International Journal of Economics, Commerce and Management
United Kingdom ISSN 2348 0386 Vol. 13, Issue 10, Oct 2025

https://ijecm.co.uk/

NON - LINEAR AND HETEROGENEOUS MODERATING EFFECT OF LIQUIDITY RISK THRESHOLDS ON FOREIGN EXCHANGE TRADING INCOME DIVERSIFICATION AND FINANCIAL PERFORMANCE OF COMMERCIAL BANKS IN KENYA (2019 – 2023)

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Abstract

Non - linear and heterogenous moderating effect of liquidity risk thresholds on foreign exchange trading income diversification and financial performance of commercial banks in Kenya (2019 – 2023). The specific objectives were to determine the effect of foreign exchange trading income diversification on financial performance of commercial banks in Kenya and to assess the moderating role of liquidity risks (non - linear and heterogeneous effects) of foreign exchange trading income diversification on financial performance across banks tiers. The period under study had regulatory changes: Basel III, IFRS 9 & Banking amendment Act 2016 capping

interest rate and environmental challenges such as COVID 19 & BREXIT that have affected banks traditional sources of income and risks management. Further, the study covered nonlinear threshold and heterogenous effect of risks across banks which is under explored in Kenya. The methods used were OLS, panel threshold and quantile regressions impacts on the theories and enhances knowledge. The study was anchored on Harry Markowitz's modern portfolio theory (MPT) supported by agency theory and resource-based view theory. The longitudinal research design approach was adopted for the period between 2019 and 2023 covering study population of 38 commercial banks in Kenya. Purposive sampling method was applied to select a total of 35 banks. Financial Statistics database of banks were used as secondary source of data to collate the data into the data collection instrument developed by the researcher. STATA Version 17 was used to test the objectives and hypothesis using multiple methods including OLS, panel threshold and quantile regression. The findings indicate that foreign exchange trading income diversification coefficient of 0.4632 with p value of 0.03784 is statistically significant and significantly moderated by liquidity risks. Panel threshold regression reveals that liquidity risks has threshold point at 46% (slightly above CBK, LCR of 40%) beyond which the foreign exchange trading income diversification gains reverses. Quantile regression results indicates that heterogenous effects of nonlinear threshold of liquidity risks effects banks differently with Tier I banks gaining more, followed by tier II and Tiers III. The study recommends liquidity risks calibrated diversification strategies, tailored tier policy, reinforcement of liquidity risk- adjusted income disclosure, dynamic regulatory threshold of liquidity risks based on bank tiers and early warning systems to identify threshold breaches like stress testing for liquidity. These insights contribute to the growing body of literature on banks income stability, directly informs CBK's risks-based supervision, adds value to the theories, Basel III implementation and provide practical guidelines for regulators and bank executives navigating turbulent financial landscapes in emerging economies.

Keywords: Non-linear threshold and heterogeneous effects, Panel Threshold regression, Quantile regression, Modern portfolio theory (MPT), Liquidity risks and Banking amendment Act 2016

INTRODUCTION

Non - linear thresholds relationship occurs when changes in one factor (liquidity risk) do not lead to proportionate or consistent changes in bank performance or behavior and finally, heterogenous effect of liquidity risk in the banking sector means that commercial banks are not affected the same way, they differ in terms of size, ownership (public/private), risk appetite, technological capacity, capital base, client base, and management practices and therefore may

be affected differently (bank tiers). The study is important as it helps establish tier specific diversification, regulatory and growth strategies. The area of non-linear threshold is underexplored in Kenya and the period between 2019 and 2023 is crucial due to numerous regulatory mechanisms (Glass – Steagall Repeal (1999), Basel III Implementation, The Banking (Amendment) Act (2016), IFRS 9) and environmental changes (BREXIT & Covid-19) that effected banks prior to the study and beyond. The changes also effected liquidity risks in banks. Liquidity risks arises when commercial banks deposits (liabilities) create liquidity which creates loans and advances (Assets), in so doing the assets generate income through interest (Interest earned) enough to be paid to depositors (Interest paid) and retain surplus (Net Interest Margin) which positively effects profitability and enhances financial performance of commercial banks. When banks fail to do this prudently, the liquidity risks creeps in and where the bank fails to lend depositors funds, they become too liquid and make losses due to interest earned. (Chen, Shen, Kao, & & Yeh, 2018) found that bank liquidity risks and performance showed a positive relationship under certain conditions, suggesting higher risks could enhance returns. The researcher sought to investigate and quantify the non - linear effect of liquidity risk on foreign exchange trading income diversification and financial performance. Further, the research assessed if liquidity risks moderate's foreign exchange trading income diversification and financial performance across high and low performing banks the same way.

Foreign exchange trading income diversification in the study includes income from spot, swap, forward and options markets. In the four markets segments, fee, commission and exchange gap earn banks income from different ways such as (transactional) which refers to the gains or loss realized when a currency is devalued at the current exchange rate (translation) for past transactions using the domestic (functional) currency. Generally, three foreign exchange risks include (translation) exposure, transaction (commitment) exposure and economic (operational, competitive or cash flow) exposure, (Eiteman, 2006) were critical in the study. Commercial banks that support and manages the risks earns from the exposures. In the four forex markets trading is done in different ways including currency pairs, bid ask price, leverage, going long and going short, fundamental and technical analysis, placing orders and market liquidity. Profit margins earned from foreign exchange trading income diversification at commercial banks are therefore highly dependent on current, future and currency exchange rates.

Objectives of the Study

i. To determine the effect of foreign exchange trading income diversification on financial performance of Commercial Banks in Kenya

ii. To assess the moderating role of liquidity risks (non - linear and heterogeneous effects) of foreign exchange trading income diversification on financial performance across banks tiers.

Research Hypothesis

H01: Foreign exchange trading income diversification has no significant effect on financial performance of commercial banks in Kenya.

H02: Liquidity risks do not significantly exert non – linear threshold and heterogeneous effect on the relationship between foreign exchange trading income diversification and financial performance of commercial banks in Kenya across banks tiers.

LITERATURE REVIEW

Theoretical Review

Modern Portfolio Theory (MPT)

(Markowitz H., 1952) seminal work established that optimal portfolio construction reduces unsystematic risks through asset diversification which is relevant in the banking context and anchored the study. The theoretical best portfolios invented by Markowitz in 1959. (Markowitz H. M., 1991), (Elton & Gruber, March 1997) explain the key concerns that investor has while making an investment, such as how to divide up capital across the various assets. Those problems have prompted debate of portfolio theories, particularly Harry Markowitz's. The modern portfolio theory of investing appears to be a suitable solution to the problem of investment risk that banks deal with. The conventional advice to "not put all your eggs in one basket" may not always be valid, according to the Winton's models' (1997, 1999) findings. Commercial banks in Kenya have diversified into foreign exchange trading income diversification to avoid putting all their hope in interest income and avoid the "Winner's Curse" problem of unending NPLs.

Resource Based View (RBV) Theory

This hypothesis was developed by Rubin and comes from Penrose's 1959 seminar paper (1973). The foundation of RBV theory is the idea that companies can achieve lasting competitive advantage by making conscious managerial decisions. According to this theory, a firm's resources can be used to erect barriers to protect the resource holders' ability to maintain their competitive advantage over rivals. The basic tenet of this theory is that businesses typically have productive resources that can be leveraged to take advantage of chances for productivity that allow for expansion. Banks get advantages through sharing physical resources, technological know-how, vertical integration, coordinated strategy, and combining their

negotiating power (Contractor, Kundu, & Hsu, 2003). By utilizing all of these, the businesses increase their efficiency in the ongoing use of these resources and create economies of scope and scale. In conclusion, firms that diversify (foreign exchange trading income diversification) across many activities maximize the exploitation of their valuable resources and thereby improve their financial performance while managing risks.

Empirical review

Ling, Fayman, & Casey (2014) looked into how foreign exchange changes affect the profitability of US banks. The study examined 22 sizable commercial banks in the United States over a 40-year period. In the study, three significant global economic regions are represented by the dollar, the euro, and the Asian currency. Major U.S. banks are exposed to foreign exchange risk, and individual bank performance is correlated with the dollar's value in relation to different currencies. According to the study, an increase in the dollar's value of the U.S dollar relative to different currencies increases US earnings.

Getachew (2015) conducted study on how exchange rates affect Ethiopian commercial banks' profits. The specific goals were to assess how exchange rate volatility impacts the bank profitability in Ethiopia and determine if the impact of exchange rate on bank profitability results from its influence on bank loan growth. Descriptive statistics and correlation were used in the study's descriptive research design. Study period from 2004 to 2014. Utilizing regression analysis, data were examined. According to the study, the exchange rate had a statistically significant beneficial impact on banks' loan growth and the profitability of their business. The study's findings revealed that profitability of Ethiopian commercial banks is highly impacted by loan growth, loan loss expenditure, currency rate, and GDP.

Majok (2015) evaluated how exchange rate changes affected the financial performance of Kenyan commercial banks. The effects of the foreign exchange rate, interest rate spread, inflation, and bank size on the financial performance of commercial banks were the study's specific objectives. ROA was employed as a metric to quantify profitability through multiple regression analysis. A descriptive research approach was used from 2002 to 2014. Second-hand information was gathered and subjected to multiple regression analysis from a sample of 43 Commercial Banks. The study results indicated that while inflation and interest rate spread had a negative impact on the profitability of commercial in Kenya, foreign exchange and bank size had a weaker negative impact. According to the study, there were somewhat negative correlation between exchange rate volatility and bank financial performance. The researcher subjected liquidity risks as a moderating variable to establish the impact between the diversification and financial performance.

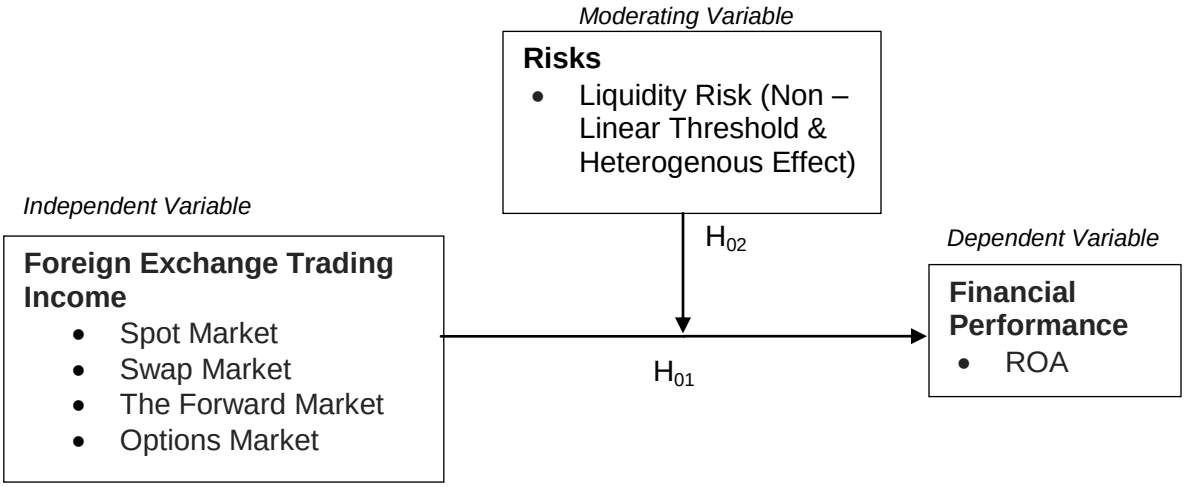
Mugambi (2016) looked at the connection between currency trading and the financial success of commercial banks, and assessed strategic alternatives for mitigating the impact of such exposure to banks listed on the NSE. The goals of the study were to quantify the exposure of commercial banks to foreign exchange rates, ascertain the link between overseas trade and the financial performance of eleven publicly traded commercial banks from 2010 to 2015 in Kenya. A descriptive study approach was used with sample size of 44 workers. Primary data was gathered through surveys and interviews, while secondary data came from financial accounts. The Statistical Package for Social Science was used for the analysis. The majority of respondents to the survey believed that commercial banks were exposed to transaction risk, that trading and a bank's financial performance were significantly correlated, and that commercial banks used hedging as a technique to control their exposure to international risk. The results of the study showed a strong correlation between forex trading and financial performance as well as the quantification of the nonlinear threshold at which liquidity risks reverse the foreign exchange trading benefits.

Langat & Nyandema (2016) examined how foreign exchange rates affect the financial performance of commercial banks listed on the Nairobi Securities Exchange. The study's main goal was to determine how exchange rate fluctuations, interest rates, and inflation rates affected the financial performance of commercial banks listed on the Nairobi Securities Exchange. Eleven commercial banks that were listed on the Nairobi Securities Exchange between 2006 and 2013 formed the sample size. The study utilized a time series correlation research approach. The gathered data were examined using multivariate linear regression. The study's findings showed that while inflation had a negative association with ROE and ROA, exchange rate and interest rate had favorable relationships with both. The puzzle motivates the study on foreign exchange trading income diversification and financial performance of commercial banks in Kenya between 2019 and 2023 with liquidity risks as moderating variables.

Conceptual Framework

This is a context that includes elements that signify the problems of a system under observation that have been seen, experienced and studied. This is a typically a synthesis of several ideas drawn from the research domains and used as the basis for subsequent presentation. Conceptual literature review covers independent variables, moderating, dependent and bank tiers. It shows that income sources diversification (foreign exchange trading income diversification) directly influences the financial performance measured by ROA and moderated by nonlinear threshold of liquidity risk across bank tiers (heterogenous effect).

Figure 1: Conceptual framework of the Study



METHODOLOGY

Research Design

The longitudinal research design enabled gathering of data on the same unit at various intervals in time, making it eligible to use panel data from 2019 to 2023. The hypothesis was tested within the 95 percent level of confidence interval. According to (Burke, J. G., & Onwuegbuzie, A. J., 2004), the 95 percent confidence level is often used in statistical analysis and is a generally acceptable standard to test the hypothesis.

Target population and Sample size

Population is defined by (Cooper & Schindler, 2006) as the entire collection of factors from which one wishes to draw conclusions. The target population of the study was 38 Commercial Banks in Kenya, according to the (CBK, Bank supervision annual report, 2019). The sampling frame for this study consisted of all the banks in Kenya. Purposive sampling method was applied and a total of 35 banks were studied out of 38 representing 92% adequate representation of the population. All Tier I and Tier II banks were selected for the study as they have higher proportion of the entire industry while in Tier III banks, three banks were excluded subjectively due to incomplete data since they were in the process of mergers and acquisition with their published financial reports showing partial operations which could be biased.

Sources of Data

Document guide analysis was utilized to collect data. Data from Banks audited annual reports were gathered via the bank's websites, together with data from CBK Annual Bank Reports and Annual Banking Survey Reports for the years between 2019 and 2023.

Data collection Instrument

The Financial Statistics database of banks was used as secondary source of data to collate the data into the data collection instrument developed by the researcher. Upon completion, the instrument was subjected to analysis. Diagnostic tests carried out included reliability test, linearity test, validity test and multicollinearity tests.

Data Analysis

STATA was used to test the objectives and hypothesis using multiple methods including OLS, panel threshold and quantile regression. H01 direct effects of foreign exchange trading income diversification on financial performance was tested using fixed effects regression (OLS) with clustered standard errors. H02 for non-linearity was tested using panel threshold regression and H02 tests for heterogenous on high/low performance bank used quantile regression.

ANALYSIS, FINDINGS AND DISCUSSION

Descriptive Statistics

Table 1: Descriptive Statistics Results

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA (%)	175	2.46	3.13	-19.81	18.86
FX Income (%)	175	7.90	9.46	0.05	48.74
Liquidity Risk (%)	175	45.22	22.17	17.20	162.20

On foreign exchange trading income diversification mean of 7.89% shows that it contributes moderately to banks income, with a maximum of 48.74% for some banks suggesting that some banks rely heavily on foreign exchange trading income diversification. This is in line with (Mwega, 2020) who noted that foreign exchange trading income diversification is a critical revenue stream for banks in volatile markets. Low of 0.05% implies that not all banks engage in foreign exchange trading income diversification possibly due to operational constrains or regulatory. Interpretation in line with nonlinear threshold and heterogeneity revealed substantial variability in foreign exchange trading income diversification and risks, supporting the need to investigate non – linear threshold with objective of knowing where risks reverse foreign exchange trading income diversification benefits and quantify heterogeneous effects a cross high/low performing banks. (Laeven & Levine, 2007) on heterogeneity suggest that high performing banks with ROA above 9.3% are likely to manage foreign exchange trading income diversification better than low performing banks. (Demirgüç-Kunt & Huizinga, 2010) suggests banks engaging in foreign exchange trading income diversification face a tradeoff while foreign

exchange trading income diversification provide liquidity, it also exposes banks to sudden stops in currency market due to hedging costs. Finally, foreign exchange trading income diversification shows skewed distribution suggesting diminishing returns or increased risks beyond a point.

Trend Analysis for the variables

Foreign exchange trading income diversification is a critical non funded income (NFI) component driven by currency volatility and demand for foreign currencies, particularly the US dollar. Foreign exchange trading income diversification increased significantly due to increased demand for US dollars (dollar shortage) and created arbitrage opportunities. This is volatility driven revenue growth.

The year 2019 was a challenging environment for forex related revenue as Kenya Shillings appreciated by 0.5 % which negatively impacted on foreign exchange trading income diversification. Further, in 2020 it nose-dived due to COV19 negative effects such as low tourism, lockdowns from 3.0 % to 1.7%. The Kenya Shillings further appreciated by 2.0 % in 2021 potentially boosting foreign exchange trading income diversification due to increased demand for dollars hence supported FX trading. While in 2022 non funded income (NFI) grew significantly with foreign exchange trading income diversification being a significant driver due to higher dollar demand amid economic pressures. Surprisingly, between 2022 and 2023 it was influenced by currency movement and had significant growth from 7% to 12%. In contradiction of the same (Sanya & Wolfe, 2011) argued that excessive forex trading exposes banks to speculative losses during volatility. Kenya' steady foreign exchange trading income diversification growth could suggest better hedging practices or appreciation of the shillings against the dollar. Liquidity risks refers to banks inability to meet short term obligations due to insufficient liquid assets or funding sources, often exacerbated by deposit outflows or market disruptions. This is measured by liquidity ratio (liquid assets to short term liabilities) as such required by CBK. The minimum statutory requirement is 20%. Banks generally maintains ratios above minimum but often faced pressures due to economic disruptions and tighter monetary policy. Liquidity ratios declined between 2019 to 2023 COVID 19 and rising interest rates (2022 – 2023) which reduced excess liquidity, social media and technology increased deposit run risks in 2023 further straining liquidity. The LRC rose from 54.7% to 63.1% between 2019 and 2023 respectively, this increases buffers aligns with Basel III adoption CBK (2020). Higher liquidity may also reflect cautious lending post crisis as noted by (Diamond & Rajan, 2001) may also confirms (Laeven & Levine, 2007), warning that diversification benefits reverse if risks thresholds are breached.

Return on Assets had overall, upward growth between but dip in 2020, due to COVID 19. While 2019 indicated moderate efficiency in generating profits from assets this turned in 2020 significantly drop likely due to the economic impact of COVID 19 pandemic which increased NPL and reduced lending activity. In the year 2021 ROA recovered showing improved assets utilization as the economy began to rebound from the pandemic. The post 2020 suggests effective risk management and diversification strategies as noted by (Berger A.; Hasan I.; Korhonen I.; Zhou, M, 2010), banks with diversified income streams exhibit higher resilience during economic shocks, supporting sustained ROA and ROE. Further, (Berger A.; Hasan I.; Korhonen I.; Zhou, M, 2010) and (Berger & Bouwman, 2013) found that diversified banks exhibit higher profitability post crisis to reduce reliance on volatile interest income, this aligns with Kenya's post 2020 recovery. In a contradiction (Stiroh, 2004) cautioned that non - interest income diversification can increase risk adjusted returns only if operational risks are well managed. The 2020 dip suggest Kenyan banks initially struggled with pandemic induced risks. (Demirgüç-Kunt & Huizinga, 2010) found that financial crisis disproportionately impacts banks reliant on traditional interest income, whereas diversified banks recover faster. While, 2022 increased reflecting enhanced efficiency in asset use and higher earnings. In year 2023 slight dipped reflecting challenges such as NPL rise, increased lending rates and world economic difficulties. (Stiroh, 2004)'s findings that non- interest income enhances profitability but requires risks controls.

Inferential Statistics

Table 2: Pearson Correlation Result

Variables	ROA	FX%	LQ %
ROA	1	0.23	-0.39
FX%	0.23	1	0.05
LQ %	-0.39	0.05	1

The MPT of (Markowitz H., 1952) cautioned against putting eggs in one basket, suggesting that diversification reduces risks by spreading income sources, potentially enhancing financial performance. Commercial banks in Kenya have embraced MPT by diversifying in foreign exchange trading to enhance their profitability. The weak positive correlation between foreign exchange trading income diversification and financial performance indicators (ROA: r= 0.23) suggests that foreign exchange trading income diversification contributes positively to ROA. This finding is supported by (Berger A.; Hasan I.; Korhonen I.; Zhou, M, 2010) who posit that foreign exchange trading income diversification boosts profitability in stable markets but

requires robust risk managements systems. In Kenya, foreign exchange trading income diversification may erode the margins during volatility (CBK, Bank Supervision Annual Report , 2021). In addition, (Choi, Uland, & Ddinandi, 2006) also found that foreign exchange trading income diversification enhances profitability in emerging markets due to high currency volatility which creates arbitrage opportunities. The very weak positive correlation with liquidity risk (LR: r = 0.05) suggests that foreign exchange trading income diversification is minimally affected by liquidity constraint, possibly due to the liquid nature of FX markets. (Baele, De Jonghe, & Vander, 2007) highlighted that FX income contributes to performance in banks with diversified portfolios, particularly in markets with high trade volumes. Foreign exchange trading income diversification negatively correlates with ROA at r = -0.39 confirming that FX diversified banks perform better that non-FX diversified bank.

The OLS regression analysis examined the relationship between foreign exchange trading income diversification and financial performance of commercial banks moderated by liquidity risks.

Table 3: OLS regression results and interpretation for ROA

Variable	Coefficient	Std error	t-statistics	P>(t)	95% CI	
FXI	0.46	0.013	3.76	0.038	0.022	0.070
LQ Risk	-0.013	0.007	-2.02	0.007	-0.025	-0.000
Constant	2.520	0.360	7.14	0.000	1.815	3.200
R^2	0.43					
Adj. R^2	0.39					

$Y_{it} = 2.520 – 0.00598X_{1it} + €_{it}$

Foreign exchange trading income diversification coefficient of 0.4632 with p value of 0.03784 indicates that foreign exchange has positive significant impact on ROA, although foreign exchange income contributes marginally positively to financial performance, its effect is statistically significant. This is supported by (Mwangi & Murigu, 2015) found that FX income significantly boosted ROA in commercial banks in Kenyan. (Berger A.; Hasan I.; Korhonen I.; Zhou, M, 2010) found that foreign exchange trading income diversification can enhance profitability in stable markets but becomes volatile during economic shocks, this is contradicted by (Yermack, 2007) and (Wanjohi, 2017) found inconsistent FX impacts depending on hedging costs and market volatility. In Kenya, the volatile nature of the FX market where gains from currency trading offset by exchange rate fluctuations or hedging cost hampers low profitable banks. Foreign exchange trading income diversification is significantly moderated by liquidity risks.

Table 4: Panel Threshold Regression Results and Interpretation

Dependent	Moderator	Tier	Threshold	β (Below)	β (Above)
ROA	Liquidity Risks (LR)	I	51%	0.046	- 0.016
		II	46%	0.041	- 0.019
		III	41%	0.036	- 0.021

This section presents findings and interpretation of the panel threshold regression results across Tier I, II and III commercial banks in Kenya between 2019 and 2023 analyzing the non-linear impact of foreign exchange trading income diversification on financial performance (ROA), moderated by liquidity risk.

For Tier I banks foreign exchange trading income diversification improves ROA when liquidity risks is below 51%, but harms it beyond that. This slightly above the CBK prudential guideline of 40%. (Béchir, Lotfi, & Ben Zaied, 2022) used threshold effects of income diversification on banks stability: an efficiency perspective based on dynamic network clacks based measured model

Foreign exchange trading income diversification has positive effects on ROA, only under low liquidity risks threshold of 46% which is slightly above LCR of 40% by CBK. The Tier II banks appear more sensitive to both liquidity risks thresholds.

For tier III banks on ROA, foreign exchange trading income diversification indicates positive effect when liquidity is below 41% and above that the benefit is eroded. These banks are the most fragile. Benefits from foreign exchange trading income diversification vanish fast as risk builds. The finding is supported by (Wanjohi, 2017) who warned that Tier III banks lacks buffer to absorb income volatility of foreign exchange trading income diversification. Tier III have low tolerance, risks quickly offset foreign exchange trading income diversification benefits. While for Tier II the foreign exchange trading income diversification is moderate and needs to maintain tighter risks control to reap the benefits of diversification. Finally, Tier I bank have got high tolerance hence can reap the benefits of foreign exchange trading income diversification more, though overexposure leads to negative effects of diversification on returns. Diversification is not a one size fits all strategy. Thresholds clearly differ by tier and ignoring them may lead to negative returns.

Table 5: Foreign exchange trading income diversification and heterogeneous effect across bank tiers

Tier	Quantile	Constant	FX	LQ Risks	S.Error	p-value
I	0.25 (Low)	0.96	0.43	- 0.29	0.29	0.001
	0.75 (High)	2.03	0.17	- 0.09	0.43	0.552
II	0.25 (Low)	0.63	0.13	- 0.23	0.32	0.000

	0.75 (High)	1.06	0.09	- 0.13	0.52	0.542
III	0.25 (Low)	1.64	0.11	- 0.46	0.36	0.000
	0.75 (High)	0.42	0.09	- 0.19	0.56	0.468

$Y_{it} = 1.123 – 0.057X_{1it} – 0.0198X_{2it} – 0.0325X_{3it} + €_{it}$

Coefficients represent the change in ROA (%) for one standard deviation increase in the independent variable.

Tier I Banks - Low Performing (25th Quantile)

Foreign exchange trading income diversification had positive and significant coefficient of 0.43, with p=0.001. This implies that a one standard deviation increase in FX increases ROA by 0.43%, indicating that foreign exchange trading is valuable income source for low performing Tier I banks. This finding is consistent with (Meslier, Tacneng, & Tarazi, 2014) who found that foreign exchange income positively impacts performance of emerging markets (Kenya is emerging markets). However, the same is in contradiction with the (Baele, De Jonghe, & Vander, 2007) who found that diversification does not always lead to performance gains, particularly for banks with high risks exposure unlike Tier I findings. The findings call for this quantile to focus on FX trading to boost ROA. Which is contradicted by (Lepetit, Nys, Rous, & Tarazi, 2008) who suggested that diversification into FX trading increase risks without significant ROA gains. The current study recommends implementation of robust liquidity risk management to maintain ratios below 30%. These banks can diversify foreign exchange trading income cautiously ensuring risks levels do not offset the gains.

Tier I Banks - High Performing (75% Quantile)

The findings of the study indicates that high performing Tier I bank rely heavily on foreign exchange trading income diversification with minimal impact from risks suggesting robust risks management systems are in place. Foreign exchange trading income diversification registered positive and significant coefficient of 0.17, with $p < 0.05$ implying that one standard deviation increase in FX increases ROA by 0.17%, indicating that foreign exchange trading is valuable income source for low performing Tier I banks. Liquidity Risks coefficient of – 0.09 indicates negative impact on diversification suggesting that the higher liquidity risks reduce ROA. (Gambacorta, Illes, & Lombardi, 2014) noted that risk management capabilities reduce the negative impact of liquidity risks as seen in high performing banks.

Tier II Banks - Low Performing (25TH Quantile)

(Kiweu, 2012) found that Kenyan banks with diversified income sources face varying risks impacts, supporting heterogeneous effects across tiers. Foreign exchange trading income diversification had positive and significant coefficient of 0.13, with $p < 0.05$. A one standard deviation increase in FX increases ROA by 0.13%, indicating that foreign exchange trading is valuable income source for low performing Tier II banks. Liquidity Risks coefficient of – 0.23 indicates negative impact on diversification suggesting that the higher liquidity risks reduce ROA. Target liquidity ratios is below 35%.

Tier II Bank - High Performing (75% Quantile)

Foreign exchange trading income diversification had low impact and insignificant coefficient of 0.09, with $p < 0.01$. A one standard deviation increase in FX increases ROA by 0.09%, indicating that foreign exchange trading is low-income source for low performing Tier II banks. Liquidity Risks coefficient of – 0.13 indicates moderate negative impact on diversification suggesting that the higher liquidity risks reduce ROA.

Tier III Banks - Low Performing (25th Quantile)

Low performing Tier III banks are highly vulnerable to liquidity risks. (Mercieca, Schaeck, & Wolfe, 2007) suggested that small Tier III do not benefit significantly from foreign exchange trading income diversification due to limited resources. Foreign exchange trading income diversification revealed a low potential and insignificant coefficient of 0.11, with $p < 0.05$ implying that one standard deviation increase in FX increases ROA by 0.11%, indicating that foreign exchange trading is a low-income source for low performing Tier III banks.

Tier III Banks - High Performing (75% Quantile)

Foreign exchange trading income diversification had positive and but insignificant coefficient of 0.09, with $p = 0.001$. The results revealed that one standard deviation increase in FX increases ROA by 0.09%, indicating that foreign exchange trading is contributing less income source for High performing Tier III banks. Liquidity Risks coefficient of – 0.19 indicates negative impact on diversification suggesting that the higher liquidity risks reduce ROA. (Muriithi & Muigai, 2017)) in a Kenyan context found that diversification into non-interest income improves performance for large banks but riskier for smaller banks. Strengthen risks management frameworks to maintain liquidity risks ratios below 35% for supporting sustained performance.

Effect of FX Income on financial performance of commercial banks in Kenya (H01)

Hypothesis H01: Foreign exchange trading income diversification has no significant effect on financial performance of commercial banks in Kenya between 2019 and 2023.

Table 6: Foreign exchange trading income diversification and financial performance (H01)

Variable	ROA (β)	Std Error	z-score	P value
Constant	2.46	0.79	2.67	0.005
Foreign exchange trading income	0.10	0.03	2.66	0.005
Adj. R^2	**0.39**			

$Y_{it} = 2.46 – 0.023X_{1it} + €_{it}$…. with moderation effect of liquidity risks on ROA.

The study findings suggests that foreign exchange trading income diversification has a positive effect on performance ROA (p value = 0.005) statistically significant. Hypothesis outcome reject (H01). Foreign exchange trading income diversification boosts profitability when paired with strong liquidity control. The results suggests that 1% increase in FX trading increases ROA by 0.19%. The study further suggests that foreign exchange trading income diversification is a viable income source for improving profitability. Foreign exchange trading should be strengthened especially in volatile market environments.

Non–linear threshold and Heterogeneous effect of liquidity risks in banks (H02)

Hypothesis H02: There is no non-linear threshold and Heterogeneous effect where liquidity risk reverse foreign exchange trading income diversification benefits across bank tiers.

The model tests the hypothesis that the effects of foreign exchange trading income diversification is not uniform across risk levels, and may change sign at a certain liquidity risk's threshold.

The study reveals that a liquidity risks threshold exists. The result of liquidity non - linear threshold is indicating at ROA (p value = 0.008. Hypothesis outcome Reject (H02) as both is strong negative. The threshold shown reverses returns beyond risks tipping points. (Chen, Shen, Kao, & & Yeh, 2018) found that threshold risks levels above which diversification gains diminish supporting (H02). High liquidity is likely due to unused capital which normally creates underperformance especially in Tier II banks. The results suggest that foreign exchange trading income diversification should be optimal and sustainable to avoid liquidity risks reducing or weakening the benefits or gains. Further, liquidity risks models should identify nonlinear breakpoints where foreign exchange trading income diversification is no longer effective. There exist threshold levels beyond a certain risk level, for both liquidity risk reverse diversification

benefits (LR: 46%), the findings are slightly above CBK risks cap of LR: 40. The study suggests implementation of liquidity risk monitoring systems to stay below the threshold.

CONCLUDING REMARKS

Conclusions

The OLS regression analysis examined the relationship between foreign exchange trading income diversification and financial performance of commercial banks in Kenya while moderating for liquidity risks. Foreign exchange trading income diversification coefficient of 0.046 with p value of 0.038 indicates that foreign exchange has significant impact on ROA, foreign exchange income contributes positively to financial performance, and its effect is statistically significant.

The study results indicate that Tier I banks benefit significantly, while small banks Tier II and III show marginal and insignificant effect respectively. From earlier findings Tier I banks gain best results in foreign exchange, Tier II banks lower return from foreign exchange and Tier III are highly sensitive to liquidity risks. In emerging markets foreign exchange trading income diversification boosts profitability during currency crises. The study further reveals that foreign exchange trading income diversification works only when matched with liquidity risks control, supervision and strategic alignment especially for lower Tier banks.

Recommendations for policy

The study revealed that foreign exchange trading income diversification's effects on commercial banks' performance are different, depending on bank tier and risk levels. While generally supporting foreign exchange trading income diversification benefits, the finding cautions against blanket approaches, emphasizing the need for risks-aware, tier specific strategies. The threshold provided concrete metrics for risks management and the dynamic dependencies highlight the need for Tier Specific Risks Management. This allows more foreign exchange trading income diversification freedom for well capitalized Tier I banks and apply stricter risk monitoring for Tier I & II. In general, the regulator should tailor policies and regulations to tier based. Regulator should incorporate Tier risks threshold into capital adequacy assessments and provide prudential guidelines on optimal foreign exchange trading income diversification strategies. This will go long way in helping enforce dynamic provisioning for banks nearing liquidity risks threshold, conducts stress test against diversification at different threshold. Further CBK should introduce tiered liquidity requirements (stricter for weak banks). Tier III banks requires closer supervisory due to lower thresholds. Banks outside Nairobi securities exchange are not consistent with the financial reporting requirements, this

compromises the quality of data for analysis. CBK should mandate uniform reporting templates and enforce adherence to standardized financial reporting across banks to improve analysis accuracy.

Recommendations for managers

Tier I bank can leverage on their higher risk threshold to pursue aggressive foreign exchange trading income diversification, but implement real -time liquidity risk monitoring to avoid crossing the threshold. Tier II banks can adopt foreign exchange trading income diversification with focus on stable liquidity risks to stay below the threshold and enhance risks mitigation through liquidity buffers, ALM and adjustments to high capital requirements by CBK. Tier III banks can prioritize conservative foreign exchange trading income diversification and maintain strict control to keep liquidity risks below threshold.

The findings on heterogenous effects suggest that high performing banks should continue diversify foreign exchange trading income diversification but invest on advanced risks analytical systems to monitor threshold dynamics especially for Tier I. Low performing banks should reduce liquidity risks exposure before diversifying into foreign exchange trading income. Tier III should prioritize operational efficiency and liquidity risks reduction to avoid negative foreign exchange trading income diversification effects. This can be achieved faster if the banks hire expertise and develop capabilities in foreign exchange trading income diversification. Each bank should develop own sustainable optimal foreign exchange trading income diversification mix with the best risks return tradeoff. Equally the banks should balance between short- and long-term foreign exchange trading income diversification strategies. FX trading being potential banks should adopt a dynamic hedging strategy to mitigate FX loss.

Deal with foreign exchange trading income diversification operations by improving risks management ability, strengthen comprehensive management ability, establish the supervision and management mechanism to efficiently manage risks -return trade off. Improving risks management ability: Firstly, the bank management must improve the ability to identify, mitigate and control liquidity risks within the foreign exchange trading income diversification. Secondly, it is necessary to improve the foreign exchange trading income diversification decision-making ability to avoid subjective consciousness. The bank management decision making level must fully grasp the basic theories, criteria, methods and techniques of liquidity risk decision making use of tools. Strengthen comprehensive management ability: Firstly, it's important to cultivate and build the core competitiveness of the bank, which includes talents, technology, corporate culture and brand influence of the foreign exchange trading income diversification to create competitive advantage.

Secondly, it is necessary to determine a reasonable structures and scale for resources allocation and enhancement of returns. Finally, strengthen the ability to integrated foreign exchange trading income, identify, analyze and select all tangible and intangible resources based on their source, structure, content and merge them to create new resources. Establish the supervision and management mechanism: Firstly, is to establish a diversified liquidity risks associated with foreign exchange trading income diversification controls and supervision with agency problems solutions. Secondly, establish a scientific reward and punishment mechanisms for the foreign exchange trading income diversification to motivate banks staff to work diligently, improve operation efficiency and reduce moral and legal risks.

Adoption of Digital transformation and integration on foreign exchange trading income diversification to enhance performance should be banks' priority. API partnerships, mobile banking penetration (diversification) and FinTech collaborations and infrastructure development can enhance banks performance.

Theoretical Implications

The theoretical contributions of the study suggest integration of traditional banking theory to analyze regulatory impacts. Secondly, the study aims to extend RBV and MPT by testing non - linear diversification effects. Finally, the study suggests diversification theory to include Africa diversification theory since the context of the studies in Africa is different from studies in other continents.

Limitations and further Research

The method of presentation and disclosure of foreign exchange trading income diversification data in the financial statements of commercial banks not listed in the NSE is not uniform or standardized therefore inconclusive for users to understand and compare.

Further study should be done to establish the effect of FinTech driven income sources diversification such as Point of sale services POS, Internet banking, Mobile banking and digital lending moderated by other nonlinear risks and financial performance using Bayesian structural equation model (BSEM) to test the threshold levels with CBK requirements as prior information. In Addition, Dynamic copula model should be used to analyze the heterogenous effect. Secondly, similar study should be extended to other African Markets and incorporate macroeconomic shocks such as inflation and interest rate risks into threshold modeling.

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