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Strategic Portfolio Investments and Financial Performance of Ecobank Rwanda Ltd.

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Abstract

The study aims to analyze the strategic portfolio investments and financial performance of Ecobank Rwanda Ltd. The study assessed why some investments perform well while others fail to produce return and revenues to the investor. Quantitative and qualitative methods were used, measuring risk and return, financial analysis, as basic tools for portfolio management. Purposive Sampling with Ecobank was chosen and four years as observations. Ecobank's investments portfolio is mainly composed by Financial Investments (FI) of 16.24%; Investments with other Banking Institutions (IBI) of 24.71% and investments in Loans and Advances to Customers (LAC) of 59.06%. Portfolio covariance in this research equals to negative result of (2,896.16). Portfolio expected return of 21%. The negative covariance of Ecobank assets means their returns move in contrariwise directions, thus can be put in the same portfolio and the portfolio risk could be diversified or decreased. With zero (0.0143) correlation coefficient, there is no linear relationship between the returns of Ecobank assets, thus combining those assets reduces the risk portfolio. Out of every RWF 1 invested, Ecobank portfolio generates RWF 0.10 (10%), loans and advances to customers on the top of other assets generating RWF 0.14 (14%) per every RWF 1 invested in. Moreover, there is a significance effect of strategic portfolio investments (FI, IBI and LAC) on financial performance (ROA, ROE and ROI). The overall negative performance of Ecobank Rwanda during 2016-2019 is mainly affected by other factors such as high total operating expenses (Appendix No1); thus costs optimization is one of the main key decisions for the company (Ecobank Rwanda Ltd)'s positive performance (generate revenues to shareholders).

Keywords: Strategic portfolio investments; Financial performance

Abbreviations: FI: Financial Investments; LAC: Loans and Advances to Customers; IBI: Investments with other Banking Institutions; FBE: Financial Bubble Experiment; FCO: Financial Crisis Observatory; ROE: Return on Equity; ALCO: Assets and Liability Committee; LAC: Loans and Advances to Customers

Introduction

Campbell [1] discussed about inter-temporal portfolio choice and asset pricing, it found that the households in United States of America make investment mistakes such as failing to participate in risky asset markets or failing to diversify their risks and the potential impact of such mistakes on asset price. It realized that investors choose not to share risks in the United States because they have different beliefs that lead them to speculate against one another. The investors in the United States need a quick return on investment. Around 36% of projects in the United states did not achieve on their original goals because of inefficient portfolio management by senior managers who change priorities implemented for project that result to poor performance of investment among institutions.

Sornette [2] showed that the financial crisis was caused by the crash of the new investment opportunities either new technology or access to new market. They start with a so called smart money without any real underlying value and end up by

collapsing- financial bubbles. Sornette [2] showed that 25, 000 assets worldwide, including indices, stocks, bonds, commodities, currencies and derivatives have showed a daily update of a number of bubble indicators. The Financial Bubble Experiment (FBE) was conducted by the Experts from the Financial Crisis Observatory (FCO) at ETC Zurich- the Swiss Federal Institute of Technology where David Sornette who is both the Professor of Entrepreneurial Risks and the Professor of Finance at The Swiss Finance Institute. This Experiment was organized to testify if the financial markets exhibit a degree of inefficiency and a potential predictability.

In Lithuania, the investor can make diversification either by having a large number of shares of companies in different regions, in different industries or those producing different types of product lines. There are many different ways to measure financial performance, but all measures should be taken in aggregation. Line items such as revenue from operations, operating income or cash flow from operations can be used, as well as total unit sales.

Furthermore, the analyst or investor may wish to look deeper into financial statements and seek out margin growth rates or any declining debt [3].

In the United Arab Emirates, Saltuk & Idrissi [4] believed that investors can enhance the performance of their pure-stock portfolios by incorporating different options strategies. Among them, the most popular strategies are covered-call writing and protective-put buying. In theory, there is no clear evidence on whether a specific option strategy is superior. According to Saltuk & Idrissi [4] the efficient market theory, an increase in returns should be accompanied by an increase in risk. Adding options to stock portfolios may also create problems of performance measurement homogeneity. Hedging is a financial transaction in which one asset is held to offset the risk of holding another asset. Typically, a hedge is used to offset price risk due to changes of financial market conditions. In this way, the development of financial derivative instruments (options, futures, forward and swap) make hedgers simple to use it to reduce risk. However, many portfolio managers use these derivative instruments to speculate instead of hedging and in turn increase risk.

This study explained how portfolio hedged risk in investment and gave optimum return to a given amount of risk at Ecobank Ltd. It also showed different investment decisions made by Ecobank Rwanda Ltd and focused on element of risk in detail while investing in securities. It also gave an in depth analysis of portfolio creation, selection, revision and evaluation. But in reality it was compared to the strategy, and ultimately to the benchmark, they are designed to beat. One can also gauge Portfolio Performance by measuring returns. Performance measurement was an important task for both investors and investment managers at Ecobank Rwanda Ltd. Portfolio Management Strategies referred to the approaches that were applied for the efficient portfolio management in order to generate the highest possible returns at lowest possible risks in Ecobank Rwanda Ltd.

Objectives

The general objective of this study is to analyze the strategic portfolio investments on financial performance of financial institutions in Rwanda focusing on the following specific objectives:

- To examine the effect of strategic portfolio investments on Return of Assets of ECOBANK Rwanda Ltd
- To assess the effect of strategic portfolio investments on Return on Equity of ECOBANK Rwanda Ltd
- To analyze the effect of strategic portfolio investments on Return of Investments of ECOBANK Rwanda Ltd.

Literature Review

Fachrudin & Fachrudin conducted a cross-sectional study on 45 real estates and property companies which had securities in Indonesia Stock Exchange with the aim of analyzing the property portfolio and sustainability of property and real estate companies. The study was quantitative and used secondary data from asset enhancement, flats, land lots, shopping centers, deport, shop, houses apartments property return and investment properties. In this study, investment properties were consider as properties and infrastructures that companies owned to earn rentals or capital appreciation or both. Findings showed that property portfolio and sustainability are not statistically significant($r=0.597$; $p\text{-value}=0.000$). This implied that there is

no association between property portfolio and return on asset. In short, risk do not predict the expected return in property investment with alpha 5%. The regression analysis showed that the model to analyze sustainability property was acceptable and suitable ($p\text{-value}$ of 0.004; Exp (B) of 2.958). The model to analyze property portfolio was also acceptable and suitable ($p\text{-value}$ of 0.002; Exp (B) of 3.339). It implied that 15 companies create sustainability while 30 companies didn't in Indonesia. Sustainable property companies are those which were environmentally friendly, saving energy, and reducing running cost including green buildings. In short, the company size predict at 73.3% its sustainability concept. The corporate performance was predicted by the inventory of property and investment properties which generate revenue. Findings showed that the highest return was from the asset enhancement and the lowest expected return was from hospitality services and infrastructure.

Talebi [5] made a theoretical analysis on how managers should adopt the useful managerial tool using an empirical analysis with PROMETHEE technique of qualitative analysis of the information collected from 17 customers of Persian Bank. They were selected using the purposing sampling technique based on their expertise in corporate banking. A semi-structured interview were conducted in 2007 to verify the level of agreement on the proposed model for customers' business attractiveness, strategic importance of customers, the complexity and difficulty of managing each customer. His objective was to create the model for classifying relationship between corporate banks and their customers in an optimized way with considerations of network approach. He reviewed the literature on the relationship portfolio models, Network Theory and Business Banking Relationship. Talebi [5] concluded that Iranian banking industry was experiencing a more competitive market after the entrance of private banks to the market.

Parlińska & Panchenko [6] conducted the study on the role of portfolio risk management in investment activities in Deutsche Bank. The study was aiming at founding out which method to be used to recognize risk and avoid systematic risk and receive adequate returns. Findings showed that Deutsche Bank investment portfolio was diversified and protected from unsystematic risk. Deutsche Bank profitability of investment portfolio return was superior to the required rare of portfolio return ($0.098 > 0.052$). Deutsche Bank invested in securities which were directly to risk for a desired income such as government securities, bonds and dividend payment as it was planned in its investment policy. Based on the Financial Theory which holds that the best possible diversification occurs when all conceivable assets are merged into a single portfolio [1]. Findings from only Deutsche Bank cannot predict the role of portfolio risk management in investment activities in banking sector in Germany. Deutsche Bank used short-term investment portfolio securities to increase bank liquidity without considering profitability as a priority target on one hand. Deutsche Bank used to combine short-term acceptance with diversification or use the method "bar" which tries to maintain an appropriate maturity structure of securities to protect itself from risks based on the current economic situation on the other hand [6].

The best methods to be used to recognize systematic risk and avoid it to receive adequate return were not well clarified. Fakir [7] did an evaluation report of the Loan Portfolio Commercial Bank Ceylon Plc in Bangladesh and showed that it is a foreign bank

that was oriented in giving loans to SMEs, garments, textile, and spinning, steeling and engineering, paper and paper products, food processing and stuff, wholesale and retail trading. The Commercial Bank of Ceylon contributed in the economic activities by expanding loans and advances. The loan portfolio substantially increased from 3.14% in 2013 to 31.45% in 2017. This theme covered different sectors such as industry, commercial credit, agriculture, import loan, stuff and miscellaneous. A big part was from agriculture sector (86.04%) and in a region called Dhaka in 2017. The only challenge to Commercial Bank of Ceylon Plc credit portfolio was that the nonperforming loan (2.21%) was higher in 2015.

The study conducted in Kenya by Charles [8], aiming at establishing the portfolio management strategies at Centum Investments and determining and determining the effects of portfolio management strategies on financial performance of Centum Investments showed that there is a significance between individual security selection and yield curve strategies ($r=0.349$; $p\text{-value}=0.001$) on one hand. There is also a significance between yield curve strategies and yield spread strategies ($r=0.783$; $p\text{-value}=0.001$) on the other hand. The regression analysis indicated that the a unit changes in Leverage strategies results in 29.4% increase in financial performance as measured by the Return on Equity (ROE). A unit changes in Yield Spread Strategies results in 23% increase in financial performance as measured by the Return on Equity (ROE). A unit changes in Interest Rates expectation strategies results in 13% increase in financial performance as measured by the Return on Equity (ROE). A unit changes in individual security selection strategies results in 42.1% increase in financial performance as measured by the ROE. A unit changes in yield curve strategies results in 32.5% increase in financial performance as measured by the ROE [8].

The study was conducted by Amayo [9] on 139 respondents from 215 Assets and Liability Committee (ALCO) members, portfolio manager, strategy teams, credit teams, finance teams, risk management teams, and credit committee members who were improved from 2016 so that they can give the real information on portfolio optimization. The fact that scholars and practitioners were concerned with the problem of poor performance of commercial banks in Kenya on one hand. There was no study that was conducted on the portfolio optimization and its effects on performance of banks in Kenya on the other hand. The reason why this study was need to be done. The study used mixed research design were both the questionnaire and the interview guide were used as instruments for Tata gathering. The data analysis used both IBM SPSS 23.0 version for quantitative data analysis and ATLAS.ti for qualitative data analysis [9]. The findings from the quantitative analysis showed that portfolio diversification ($r=0.554$, $p\text{-value}=0.010$), asset allocation ($r=0.743$, $p\text{-value}=0.009$) and portfolio risk management ($r=0.674$, $p\text{-value}=0.010$) significantly correlate with the financial performance of Commercial Banks in Kenya.

Findings showed that the portfolio diversification had the least influence in the performance of commercial banks in Kenya ($\beta=0.192$; $p\text{-value}=0.000$). This meant that a unit increase in portfolio diversification index led to an increase in performance of commercial banks' index in Kenya by 19.2%. The asset allocation use had the greatest influence in the performance of commercial banks in Kenya ($\beta=0.253$; $p\text{-value}=0.000$). In other words, a unit increase in asset allocation index use led to an

increase in performance of commercial banks' index in Kenya by 25.3%. There is a positive significant relationship between portfolio risk management and performance of commercial banks in Kenya ($\beta=0.251$; $p\text{-value}=0.000$). Therefore, a unit increase in use of portfolio risk management index led to an increase in performance of commercial banks' index by 25.1%. The qualitative analysis showed that commercial banks' high performance is composed with the market share, increased return, improved competitiveness, new market and enhanced resource utilization. The portfolio risk management use involved internal control, risk monitoring, risk motivation and risk measurement. The use of portfolio diversification involved the cannel diversification, allocation diversification and investment diversification. The use of asset allocation involved strategic asset allocation and tactical asset allocation by dividing investment into different asset classes such as stocks, bonds, and money market securities. The gap analysis showed that the study lack the generalizability of findings from data collected form the Head Offices of Commercial banks in Nairobi to all branches located in all corners of Kenya [9].

Bandorayingwe [10] conducted a study on 130 employees of cog bank and found that loan portfolio management activities have a high positive collimation with the financial performance of Cog bank ($r=0.921$, $p\text{-value}=0.000$). The analysis of variance showed that there is a significant relationship between loan portfolio management and the financial performance of cog bank ($F=11.084$, $p\text{-value}=0.029$). The regression analysis showed that a unit increase in loan portfolio management index led to an increase in net profit index by 2.4%. The research gap analysis indicate that the study of Bandorayingwe [10] have not analyzed well the regression analysis. The reliability analysis was not well done because Bandorayingwe [10] has not described where the pilot study took place and the reliability analysis was not well done and interpreted. Here there is no proof that the questionnaire was able to measure what it is supposed to measure. Bandorayingwe [10] did not specify how the sample size was calculated and how 130 employees were selected among 299 employees of Cog bank.

Rop, Kibet, & Bokongo [11] conducted an explanatory study on 40 commercial banks in Kenya aiming at investigating the effect of portfolio diversification on the financial performance of commercial banks in Kenya. The empirical study dealt with analyzing critically other related studies conducted on the effect of insurance investment, government securities, real estate, buying shares and financial performance. Rop, Kibet, & Bokongo [11] were motivated by the fact that other scholars and practitioners were concerned with the problem of poor performance of banks in Kenya. Findings showed that there was a significant relationship between insurance investment ($\beta=0.389$; $p\text{-value}=0.002$), government securities ($\beta=0.161$; $p\text{-value}=0.001$), real estate investment ($\beta=0.116$; $p\text{-value}=0.037$), buying shares ($\beta=0.374$; $p\text{-value}=0.000$) and the financial performance of Commercial banks in Kenya.

Methodology

This study adopted a descriptive survey. Descriptive survey research design is a scientific method which involved observing and describing the behavior of a subject without influencing it in any way. It employed both quantitative and qualitative approaches.

The model specification was done as follows:

x = independent variables = Strategic Portfolio Investments X= f(X1, X2, X3)

Where: X₁= Financial Investments (FI), X₂= Investments in Banking Institutions (IBI), X₃= Loans and Advances to Customers (LAC), Y= Dependent variables = Financial performance, Y= f (y₁, y₂, y₃), y₁= Return on Assets (ROA), y₂= Return on Equity (ROE), y₃= Return on Investment (ROI), Y= f (X), ROA= f (FI, IBI, LAC): Function 1; ROE= f (FI, IBI, LAC): Function 2; ROI= f (FI, IBI, LAC): Function 3. Based on these functions, the following models are set:

$$ROA = +\beta_1FI + \beta_2IBI + \beta_3LAC + \mu : \text{Model 1}$$

$$ROE = +\beta_1FI + \beta_2IBI + \beta_3LAC + \mu : \text{Model 2}$$

$$ROI = +\beta_1FI + \beta_2IBI + \beta_3LAC + \mu : \text{Model 3}$$

Where: β_0 =Constant, β_1 - β_3 =Coefficients of determination for Independent variables μ =Error

Results and Discussion

The following sections show the results obtained through the survey conducted in Ecobank Rwanda.

Return on Assets (ROA)

Return of Assets ratio is a ratio gives an idea of how efficient management is at using its assets to generate profit. Return on Assets can vary substantially across different industries. This is the reason why it is recommended to compare it against company's previous values or the return of a similar company. The only common rule is that the higher return on assets is the better because the company is earning more money on its assets.

Table 1: Ecobank Return on Assets (ROA).

	2019	2018	2017	2016
Net profit	(2,188,260,000)	(3,192,592,000)	706,480,000	518,378,000
Total Assets	133,943,037,000	158,651,288,000	168,723,301,000	142,771,950,000
	(0.016)	(0.020)	0.004	0.0036

Source: Secondary Data, 2020.

The data from the table above explain that each 1 Rwf used to purchase assets of Ecobank Ltd generated 0.0036%; 0.004%; (0.020%); and (0.016%) in the year 2016; 2017; 2018; and 2019 respectively. Return on assets indicates the profitability on the assets of the firm after all expenses and taxes as it is confirmed by Reilly & Brown.

Return on Equity (ROE)

A rising ROE suggests that a company is increasing its ability to generate profit without needing as much capital. It also indicates how well a company's management is deploying the shareholders' capital.

Table 2: Ecobank Return on Equity.

	2019	2018	2017	2016
Net profit	(2,188,260,000)	(3,192,592,000)	706,480,000	518,378,000
Average Equity	19,074,866,000	14,621,352,000	13,897,646,000	13,191,165,000
ROE	(11.4)	(21.8)	5.08	3.92

Source: Secondary Data, 2020.

This means that Ecobank Ltd generated -11.4%; -21.8% of loss for every 1 Rwf of shareholders' equity in 2019 and 2018, and generated 5.08; and 3.92% of profit for every 1Rwf of shareholders' equity in 2017 and 2016 respectively for those four years taken into consideration under this study. This confirms the idea of Reilly & Brown who hold that the return on equity reveals how much profit a company earned in comparison to the total amount of shareholder equity found on the balance sheet.

Table 3: Ecobank Return on Investment (ROI).

	2019	2018	2017	2016
Net profit	(2,742,196,000)	(4,424,355,000)	1,340,485,000	956,968,000
Total Equity	19,074,866,000	14,621,352,000	13,897,646,000	13,191,165,000
ROI	-14.37	-30.25	9.64	7.25

Source: Secondary Data, 2020.

This means that Ecobank Ltd generated -14.37% for every 1 Rwf of shareholders' equity in 2019 and -30.25% of loss for every 1 Rwf of shareholders' equity in 2018, and generated 9.64% for every 1Rwf of shareholders' equity in 2017 and 7.25% of profit for every 1Rwf of shareholders' equity in 2016 for those four years taken into consideration under this study. This result supported by the idea of Reilly & Brown (2012) who said that Return On Investment (ROI) is the benefit to the investor resulting from an investment of some resource.

Investment in Government Treasury Bills

$$HPR_{2016-2017} = \frac{375,497}{162069} = 2.31, \text{HPY} = 2.31 - 1 = 1.31;$$

$$HPR_{2017-2018} = \frac{680,673}{375,497} = 1.81, \text{HPY} = 1.81 - 1 = 0.81$$

$$HPR_{2018-2019} = \frac{1,198,539}{680,673} = 1.76, \text{HPY} = 1.76 - 1 = 0.76;$$

$$AM = (1.31 + 0.81 + 0.76) / 4 = 0.72 = 72\%$$

$$\text{Variance} = \frac{\sum[(\text{HPY} - E(\text{HPY}))^2]}{N}$$

$$\sigma^2 = (1.31 - 0.72)^2 + (0.81 - 0.72)^2 + (0.76 - 0.72)^2 / 4 = (0.3721 + 0.0081 + 0.0016) / 4 = 0.10$$

Table 4: Ecobank Weight in Portfolio and expected return for each security.

	FI	IBI	ILA
Expected return (%)	1.053	0.33	-0.073
Proportion Investment(%)	16.24	24.71	59.06

Standard deviation is square root of variance

$$\sigma = \sqrt{0.10} = 0.31 = 31\%$$

Investment in Government Bonds

$$HPR_{2016-0} : HPR_{2016-2017} = \frac{466,444}{33,000} = 14.13, \text{HPY} = 14.13 - 1 = 13.13;$$

$$HPR_{2017-2018} = \frac{535,610}{466,444} = 1.14, \text{HPY} = 1.14 - 1 = 0.14;$$

$$HPR_{2018-2019} = \frac{846,323}{535,610} = 1.58, \text{HPY} = 1.58 - 1 = 0.58;$$

$$AM = (13.13 + 0.14 + 0.58) / 4 = 3.46$$

$$\text{Variance} = \frac{\sum[(\text{HPY} - E(\text{HPY}))^2]}{N}$$

$$\sigma^2 = (13.13 - 3.46)^2 + (0.14 - 3.46)^2 + (0.58 - 3.46)^2 / 3 = (93.5089 + 11.0224 + 8.2944) / 4 = 28.21$$

Standard deviation is square root of variance

$$\sigma^2 = 28.21 = -5.31 = 531\%$$

Investment in Corporate Bonds

$$HPR_{2014-0}$$

$$HPR_{2016-2017} = \frac{22,360}{15,069} = 1.48, \text{HPY} = 1.48 - 1 = 0.48;$$

$$\begin{aligned} \text{HPR}_{2016-2017} &= \frac{28,513}{22,360} = 1.27, \text{HPY}=1.27-1=0.27; \\ \text{HPR}_{2014-2015} &= \frac{22,360}{15,069} = 0.82, \text{HPY}=0.82-1=-0.18; \\ \text{AM} &= (0.28+0.27-0.18)/4=0.1425 \end{aligned}$$

$$\begin{aligned} \text{Variance} &= \frac{\sum[(\text{HPY} - \text{E}(\text{HPY}))^2]}{N} \\ \sigma^2 &= (0.48 - 0.1425)^2 + (0.27 - 0.1425)^2 + (-0.18 - 0.1425)^2 / 4 \\ &= (0.11390625 + 0.01625625 + 0.10) / 4 = 0.06 \end{aligned}$$

Standard deviation is square root of variance

$$\sigma = \sqrt{0.06} = 0.24 = 24\%$$

Investment in Placements with other Banks

$$\begin{aligned} \text{HPR}_{2016=0} & \\ \text{HPR}_{2016-2017} &= \frac{219,070}{373,712} = 0.58, \text{HPY}=0.58-1=-0.42; \end{aligned}$$

$$\text{HPR}_{2016-2017} = \frac{604,679}{219,070} = 2.76, \text{HPY}=2.76-1=1.76;$$

$$\text{HPR}_{2016-2017} = \frac{324,548}{604,679} = 0.53, \text{HPY}=0.53-1=-0.47;$$

$$\text{AM} = (0.42+1.76-0.47)/3=0.42$$

$$\text{Variance} = \frac{\sum[(\text{HPY} - \text{E}(\text{HPY}))^2]}{N}$$

$$\begin{aligned} \sigma^2 &= (0.42 - 0.42)^2 + (1.76 - 0.42)^2 + (-0.47 - 0.42)^2 / 4 \\ &= (0 + 1.79 + 0.79) / 4 = 0.645 \end{aligned}$$

Standard deviation is square root of variance

$$\sigma = \sqrt{0.645} = 0.803 = 80.3\%$$

Investment in Placements with Affiliates

$$\begin{aligned} \text{HPR}_{2016=0} & \\ \text{HPR}_{2016-2017} &= \frac{94,062}{0} = 0, \text{HPY}=0-1=-1; \end{aligned}$$

$$\text{HPR}_{2017-2018} = \frac{318,916}{94,062} = 3.39, \text{HPY}=3.39-1=2.39;$$

$$\text{HPR}_{2018-2019} = \frac{172,934}{318,916} = 0.54, \text{HPY}=0.54-1=-0.46;$$

$$\text{AM} = (-1+2.39-0.46)/3=0.2325$$

$$\text{Variance} = \frac{\sum[(\text{HPY} - \text{E}(\text{HPY}))^2]}{N}$$

$$\begin{aligned} \sigma^2 &= (-1 - 0.2325)^2 + (2.39 - 0.2325)^2 + (-0.46 - 0.2325)^2 / 4 \\ &= (1.51 + 4.65 + 0.47) / 4 = 1.6575 \end{aligned}$$

Standard deviation is square root of variance

$$\sigma = \sqrt{1.6575} = 1.287 = 128.7\%$$

Investment in Term Loans

$$\begin{aligned} \text{HPR}_{2016=0} & \\ \text{HPR}_{2016-2017} &= \frac{9,360,530}{8,386,895} = 1.12, \text{HPY}=1.12-1=0.12; \end{aligned}$$

$$\text{HPR}_{2017-2018} = \frac{8,569,901}{9,360,530} = 0.91, \text{HPY}=0.91-1=-0.09;$$

$$\text{HPR}_{2018-2019} = \frac{5,943,638}{8,569,901} = 0.69, \text{HPY}=0.69-1=-0.31;$$

$$\text{AM} = (0.12+0.09-0.31)/3=-0.07$$

$$\text{Variance} = \frac{\sum[(\text{HPY} - \text{E}(\text{HPY}))^2]}{N}$$

$$\begin{aligned} \sigma^2 &= (0.12 - 0.07)^2 + (-0.09 - 0.07)^2 + (-0.31 - 0.07)^2 / 4 \\ &= (0.0025 + 0.0256 + 0.1444) / 4 = 0.043 \end{aligned}$$

Standard deviation is square root of variance

$$\sigma = \sqrt{0.043} = 0.207 = 20.7\%$$

Investment in Overdrafts

$$\begin{aligned} \text{HPR}_{2016=0} & \\ \text{HPR}_{2016-2017} &= \frac{2,661,064}{2,603,971} = 1.02, \text{HPY}=1.02-1=0.02; \end{aligned}$$

$$\text{HPR}_{2017-2018} = \frac{2,295,530}{2,661,064} = 0.86, \text{HPY}=0.86-1=-0.14;$$

$$\text{HPR}_{2018-2019} = \frac{1,614,552}{2,295,530} = 0.70, \text{HPY}=0.70-1=-0.30;$$

$$\text{AM} = (0.02-0.14-0.30)/3=-0.105$$

$$\text{Variance} = \frac{\sum[(\text{HPY} - \text{E}(\text{HPY}))^2]}{N}$$

$$\begin{aligned} \sigma^2 &= (0.02 - 0.105)^2 + (-0.14 - 0.105)^2 + (-0.30 - 0.105)^2 / 4 \\ &= (0.007225 + 0.06 + 0.164) / 4 = 0.057 \end{aligned}$$

Standard deviation is square root of variance

$$\sigma = \sqrt{0.057} = 0.238 = 23.8\%$$

Investment in Mortgage Loans

$$\begin{aligned} \text{HPR}_{2016=0} & \\ \text{HPR}_{2016-2017} &= \frac{210,706}{170,658} = 1.23, \text{HPY}=1.23-1=0.23; \end{aligned}$$

$$\text{HPR}_{2017-2018} = \frac{236,158}{210,706} = 1.12, \text{HPY}=1.12-1=0.12;$$

$$\text{HPR}_{2018-2019} = \frac{222,217}{236,158} = 0.94, \text{HPY}=0.94-1=-0.06;$$

$$\text{AM} = (0.23+0.12-0.06)/3=0.0725$$

$$\text{Variance} = \frac{\sum[(\text{HPY} - \text{E}(\text{HPY}))^2]}{N}$$

$$\begin{aligned} \sigma^2 &= (0.23 - 0.0725)^2 + (0.12 + 0.0725)^2 + (-0.06 - 0.0725)^2 / 4 \\ &= (0.091 + 0.037 + 1.56) / 4 = 0.422 \end{aligned}$$

Standard deviation is square root of variance

$$\sigma = \sqrt{0.422} = 0.649 = 64.9\%$$

Ecobank Portfolio return and Risk

The return of portfolio is equal to the weighted average of the returns of individual assets (or securities) in the portfolio with weights being equal to the proportion of investment in each asset. Ecobank's investment portfolio of 2016-2019 is mainly composed of on financial investments of 16.24% including Government Treasury Bills with 11.87%, Government Bonds 4.21%, Corporate Bonds of 0.16%; investments with other banking institutions of 24.71% including Placements with other Banks with 18.61%, and Placements with Affiliates with 6.09%; and investments in loans and advances to customers of 59.06% including Term Loans 43.34%, Overdrafts 14.69%, Mortgage Loans and loans 1.03%. Suppose that financial investments symbolized by (FI), investments with other banking institutions be symbolized by (IBI), investments in Loans and Advances to Customers (LAC) be symbolized by.

Financial investments (FI)

$$\begin{aligned} \text{HPR}_{2014=0} & \\ \text{HPR}_{2016-2017} &= \frac{864,301}{210,138} = 4.113019495, \text{HPY}=4.113019495-1=3.113019495; \\ \text{HPR}_{2017-2018} &= \frac{1,244,796}{864,301} = 1.440235378, \text{HPY}=1.440235378-1=0.440235378; \\ \text{HPR}_{2018-2019} &= \frac{2,068,419}{1,244,796} = 1.661652672, \text{HPY}=1.661652672-1=0.661652672; \end{aligned}$$

$$AM = (3.113019495 + 0.440235378 + 0.661652672) / 3 = 1.053$$

$$\text{Variance} = \frac{\sum [(HPY - E(HPY))]^2}{N}$$

$$\sigma^2 = (3.11 - 1.053)^2 + (0.44 - 1.053)^2 + (0.66 - 1.053)^2 / 4 = (4.231249 + 0.375769 + 0.154449) / 4 = 1.19$$

Standard deviation is square root of variance

$$\sigma = \sqrt{1.19} = 1.09 = 109\%$$

Investments in other Banking Institutions (IBI)

$$HPR_{2016=0}$$

$$HPR_{2016-2017} = \frac{313,131}{373,712} = 0.837893806, HPY = 0.837893806 - 1 = -0.162106194;$$

$$HPR_{2017-2018} = \frac{923,596}{313,131} = 2.949548692, HPY = 2.949548692 - 1 = 1.949548692;$$

$$HPR_{2018-2019} = \frac{497,482}{923,596} = 0.538635892, HPY = 0.538635892 - 1 = -0.461364108;$$

$$AM = (-0.162106194 + 1.949548692 - 0.461364108) / 3 = 0.33$$

$$\text{Variance} = \frac{\sum [(HPY - E(HPY))]^2}{N}$$

$$\sigma^2 = (-0.16 - 0.33)^2 + (1.94 - 0.33)^2 + (-0.46 - 0.33)^2 / 4 = (0.2401 + 2.5921 + 0.62) / 4 = 0.86$$

Standard deviation is square root of variance

$$\sigma = \sqrt{0.86} = 0.927 = 92.7\%$$

Investment in Loans and Advances (LAC)

$$HPR_{2016=0}$$

$$HPR_{2016-2017} = \frac{12,232,299}{11,161,524} = 1.095934477, HPY = 1.095934477 - 1 = 0.095934477;$$

$$HPR_{2017-2018} = \frac{11,101,590}{12,232,299} = 0.907563639, HPY = 0.907563639 - 1 = -0.092436361;$$

$$HPR_{2018-2019} = \frac{7,780,406}{11,101,590} = 0.700837113, HPY = 0.700837113 - 1 = -0.299162887;$$

$$AM = (0.095934477 - 0.092436361 - 0.299162887) / 3 = -0.073$$

$$\text{Variance} = \frac{\sum [(HPY - E(HPY))]^2}{N}$$

$$\sigma^2 = (0.095 - 0.073)^2 + (-0.092 - 0.073)^2 + (-0.299 - 0.073)^2 / 4 = (0.000484 + 0.027225 + 0.13) / 4 = 0.04$$

Standard deviation is square root of variance

$$\sigma = \sqrt{0.04} = 0.2 = 20\%$$

$$\sigma_p^2 = \sigma_x^2 w_x^2 + \sigma_y^2 w_y^2 + 2w_x w_y \sigma_x \sigma_y \text{cor}_{xy}$$

$$\sigma^2 = (16.24)^2 (109)^2 + (24.71)^2 (92.7)^2 + (59.06)^2 (20)^2 + 2 * 16.24 * 24.71 * 59.06 * 109 * 92.7 * 20 * 0.0143 = 3,133,466.43 + 5,246,926.24 + 1,395,233.44 - 136,979,152.17 = (127,203,526.06)$$

$$\sigma_p = \sqrt{(127,203,526.06)} = -11,278.45$$

The standard deviation of Ecobank portfolio as shown in the above computation is 11,278.45%, which is less compared to the standard deviation of every single investment of Ecobank and when you compare a portfolio expected return of 21% and its standard deviation, it shows that the expected return of Ecobank portfolio is greater than its risk, but when you compare it to a single investment, portfolio investment is less risky than single investment. This makes to conclude that Individual assets or securities are more risky than the portfolio investment.

Ecobank Portfolio Expected Rate of Return

Portfolio Expected Rate of Return

$$E(r_{\text{portfolio}}) = [w_1 \times E(r_1)] + [w_2 \times E(r_2)] + [w_3 \times E(r_3)] + \dots + [w_n \times E(r_n)]$$

Where:

$w_{1,2,3}$: Proportion Investment (weight) of different assets respectively within a portfolio

$E(r_{1,2,3})$: expected rate of return of individual assets within a portfolio

$$E_p = (1.053 * 16.24) + (0.33 * 24.71) + (-0.073 * 59.06) = 17.10072 + 8.1543 - 4.31138 = 21\%$$

This is expected return of portfolio of Ecobank which is equal to 21%.

It is confirmed by the idea of Reilly & Brown (2012), who said that expected return demonstrates how much investors want to derive in the future return. To do this, investor needs to assign the probability value to all possible returns. The probability was computed on the basis of the historical performance or similar investment modified by investor's expectation in the future. The weight applied to each return is the fraction of the portfolio invested in that security.

Table 5: Ecobank Portfolio Performance.

	FI	IBI	ILA	Correlation Coefficient
Expected return (%)	1.053	0.33	-0.073	-0.0143
Standard deviation (%)	109	92.7		20
Proportion Investment (%)	16.24	24.71		59.06

Source: Secondary data, 2020.

Covariance of Ecobank Rwanda Investments

$$\text{Cov}(r_{FI}, r_{IBI}, r_{ILA}) = \frac{\sum_{t=1}^n [1.053 - 21] * (0.33 - 21) * (-0.073 - 21)}{4 - 1}$$

$$\text{Cov}(r_{FI}, r_{IBI}, r_{ILA}) = \frac{[-19.947 * -20.67 * -21.073]}{4 - 1} = 2,896.16$$

Portfolio covariance in this research equal to negative result of -2,896.16. Negative number of covariance shows that rates of return of two or more assets are moving in the contrariwise directions: this indicated the when returns on financial investments (IF), and investments with others Banking institutions are above its mean of return (positive), the returns of the other asset invested by Ecobank in Loans & Advances to customers (LAC), is tend to be the negative and vice versa. This confirms the idea of De Brouwer [12] which says that covariance is a measure of how much two random variables varies together [13-29].

Correlation Coefficient of Ecobank Rwanda Investments

The correlation coefficient between two assets A, B, and C (kABC) can be calculated using the next formula:

$$k_{A,B,C} = \frac{\text{Cov}(r_A, r_B, r_C)}{\delta(r_A)\delta(r_B)\delta(r_C)}$$

$$K_{FI, IBI, ILA} = \frac{2,896.16}{109 * 92.7 * 20} = \frac{2,896.16}{202.086} = -0.0143 = 14.3\%$$

According to the above correction result, there is perfectly negative correlation once correlation coefficient is -0.0143 that means the Ecobank asset returns have a perfect inverse linear relationship to each other.

Ecobank Portfolio Discounted Profitability Index (DPI) [30-39]. This indicated that every RWF 1 invested by Ecobank in financial investments (IF), generates Rwf 0.05; every RWF 1 invested by Ecobank in investments with others Banking institutions (IBI), generates Rwf 0.02; whereas RWF 1 invested by Ecobank in Loans & Advances to customers (LAC), generates Rwf 0.14. This

Table 6: Ecobank Portfolio Discounted Profitability Index (DPI).

Asset class/Investments vehicles	Total Return (2016-2019)	Total Assets (2016-2019)	Discounted Profitability Index(DPI)	DPI (%)
Financial Investments (FI)	4,387,653.8	81,772,666.2	0.05	5
Due from others Banking institutions (IBA)	2,107,920.9	124,428,460.0	0.02	2
Loans & Advances to customers (LAC)	42,275,819.9	297,411,743.3	0.14	14
Total Portfolio	48,771,394.6	503,612,869.5	0.10	10

Source: Secondary data, 2020.

indicated that the investment in Loans & Advances to customers by Ecobank is more profitable compared to the rest of mentioned investments.

Conclusion

This study focused on analysis of strategic portfolio investments and financial performance of Ecobank Rwanda. Portfolio management is a very important in development, survival, sustainability, growth and performance of investment companies. An investment does not translate to high returns in all cases. Therefore, portfolio management should be well managed in order to obtain an optimal level of returns. Portfolio management is an important factor in determining the profitability of the investment firms. Portfolio covariance in this research equals to negative results of -2,896.16. The correlation coefficient between the above mentioned Ecobank assets is 0.0143 closely related to their covariance. The standard deviation of Ecobank portfolio is 11, 278.45, which is less compared to the standard deviation of every single investment. With portfolio expected return of 21%. The negative covariance of Ecobank assets means their returns move in contrariwise directions, thus can be put in the same portfolio and the portfolio risk could be diversified or decreased.

With 0.0143 correlation coefficient, there is no linear relationship between the returns of Ecobank assets, thus combining those assets reduces the risk portfolio. Looking standard deviation figures makes the researcher to conclude, that Individual assets or securities are riskier than the portfolio investment. Out of every RWF 1 invested, Ecobank portfolio generates RWF 0.10 (10%), loans and advances to customers on the top of other assets generating RWF 0.14 (14%) per every RWF 1 invested in. Total operating expenses of Ecobank Rwanda Ltd increased from 10.6 billion out of 6 billion incomes in 2018 to 11 billion out of 8 billion in 2019, which is negatively impacted the overall company performance being in loss of 3 billion in 2018 and 2 billion in 2019.

Recommendations

After conducting this research, the researcher recommends the following:

- Ecobank Rwanda Ltd to improve diversification of portfolio which will increase its investment performance.
- Ecobank Rwanda Ltd to take some measures about cost optimization to cut off or reduce operating expenses which are the main root causes of losses.
- Ecobank Rwanda Ltd to improve the asset allocation.
- The management of Ecobank Rwanda Ltd to reduce investment in Due from others Banking institutions (IBA) because expected return is very low compared to the risk and it reduces considerably the expected return while increase portfolio risk.

- Ecobank Rwanda Ltd to increase investment in Loans & Advances to customers (LAC) to reduce its portfolio risk.

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