THE IMPACT OF PORTFOLIO DIVERSIFICATION ON THE PROFITABILITY OF LICENSED COMMERCIAL BANKS IN SRI LANKA

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ABSTRACT

Licensed commercial banks are essential for ensuring the stability of any country's financial system. According to the 2022 annual report of the Central Bank of Sri Lanka (CBSL), licensed commercial banks collectively held fifty-five percent of total assets. Portfolio diversification stands as a fundamental strategy for mitigating risk and enhancing returns in the banking sector. Thus, this study aims to investigate the relationship between portfolio diversification and profitability within the realm of licensed commercial banks operating in Sri Lanka. The researcher set out to achieve two research objectives by examining the correlation between the diversification index and profitability. Return on Asset and Return on Equity were used as measurement criterion of profitability. The dependent variable, portfolio diversification, was measured using a diversification index derived from the Herfindahl-Hirschman Index (HHI). A sample of ten listed banks was selected out of twenty-four licensed commercial banks. Secondary data were collected from the annual reports of ten listed commercial banks for the period of 2012 – 2022. A fixed effect model was selected among panel data regression models after conducting the F test, LM test, and Hausman test. The study's findings indicate that the diversification index has an insignificant negative impact on ROA and a significant negative impact on ROE. The equity ratio of banks has a negative, insignificant impact on both ROA and ROE. Bank size has a significant and negative impact on both ROA and ROE. Therefore, the findings of the study demonstrate that diversification negatively impacts both ROA and ROE. The findings from this study hold significant implications for both banking institutions and policymakers in Sri Lanka. Understanding the relationship between portfolio diversification and profitability can inform strategic decision-making within banks, guiding them towards more effective risk management practices and resource allocation strategies. In essence, this study contributes to the existing literature by offering empirical evidence and theoretical insights into the impact of portfolio diversification on the profitability of licensed commercial banks in Sri Lanka.

Keywords: *Asset-based Diversification, Commercial Banks, Diversification Index, Portfolio Diversification, Profitability*

01. INTRODUCTION

Financial markets are the places that connect two parties with surplus and deficit funds. There are various markets, and each market deals with a distinct kind of instrument, customer, and place (Musembi and Jagongo, 2017). Excess fund holders try to use the most common and traditional investment methods, such as savings accounts, one of the primary investment methods, typically yield a lower return due to their lower risk. Investment is the commitment of resources for a specific period, thereby expecting a return.

Rather than selecting traditional low-return investments, it is better to diversify the investments with portfolios with various assets for a maximum return. If an investment is separated across investment assets, it is called diversification. When considering the many individual fund holders, diversification is not a popular method. As previously mentioned, many individual investors choose to deposit their money with banks or other financial institutions due to their limited knowledge and aversion to risk, expecting a return on their investment. When it comes to institutional investors, they can benefit more from investments than individual investors. Mwita (2011) revealed that institutional investors have professional knowledge, and therefore they are more accessible in information collection and efficient in information analysis.

Licensed commercial banks play a crucial role in maintaining financial system stability. According to the annual report of CBSL, these banks held 55% of total assets in 2021. The banking sector is a key sector in the Sri Lankan financial system, which assists to ensure economic and price stability through controlling the money supply. In the banking sector, licensed commercial banks play a major role. According to the CBSL annual report (2022), commercial banks hold around 55% of total assets of the Sri Lankan financial system, which is a significant level. Mainly, banks diversify their income across interest income and non-interest income sources (Amarasinghe, 2018). Non-interest income sources are composed of different kinds of asset classes such as bonds, equity, debentures, units, etc., and the need for proper portfolio management is crucial for those non-income sources.

According to Amarasinghe (2018), developed and developing countries have faced major changes in their financial markets and financial sector. The volatility of interest rates, increased competition, changes in the regulatory background, and new trends in economic conditions are some of them. These changes prompted banks to explore alternative revenue streams, instead of relying solely on traditional loan-based revenue streams. Portfolio diversification among financial assets, underwriting, wealth management, remittance, etc. are some of those income sources (Allen and Santomero, 2001)

This study is conducted to investigate the relationship between portfolio diversification and the profitability of licensed commercial banks registered with the Central Bank of Sri Lanka under the laws of the Banking Act No. 1988, the Monetary Law Act No. 58 of 1949 and the Companies Act No. 07 of 2007. Although many studies have been conducted about diversification and profitability, there are some

gaps in knowledge, such as context, theoretical implication, and dimensions used to be fulfilled. While investigating the relationship between diversification and profitability, this study enhanced the awareness of institutional investors about portfolio management and whether diversification has an impact on profitability. This study investigates the impact of the diversification index on the return of assets of licensed commercial banks in Sri Lanka. Based on the problem statement, the following research objectives have been formulated. The main objective is identifying the relationship between portfolio diversification and the profitability of licensed commercial banks in Sri Lanka.

2.   LITERATURE REVIEW

2..1.   *Theories of Portfolio Diversification*

Different scholars developed various theoretical frameworks for diversification. The Markowitz Portfolio Theory (MPT-1952) can be identified as the most appropriate theory for diversification. The implication of this MPT in diversification has reduced the variance of return and the probability of future failures (Brighi and Venturelli, 2014). MPT is a method of quantifying diversification through covariance and correlation (Fabozzi et al., 2011). Many scholars identify this MPT as a statistical framework that assists in assessing the risk and expected return of a portfolio of assets. Kumar (2018) stated that the risk and rewards or returns are two key aspects that investors consider when making investment decisions. Generally, an investment's risk can be classified as systematic or unsystematic. On the other hand, Lubatkin (2023), physical asset damage, or immediate change in technology are sources of unsystematic risk. Further, he emphasized that systematic risk arises due to tax policies and laws, changes in monetary and fiscal policy, cost of energy, etc.

Markowitz (1952) has suggested that variance is a reasonable measure of the risk, which is a statistical tool. Variance shows how a portfolio's return differs from its mean return. The MPT discusses portfolio optimization and states that investors tend to invest in portfolios with assets that have high risks and low risks in different ratios. The MPT suggests identifying efficient portfolios that generate a higher return than risk and selecting the best ones among them.

According to Sholehah et al. (2020), an efficient portfolio is a combination of assets that derive a high Expected Return (ER) for a given level of risk. It depends on the investor's choice based on their risk tolerance. An optimum portfolio the correlation factor between the assets plays a crucial role. This correlation shows the direction of risk and return among two assets. According to Markowitz (1952), negatively or imperfectly correlated assets derive a superior risk-adjusted portfolio.

Gottschalk (2011) and Griffith-Jones et al. (2002) suggested that portfolios that have been diversified geographically perform well in terms of reducing the investment risk. Simply, assets that are negatively correlated show an inverse direction. When the return of one asset increases, the return of another asset decreases. This will ultimately impact setting off the risk of one asset on the profitability of the other one.

If both assets have the same direction, there is no point in gaining a maximum outcome in portfolio diversification.

2.2.   *Theories of Profitability*

Banks manage the funds of deposit holders, and fund managers invest these funds in diversified portfolios. This process involves a relationship between bank fund managers and deposit holders. Savings account holders and fixed deposit holders try to deposit their excess funds for saving purposes, as well as to cover the opportunity cost of holding money. Shareholders, bond holders, repo holders, and debenture holders expect a high return on their investment in the banks. This relationship can be identified as the agency relationship. As the fund investors, they expect fund administrators to manage the invested funds to gain a maximum return (Dalmácio, 2004).

Bebchuk et al. (2018) found that different kinds of drivers of agency problems affect the decisions of fund managers in banks. This agency problem is primarily due to a lack of knowledge about investment analysis among individual investors. Dalmácio (2004) stated that the formation of a portfolio by individual investors is more expensive, and they have less knowledge about when and how to buy and have less experience. Individual investors select investment funds, such as unit trust funds, to overcome those problems.

Generally, agency theory discusses the responsibility of an agent on behalf of the principal. Agents must undertake some of the principal's activities, and the principal is liable to remunerate the agent. This agency theory emphasizes that there may be a conflict between banks as the borrowers and deposit holders and investors as lenders. In line with this agency conflict, Kurincheedaran (2015) found that this problem leads to reducing the value of diversification.

However, several studies have been conducted to investigate the relationship between portfolio diversification and profitability. The findings of those studies have demonstrated that the impact relationship between diversification and profitability varies based on several factors. The following section discussed about the

2.3   *Portfolio Diversification and Profitability*

Li et al. (2021) conducted a study on how diversification impacted the profitability of banks during the Covid – 19 pandemic period. The researchers realized that diversification in terms of non-interest income has a positive impact on bank performance and a negative impact on risk. Also, they emphasized that banks tended to diversify their income across non-interest-earning activities since the demand for most loans decreased due to the pandemic crisis.

Hamid and Ibrahim (2021), investigated the impact of competition, diversification, and performance on dual banking in Malaysia. They discovered that diversification has no significant impact on the performance of a dual banking system, and it reduces stability. Further studies stated that a negative relationship between diversification

and profitability is most adverse for developing countries. This result is consistent with the result of the study by Saona (2016).

The above studies reveal that there was positive as well as negative relationships between diversification and profitability. Some other studies have found that there is no relationship between diversification and profitability (Pascual et al., 2018). Those studies did not find a significant relationship between diversification and risk. As a result, the study cannot confirm the predictions in related theories about reducing or increasing bank risk. The study of Iqbal et al. (2012) emphasizes that firms are performing equally, irrespective of the low or high diversification, and the ANOVA results indicate that there is no relationship between the variables.

In the Sri Lankan context, some studies have been conducted to investigate the relationship between diversification and profitability or performance. Perera (2018) examined the relationship between income diversification and the performance of Sri Lankan commercial banks. This study was conducted for Sri Lankan private commercial banks using secondary data with control variables, including asset size, interest rates, equity, and asset growth. The result of this study indicates that Sri Lankan banks derive benefits from diversification, and there is a positive relationship between revenue diversification and performance. The study also reveals that Sri Lankan banks can gain competitive advantages by diversifying in the banking industry. Amarasinghe (2018) provided the same result by emphasizing there is a significant positive relationship between diversification with ROA and ROE.

Kumanayake et al. (2019) conducted a study to examine the impact of loan portfolio diversification on performance. The Hirschman Herfindahl Index was used to measure diversification, while the CAMEL model was used to measure performance. They suggest that portfolio diversification cannot reduce the default risk but can reduce credit risk. In conclusion, they emphasized that there is a significant negative impact of loan portfolio diversification on the banks' performance.

According to Nadanalingam and Larojan (2018), portfolios made up of income from loans, deposits, and pawning have different impacts on ROA and ROCE. They found that the income from loans has a negative impact on ROA, while income from pawning has a positive impact on ROA.

Theoretical gap

Previous studies have used different types of theories to explain the concepts and the relationship between variables. Most studies have used MPT to explain the impact of diversification. Five different groups of researchers (Brighi and Venturelli (2014), Engida (2023), Nisar et al. (2018), Oladimeji and Udosen (2019), Vu and Ha (2021), all used MPT to find out how diversification affected their data.

On the other hand, some scholars have emphasized the responsibility of institutional investors for the funds of individual investors (Brighi and Venturelli, 2014; Jouida, 2018; Pascual et al., 2018; Zamore, 2018). But considering the implementation of both theories, only a few studies have used both. There is a dearth of studies that use both MPT and agency theory to define and combine the concepts.

Empirical gap

In the empirical review, previous studies' findings and results have been discussed. That review demonstrates that the relationship between portfolio diversification and profitability is different based on different kinds of factors and that those findings are mixed.

The results of the study by Musembi and Jagongo (2018) in emerging markets are still inconclusive and in conflict. Some studies (Brighi and Venturelli, 2014; Chen and Lai, 2017; Lee et al., 2014; Sanya and Wolfe, 2011) conducted at emerging markets demonstrate that there is a positive relationship between the concepts, while some other studies (Saona, 2016) emphasize there is a negative impact.

Even though those studies have been conducted in the same kind of emerging markets, the results are different. Saona (2016) found a positive relationship, while Baselga-Pascual et al. (2018) found a negative relationship in a developed market. Hence, the results of studies vary from country to country or market to market. So, the results of a frontier market cannot be applied to another frontier market like Sri Lanka.

The impact of portfolio diversification on profitability or performance has been extensively studied and continues to be a subject of ongoing research. Engida (2023) has done a study to investigate the impact, which is still inconclusive. On the one hand, many studies (Ashyari and Rokhim, 2020; Doeh Agblobi et al., 2020; Engida, 2023; Lee et al., 2014; Nisar et al., 2018; Paltrinieri et al., 2021; Pascual et al., 2018; Prastiwi and Anik, 2021; Saona, 2016; Widarjono and Sidiq, 2022) have been conducted to find the relationship between the variables in banking corporations, while only a fewer number of studies (Musembi and Jagongo, 2017; Oladimeji et al., 2019) have been conducted for non-banking corporations in a global context. Few studies have been conducted in Sri Lanka for listed commercial banks. Some studies (Amarasinghe, 2018; Kumanayake et al., 2019; Kurincheedaran, 2015; Nadanalingam and Larojan, 2018; Perera, 2018) have been conducted on Sri Lankan commercial and private banks. So, it is clear that there is a dearth of studies conducted for listed commercial banks in Sri Lanka. This study was conducted to fill this gap.

Considering the theory and empirical studies, the researcher developed the following conceptual framework. A conceptual framework includes variables, dimensions, and presumed relationships among them.
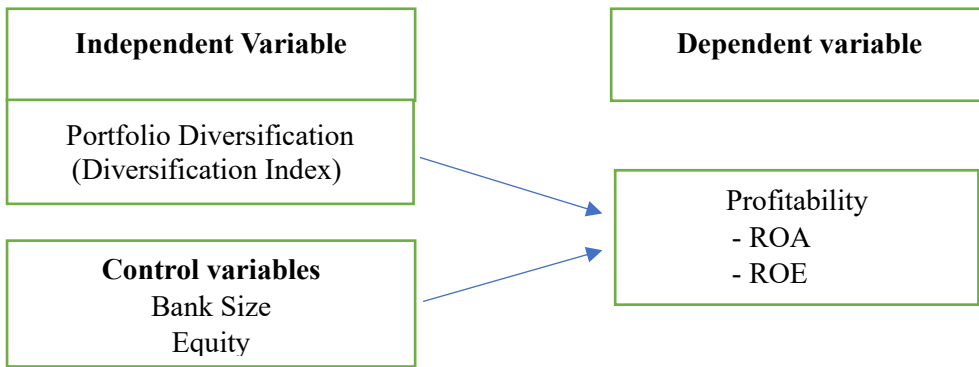
Figure 1: Conceptual Framework

Based on the theoretical and empirical review of a study, the following hypotheses are developed.

H_1: – Diversification index has significantly impacted the ROA of licensed commercial banks in Sri Lanka

To measure diversification and find the relationship between portfolio diversification and profitability, Perera (2018) used the diversification index. Further, the diversification was measured using the diversification index, and one of the profitability measures was the return on assets (ROA).

H_2: – Diversification index has significantly impacted the ROE of licensed commercial banks in Sri Lanka

Many researchers (Amarasinghe, 2018; Kioko and Ochieng, n.d.; Kurincheedaran, 2015; Saona, 2016) investigated the relationship between diversification and profitability in terms of the diversification index and ROE.

2.4.   Operationalization

Operationalization is used to measure the conceptual framework. The following table provides information about measurements of independent and dependent variables.

Table 1: Operationalization

	Variable	Dimensions	Measurements	Literature
Independent	Portfolio Diversification	Diversification Index	$\dfrac{\text{Asset Exposure}}{\text{Total investment in Assets}}$	(Amarasinghe, 2018; Perera, 2018; Saona, 2016)

Dependent	Profitability	ROA	$\dfrac{\text{Net Profit}}{\text{Total Assets}}$	(Nisar et al., 2018; Oladimeji and Udosen, 2019)
		ROE	$\dfrac{\text{Net Profit}}{\text{Shareholder Equity}}$	(Amarasinghe, 2018; Kioko and Ochieng, n.d.)

Ashyari and Rokhim (2020); Delpachitra and Lester (2013); Elsas et al. (2010); Lee et al. (2014); Paltrinieri et al. (2021); Pascual et al. (2018); Hamid and Ibrahim (2021); Sanya and Wolfe (2011); Zamore (2018) measured the diversification using the Diversification Index (DIVI) which is derived using the Herfindahl-Hirschman Index (HHI). HHI is the sum of the squared weights of each investment asset and non-interest income sources that banks invested in.

DIVI = 1 - HHI

$$HHI = \sum_{i=1}^{n}(sj)^2 \qquad\qquad (sj)^2 = \frac{\text{Amount inveted in relevant asset}}{\text{Total financial instruments}}$$

HHI value 1.000 denotes the lowest level of diversification, and the highest diversification level depends on the number of the assets and the weights included in the portfolio. The Diversification Index value 0 represents the lowest level of diversification.

Profitability of licensed commercial banks. Return on assets is the ratio between the net operating profit after tax and the total assets of the banks, while return on equity is the ratio between shareholder equity and total assets of the banks (Amarasinghe, 2018; Perera, 2018; Sanya and Wolfe, 2011). ROE is a significant measure that shows the effective use of the capital of the banks. ROE demonstrates how well investors' funds are managed by the organization and how the banks increase the wealth of the investors.

Control variables are considered to eliminate any effect on the relationship between two variables of the study (Perera, 2018). Bank size is one of the control variables considered in this study. Sanya and Wolfe (2011) reveal that better risk management procedures are implemented in larger banks, while small banks are more flexible. Bank size is calculated using the natural logarithm of total assets of the banks. The next controllable variable is the equity ratio, which is the ratio between shareholders' equity and the total assets, and it can be defined as the financial leverage of the bank. Studies such as Li et al. (2021); Paltrinieri et al. (2021); Sanya and Wolfe (2011); Saona (2016) have used equity ratio as a control variable that affects the relationship between portfolio diversification and profitability.

3.   RESEARCH METHODOLOGY

3.1 Research Design.

Research design discusses the collection, analysis, and interpretation of data to provide answers to the research questions (Sekaran, 2003). This research is descriptive in nature.

3.2 Population and Sampling

Sekaran and Bougie (2016) state that a population is the whole group of people, events, or things that a study will investigate. This study's population consists of twenty-four (24) licensed commercial banks in Sri Lanka. The sampling technique deals with the process of selecting the sample and determining its appropriate size from the population. According to Van Haute (2021), there are two sampling techniques: probability sampling for quantitative studies and non-probability sampling for qualitative studies. But in this study, the sample was selected based on the purpose of the researcher to collect data, and therefore a non-probability sampling method was used. To identify the sample in the sampling frame, the purposive sampling method was employed.

As of the end of the year 2023, there are eleven (11) commercial banks listed on the Colombo Stock Exchange (CSE) Sri Lanka. From those eleven listed commercial banks, the DFCC bank PLC was excluded from the sample as its annual planning did not match with the financial year (DFCC financial year is from 1st January to 31st December). The sampling frame that was used in this study observes the commercial banks that have an annual financial report for the period of 2012 – 2022. Secondary data is used for this study.

3.3 Data Analysis

Different analytical techniques were used to analyze the data to achieve the research objective. The research objectives of this study focus on investigating the impact of portfolio diversification on profitability in terms of diversification index, ROA, and ROE. For obtaining this research objective, the panel data regression model was used as the data analysis method.

3.4 Model Specification

The following models were developed to identify the relationship between dependents and independent variables.

$$ROE_{i,t} = \beta_1 + \beta_2\,DIVI_{i,t} + \beta_3\,SIZE_{i,t} + \beta_4\,EQUITY_{i,t} + U_{i,t} - \dotsc\dotsc\dotsc\dotsc \quad (1)$$

$$ROA_{i,t} = \beta_1 + \beta_2\,DIVI_{i,t} + \beta_3\,SIZE_{i,t} + \beta_4\,EQUITY_{i,t} + U_{i,t} - \dotsc\dotsc\dotsc\dotsc \quad (2)$$

$DIVI_{i,t}$ = asset diversification for the bank i and time t.

β_1 is the coefficient of the model, and β_1, β_2, β_3 demonstrate the coefficients of individual variables.

SIZE　　　=　　the natural logarithm of total assets of bank i for the year

EQUITY　=　　the equity ratio of the bank for the year.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Descriptive analysis is conducted for the purpose of describing the properties of data and to recognize unusual observations that influence inferential analysis. The following table represents the summary statistics, including the mean, median, maximum, minimum, and the standard deviation of the variables.

Table 2:　Descriptive Statistics

	ROA	ROE	DIVI	EQIUTY
Mean	0.0112	0.1311	0.4945	0.0925
Median	0.0117	0.1392	0.5325	0.0840
Maximum	0.0384	0.3936	0.7510	0.3420
Minimum	-0.0135	-0.0626	0.0030	0.0070
Std. Dev.	0.0058	0.0719	0.1932	0.0447

Source: Author constructed

According to the statistics, return on assets (ROA) and return on equity (ROE) have a mean of 0.0112 (1.22%) and 0.1311 (13.11%) respectively.

The diversification index (DIVI) indicates a mean of 0.4945 (49.45%) and there is a deviation of 0.1932 (19.32%) from the mean value, which does not create a significant impact. The standard deviations for ROA and ROE are also not significant.

4.2. Diagnostic Test

The diagnostic test includes the assumptions of normality, multicollinearity, autocorrelation and homoscedasticity that were tested for the data set before running the regression. According to Bebchuk et al. (2018) this test is carried out as a diagnostic test to assure the applied regression model is appropriate.

Normality

The researcher used the Shapiro-Wiki test to test the normality of the data set. This test's null hypothesis is normally distributed in that data set. If the probability value is greater than 0.05 (Prob > 0.05) the null hypothesis is accepted, and if not, the null hypothesis is rejected. The findings are presented in the below table.

H_0 – The data follows a normal distribution.

H_1 – The data does not follow a normal distribution.

Table 3:   Normality Test Result

Variable	Pr (Skewness)	Pr (Kurtosis)	Prob>chi2
ROA	0.9908	0.0000	0.0002
ROE	0.5150	0.0619	0.1348
DIVI	0.0000	0.1894	0.0005
EQUITY	0.0000	0.0000	0.0000
SIZE	0.1599	0.3921	0.2500

Source: Author constructed

The probability values for ROE and SIZE are above the threshold value of 0.05. It indicates that ROE and SIZE are normally distributed. Hence, the null hypothesis is accepted.

The probabilities of ROA, DIVI, and EQUITY are below 0.05 (Prob <0.05) which leads to rejecting the null hypothesis, and it demonstrates those variables are not normally distributed.

Multicollinearity

The multicollinearity test is conducted to find out whether there is interdependency among the independent variables. Multicollinearity demonstrates the linear relationship between the independent variables (Sholehah et al., 2020). The Variance Inflation Factor (VIF) test was conducted to check the multicollinearity. The null hypothesis (H_0) is accepted when VIF is less than 10 (VIF<10). Findings of the VIF test are indicated in the following table.

H_0 – There is no multicollinearity among independent variables.

H_1 – There is multicollinearity among independent variables.

Table 4: Multicollinearity Test Results

Variable	VIF
SIZE	1.69
EQUITY	1.49
DIVI	1.17

Source: Author constructed

According to the findings, the VIF values of the independent variables of SIZE, EQUITY, and DIVI support the null hypothesis since all the VIF values are less than 10.

Autocorrelation

Autocorrelation is built with the assumption that the model's errors in the analysis do not depend on another variable. When this assumption is not satisfied, the errors are said to be serially correlated. The researcher used the Durbin-Watson test to identify the serial correlation among the variables. The Durbin Watson value equal to or near 2 indicates there is no autocorrelation. Table 4.5 shows the findings of the Durbin-Watson test for the two models.

Table 5: Autocorrelation Test Results

	Durbin-Watson stat
ROA	1.472
ROE	1.489

Source: Author constructed

According to the Durbin Watson value, the acceptance level is from 1.5 to 2.5. However, the value indicates above, near to 1.5. Hence it can indicate that there is no autocorrelation.

Heteroscedasticity

For this study, the Breusch-Pagan test was conducted to test the heteroscedasticity. When the probability value of the Breusch-Pagan test is greater than 0.05 (P>0.05) there is no heteroscedasticity issue, and it is believed to be homoscedasticity.

H_0 – Homoscedasticity is present (No Heteroscedasticity)

H_1 – Heteroscedasticity is present

Table 6: Heteroscedasticity Test (Breusch-Pagan test)

Breusch-Pagan	
chi2(1)	0.83
Prob > chi2	0.3619

Source: Author constructed

In this model, P > 0.05 and therefore the null hypothesis of homoscedasticity exists (No Heteroscedasticity) can be accepted.

Panel Data regression

The study was conducted to determine the relationship between portfolio diversification and the profitability of licensed commercial banks in Sri Lanka. For this purpose, secondary data was collected, and those included cross-sectional and time series data that is called collectively ad panel data. For analyzing those data panels, the data regression model was applied. There are three regression models that can be used to panel data, and they are the pooled OLS model, the fixed effect model,

and the random effect model. There is no time effect or cross-sectional effect on the pooled data in the Pooled Ordinary Least Square (Pooled OLS) model, and the fixed effects model is commonly used to account for unobserved heterogeneity, which refers to missing factors that remain constant throughout time but vary among units. Further, a study random effect model is used to eliminate the unobserved heterogeneity. To select the most appropriate regression model, the F test, Hausman test, and Lagrange multiplier (LM test) were carried out.

F Test (Frisher (F)-test)

The F test is usually used to identify the statistical model that is fitted to the data set by comparing fixed effect models and pooled OLS models (Amarasinghe, 2018). The null hypothesis (Homoscedasticity is present) is accepted when the p-value is greater than 0.05 ($p > 0.05$). Summary statistics of the F test for the two models of dependent variables are as follows:

Table 7: F Test

	Statistic	Prob. (p-value)
ROA	11.2696	0.000
ROE	24.5470	0.000

 Source: Author constructed

According to the findings of the F test, the p value for both ROA and ROE models is less than 0.05 ($p < 0.05$). This means that the null hypothesis is rejected and an alternative hypothesis that indicates a fixed effect model is appropriate is accepted.

Hausman Test

The Hausman test is performed to identify the best panel regression among the fixed effect model and the random effect model. The null hypothesis of the random effect model is appropriate over the fixed effect model, which is accepted when the p value is greater than 0.05.

H_0 – Random effect model is appropriate

H_1 – Fixed effect model is appropriate

Summary of the findings of Hausman test related to dependent variable are as follows:

Table 8: Hausman Test

	Chi-Sq. Statistic	Prob. (p vale)
ROA	28.4616	0.0000
ROE	24.5470	0.0000

Source: Author constructed

Both the tests conducted on two dependent variables indicate a p-value less than 0.05 which leads to rejecting the null hypothesis that the random effect model is appropriate. Therefore, among the fixed effect model and random effect model, the most appropriate model is the fixed effect based on the Hausman test.

Based on the above tests carried out to select the most appropriate regression model among pooled OLS, fixed effect, and random effect models to test the research hypothesis for the dependent variables of ROA and ROE, the following summary was derived.

Table 9: Selection of Regression Model

ROA			
Test	P-Value	Models compared	Selection
F test	0.0000	Fixed/ OLS	Fixed
Hausman	0.0000	Fixed/ Random	Fixed
LM test	0.0021	OLS/ Random	Random
ROE			
F test	0.0000	Fixed/ OLS	Fixed
Hausman	0.0000	Fixed/ Random	Fixed
LM test	0.0000	OLS/ Random	Random

Source: Author constructed

According to the F test, Hausman test, and LM test, the fixed effect model was the best fitted model for both dependent variables of ROA and ROE.

Model 01 - ROA

The following table shows the model summary

Table 10: ROA Model

Variable	Coefficient	t-Statistic	Prob.
DIVI	-0.0018	-0.9293	0.3550
EQIUTY	-0.0139	-1.3094	0.1935
SIZE	-0.0030	-5.2862	0.0000
C	0.0937	6.0912	0.0000
Cross-section fixed (dummy variables)			
R-squared	0.6794	Mean dependent var	0.0167
Adjusted R-squared	0.6398	S.D. dependent var	0.0103
S.E. of regression	0.0043	Sum squared resid	0.0018
F-statistic	17.1334	Durbin-Watson stat	1.4272
Prob(F-statistic)	0.0000		

Source: Author constructed

The summary statistics indicate the regression results between independent and dependent variables, including control variables. The R-square value has increased to 67%, indicating that 67% of the variation in the dependent variable, ROA, is explained by the diversification ratio, bank size, and equity ratio. The remaining 33% is attributed to unobserved variables. As well as the F statistic of the regression model is less than 0.05 ($p < 0.05$) which elaborates that the regression model is fit for the data of the population where the sample is derived.

The coefficient value of DIVI is negative, and it demonstrates a negative impact on the ROA. The control variable of EQUITY indicates a negative relationship with the ROA (Coefficient = -0.0139) and SIZE indicates a negative relationship with the ROA. When considering the p-value, DIVI has a p-value greater than 0.005 ($p > 0.05$) and it determines an insignificant impact on the ROA. As well as EQUITY shows an insignificant impact on ROA, while the effect of SIZE is significant to ROA ($p > 0.05$). ROA is 0.0937 when DIVI, EQUITY, and SIZE equal to zero. The model equation is as follows:

$$ROA_{i,t} = 0.0937 - 0.0018DIVI_{i,t} - 0.003SIZE_{i,t} - 0.0039EQUITY_{i,t} + U_{i,t} \ldots \ldots (3)$$

Model 02 – ROE

As the model selected for the ROA, the F test, LM test, and Hausman tests were conducted to recognize the best-fit model for the ROE and select the fixed effect model.

$$ROE_{i,t} = \beta1 + \beta2\ DIVI_{i,t} + \beta3\ SIZE_{i,t} + \beta4\ EQUITY_{i,t} + U_{i,t} \ldots \ldots \ldots \ldots \ (4)$$

Table 11:   ROE Model summery

Variable	Coefficient	t-Statistic	Prob.
DIVI	-0.0725	-3.5206	0.001
EQIUTY	-0.1474	-1.7802	0.078
SIZE	-0.0278	-5.0977	0.000
C	0.9198	6.22505	0.000
Cross-section fixed (dummy variables)			
R-squared	0.8660	Mean dependent var	0.1735
Adjusted R-squared	0.8495	S.D. dependent var	0.1135
S.E. of regression	0.0414	Sum squared resid	0.1664
F-statistic	52.252	Durbin-Watson stat	1.4189
Prob(F-statistic)	0.0000		

Source: Author constructed

The summary statistics included in the above table show the relationship between the diversification index and the ROE and the relationship between control variables (bank size and equity ratio) and the dependent variable of ROE. The F statistic p-value is less than 0.05 and it determines that the regression model is fit for the data

of the population. Independent variables of DIVI and control variables of SIZE and EQUITY explained 86% of the dependent variable of ROE. The remaining 14% is explained by the other variables.

The DIVI coefficient indicates that there is a negative relationship between DIVI and ROE. Then EQUITY negatively effects ROE as well as the impact of SIZE is negative on the ROE. The p-value of DIVI is 0.001 demonstrates a significant impact of DIVI on the ROE. The effect of the control variable of EQUITY has an insignificant impact and SIZE has a has a significant impact ($p < 0.05$) on the ROE of licensed commercial banks in Sri Lanka. According to the regression analysis model equation for ROE, it is as follows:

$$ROE_{i,t} = 0.9198 - 0.0725DIVI_{i,t} - 0.0278SIZE_{i,t} - 0.1474EQUITY_{i,t} + U_{i,t}\ldots\ldots\ldots(5)$$

Table 12: Summery Table of Results

ROA			
Variable	**Coefficient (β)**	**p-Value**	**Relationship**
DIVI	-0.0018	0.3550	Negative Insignificant
EQUITY	-0.0139	0.1935	Negative Insignificant
SIZE	-0.0030	0.0000	Negative Significant
ROE			
DIVI	-0.0725	0.001	Negative Significant
EQUITY	-0.1474	0.078	Negative Insignificant
SIZE	-0.0278	0.000	Negative Significant

Source: Author constructed

Hypothesis Testing

The study aimed to determine the impact of portfolio diversification on the profitability of licensed commercial banks in Sri Lanka. Based on literature, two hypotheses were developed for ROA and ROE, and panel data regression methods were used to test the hypotheses.

The first hypothesis is related to the relationship between diversification index (DIVI) and ROA. The null hypothesis was diversification index effects The profitability of licensed commercial banks is significantly impacted. According to the regression analysis, there is an insignificant negative impact of DIVI on the ROA, and the null hypothesis can be rejected.

The second hypothesis was developed to find the impact of diversification index on the return on equity (ROE). The hypothesis was that the diversification index has a significant impact on the ROE of licensed commercial banks in Sri Lanka.

Table 13: Summary of Hypothesis

Hypothesis	Ranel data regression	Acceptance or rejection of null hypothesis
H_1 – Diversification index effects significantly on the ROA of licensed commercial banks in Sri Lanka	Negative Insignificant	Not supported
H_2 – Diversification index effects Significantly on the ROE of licensed commercial banks in Sri Lanka	Negative Significant	Supported

Source: Author constructed

5. CONCLUSION

The aim of this research study was to examine the impact of portfolio diversification on the profitability of licensed commercial banks in Sri Lanka. Theoretical, methodological, and empirical reviews were conducted to build arguments and develop the base of the study. To test and fill the gap, the conceptual framework and hypothesis were developed. To test the hypothesis, this study used verified theories from Markowitz Portfolio Theory (MPT) and agency theory. The study followed a quantitative approach using secondary data extracted from the annual reports of listed commercial banks in Sri Lanka. The summary was selected in the sampling frame designed based on the reporting period and listing in CSE.

Based on the conclusion and findings of the study, there are motivating directives for future researchers. This study focuses only on the 11 licensed commercial banks operated in Sri Lanka and doesn't consider licensed specialized banks in Sri Lanka. Further, some significant control variables, such as growth of the bank, are not considered. However, future researchers are able to examine the relationship between portfolio diversification and profitability of other financial companies, such as diversified finance companies, unit trust companies, and insurance companies.

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