

**EFFECTS OF FINANCIAL RISK ON PROFITABILITY OF COMMERCIAL BANKS LISTED IN THE NAIROBI SECURITIES EXCHANGE**

**Kiragu Duncan Ndegwa**

PhD Scholar, University of Nairobi

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**Abstract**

Profitable and strong banking system promotes broader financial stability and increases the economy's resilience to adverse macroeconomic shocks. The current challenges' facing the financial services industry includes customer retention, financial risk, legal and compliance risk, strategic risk, technological risk and stiff competition from MFIs, mortgage firms and SACCOs. The study focused on the effects of financial risk on profitability of commercial banks listed in the Nairobi Securities Exchange. The study used quantitative research design. Time Series Cross Sectional (TSCS) data was used. Panel data estimation technique was adopted. The target population of this study comprised of all the 11 commercial banks in Kenya that are listed in the Nairobi Securities Exchange. The study employed secondary data that was extracted from audited financial statements and annual reports of listed commercial banks over the 10-year period, 2007 to 2016. The collected quantitative data was edited and coded and entered into a Stata version 14 for analysis. Both descriptive and inferential statistics was used to analyses the quantitative data. The study established that there was a strong correlation between profitability and credit risk. The study found that an increase in market risk would lead to decrease in profitability. The study revealed there was strong correlation between profitability and market risk. The study also found that liquidity risk was statistically significant in affecting profitability of commercial banks. The study revealed that an increase in operational risk would lead to decrease in profitability. The study recommends there is need for the management of commercial bank to control their credit risk, through non-performing loan level as it was revealed that credit risk negatively affect the financial performance of commercial banks in Kenya. The management of commercial banks in Kenya should hedge against market risk as it was found that market risk negatively affect the profitability of commercial bank in Kenya.

**Keywords:** *Financial risk, profitability, credit risk, market risk, liquidity risk, operational risk*

**INTRODUCTION**

Profitable and strong banking system promotes broader financial stability and increases the economy's resilience to adverse macroeconomic shocks. A healthy and sustainable profitability is important in maintaining the stability of the banking system and for sustainable economic growth in general (Tafri, Hamid, Meera & Omar, 2013). Risk is inherent in every business, but organizations that embed the right risk management strategies into business planning and

performance management are more likely to achieve their strategic and operational objectives. Taking risk is core to the Bank's business, and risks are an inevitable consequence of being in business. The bank's aim is therefore to achieve an appropriate balance between risk and return and minimize potential adverse effects on its performance. Dynamic business practices and demanding regulatory requirements mean that organizations require a broader and clearer perspective on enterprise-wide risk than ever before (Wei, 2013).

Financial risk is the quality control of finance. It is a broad term used for different senses for different businesses or things but basically it involves identification, analyzing, and taking measures to reduce or eliminate the exposures to loss by an organization or individual. Various authors including Stulz (2016) have offered reasons why managers should concern themselves with the active management of risks in their organizations. The main aim of management of banks is to maximise expected profits taking into account its variability/volatility (financial risk). Risk management is pursued because banks want to avoid low profits which force them to seek external investment opportunities. When this happens, it results in suboptimal investments and hence lower shareholders' value since the cost of such external finance is higher than the internal funds due to capital market imperfections (Siba, 2012). There are five main types of financial risks classified in the following categories:

**Credit Risk;** the analysis of the financial soundness of borrowers has been at the core of banking activity since its inception. This analysis refers to what nowadays is known as *credit risk*, that is, the risk that counterparty fails to perform an obligation owed to its creditor. It is still a major concern for banks, but the scope of credit risk has been immensely enlarged with the growth of derivatives market.

**Interest Rate Risk;** Interest rate risk is founded on variations on interest rates and can be perceived in different forms. The first methods refer to variation in interest rates in joining with variable loans and short-term financing. An increase in the interest rate leads to higher interest payments for the variable rate loan and more expensive follow-up funding. This decreases the company's earnings and can in worst case lead to financial distress.

**Foreign Exchange Risk;** Exchange risk occurs when a company is involved in international business and the cash in or outflows are in a foreign exchange rate. As this rate is not fixed and cannot be fully anticipated a possible change in a foreign exchange rate leads to the risk of changes in the amount of a payable / receivable and by that a change in the amount of money the company has to pay / will receive. This risk is measured by the concept of transaction exposure (Kargi, 2011).

**Capital Management Risk;** Capital requirement is of great importance under the Basel Accords and these set the guide lines for the financial institutions. It is internationally accepted that a financial institutions should have capital that could cover the difference between expected losses over some time horizon and worst case losses over the same time horizon (Greuning & Bratanovic, 2013).

**Liquidity Risk;** According to Greuning and Bratanovic (2012), a bank faces liquidity risk when it does not have the ability to efficiently accommodate the redemption of deposits and other liabilities and to cover funding increases in the loan and investment portfolio. These authors go further to propose that a bank has adequate liquidity potential when it can obtain needed funds (by increasing liabilities, securitizing, or selling assets) promptly and at a reasonable cost.

Company motives for managing financial risks are the same as those for employing a risk management, as financial risks are a subgroup of the company's risks. One of the main motives is to reduce the instability of earnings or cash flow due to financial risk exposure (Dhanini,

2014). The reduction enables the firm to perform better forecasts (Drogt & Goldberg, 2014). This will help to guarantee that sufficient funds are available for the company for investment and dividends (Ammon, 2014). Another reason for management of financial risks is to avoid financial distress and the costs connected with it (Triantis, 2010; Drogt & Goldberg, 2012). Lastly also management own-interest of stabilizing earnings or the objective to keep a constant tax level can be motives for risk management (Dhanini, 2014). Depending on which of the arguments is in the focus of the company, the risk management can be structured.

The banking sector in Kenya is regulated by the Central Bank of Kenya (CBK). Commercial banks are licensed and regulated under the Banking Act cap 488; deposits taking micro finance institutions are regulated under Micro Finance Act and the Forex Bureaus under the Central Bank of Kenya Act cap 491. During the quarter ended 31<sup>st</sup> March 2015, the banking sector comprised 43 commercial banks, 1 mortgage finance company, 10 microfinance banks, 8 representative offices of foreign banks, 86 foreign exchange bureaus, 14 money remittance providers and 2 credit reference bureaus. Out of the 44 institutions, 31 are locally owned and 13 are foreign owned. The locally owned financial institutions comprise 3 banks with significant shareholding by the Government and State Corporations, 27 commercial banks and 1 mortgage finance institution (CBK, 2015).

### **Statement of Problem**

In Kenya, financial performance of commercial banks has continued to be impressive. In 2016 first quarter, the banking sector recorded Ksh. 37.3 billion pre-tax profits, which was an increase of 2.7 percent from Ksh. 36.32 billion registered in the quarter ending December 2015 (CBK, 2016). Similarly, the profitability of the sector increased by 11.7 per cent from Ksh. 33.4 billion registered in March 2015 to Ksh. 37.3 billion in March 2016 (CBK, 2016). Despite the impressive financial performance, the banking sector still face many challenges with respect to management of financial risks which they are exposed to, despite the tremendous growth in the sector (CBK, 2016).

Deterioration of asset quality relates to increase in credit risk which reduces the expected profits. For instance, according to CBK report in 2016 this growth has however been accompanied by an increase in non-performing loans from 7.7 % in 2015 to 10.2% in 2016. Market risk also emanates from the fluctuations of interest rate and foreign exchange rate affect their returns since banks accept financial instruments exposed to market price volatility as collateral for loans. Liquidity risk arises due to mismatch of assets and liabilities as well as recessionary economic conditions. Operational risk which is paramount generates losses due to high costs which reduce the returns expected. Despite the significant 84% (36) of commercial banks in Kenya complying with risk management guidelines issued by CBK, 95% of commercial banks are concerned with risk (CBK, 2015). Also, despite the good overall financial performance of banks in Kenya, there are a couple of banks declaring losses (Oloo, 2011). It is against this background that the study seeks to establish the effects of financial risk on profitability of commercial banks.

A number of research studies in Kenya have attempted to address the issues of financial risk which have been studied in piece meal manner. They have addressed the different components of financial risk individually. For instance, Fredrick (2012), Kargi (2011), and Kithinji (2010) and researched on credit risk while Abid and Mseddi (2014), Wachiaya (2011) studied on market risk. Akhtar, Ali and Sadaqat (2011) on liquidity risk. By tackling the risks individually these studies fail to acknowledge the effect of financial risk on profitability of commercial bank, thus the need to take a comprehensive view. This study therefore sought to fill the existing research

gap by conducting study to establish the effects of financial risk on profitability of commercial banks listed in the Nairobi Securities Exchange.

### **Objectives of the Study**

#### **General Objective**

The general objective of the study was establish the effects of financial risk on profitability of commercial banks listed in the Nairobi Securities Exchange

#### **Specific Objectives**

The study was guided by the following objectives;

- i. To determine the effect of credit risk on profitability of commercial banks listed in the Nairobi Securities Exchange.
- ii. To examine the effect of market risk on profitability of commercial banks listed in the Nairobi Securities Exchange.
- iii. To establish the effect of liquidity risk on profitability of commercial banks listed in the Nairobi Securities Exchange.
- iv. To determine the effect of operational risk on profitability of commercial banks listed in the Nairobi Securities Exchange.

### **Theoretical Review**

#### **Finance Distress Theory**

Baldwin and Scott (1983) purported that when a firm's business deteriorates to the point where it cannot meet its financial obligation, the firm is said to have entered the state of financial distress. The first signals of financial distress are violations of debt payments and failure or reduction of dividends payouts. Whitaker (1999) defines entry in financial distress as the first year in which cash flows are less than current maturities' long-term debt. The firm has enough to pay its creditors as long as the cash flows exceed the current debt obligations. The key factor in identifying firms in financial distress is their inability to meet contractual debt obligations.

However, substantial financial distress effects are incurred well prior to default. Wruck (1990) stated that firms enter into financial distress as a result of economic distress, declines in their performance and poor management especially on risks. Boritz (1991) depicts a process of a financial distress that begins with an incubation period characterized by a set of bad economic conditions and poor management which commits costly mistakes. In the case of commercial banks, in ability to provide cash to depositors and loans to borrowers as and when the demand may constitute a liquidity crisis. Other creditors also need to be taken into account when firms are putting in place risk management measures. Credit risks in banks also need to be addressed since it may lead to financial distress. Loan portfolio management is an important determinant of the firm's liquidity. The banks should manage the credit and liquidity risk in order to avoid the financial distress. The theory of financial distress emanates from the liquidity and credit risk facing a firm. This theory provides for a non-biased perspective on the relationship between credit risk and financial performance variables employed by the study. By providing information that the effects of financial distress occurs prior default risk, the theory offers a neutral platform to undertake an incisive empirical analysis of this relationship within the commercial banks.

#### **Shiftability Theory of Liquidity**

Formally developed by Harold and Moulton in 1915, the shiftability theory held that banks could most effectively protect themselves against massive deposit withdrawals by holding, as a form of liquidity reserve, credit instruments for which there existed a ready secondary market. The theory is based on the proportion that banks liquidity is maintained if it holds assets that could be shifted or sold to other lenders or investors for cash. Also, these assets could be shifted to the

Central Bank for cash without material loss in case of necessity than relying on maturities to solve their liquidity problems (Ngwu, 2006). This theory posits that a bank's liquidity is maintained if it holds assets that could be shifted or sold to other lenders or investors for cash. This point of view contends that a bank's liquidity could be enhanced if it always has assets to sell and provided the Central Bank and the discount market stands ready to purchase the asset offered for discount. Thus this theory recognizes and contends that shiftability, marketability or transferability of a bank's assets is a basis for ensuring liquidity.

This theory further contends that highly marketable security held by a bank is an excellent source of liquidity. Dodds (1982) contends that to ensure convertibility without delay and appreciable loss, such assets must meet three requisites. According to Dodds (1982), liquidity management theory consists of the activities involved in obtaining funds from depositors and other creditors and determining the appropriate mix of funds for a particular bank. Liquidity theory has been subjected to critical review by various authors. The general consensus is that during the period of distress, a bank may find it difficult to obtain the desired liquidity since the confidence of the market may have seriously affected and credit worthiness would invariably be lacking. However, for a healthy bank, the liabilities constitute an important source of liquidity. The liquidity shiftability theory provides for explicit understanding of how the liquidity risk affects the financial performance using liquidity coverage and net stable funding ratios as stated by new Basel III framework. The analysis of this study provides the information as to whether liquidity maintained by the commercial banks affect the returns to the shareholders.

### **Extreme Value Theory**

In 1709, Bernoulli discussed the mean largest distance from the origin when  $n$  points lie at random on a straight line of length (Johnson *et al.*, 1995). A century later Fourier stated that, in the Gaussian case, the probability of a deviation being more than three times the square root of two standard deviations from the mean is about 1 in 50,000, and consequently could be omitted (Kinnison, 1985). The financial institutions with significant amounts of trading activity proved to be very vulnerable to extreme market movements and, in time, the measurement of market risk became a primary concern for regulators and also for internal risk control. This calls for indicators showing the risk exposure of firms and the effect of risk reducing measures. Value-at-Risk (VaR) has been established as a standard tool among financial institutions to depict the downside risk of a market portfolio. It measures the maximum loss of the portfolio value that will occur over some period at some specific confidence level due to risky market factors (Jorion, 1997). Banks and bank holding companies with an important trading portfolio are subject to market risk requirements. They have been required to hold capital against their defined market risk exposures, and, the necessary capital is a function of banks' own risk estimates.

As a result, several alternative methods have been proposed for estimating VaR, one of which being the Extreme Value Theory (EVT). EVT methods make VaR estimations based only on the data in the tails as opposed to fitting the entire distribution and can make separate estimations for left and right tails (Diebold *et al.*, 2000). Proper estimation of VaR is necessary in that it needs to accurately capture the level of risk exposure that the firm is exposed to, but if it overestimates the risk level, then the firm will set unnecessarily set aside excess capital to cover the risk, when that capital could have been better invested elsewhere (Hull, 2012). Extreme value theory helps in determining the minimum and the maximum capital that should be set aside to cover the market risks. To achieve this goal the banks need to manage the market risk by managing the financial leverage.

### New Institutional Economics Theory

According to Williamson (1998), this theory predicts that risk management practices may be determined by institutions or accepted practice within a market or industry. Further, the theory links security with specific assets purchase, which implies that risk management can be important in contracts which bind two sides without allowing diversification, such as large financing contract or close cooperation within a supply chain. Firms in regulated industries provide top management with few opportunities for discretion in corporate investment and financing decisions. Smith and Watts (1992) showed that regulation is a key determinant of a firm's corporate financial policy. Therefore, if regulated firms face tighter scrutiny and face lower contracting costs, then they are less likely to hedge firm risk. In particular, firms can hedge cash flows to avoid a shortfall in funds that may require a costly visit to the capital markets and at the same time financial risk management is positively related to measures of the firm's investment opportunity set proxies.

### Conceptual Framework

#### Independent Variables

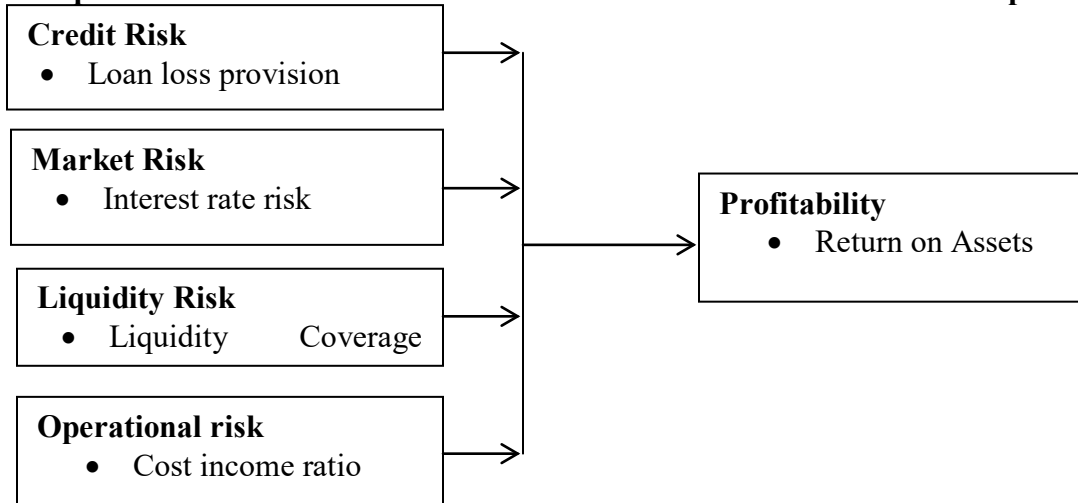


Figure 1: Conceptual Framework

### Empirical Review

#### Credit Risk and Financial Performance

The main purpose of a bank existence is to accept deposits as well as to grant credit facilities, therefore inevitably exposed to credit risk. Credit risk is the most significant risk faced by banks and the success of their business depends on accurate measurement and efficient management of this risk to a greater extent than any other risks (Gieseche, 2014). Companies would benefit from a process that is woven into their overall business strategies and management process. When doing business, constantly decisions, where the outcomes cannot be foreseen with certainty due to incomplete information, have to be made (Stroeder, 2014). This uncertainty connected with every kind of business activity is risks. Risk management can add value to the firm when market imperfections like progressive taxing of the company, expected costs of financial distress or agency problems are present (Oosterhof, 2011). Therefore risk management is a responsibility of every stakeholder. Financial risks are also managed to avoid financial distress and the costs connected with it (Triantis, 2010). Managerial self-interest of stabilizing earnings or keeping constant tax level can be motives for financial risk management (Dhanini *et al.*, 2013).

### **Market Risk and Financial Performance**

Market risk is a dominant source of income fluctuations in financial institutions all over the world. According to the classification of banking risks introduced by foreign economists Koch and MacDonald (2016), market risk can be generally said to consist of three lesser risks: stock price risk, interest rate risk and foreign exchange risk. According to Worzala, (2015) form of market risk also arises where banks accept financial instruments exposed to market price volatility as collateral for loans. The price fluctuations or volatility increases and decreases in the day-to-day market. This type of risk mainly applies to both stocks and options and tends to perform well in a bull (increasing) market and poorly in a bear (decreasing) market. Generally, the more volatility within the market, the more probability there is that the investment will increase or decrease. Market risks may be divided into interest rate risk and exchange rate risk including gold, share price risks and commodity price risks which refer to respectively the risks created by any adverse change in interest rates exchange rates share prices and commodity prices.

### **Liquidity Risk and Financial Performance**

Goodhart (2014) stated that there are two basic facets of liquidity risk. These are maturity transformation which is the maturity of a bank's liabilities and assets and the inherent liquidity of a bank's asset which is the extent to which an asset can be sold without incurring a significant loss of value under any market condition. Banks do not need to be worried about the maturity transformation if they have the assets that can be sold without bearing any loss. Whereas, banks having assets that are going to be matured in a shorter period may have a less need to keep the liquid assets (Ahmed, 2015). Liquidity mismatch risk or liquidity mismatch, it is one way of measuring the organization's level of financial risk (Brunnermeier & Yogo, 2011). Liquidity match is also called liquidity gap (Plochan, 2013). Liquidity gap is the difference between a bank's assets and a bank's liabilities (Plochan, 2013). This gap can be positive or negative. It is depending on if the firm has more assets than liabilities or vice versa. A negative gap means that the bank is netting less income than the amount of liabilities assumed. When the gap is positive, the bank has liquid assets left over after all of the liabilities have been fulfilled.

### **Operational Risk and Financial Performance**

If operational risk is not addressed systematically it can result in inconsistent performance and earnings surprises for the stakeholders. Thus, operational risk exposures can have an impact on banks' revenues and net worth. Operational risk, thus, generates operational losses and the losses generated are a cost to the bank. Hence, the pricing and the consequent measurement of the operational risk capital charge has to be adequate to cover for these losses. Tripe (2014) demonstrates how an operational risk capital charge (economic capital allocation) might be linked to volatility in the cost-to-income ratio, using a multiple of the standard deviation of the ratio. Tripe also shows how volatility in other measures, such as cost-to-assets, could be used to produce an economic capital charge. As explained by Tripe, different cost-based ratios produce significantly different capital charges. Further, the cost-to-assets ratio does not capture non-interest income though may be a leading indicator of operational risk in a bank. Operational risk may materialize directly, for instance in electronic fund transfer (transfer of funds to the wrong person) or could result indirectly as a credit or market loss. Since there is a close linkage of operational risk with other types of risks, it is very important for every institution to first have a clear understanding of the concept of operational risk before designing the appropriate operational risk measurement and management framework (Epetimehin & Obafemi, 2015).

## **Profitability**

Financial risk includes credit risk, liquidity risk, and market risk, which, together, contribute to the volatility of financial performance (Dimitropoulos *et al.*, 2010). Credit risk is the main financial risk that hinders the performance of banks, especially in Africa. This is the risk of the varying net worth of the assets due to the failure of the contractual debt of the counter party to meet the obligation (Pyle, 2011). Interest rate risk is the risk of lending or deposit interest rate fluctuation (Dimitropoulos *et al.*, 2010). When the commercial bank lending interest rate is less than the deposit rate, or when the lending interest rate of the bank is greater than the market rate, or the deposit interest rate is less than the market rate, banks may face interest rate risk. The exchange rate risk is associated with depreciation in the local currency, an increase in prices and a decrease in output (Berument & Dincer, 2014). When a bank fails to put a fair price on currency when it sells and buys foreign currency or when foreign currency depreciates its value continuously the bank faces an exchange rate loss.

Profitability offers information about the ability of the bank to undertake risks and to expand its activity. The main indicators used in the appreciation of the bank profitability are return on equity, ROE (Net income / Average Equity), return on asset, ROA (Net income / Total assets) and the indicator of financial leverage or (Equity / Total Assets) (Dardac & Barbu, 2015). A commonly used measure of bank performance is the level of bank profits (Ceylan, Emre & Asl, 2014). Bank profitability can be measured by the return on a bank's assets (ROA), a ratio of a bank's profits to its total assets. The income statements of commercial banks report profits before and after taxes. Another good measure on bank performance is the ratio of pre-tax profits to equity (ROE) rather than total assets since banks with higher equity ratio should also have a higher return on assets (Ceylan, Emre & Asl, 2014). The continued viability of a bank depends on its ability to earn an adequate return on its assets and capital. The evaluation of earnings performance relies heavily upon comparison on the key profitability measures, such as return on assets and return on equity, to industry bench mark and peer group norms (Duca & McLaughlin, 2010).

## **METHODOLOGY**

The study used quantitative research design. The target population of this study comprised all the 11 commercial banks in Kenya that are listed in the Nairobi Securities Exchange. This aimed at achieving comprehensive coverage and 10 year period give much accurate results. Thus the target population comprises all 11 Commercial Banks listed in the Nairobi Securities Exchange. The study employed secondary data that was extracted from audited financial statements and annual reports of listed commercial banks over the 10-year period, 2007 to 2016. The Central Bank of Kenya Banking reports was collected. This data was collected through a data collection form. Data was obtained for the last ten years (2007 to 2016) as shown in Appendix II. The researcher wrote to CBK, CMA and NSE requesting for an access of annual financial statements for the last ten years from 2007 to 2016. The banks supervision department provided the published reports from which the researcher extra the data the data using the desk search techniques. The required data was input into Excel data collection instrument. The secondary data was quantitative in nature (continuous data).

The collected quantitative data was edited and coded and entered into a Stata version 14 for analysis. Both descriptive and inferential statistics was used to analyses the quantitative data. In descriptive statistics, the study used frequency distributions, mean, standard deviation and percentages. The time series analysis tests that were performed on the model include correlation analysis, normality test, Heteroscedasticity Test, Autocorrelation, Linearity test, Stationarity and



Unit Root Test and Co-integration test. Spearman's rank coefficients were used to show the relationship between various pairs of variables (Creswell, 2006). The significance of the relationships was further investigated to show whether the pairs of relationships are significant. To fulfil the requirements of OLS, Shapiro Wilk test was used to investigate whether the variables are normally distributed or not (Cooper & Schindler, 2006).

## FINDINGS AND DISCUSSION

### Test for Normality

Regression analysis assumes that variables have normal distributions. Non-normally distributed variables can distort relationships and significance tests. In this study normal distribution of data was tested by use of Shapiro Wilk Test. The Shapiro–Wilk test is a test of normality in frequentist statistics. The null-hypothesis of this test is that the population is normally distributed. Thus if the p-value is less than the chosen alpha level, then the null hypothesis is rejected and there is evidence that the data tested are not from a normally distributed population. In other words, the data are not normal. On the contrary, if the p-value is greater than the chosen alpha level, then the null hypothesis that the data came from a normally distributed population cannot be rejected.

**Table 1: Shapiro-Wilk Test**

	Shapiro-Wilk Statistic	df	Sig.
Profitability	.744	109	.240
Credit Risk	.968	109	.368
Market Risk	.841	109	.382
Liquidity Risk	.827	109	.267
Operational risk	.833	109	.245

The findings show that profitability (p-value=0.240), credit risk (p-value=0.368) and market risk (p-value=0.382), liquidity risk (p-value = 0.267) and operational risk (0.245) were normally distributed.

### Autocorrelation Test

Durbin-Watson  $d$  test was used to check for autocorrelation where the value of  $d$  lies between 0 and 4. If the value is 2 then we will conclude that no autocorrelation, when its 4 or close to 4 then there is negative autocorrelation while it's close to 1 and 0 then the is positive autocorrelation. In this study, Durbin Watson  $d$ -statistic (5, 36) was 2.3522, which indicates that there was no serial correlation between the variables. Breusch-Godfrey Langrage Multiplier test was also used to test for autocorrelation.

**Table 2: Breusch-Godfrey Langrage Multiplier test**

Breusch-Godfrey Langrage Multiplier test for autocorrelation

Lags (p)	chi 2	df	prob >chi 2
1	1.937	1	0.1640

H0: no serial correlation

From the findings, the p-value (0.1640), which is less than the significance level (0.05), and hence we accept the null hypothesis that there is no serial correlation among the variables.

### Heteroscedasticity Test

The study used Breusch-Pagan/Cook-Weisberg test for heteroscedasticity. Homoscedasticity describes a situation in which the error term (that is, the “noise” or random disturbance in the relationship between the independent variables and the dependent variable) is the same across all values of the independent variables. Heteroscedasticity (the violation of homoscedasticity) is

present when the size of the error term differs across values of an independent variable. The impact of violating the assumption of homoscedasticity is a matter of degree, increasing as heteroscedasticity increases.

**Table 3: Breusch-Pagan/Cook-Weisberg test for heteroscedasticity**

<b>Breusch-Pagan/Cook-Weisberg test for heteroscedasticity</b>		
Ho: Constant variance Variables: fitted values of FDI		
Chi2 (1)	=	16.82
Prob > chi2	=	0.0000

From the findings, as shown in table 3, it was revealed that the p- value of 0.000 was less than 0.05 significant levels implying that the study rejects the null hypothesis of homoscedasticity.

**Augmented Dickey Fuller unit root test (ADF)**

In order to check for stationary of the data, the study employed Augmented Dickey Fuller unit root test (ADF); this was chosen because it is not affected by autocorrelation as opposed to other tests. If the data is found to contain unit root and require first difference in order to be stationary, then the variable in question will be deemed to have a long run relationship with the dependent variable and would therefore require a co-integration test to be conducted. If the exogenous data is run through ADF test and happens to be stationary at level, the data would be assumed to be affecting the model in the short run. The null hypothesis is that the variables are not stationary or they got unit root.

**Table 4: Augmented Dickey Fuller unit root test**

Variable	Number of obs	Test Statistic	Interpolated Dickey-Fuller			Z(t) p-value
			1% critical value	5% critical value	10% Critical value	
Profitability	109	-6.313	-3.682	-2.972	-2.618	0.0000
Credit risk	109	-3.430	-3.682	-2.972	-2.618	0.0100
Market risk	109	-2.985	-3.682	-2.972	-2.618	0.0363
Liquidity risk	109	-3.360	-3.682	-2.972	-2.618	0.0124
Operational risk	109	-1.716	-3.682	-2.972	-2.618	0.0230

The null hypothesis is that the profitability has no unit root. The results show that profitability has no unit root. This is because the p-value (0.000) was less than the significance level (0.05). The null hypothesis is that profitability has no unit root. The results show that credit risk has no unit root. This is shown by a p-value of 0.010, which less than the significance level (0.05).

The null hypothesis is that market has no unit root. According to the findings, the p-value (0.0363) is less than the significance level (0.05), which implies that market risk has no unit root.

The null hypothesis is that liquidity risk has got unit root. From the findings, the p-value (0.0124) is less than the significance level (0.05). These findings imply that liquidity has no unit root or it is stationary. The null hypothesis indicated that operational risk had no unit root or is it is stationary. According to the findings, the p-value (0.023) is more than the significance level (0.05). This implies that operational risk has unit root or is not stationary. These findings show that profitability, credit risk, market risk, liquidity risk and operational risk have no unit root, which means they are stationary.

**Co-integration**

Since some of the data was found to have a unit root, the Engel Granger test was used to test for co-integration.

**Table 5: Engel Granger test**

Equation	Excluded	Chi <sup>2</sup>	df	Prob>chi <sup>2</sup>
Profitability	Market risk	3.2188	2	0.200
Market risk	Profitability	1.8602	2	0.395
Profitability	Credit risk	3.6978	2	0.157
Credit risk	Profitability	1.8602	2	0.395
Profitability	Liquidity risk	3.3824	2	0.292
Liquidity risk	Profitability	12.593	2	0.232
Profitability	Operational Risk	2.4647	2	0.393
Operational risk	Profitability	18.429	2	0.000
Profitability	All	8.4295	2	0.393

In the first equation, the null hypothesis indicates that market risk does not Granger-cause profitability. Since the p-value (0.200) is more than the significance level (0.05) the null hypothesis cannot be rejected. In addition, profitability does not granger cause market risk. This is because the p-value (0.395) is greater than the significance level (0.05). In the second equation, we reject the null hypothesis that credit risk index does not granger cause profitability. This is because the p-value (0.157) is greater than the significance level (0.05). Further, profitability does not granger-cause credit risk as the p-value (0.395) is greater than the significance level (0.05).

In the third equation, we accept the null hypothesis that liquidity does not Granger-cause profitability. This is because the p-value (0.292) is less than the significance level (0.05). However, profitability does not granger causes liquidity risk. This is shown by a p-value of 0.232 which is greater than the p-value (0.05). In the fourth equation, we can accept the null hypothesis that operational risk does not Granger-cause profitability. This is because the p-value (0.393) is greater than the significance level (0.05). However, profitability does not granger causes operational risk.

### Inferential Statistics

A correlation analysis and multiple regression analysis were conducted to test the influence among predictor variables. Pearson product moment correlation was conducted to determine the strength of relationship between the study variables. Multiple regression Analysis was done to establish the effects of financial risk on profitability of commercial banks listed in the Nairobi Securities Exchange.

### Correlation Analysis

**Table 6: Correlations Table**

		Profitability	Credit risk	Market risk	Liquidity risk	Operational risk
Profitability	Pearson Correlation	1	.661**	.578**	.820**	.525**
	Sig. (2-tailed)		.002	.003	.001	.000
	N	110	110	110	110	110
Credit risk	Pearson Correlation	.661**	1	-.041	-.119	-.129
	Sig. (2-tailed)	.003		.802	.463	.428
	N	125	125	125	125	125

Market risk	Pearson Correlation	.578**	-.041	1	.205	.035
	Sig. (2-tailed)	.022	.002		.004	.001
	N	125	125	125	125	125
Liquidity risk	Pearson Correlation	.820**	.119	.205	1	.546**
	Sig. (2-tailed)	.004	.003	.004		.000
	N	125	125	125	125	125
Operational risk	Pearson Correlation	.525**	.129	.035	.546**	1
	Sig. (2-tailed)	.003	.002	.001	.000	
	N	125	125	125	125	125

\*\* . Correlation is significant at the 0.01 level (2-tailed).

On the correlation of the study variable, the researcher conducted a Pearson moment correlation. From the finding in the table above, the study found that there was strong correlation coefficient between profitability and liquidity risk as shown by correlation factor of 0.820, this strong relationship was found to be statistically significant as the significant value was 0.001 which is less than 0.05, the study also found strong correlation between profitability and credit risk as shown by correlation coefficient of 0.661, this too was also found to be significant at 0.002 level. The study also found strong correlation between profitability and operational risk as shown by correlation coefficient of 0.525 at 0.000 level of confidence. Finally, the study found a strong correlation between profitability and market risk as shown by correlation coefficient of 0.578 at 0.003 level of significance.

### Model Summary

**Table 7: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.884 <sup>a</sup>	.781	.740	.02225

Adjusted R squared is coefficient of determination which tells us the variation in the dependent variable due to changes in the independent variable. From the findings in the table below the value of adjusted R squared was 0.740 an indication that there was variation of 74.0% on the profitability of commercial banks due to changes in market risk, credit risk, liquidity risk and operational risk at 95% confidence interval. This shows that 74.0 % changes in profitability of commercial banks could be accounted to changes in market risk, credit risk, liquidity risk and operational risk. R is the correlation coefficient which shows the relationship between the study variables, from the findings shown in the table below there was a strong positive relationship between the study variables as shown by 0.884.

### Analysis Of Variance

**Table 8: Analysis Of Variance**

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	3.001	4	0.750	8.431	.008 <sup>b</sup>
Residual	7.298	105	0.089		
Total	10.299	109			

From the ANOVA statistics in the table below, the processed data, which is the population parameters, had a significance level of 0.8% which shows that the data is ideal for making a conclusion on the population parameters as the value of significance (p-value ) is less than 5%. The F calculated value was greater than the F critical value (8.431>2.483) an indication that there were significant difference between profitability of commercial banks and market risk, credit risk, liquidity risk and operational risk. The significance value was less than 0.05 indicating goodness of fit of the model.

## Beta Coefficients

**Table 9: Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.878	0.157		5.592	.016
	Credit risk	-0.365	0.097	-.402	-3.763	.002
	Market risk	-0.274	0.081	-.182	-3.383	.010
	Liquidity risk	-0.148	0.051	-.183	-2.902	.049
	Operational risk	-0.171	0.053	-.091	-3.226	.020

The established regression equation was

$$Y = 0.878 - 0.365 X_1 - 0.274X_2 - 0.148 X_3 - 0.171 X_4$$

From the above regression equation, it was revealed that holding market risk, credit risk, liquidity risk and operational risk to a constant zero, profitability of commercial banks would stand at 0.878, a unit increase in market risk would lead to decrease in profitability by a factor of 0.365. A unit increase in credit risk would lead to decrease in profitability by factors of 0.274. A unit increase in liquidity risk would lead to decrease in profitability by a factor of 0.148 and unit increase in operational risk would lead to decrease in profitability by a factor of 0.171. The study further revealed that market risk, credit risk, liquidity risk and operational risk were statistically significant in affecting profitability of commercial banks, as all the p value (sig) were less than 0.05. The study also found that there was a negative relationship between profitability and market risk, credit risk, liquidity risk and operational risk.

## Conclusions

The study established that there was a strong correlation between profitability and credit risk; this strong relationship was found to be statistically significant as the significant. The study found that a unit increase in market risk would lead to decrease in profitability. From the finding the study concludes that credit risk negatively affects profitability of commercial banks listed in the Nairobi Securities Exchange.

The study revealed there was strong correlation between profitability and market risk. The study found that a unit increase in credit risk would lead to decrease in profitability. The study also found that market risk was statistically significant in affecting profitability of commercial banks. From the finding the study concludes that market risk negatively affects profitability of commercial banks listed in the Nairobi Securities Exchange.

The study found that there was strong significant correlation between profitability and liquidity risk. The study found that increase in liquidity risk would lead to decrease in profitability. The study also found that liquidity risk was statistically significant in affecting profitability of commercial banks. From the finding the study concludes that liquidity risk negatively affects profitability of commercial banks listed in the Nairobi Securities Exchange.

The study found that there was strong significant correlation between profitability and operational risk. The study revealed that a unit increase in operational risk would lead to decrease in profitability. The study further revealed that there was statistically significant in affecting profitability of commercial banks. From the finding the study concludes that operational risk negatively affects profitability of commercial banks listed in the Nairobi Securities Exchange.

## **Recommendations**

The study recommends there is need for the management of commercial bank to control their credit risk, through non-performing loan level as it was revealed that credit risk negatively affect the financial performance of commercial banks in Kenya. Since a high level of risk management, yield high returns, the process of dealing with risk should be a continuous and developing with time. The act of balancing risk and returns cannot therefore be under emphasized.

The management of commercial banks in Kenya should hedge against market risk as it was found that market risk negatively affect the profitability of commercial bank in Kenya. Kenyan commercial banks especially locally owned are required to consider findings ways of mitigating the market risks such as use financial derivatives and assets securitization which will reduce their interest rate and foreign currency risk exposure. The commercial banks also are required to monitor the financial leverage so as to reduce the financial risk.

There is need for the management of commercial banks in Kenya to maintain the liquidity level at safe level as it was found that liquidity risk negatively affect the financial performance of commercial banks in Kenya . There is need for banks listed at the Nairobi Securities Exchange to increase their current assets so as to increase their liquidity. There is need for non-financial companies listed on the Nairobi Securities Exchange to increase their operating cash flow, through reduction of their credit repayment period in order to positively influence their financial performance

The management of commercial banks in Kenya should hedge against operational risk as it was found that operational risk negatively affect the financial performance of commercial bank in Kenya. Risk that continues to face business like commercial banks are many hence institutions should allocate resources to the risk management department so that they can act effectively and promptly. An establishment of comprehensive risk management of the commercial banks should be made a prerequisite as it contributes to the overall risk management systems

## **Areas for further study**

The study also recommends that a study should be done on the determinants of financial risk management among commercial banks in Kenya. The study also recommends that a similar study should be done on relationship between financial risk management and financial performance of Insurance Companies in Kenya. The study further recommends that a study should be done on relationship between financial risk management and financial performance of Micro Finance Institution in Kenya.

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