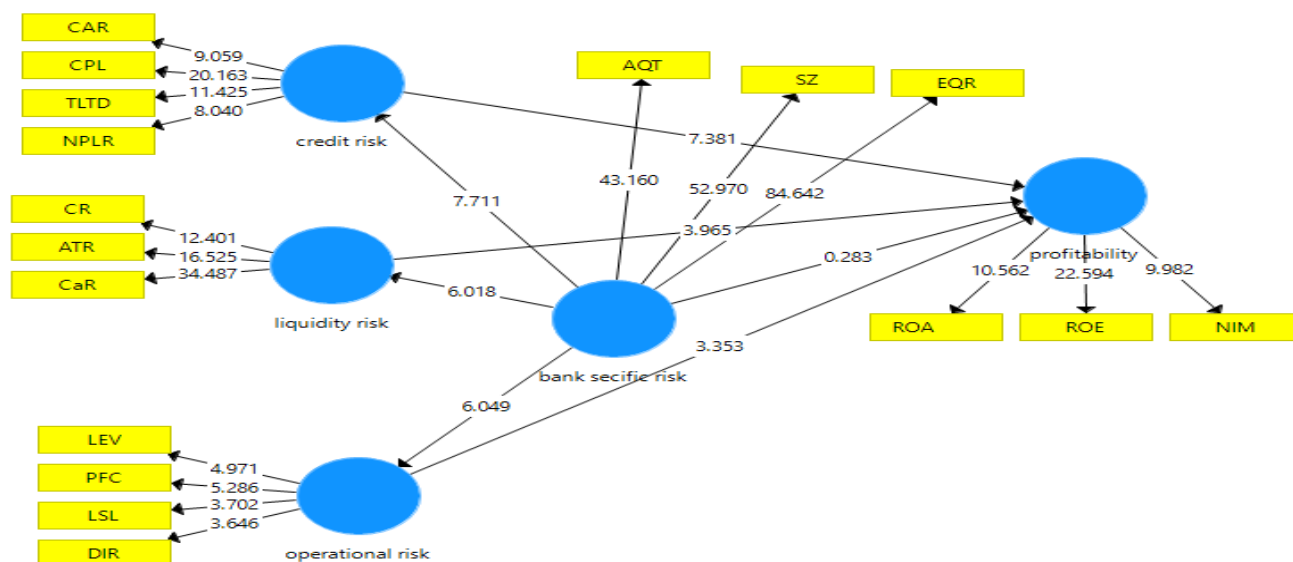

Figure 3 presenting bootstrapping of PLS analysis

4.3 Discussion of Results

From the Smart PLS-SEM analysis of 54 registered commercial banks both private and public on the Johannesburg Stock Exchange (JSE), this article studied the influence of credit risk, operational risk, liquidity risk, and bank-specific risk on the profitability of banks.

The article developed some hypotheses to test the connection between risks and profitability. The association between credit risk and profitability was measure by 4 constructs non-performing loan ratio, capital adequacy ratio, cost per loan, and total loans to the total deposit. The Basel committee in 2016 stated that credit creation is the main source of live

survival for banks. Therefore, banks that are not able to manage credit get into insolvency. The article's null hypothesis indicated a negative link exiting between credit risk and profitability *(H1).* The results of this article rejected the null hypothesis and adopted the alternative hypothesis. As depict in *table 1 and figure 3,* credit risk indicated a positive link with bank profitability. The finding of this research is in support of studies conducted in Ghana by Samuel, Dasah and Agyei (2012) indicated that credit risk had a positive association with profitability as a proxy by ROE. Similarly, (Suganya and Kengatharan, 2018; Noman, et al., 2015) in their research also find a positive connection between

credit risk and profitability. The finding of this study, however, are not in support of the results of (Limei et al, 2019; Gadzo, Kportorgbi, and Gatsi, 2019) whose article indicated a negative association between credit risk and profitability. The key factors contributing to credit risk are bad management, ineffective loan policy, interest rate volatility, weak capital and liquidity rates, insufficient credit appraisal, improper lending procedures, bad lending underwriting, government intervention, and ineffective central bank regulation (Kolapo et al. 2012). A positive credit means that banks in South Africa put proper measures to mitigate these problems stated.

To test the association between operational risk and profitability, the study developed the second hypothesis *(H2- operational risk has a negative influence on bank profitability).* As indicated in *table 1 and figure 3,* the bootstrapping results show an inverse coefficient and were supported by the hypothesis developed. Therefore, the null hypothesis was accepted and the alternative rejected. The findings of this article support the works of (Aruwa and Musa, 2014; Al-Tamimi, Miniaoui, and Elkelish, 2015; Gadzo, Kportorgbi, and Gatsi, 2019) whose investigation into the association resulted in a negative link between operational risk and profitability. As stated by the Basel Committee, operational risk can be reduced or mitigated through three ways; Basic indicator approach, standardized approach, and advanced measurement approach. Similarly, Robertson (2011) stated that operational risk is the failure of the inner and outer operations of the firm. The finding proved that banks in South Africa do not have proper internal and external control measures to mitigate operational risk. The third risk studied was liquidity risk. Liquidity risk measures the liquid and solvency of the bank. The next Hypothesis *(H3- liquidity risk has a negative connection with the profitability of the banks in South Africa).* As depleted in *table 1 and figure 3* path analysis and bootstrapping results liquidity risk shows a positive association with the bank's profitability. The results of this study support previous work of Njure (2014) in Kenya and find a positive connection with profitability. Similarly, Lartey, Antwi and Boadi, (2013) explored the influence of liquidity risk on 7 registered banks in Ghana, the results indicated a positive significant affiliation between liquidity risk and profitability. However, other studies did find a negative association between the two variables (Mamatzakis and Bermpei, 2014; Marozva, 2015; Rifqah and

Hafinaz, 2019). Positive liquidity means that the banks in South Africa are keeping enough cash and cash equivalent to meet the pressing withdrawal by customers. Finally, the study introduced some mediating bank-specific risk indicators which have been similarly been used as controls variables by previous work on the relationship between risk and bank profitability. To test this hypothesis, the article introduce *H4a- bank-specific risk has a positive influence on profitability; H4b- bank-specific risk has a positive connection as a mediating between credit risk and bank profitability H4c - bank-specific risk has a positive impact as a mediating between operational risk and bank profitability and H4d - bank-specific risk has a positive association as a mediating between liquidity risk and bank profitability.* As indicated in table 1 and figure 3 path analysis and PLS-SEM bootstrapping results, bank-specific risk had an insignificant positive influence on bank profitability. The relationship between bank-specific risk and the other three risk constructs all indicated a positive and significant effect on bank profitability. The article results have shown that registered banks on the Johannesburg Stock Exchange (JSE) are putting proper measures to mitigate credit risk, operational risk and liquidity as recommended by the Basel Accord and following the guidance put place the SARB.

5. Conclusion and Policy Recommendation

The conclusions from this research indicate that credit risk, operational risk, liquidity risk, and bank-specific risk influence the bank profitability of South African registered firms on the Johannesburg Stock Exchange (JSE). The findings of this article indicated that credit risk as measured by non-performing loan ratio, cost per loan, total loans to total assets, and capital adequacy ratio exhibited a positive link with profitability proxied by ROA, ROE, and NIM. From this outcome, this research can state that bank managers have proper measures in place to monitor loans granted to third parties and these loans are paid back on time. Similarly, the minimum capital requirement by the Basel Committee is been maintained and the cost of the loan is kept at a minimum with proper moral and adverse selection are been put in place. On the part of operational risk, the study findings showed an adverse effect on bank profitability. The operational risk was calculated using lawsuit losses, portfolio concentration, leverage, and loss or resign of key directors. Furthermore, liquidity risk indicated a significant favorable association with bank's profitability (ROA,

ROE, and NIM) with liquidity risk proxied by current ratio, acid-test ratio, and cash ratio. The Basel accord III stated that the bank should keep enough cash to meet short-term demands for at least 30-days. Finally, the bank-specific risk which was employed as a mediating indicator between the three risk variables (credit risk, operational risk, and liquidity risk) and bank profitability (ROA, ROE, and NIM). The bank-specific risk results have confirmed the studies of other similar articles, asset quality, equity ratio, and bank size have significant positive effects on credit risk, operational risk, and liquidity risk of banks in South Africa.

5.1 Theoretical contributions

This article has promoted an integrated study on the drivers of the enterprise's risk strategy. In the past, most of the studies were conducted using the regression model. However, this paper adopted the Smart PLS-SEM analysis method to analyze the key issues influencing the decision-making of risk. This study proposes that credit risk, operational risk, liquidity risk, and bank-specific risk have an all-inclusive impact on bank profitability. This research discovery will help managers, credit risk officers, and other stakeholders of risk better understand the root causes of the enterprise's risk strategic choice, and it will also provide a useful reference value for the enterprise to choose the risk management strategic model more effectively. Second, the study has contributed to the studies and recommendations by the Basel Accord Committee on Basel I, II, and III. Whether the enterprise can make full use of the risk management resources and capabilities and translate them into opportunities for the risk strategy depends on the concern of the top management's risk awareness.

5.2 Implications for strategy and policy

From the finding of the research, the following strategic management planning is required for the success of risk management practices in commercial banks in South Africa. Management should consider risk and its's management as crucial accept of the day-day business activities benefit out weights the cost. As the finding of the study indicates a positive and significant link between the risk variables with bank profitability. Businesses should make proper use of the available resources and capabilities of staff to reduce the internal and external operational risk associated with banks in South Africa. Banks show invest their resources in portfolios that have a good return, and also change the cost associated with their leverage and operating expenses. The central bank monitoring team should visit banks regularly to check their operations and conduct short courses for banking staff on the management of risk in the banking sector.

5.3 Limitations of the study

There are drawbacks to this article's sample source. The research sample comes mainly from the banks registered in South Africa for a period from 2012-2018 due to resource constraints. Information may be obtained in a wider range in the future to increase the generalizability of the research results. The data on credit risk, operational risk, liquidity, bank-specific risk, and profitability indicators were all accumulated to form single variables for the analyses. Future studies can adopt other means to collect and analyze the variables. Again, this article adopted the Smart PLS-SEM as means of measurement of variables. Later studies can employ other means such as GMM, Multiple regression, and Structural equation model (AMOS). Despite the shortfalls, this research is important for companies and state banking regulator agencies, as it seems likely that the thirst to have better risk management will continue persistently.

Note: All data can be acquired though the Johannesburg Stock Exchange (https://www.african-markets.com/en/stock-markets/jse)

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