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Revenue Stream Diversification and Returns on Assets of Commercial Banks in Kenya

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Abstract

Purpose: *This paper examines whether revenue diversification index significantly affects returns on assets of commercial banks in Kenya and establish the presence of a long run and the speed of adjustment to equilibrium/disequilibrium between the variables.*

Methodology: *The study used balanced panel data sourced from the central bank of Kenya database, across 42 commercial banks from 2009 to 2018. The Hirschman-Herfindahl model was used to assess the diversification index, while returns on assets were captured using earnings before interest over total assets. Regressions analysis was used to evaluate the direction and magnitude of the relationship as guided by the resource-based theory while autoregressive distributed lag (ARDL) was adopted to establish the presence of a stable long-run relationship between the variables. The paper adopted a 2-tailed test, both at 95 percent ($\alpha = 0.05$) and 99 percent ($\alpha = 0.01$) confidence level.*

Findings: *The results revealed that on aggregate, commercial banks in Kenya were moderately diversification in both interest ($HHI_{II} = .36$) and noninterest ($HHI_{NII} = .63$). The study found a statistically significant ($P < .05$) positive relationship between returns on assets and both in interest ($R^2 = .3237$, $\beta = 3.029$, $P = .049$) and noninterest ($R^2 = .062$, $\beta = 4.432$, $P = .027$) diversification indices. Further, the study established the existence of a long-run relationship with a speed of adjustment to the equilibrium of 89% (-.889) in the period. The paper concluded that diversification index influences became plausible up to a certain threshold (40%) when the weighted exposure sets in to outweigh the benefits and the relationship with returns decline. Therefore, the study demonstrates the existence of a stable long-run U-shaped relationship between revenue diversification and return on assets.*

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Implication: *This implies that bank can apply consolidation as a mechanism to achieve activities diversification in order to improve returns. The study shows that returns on assets move in a similar direction with both interest and noninterest diversification index and therefore the growth of return on asset is associated with the diversification levels of revenue streams and thus the stability of returns in commercial banks is associated with revenue diversification stability.*

Value: *The study adds value to the theory building and extend knowledge frontier in diversification-performance relationships, while providing an evidence-based integrated theoretical framework, linking the concepts together through the resource-based theory. Provides policymakers with a scale of opportunities and understanding of issues and constraints that affect the banking sector's performance.*

Keywords: *Return on assets, diversification, Autoregressive distributed lag.*

1.1 Introduction

The banking regulatory squeeze has prompted banks to shift the business tone from profit growth, to diversification, scale and returns. This has ignited a wave of banking consolidation as a way of diversifying business model, aimed at generating sustainable revenue in order to stabilize the key financial ratio and gaining market power. World over, banking business is heavily regulated and more sensitive to economic shocks, which more than often, subvert the interest revenue generation. This reduces the interest margin, which a key pillar to banks returns on assets. This ultimately weakens financial indicators, depletes the bank's capital base, and limits the funded activities. To edge these, the industry players and regulators have pushed for banking consolidation, which driven by; the market needs, bank size, market shares and circumvent barrier to new markets while the regulatory push is driven by the need to rescue the vulnerable and weak banks. Banking consolidation, therefore, would allow banks to circumvent and diversify into unfamiliar territorial activities such as bancassurance, trading in foreign exchange and other investments, which generate noninterest income, perceived less regulated and stable relatively (Muthui, 2019).

When interest rate is low or high default rate, banks rely on noninterest income to smoothen interest margin. For instance, when the interest rate is high, noninterest income sources is lowered, to outcompete competition and retain the loyal customer. Therefore, this option becomes a strategic line for banks to maintain margin spread and thus, during a harsh economic condition, regulatory squeeze or stiff competition, banks with more revenue drivers are placed better relatively (De Young & Torna, 2013). In the context of Kenya, the banking landscape has changed drastically with a wave of consolidation prompted by regulation and assets quality. To form larger, well-capitalized and stable entities, banks have either merged or been acquired. For instance, fifteen (15) consolidation occurred between 2013 and 2019, an average of three (3) consolidation per year (Cytonn, 2017). In the concept, the relatively weaker banks are acquired as banks navigate the murky regulatory environment, which has been exacerbated by stiff competition among banking sector players (CBK, 2018). This increases the customer base and products offering which is aimed at steading profitability growth, hitherto, constrained by interest rate caps on loans. This enables banks to expand both in funded and non-funded revenue streams (Gambacorta et al., 2014). With this trend, seemingly Kenyan banks are overzealously bundling their services to form a financial supermarket, perhaps to increase the noninterest revenue base. Thus, banks perceive consolidation as a model for diversification, which is perceived also as a possible solution to the problems related to performance in Kenya.

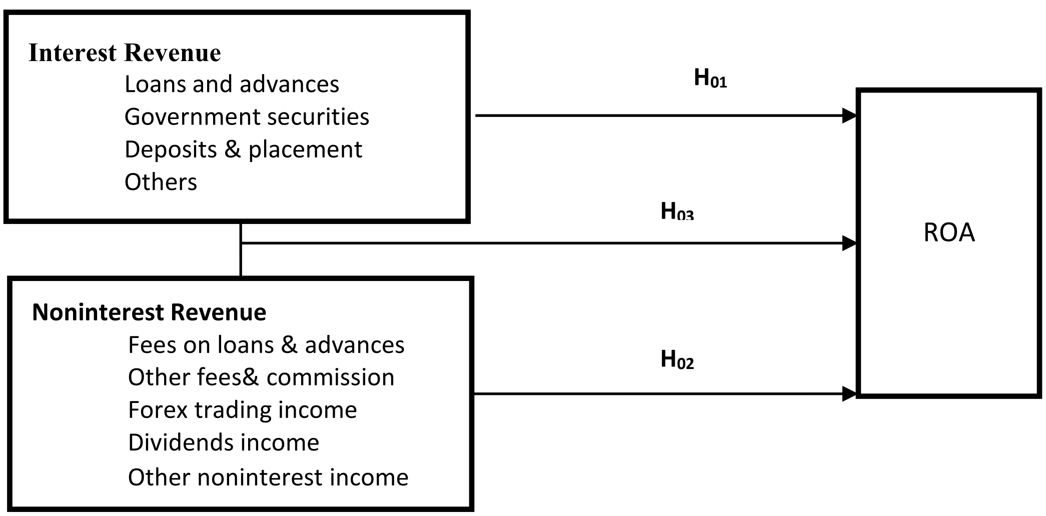
1.2 Research Problem

Despite several studies on revenue diversification and returns on assets, findings conflict. For example, EU zone studies (Staikouras et al., 2006; Chiorazzo et al., 2008; Sanya & Wolfe, 2011; De Young & Torna , 2013; Gambacorta et al., 2014; Brighi & Venturelli, 2015; Saunders et al., 2016; and Wallmeier & Guerry, 2017) argue that revenue diversification enhances returns, which contrasts USA studies (De Young & Rice, 2004; Stiroh, 2004) which suggests that it weakens banks returns. In developing markets studies found diversification to be favourable (Kiweu, 2012; Tarazi et al., 2013; Natalia et al., 2016) which contrasts Mulwa and Kosgei (2016) negative findings. Besides, some scholars have argued that banks in developing markets need to widen their scope due to inherent market failure (Khanna & Rivkin, 2001). The question therefore is; what is the relationship between the degree of revenue diversification and returns on assets. That is, whether banks would be better by remaining focused on the traditional banking activities or would be better to bundle along with non-traditional activities as a compliment. Answering this research question successfully would add value to the theory building in the field of finance, extends the theoretical knowledge frontier in diversification and returns relationships. The understanding would unearth the conflicting relationship puzzle while appealing to scholars as a basis for future research.

2.1 Conceptual Framework

In order to address the research question, the study had sub-hypothesized that: interest diversification level does not significantly affect returns on assets (H_{01}), Non-interest income diversification level does not significantly affect returns on assets (H_{02}) and combined interest and noninterest income diversification level does not significantly affect returns on assets **(**H_{03}). Finally, the study hypothesized on the existence of a long-run equilibrium relationship between the variables. The hypothetical relationships are presented in figure 1.

Figure 1: Conceptual Framework



Source: Author, 2019.

3.1 Methodology and Measurement of Variables

The study examined the effect of diversification on returns of commercial banks. The literature reviewed revealed that theorists and external analysts mostly adopts sales, assets or equity as metrics measure of firm's scale returns (Jung, 2003). This study adopted returns on assets (ROA) an indicator to assess the bank’s returns. The measure is perceived to be most suitable for the banking sector and appeals to external analysts or stakeholders. The ROA metric was measured as a ratio of earnings before interest and tax (EBIT) over the total assets (TA). The ratio shows how best a bank uses its investment funds in generating returns (Almazari, 2014). Diversification was modelled using the Herfindahl-Hirschman Index (HHI). HHI is a composite index, which was introduced by Hirschman (1945) and Herfindahl (1950) independently. Other authors (Staikouras et al., 2006; stiroh, 2004; Chiorazzo, 2008) have since adopted this as a measure of diversification in the banking industry. The index is a sum-up of weighted squared exposures as a percentage of total exposure. The higher index reflects concentration while a lower value reflects diversification. This study adopted an adjusted Herfindahl-Hirschman Index, which is a unit less (1-HHI) so that the index level implies the level of diversification. The index ranges from zero to one (0 < HHI < 1), where zero is the least diversified (focused) bank while one is a fully diversified bank. The rule of thumb is that diversification index less or equal to 0.25 (HHI ≤ .25) implies a focused (undiversified) bank, while greater than or equal to 0.75 (HHI ≥ .75) imply a fully diversified. Equations (1) and (2) represented Herfindahl-Hirschman and return on assets models respectively.

$$HHI = \sum_{i=1}^{n} \left(\frac{xi}{Q}\right)^2 \qquad (1)$$

Where $: Q = \sum_{i=1}^{n} xi + ... + xn$ represents thetotal revenue exposure, ∑ = Sum, HHI= diversification index and x_i = an exposure variable.

$$Return\ on\ assets = \frac{Earnings\ Before\ Interest\ and\ Tax}{Total\ Assets} \qquad (2)$$

The regression prediction model can be presented as:

$$\boldsymbol{ROA_{it} = \beta_0 + \beta_1\ (HHI)_{it} + \mathcal{E}_{it}} \qquad \textbf{(3)}$$

Where: ROA**;** return on assets for bank i at time t, β_0; constant, β_1, coefficients for revenue diversification, HHI; Revenue diversification index, Ɛ; error term. As earlier alluded, banks generate revenue from two sources components: interest and non-interest. The construction of the different diversification index is as represented by equation 4, 5 & 6.

$$HHI_{II}) = \mathbf{1} - \left\{ \left(\frac{\mathbf{LA}}{\mathbf{TR}}\right)^2 + \left(\frac{\mathbf{GS}}{\mathbf{TR}}\right)^2 + \left(\frac{\mathbf{DP}}{\mathbf{TR}}\right)^2 + \left(\frac{\mathbf{OII}}{\mathbf{TR}}\right)^2 \right\} \qquad (4)$$

$$HHI_{NII}=\mathbf{1}-\left\{\left(\frac{\mathbf{FLA}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{OFC}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{FEX}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{DI}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{ONI}}{\mathbf{TR}}\right)^{\mathbf{2}}\right\}\ldots\ldots\ldots\ldots \quad (5)$$

$$HHI=\mathbf{1}-\left\{\left(\frac{\mathbf{LA}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{GS}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{DP}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{OII}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{FLA}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{OFC}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{FEX}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{DI}}{\mathbf{TR}}\right)^{\mathbf{2}}+\left(\frac{\mathbf{ONI}}{\mathbf{TR}}\right)^{\mathbf{2}}\right\}\ldots \quad (6)$$

Where: HHI_{II} = interest diversification index, $HHIN_{II}$ =noninterest diversification index, HHI= combined diversification, 1= a unit, LA = interest from loans and advances, GS = interest from government securities, DP = interest from deposits and placements, OII = other interest income. FLA = fees on loans and advances, OFC = other fees and commission, FEX= foreign exchange trading, DI= dividends income and TR = total revenue.

4.1 Data Analysis

The study used panel data from CBK database, across 42 banks over 10 years (2009-2018). Regression analysis was used to assess the magnitude and direction of the relationships and whether returns on assets, could be predicted based on the revenue diversification index. Autoregressive Distributed Lag (ARDL) model was used, to establish the presence of a stable long-run relationship between the variables. Since the total population was used in the analysis, the results were interpreted using the adjusted R squared ($\bar{R}^2$) correlation coefficient. $\bar{R}^2$ informs as to how useful a variable in accounting for the dependent variable. The regression power was assessed through the t-test, which informs on the strength of dependent and independent relationship.

4.1.1 Descriptive Statistics

In order to visualize the data, descriptive statistics were generated as shown in table 1.

Table 1: Panel Data Descriptive Statistics Results

Statistic	ROA	HHI_{II}	HHI_{NII}	HHI
Mean	0.020365	0.356607	0.633184	0.577250
Std. Dev.	0.037901	0.123568	0.101797	0.106667
Skewness	-2.259649	-0.159398	-1.694060	-0.279526
Kurtosis	3.07596	2.553445	3.686501	3.381017
Jarque-Bera	355.803	5.243159	436.6297	7.971817

Probability	0.07687	0.072688	0.129879	0.08576

Table 1 reveals the mean diversification indices of interest, noninterest and combined (Interest and noninterest) of .36±1, .63±1 and .58±1 respectively. Results depict a moderate diversification in revenue, with higher diversification index observed in noninterest components than in interest components. Negative skewness and positive Kurtosis shows that the data falls within the accepted range and leans to the left of mean and heavily tailed distribution than normal. Jarque-Bera insignificance ($P > .05$) reveals that the variables data in all cases were normally distributed.

4.1.2 Model specification

The Hausman (1978) test assessed for the model suitability. The null hypothesis was the random-effects model was appropriate while the alternative was the fixed-effects model was appropriate. The decision criterion was to reject the null hypothesis if the p-value was insignificant. The results are presented in Table 2.

Table 2: Correlated Random Effects - Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.400621	2	0.0937

Table 4.2, shows an insignificant chi-square ($\chi^2 = 6.4$, df = 2, P = 0.0937), which imply that the random-effect model was most appropriate in the prediction. This model can be represented as:

$$\mathbf{Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \mathcal{E}_i + U_{it}} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

Where : Y_{it} = dependent variable of bank i at time t, i = observation, t = time period, Xit = vector of independent variables, β_0 = constant term, $\beta_1, \beta_2, \beta_3,$ = coefficients of independent variables, Ɛit = composite error term, Uit=idiosyncratic disturbances. Equation (7) assumes that the slope (β_1) is a random mean and the intercept for each bank is $\beta_{1i} = \beta_1 + \mathcal{E}_i$.

4.1.3 Data stationarity

The Augmented Dickey Fuller (ADF) unit root tested for the data stationarity and the cointegration order. The null-hypothesis was variables data contains a unit root, while alternative was no unit root. The ADF decision criteria was to reject the null hypothesis if the computed ADF value was greater than critical values with significance. Results are as shown in Table 3.

Table 3: Unit Root Tests Results

Var	ADF	P	t @5%	Lag	D-W	Decision Verdict
ROA	-10.13	.00	-2.87	-.3967	2.014	ADF > CT, P. <0.05 *1(0)*. Reject H_0
HHI	-8.36	.00	-2.87	-.6172	2.018	ADF > CT, P.<0.05. *1(0)*. Reject H_0
HHI_{II}	-18.99	.00	-2.87	-.9296	1.991	ADF > CT, P.<0.05, *1(0)*. Reject H_0
HHI_{NII}	-21.76	.00	-2.87	-1.067	2.014	ADF > CT, P.<0.05, *1(0)*. Reject H_0

*MacKinnon (1996) one-sided p-values.

Table 3 shows that all data variables had no unit root (ADF>CT) at level with significance (p <. 05). Therefore, the variables data was stationary at a 5 percent level and exhibits integration order 1(*0*). Therefore, based on these results, the panel data variables co-integrated well and as such, it was safe to adopt other time series models such as ARDL.

4.1.4 Normality test

The study used the Kolmogorov-Smirnov (K-S) test to assess for normality distribution. The null hypothesis was that the sample distribution was normal. The insignificance (P > .05) outcome of the K-S test is normally desired. The results are presented in Table 4.

Table 4: One-Sample Kolmogorov-Smirnov Test Results

	ROA	HHI	HHI_{II}	HHI_{NII}
Kolmogorov-Smirnov Z	3.322	.521	.969	2.599
Asymp. Sig. (2-tailed)	.0784	.949	.305	.067

a. Test distribution is Normal.

Table 4: One-Sample Kolmogorov-Smirnov Test Results

	ROA	HHI	HHI_{II}	HHI_{NII}
Kolmogorov-Smirnov Z	3.322	.521	.969	2.599
Asymp. Sig. (2-tailed)	.0784	.949	.305	.067

a. Test distribution is Normal.

b. Calculated from data.

Table 4 shows that all data variables had insignificant (P > .05) K-S test results, which conforms the Jarque-Bera test results (see table 1) of data normally. This implies that the study data did not deviate significantly from a normal distribution.

4.1.5 Serial correlation

The Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) test was used to evaluate autocorrelation. The null-hypothesis was data variables have a serial correlation with the alternative of no serial correlation. Insignificant LM outcome is desirable as shown in table 5.

Table 5: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	112.6918	Prob. F(2,413)	0.17662
Obs*R-squared	147.5745	Prob. Chi-Square(2)	0.07945

Table 5 shows insignificant LM test results (F (2,413) = 112.7, P = .17, and $\chi 2$ = 147.6, P = .079), which implies no serial correlation between the explanatory variables.

4.1.6 Heteroscedasticity

The Breusch and Pagan (1979) test was used to assess the error terms homogeneity. The null-hypothesis was error terms are homoscedastic with the alternative of heteroscedasticity. The insignificance outcome is desired. Table 6 shows the results.

Table 4.6: Heteroscedasticity Test: Breusch-Pagan-Godfrey Results

F-statistic	0.410320	Prob. F(3,414)	0.7457
Obs*R-squared	1.239167	Prob. Chi-Square(3)	0.7436

Table 6 results reveal insignificant results (F (3,414) = .41, P = .74 χ^2 = 1.24, P = 74), which imply that error terms were homogeneous.

4.2 Hypothesis Testing and Discussions

In order to estimate the coefficients of the linear equations between independent and dependent variables, the study used regression analysis.

The first null hypothesis (**H_{01}**) stated that interest diversification index does not significantly affect returns on assets. Simple regression results are as presented in Table 7.

Table 7: Regression results for HHIII and ROA.

Model Summary

Model		**R**	**R Square**	**Adjusted R Square**	**Std. Error**	**Durbin-Watson**
1	HHI_{II}	.569[a]	.3237	.3191	.03777	1.812

Anova

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	.246	1	.246	246	.049[a]
	Residual	.456	416	.001		
	Total	.702	417			

Coefficients

Model		**Unstandardized β**	**S.E**	**Standardized β**	**t**	**Sig.**
1	(Constant)	2.010	.948		2.120	.081
	HHI_{II}	3.029	.954	.569	3.175	.049

a. Predictors: (Constant), Interest diversification index (HHI_{II}).

b. Dependent Variable: Return on assets (ROA)

Table 7 shows that HHI_{II} explained 32 percent ($\bar{R}^2$ = .3191) of the variations in ROA. The model finding shows that the independent variable, HHI_{II} predicted precisely the dependent variable, ROA with significance (F (1,416) = 246, P = .049). The Durbin-Watson (*d* = 1.812) was close to two, which implied that the independent error term assumption was tenable. The model further revealed that both unstandardized beta coefficient (β = 3.029, t = 3.175, P=.049) were positive and statistically significant. This implied that the interest diversification coefficient was significantly different from zero and as such, the null-hypothesis (H_{01}) that the population value for the regression coefficient was zero (0) was rejected. The prediction equation can be presented as;

$$\mathbf{ROA_{it} = \beta_0 + \beta_1 (HHI_{II}) + \varepsilon_{it}.}$$

$$\mathbf{ROA` = 2.010 + 3.029(HHI_{II})}$$

Where: ROA`= the predicted return on assets, 2.010 = constant ($\beta_0$), 3.029 = the expected change on ROA` due to a 1-unit change in HHI_{II}.

The second null hypothesis (H_{01}) had stated that noninterest diversification index does not significantly affect returns on assets. The regression results are as shown in Table 4.8.

Table 8: Regression results for HHI_{NII} and ROA

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error	Durbin-Watson
1	.251[a]	.063	.062	.03795	1.793

Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.324	1	.324	324.0	.027[a]
	Residual	.378	416	.001		
	Total	.702	417			

Coefficients

Model		Unstandardized β	S.E	Standardized β	t	Sig.
1	(Constant)	4.019	1.112		3.614	.100
	HHI_{NII}	4.432	2.118	.251	2.092	.027

a. Predictors: (Constant), Noninterest diversification index (HHI_{NII})

b. Dependent Variable: Return on assets (ROA)

Table 8 suggests that HHI_{NII} explains 6.2 percent ($\bar{R}^2$ = .062) of the variation in ROA. The unstandardized beta coefficients (β = 4.432, t = 2.092, P=.027) were both positive and significant. This implies that noninterest diversification is a good predictor for the dependent variable, ROA (F (1, 416) = 324, P = .027). This means that noninterest diversification coefficients were statistically different from zero and thus, the study rejected the second null-hypothesis (H_{02}). The prediction can be represented as;

$$\mathbf{ROA_{it} = \beta_0 + \beta_1 (HHI_{NII}) + \mathcal{E}_{it}.}$$

$$\mathbf{ROA` = 4.019 + 4.432(HHI_{NII})}$$

Where: ROA`= predicted return on assets, 4.019 = constant ($\beta_0$), 4.332 = expected estimate ($\beta_1$) change on ROA` due to a 1-unit change in HHI_{II}.

The third null-hypothesis ($\mathbf{H_{03}}$) had stated that the combined interest and noninterest diversification level does not significantly affect returns on assets. The regression model results are as presented in Table 4.9. Table 4.9 suggests that revenue diversification explains 22 percent ($\bar{R}^2$ = .2241) of the variation in return on assets (F (1, 416) = 248, p = .016). The unstandardized (β) coefficient for HHI_{NII} (β = 3.027, t = 2.710, p = .016) were positive and statistically significant (P < .05). The hypothetical predicted equation;

$$ROAit = \beta 0 + \beta 1 (HHI) + \mathcal{E}it.$$

$$ROA` = 2.005 + 3.027 (HHI)$$

Where: ROA` is the predicted return on assets, 2.005 is a constant ($\beta_0$), 3.027 is expected change on ROA` due to a 1-unit change in HHI.

Table 9: Regression Results for HHI_{II}, HHI_{NII} and ROA

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error	Durbin-Watson
1	.477[a]	.2243	.2241	.03783	1.808

Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.248	1	.248	248	.016[a]
	Residual	.454	416	.001		
	Total	.702	417			

Coefficients

Model		Unstandardized β	S.E	Standardized β	t	Sig.
1	(Constant)	2.005	.911		2.201	.654

HHI	3.027	1.117	.477	2.710	.016

a. Predictors: (Constant), combined diversification HHI(HHI_{II} + HHI_{NII})

b. Dependent Variable: Return on Assets (ROA)

Table 9 suggests that revenue diversification explained 22 percent ($\bar{R}^2$ = .2241) of the variation in return on assets (F (1, 416) = 248, p = .016). The unstandardized (β) coefficient for HHI_{NII} (β = 3.027, t = 2.710, p = .016) were positive and statistically significant. The hypothetical predicted equation;

$$ROAit = \beta 0 + \beta 1 (HHI) + \mathcal{E}it.$$

$$ROA` = 2.005 + 3.027 (HHI)$$

Where: ROA` is the predicted return on assets, 2.005 is a constant ($\beta_0$), 3.027 is expected change on ROA` due to a 1-unit change in HHI.

The fourth null-hypothesis (H_{04}) evaluated the absence of a long-run equilibrium relationship between the dependent and independent variables, using the Autoregressive Distributed Lag (ARDL) approach. The ARDL long-run form and bounds test the presence of a steady-state equilibrium between variables. The rule of thumb was long-run equilibrium existed if F-statistic becomes greater than the upper bound critical values and does not exist if less than the lower bound. The results would be inconclusive if F-statistics falls in between the upper and the lower bounds critical values (Nayaran, 2005). The ARD model estimates are as shown in table 10.

Table 10: ARDL Long Run Form and Bounds Test Results

Levels Equation

Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HHI	0.32280	0.25259	1.277977	0.0220
II	0.26817	0.21351	1.255995	0.0298
NII	0.63102	0.38541	1.637269	0.0088

EC = ROA - (.323*HHI + .268*II+.631*NII)

F-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
			Asymptotic: n=1000	
F-statistic (k=3)	24.18337	5%	4.01	5.07
Actual Sample Size	415		Finite Sample: n=80	
		5%	4.203	5.32
t-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-9.495111	5%	-3.41	-4.16

Table 10 shows the critical values at a 5 percent level of significance. The upper and lower bounds were 4.01 and 5.07, while the F-statistic was 24.18337. Based on these results, the F-statistic was above the upper-bound critical value and thus, the test result provides enough evidence to reject the fourth null-hypothesis (H_{04}). The study found a non-spurious long-run level relationship between the degree of diversification and returns on assets, with an error correction equation, EC = ROA - (.323*HHI + .268*II+.631*NII).

4.2.1 Error Correction Model (ECM) Estimator Tests Results

Given the evidence of the existence of a long-run equilibrium relationship between the dependent and the independent variables, a short-run relationship was explored using Error Correction (ECM). ECM explains the speed of adjustment in restoring disequilibrium in the dynamic model, with a negative sign desired. The ECM results estimates are presented in Table 4.11.

Table 11 shows a negative (-.886894) ECM cointEq (-1)* with significant (P = .0000) at 5 percent level. This implies that the speed of adjustment is very high. In addition, all the independent variables HHI, HHI_{II}, and HHI_{NII} had negative coefficients with significant (β = -.028629, P = .0203), (β = -.023784, P = .0225), (β = -.046707, P = .0012) respectively. The results indicate a goodness-of-fit short-run model with satisfactory as evidenced by R-squared (R^2 = .441733) and adjusted R-squared of 43% ($\bar{R}^2$ = .432131), with the Durbin-Watson (*d =1.8*) falling within the acceptable range (1.5 and 2.5). This implies that the short-run effects of the diversification index explained about 43 percent of the change in returns on assets. The estimated value of the coefficient of the ECM implies that about 89 percent (cointEq (-1)* = -.886894) of the disequilibrium in returns on assets would offset by the short-run adjustment within the same period (year).

Table 11: ARDL Error Correction Regression

ECM Regression. Selected Model: ARDL(4, 1,1, 2), Case 5: Unrestricted Constant and Unrestricted Trend				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.051559	0.006637	-7.768475	0.0000
@TREND	2.06E-05	1.65E-05	1.248924	0.2124
D(ROA(-1))	0.020175	0.081966	0.246138	0.8057
D(ROA(-2))	0.032949	0.069945	0.471064	0.6378
D(ROA(-3))	0.229910	0.054253	4.237711	0.0000
D(HHI)	-0.028629	0.022566	-1.268686	0.0203
D(HHI_{II})	-0.023784	0.018630	-1.276665	0.0225
D(HHI_{NII})	0.41320	0.014385	2.872513	0.0043
D(HHI_{NII}(-1))	-0.046707	0.014344	-3.256289	0.0012
CointEq(-1)*	**-0.886894**	**0.089841**	**-9.871768**	**0.0000**
R-squared	0.441733	Mean dependent var		-0.000869
Adjusted R-squared	0.432131	S.D. dependent var		0.052397
S.E. of regression	0.039485	Akaike info criterion		-3.606697
Sum squared resid	0.634543	Schwarz criterion		-3.529044
Log likelihood	756.3897	Hannan-Quinn criter.		-3.575990
F-statistic	46.00600	Durbin-Watson stat		1.861928
Prob(F-statistic)	0.000000			

5.1 Summary of Findings

The study examined the effects of the degree of diversification on return on assets. The study modelled four null-hypothesis, namely; interest diversification index does not significantly affect returns on assets (H_{01}), non-interest diversification index does not significantly affect returns on assets (H_{02}), combined interest and noninterest income diversification index does not significantly affect returns on assets (H_{03}) and lastly, degree of revenue diversification have no long-run equilibrium relationship with returns on assets (H_{04}).

The study found that commercial banks in Kenya were moderately diversified, in revenue activities. That is the diversification index for interest, noninterest and combine diversification index was .36, noninterest was .63 and combined was .58, while their explanatory powers were 32, 6 and 22 percent respectively. This implies that on average the higher the degree of diversification, the lower the explanatory power and vice-versa. This finding was somewhat unexpected; however, this implies that more diversified commercial banks report lower returns on assets than the focused commercial banks.

The study found a statically significant positive linear relationship between the degree of diversification and return on assets. That is, interest diversification HHI_{II} ($\beta = 3.029$, $P = .049$), noninterest diversification HHI_{NII} ($\beta = 4.432$, $P = .027$) and combined diversification HHI ($\beta = 3.027$, $P = .016$). However, the study found that as diversification index increases, the relationship with return on assets diminishes. This demonstrates that as commercial banks engage in revenue diversification as an expansion strategy, the exposure level increases as well to the extent that the exposure outweighs the benefits and as such, the effects on returns on assets becomes adverse.

The study found a non-spurious long-run and short-term level relationship between the degree of diversification and return on assets, with the error correction equation, EC = ROA - (.323*HHI + .268*II+.631*NII. The estimated value of the coefficient of ECM implies that about 89 percent of the disequilibrium in returns on assets is corrected by the short-run adjustment within the same period (normally a year). This shows that there existed a statistically significant relationship between the degree of diversification and return on assets in the short-run. This means that in the short-run a 1 percent increase in diversification leads to a respective decrease in returns on assets. Thus implies that the degree of revenue diversification in the short-run does not improve returns of commercial banks in Kenya. This means that expansion into noninterest activities does not pay back immediately and does not influence profitability quickly but after some time.

These results were consistent with previous studies, which suggested a positive linear relationship between the degree of diversification and returns on assets (Staikouras et al., 2006; Chiorazzo et al., 2008; Sanya & Wolfe, 2011; Kiweu, 2012; De Young & Torna, 2013; Tarazi et al., 2013; Gambacorta et al., 2014; Brighi & Venturelli, 2015; Natalia et al., 2016; and Saunders et al., 2016). However, on contrast those studies, which suggested negative effects (De Young & Rice, 2004; Stiroh, 2004; Goddard et al., 2008; Mulwa & Kosgei, 2016) on returns on assets. In summary, the findings of this study demonstrate that the degree of diversification influences returns of commercial banks in Kenya.

5.2 Conclusions

Although consolidation is an emerging concern in Kenya as a diversification strategy, hitherto, banks had embraced non-interest generating activities to complement the traditional interest generating activities in almost equal measure. The results reveal that on aggregate, commercial banks in Kenya are moderately diversified in both interest and noninterest income, with a statistically significant effect on returns on assets. The paper concludes that the diversification level relationship with returns on assets becomes plausible up to a certain threshold when the weighted exposure sets in to outweigh the benefits and the relationship become adverse. The study in additions reveals the existence of a long run and short-run equilibrium between the degree of diversification and returns of assets. The model prediction shows that commercial bank embraces revenue diversification as an expansion strategy; though it brings along with the cost aspects, management complexity and perhaps increased exposure. This has an effect of reducing the benefits from diversification and as such, the relationship declines with the level of revenue diversification, thus forming a U shaped relationship. The findings contribute to the pool of knowledge of diversification and returns on assets relationships with implications to the bank management, bank regulators and potential investors.

5.3 Recommendations

This study was specifically on revenue diversification; however, there is a need for research on diversification across geographic locations, financial product lines and diversification in non-financial institutions such as industries. Considering the dynamism of technology and the influx of micro-financial institution and agency banking, the study suggests a study on their impact on the profitability of commercial banks in Kenya. The current paper focuses only on the registered commercial banks in Kenya and replication of the study could be undertaken on financial institution not falling under this jurisdiction such as insurance, housing finance, microfinance institutions and foreign exchange bureaus.

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