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Modeling the Relationship between Profitability and Market Share of Licensed Commercial Banks in Sri Lanka

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***Abstract* — Sri Lankan banking industry comprises of two major types of establishments viz. Licensed Commercial Banks (LCB) and Licensed Specialized Banks of which the profitability of the former being determined by the size of the firm, indicated by total assets held by the bank. In this study, the relationship between market share and profitability of LCBs was investigated using Multiple Linear Regression (MLR) analysis and considering the variables unique to the Sri Lankan banking industry. Quarterly data were obtained from the Central Bank of Sri Lanka from 2008 to 2020. In addition to MLR, analysis of variance and time-series analysis was also carried out to ensure the reliance of the results and conclusions. It was found that the market share represented by Deposit Customers and Loan Customers have a positive relationship with the profitability measured by Profit After Tax (PAT). Further, market share explained a substantial 96.5% of the variability in profitability. The model predicted that a unit increase in deposits and loans lead to an increase in profitability by 6.1% and 10.7% respectively. Finally, it could be concluded that the loans granted to bank customers accounted for increasing the profitability of LCBs in Sri Lanka than the deposits made by the customers. Accordingly, the LCBs can review their strategies to optimize profitability based on the loans granted to and deposits received from the customers.**

Keywords — Deposit, Loan, Profitability

I. INTRODUCTION

The banking sector of any country determines the financial stability of economic activities while providing funds for long term investments. The high profitability of banks accounts for financial stability which needs consistency over long periods for ensuring sustainable growth of the financial system. The success of the banking industry is presented to the public mostly through the profitability statistics and their consistency over the years is achieved through prudent decisions by the top management. Precise strategies implemented to achieve effectiveness and efficiency in dealing with deposit portfolios and loans will earn customer confidence which is crucial to boost profitability. Therefore, the managers should possess updated knowledge on present and future trends not only in the banking sphere but also in the competitive business world. It is reported in the literature that some researchers: [1], [10], [8], and [7] have focused on modelling the correlation between market share and profitability in order to expose potential avenues for achieving reliable and sustainable profitability. More specifically the following works have presented the most relevant findings to the present study.

A study, [6], on the impact of bank capital on profitability and risk was carried out by applying the Generalized Method of Moment (GMM) technique on bank level data from 42 countries in Asia covering the period from 1994 to 2008. It was pointed out that different profitability variables influence the persistence of profit while showing a positive (negative) relationship between capital and profitability (risk) in the Asian region. The relationship between the market share and profitability of the banking sector in Nigeria was examined using nine years of secondary data obtained from the Stock Exchange in Nigeria from 2003 to 2011, [2]. Applying MLR with PAT as the dependent variable and both deposit and loan customers as independent variables, it was shown that the market share represented by those customers is positively correlated with the PAT of the banks in Nigeria. While concluding that loans granted to customers can increase the profitability in Nigerian banks, the authors recommended the use of other modelling techniques like multivariate adaptive regression splines (MARS) and conic multivariate adaptive regression splines (CMARS) in future studies.

The factors influencing the profitability of banks can be broadly classified into macroeconomic-, industry-, and bank-specific levels. Bank specific factors are confined to the functions carried out within the institution some of which are indicated by deposit ratio, capital ratio, liquidity ratio, overhead cost of management, and the bank size. Considering some of the above factors as independent variables, an MLR was used on the STATA statistical package to investigate their impact on the bank's profitability based on data from 12 commercial banks in Sri Lanka covering the period from 2011 to 2015, [5]. It was found that a positive relationship exists between the bank profitability and the bank specific factors: firm size, capital ratio, and deposit ratio while the liquidity was shown to be an insignificant factor which is negatively related to the profitability of Sri Lankan

commercial banks. The impact of market share and concentration ratio on the profitability of banks in Bulgaria in Eastern Europe was studied by [4] using balanced panel data of 22 banks during the 5-years from 2006 to 2010 and choosing return on equity as the profitability indicator. This study found a statistically significant positive correlation between market share and profitability but no such relationship between the concentration and profitability. Further, having applied the pooled Ordinary least squares (OLS) estimation and random-effects methods, it was empirically shown that the performance of Bulgarian banks depends solely on the prudence of managerial decisions within the institutions and not on either macroeconomic or industry specific external issues.

The factors determining the performance of Spanish banks during the period 1999-2009 were examined in [9] using the GMM estimator which revealed that more loans in total assets and customer deposits, efficiency in transactions, and low uncertain assets ratio are associated with high bank profitability. Further, it was concluded that higher returns of the bank is proportional to the higher capital ratios subject to the profitability measured by the return on assets. Addressing a wider range of determinants within all bank-specific, industry-specific, and macro level spheres, the dynamic estimation technique was applied [3] to identify probability models for selected banks in Croatia for the period from 2007 to 2014. Projecting the profitability in terms of return on assets (ROA) and the ratio net interest margin (RNIM), they proved that asset size, loan portfolio, and gross domestic product create a positive impact on the banks' profitability while risks and administrative costs create a negative impact. They also showed a correlation between market concentration and profitability in addition to the influence of the capital adequacy ratio on ROA and RNIM.

In Sri Lanka, the banking industry is one of the most significant sectors of the economy and also it dominates the financial sector. The rapid booming of this sector began with the liberalization of the financial sector under the open economic policies introduced in the late 1970s. As of now, there are three major categories of institutions that are subject to licensing, regulation, and supervision by the Central Bank of Sri Lanka in the public interest because they accept deposits from the general public. They are licensed commercial banks, licensed specialized banks, and registered finance companies. With the establishment of private banks and branches of leading foreign banks over the years, there are 23 licensed commercial banks of which 11 are locally incorporated while the other 12 are local branches of foreign banks. They all have a total of 1711 branches and other service outlets spread throughout the country.

The Sri Lankan banking industry comprises two major types of banks namely licensed commercial banks and licensed specialized banks. A licensed commercial bank is a banking institution issued with a license by the Central Bank to carry on among other things, maintaining current accounts for customers from which money could be transferred by cheques and withdrawn on demand. The licensed specialized banks are different from the licensed commercial banks since they are not authorized to accept demand deposits from the public and therefore they do not maintain current accounts for customers. Also, they are not authorized to deal in foreign currency. The profitability of Sri Lankan commercial banks are mainly determined by the size of the firm indicated by the total assets held by the institution. Though the notion that higher market share is positively associated with higher profits are generally accepted in virtually all studies, it is still studied in every country due to the diverse and unique nature of the business environment in different countries.

Although the above scholars have examined the relationship between market share and profitability, it has not been possible to generalize their findings to the banking sector due to the dynamic business environments that change over the years with the change of policies. Some researchers have considered only the domestic commercial banks in Sri Lanka which may restrict the representativeness of the findings. This research considered all the commercial banks in Sri Lanka as it is important to identify high-net-worth customers with integrity and good credit rating whose patronage immensely contributes to the growth of banks and a developing economy. Having considered such uncertainties, this study was designed to address the relationship between market share and profitability in LCBs using variables peculiar to the Sri Lankan context. More specifically, we set our research objectives to identify how various deposits and loans affect the bank profitability and to develop a model that can be used to define the relationship between deposit customers, loan customers, and the PAT. Further, a predictive model for forecasting the Profitability of the ensuing year is also attempted. The specificity of the prediction model is that it takes into account deposit and loan indicators of bank profitability. Quarterly data were collected from the Central Bank covering a period of twelve years from 2008 to 2020 and multiple regression analysis was used to test the hypotheses.

II. OBJECTIVES

Our objectives are to identify how various deposits and loans affect the profitability of LCBs; develop a model for presenting the relationship between deposit customers, loan customers, and profit after tax; and to explore the possibility for a time-series model to forecast realization.

III. METHODOLOGY

Multiple linear regression analysis was used to identify the relationship between market share and profitability of licensed commercial banks using quarterly records from 2008Q4 to 2020Q4 which were obtained from the official website of the Central Bank of Sri Lanka. Deposit customers (DC) and loan customers (LC) were used to represent the market share of banks with a quantitative approach to analyze the data.

Bank Profitability (P), which is measured by the Operating Profits After Corporate Tax (PAT), was used as the dependent variable of the multiple linear regression. Deposits made by customers (DC), which was quantified by Deposits to Total Assets, and the loans granted to customers (LC), measured by Total Loans and Advances to Total Assets were

used as the independent variables in the regression model as presented in Table 1 and Equation (1).

Table 1. Operationalization of Variables

Concept	Variable	Indicator	Measurement
Profitability	P- Profitability	Number	Operating Profits After Corporate Tax (PAT)
Market share	DC-Deposit Customer	Ratio	Total deposits/Total assets
	LC-Loan Customer	Ratio	Total Loans and Advances /Total assets

$$P = \beta_0 + \beta_1 *(DC) + \beta_2 *(LC) + \varepsilon \quad (1)$$

where; β_0 is a constant, $\beta_1$and β_2 are the coefficients of the independent variables, and ε is the associated error term.

Apart from identifying the relationship between bank profitability and market share, it is vital to understand the expected profitability which enables bank managers to successfully implement their future plans. Therefore, Box-Jenkins approach of time series analysis was used to forecast the Bank Profitability by using the quarterly data from 2008Q4 to 2020Q4 obtained from the official website of the Central Bank of Sri Lanka.

IV. RESULTS AND DISCUSSION

A. Regression Analysis

The following hypothesis was assumed to assess the significance of correlation between profitability and explanatory variables.

H_0: Correlation is not significant

H_1: Correlation is significant.

The correlation between the variables was examined using the Pearson's Correlation coefficient at 5% level of significance, summarized in Table 2.

Table 2. Correlations

		P	DC	LC
P	Pearson Correlation	1	.172	.424
	Sig. (2-tailed)		.023	.002
	N	52	52	52
DC	Pearson Correlation	.172	1	.148
	Sig. (2-tailed)	.023		.026
	N	52	52	52
LC	Pearson Correlation	.424	.148	1
	Sig. (2-tailed)	.002	.026	
	N	52	52	52

The results in Table 2 indicate that there are significant positive correlations between the dependent variable and the independent variables at 5% significance level. Therefore, H_0 is rejected and it can be concluded that the correlation is statistically significant.

The normality of the variables was examined with the following hypothesis using the Kolmogorov-Smirnov Test and the Shapiro-Wilk Test, which yielded the values summarized in Table 3.

H_0: Data are normally distributed.

H_1: Data are not normally distributed

Table 3. Tests of Normality

	Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	df	Sig.	Statistic	df	Sig.
P	.129	52	.031	.922	52	.002
DC	.119	52	.064	.962	52	.097
LC	.122	52	.051	.952	52	.065

According to the results in Table 3, profitability (P) is not normally distributed (p = 0.002) but DC (p = 0.97) and LC (p = 0.065) are normally distributed at 5% significance level. Therefore, the dependent variable was log transformed. The performance of the model was evaluated in terms of the coefficient of determination, which resulted in the figures in Table 4.

Table 4. Interpretation of Model Summary

Model	**R**	**R Square[b]**	**Adjusted R Square**	**Std. Error of the Estimate**	**Durbin-Watson**
1	.978[a]	.965	.965	.72846	1.220

According to Table 4, the coefficient of determination is .965 which means that 96.5% of the variation of bank profitability can be explained by the amount of deposits made by customers (DC) and the amount of loans granted to customers (LC).

Analysis of Variance test was also employed to test the statistical significance of the model using the following hypothesis and the results are shown in Table 5.

H_0: Model is not significant

H_1: Model is significant

Table 5. ANOVA Table

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5763.980	2	2881.990	431.085	.000[b]
	Residual	26.199	50	.531		
	Total	5790.513[d]	52			

It is clear from Table 5 that p-value of the F-statistic is less than 0.05 and accordingly H_0 is rejected at 5% significance level. Therefore, it is evident that the independent variables significantly predict the dependent variable.

The non-zero existence of model coefficients was also looked into with the following hypothesis and the values obtained are given in Table 6.

H_0: $\beta_i = 0$

H1: $\beta_i \neq 0$;i =1,2.

Table 6. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	DC	.059	.026	.395	2.305	.025
	LC	.102	.029	.603	3.522	.001

Results in Table 6 show that deposits made by customers (DC) (p = .025< 0.05) and amount of loans granted to customers (LC) (p = .001< 0.05) have a significant impact on the log of bank profitability. The model predicts that 1-unit increase in deposits leads to an increase in profitability by 6.1% and 1-unit increase in Loans increases the profitability by 10.7%. Therefore, it can be concluded that with the increment of the deposits and loans, the profitability of the bank also increases. The assumptions of regression analysis were checked to confirm the accuracy of the identified model and the results are given below.

a. Homoscedasticity of Residuals

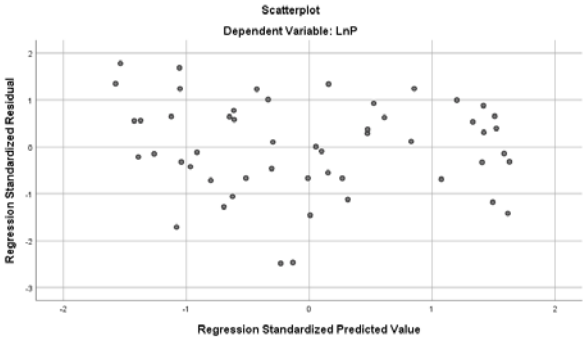

Fig. 1. Scatter plot of Residuals against the predicted value

According to Figure 1, the scatter plot of residuals does not show any visible pattern and the points that are randomly scattered, which confirm the constant variance of the residuals.

b. Normality of Residuals

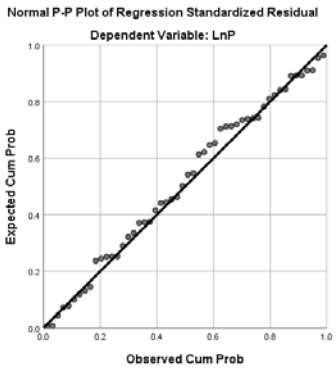

Fig. 2. Normality of residuals

According to Figure 2, the standardized residuals follow an approximately straight line indicating the normally distributed nature of residuals.

The multi-collinearity between the independent variables was checked according to the values of Variance Inflation Factor (VIF) in Table 7.

Table 7. Coefficients determining multicollinearity

Model	Collinearity Statistics	
	Tolerance	VIF
DC	.978	1.022
LC	.868	1.262

Table 7 clearly indicates that the values of VIF of both independent variables are less than 5 confirming the absence of multi-collinearity between the independent variables.The best fitted regression model can thus be presented as follows.

log(Profitability) = .059*(Deposit Customers) +.102* (Loan Customers) (2)

B. Time Series Analysis

A Time Series analysis was also carried out to explore the existence of temporal behavior of profitability

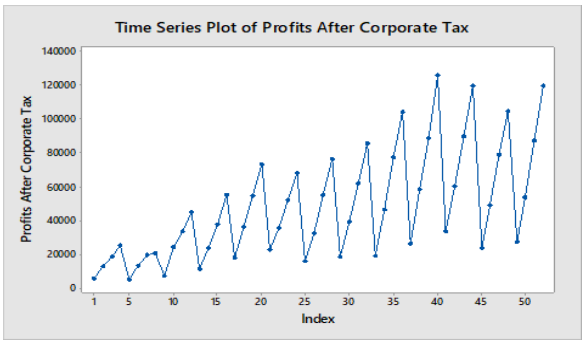

Fig. 3. Time Series of Profit After Corporate Tax

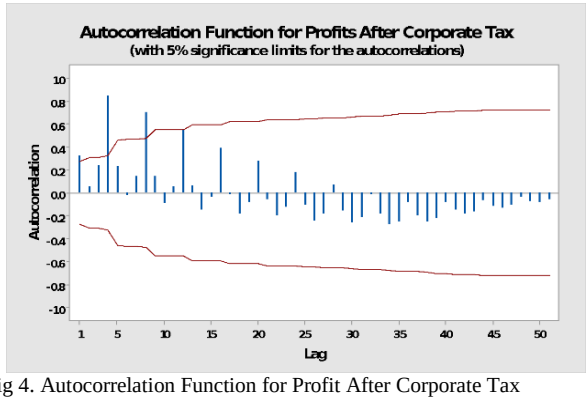

Fig 4. Autocorrelation Function for Profit After Corporate Tax

According to Figures 3 and 4, it can be observed that the series is not stationary as the plotted graph and the corresponding ACF show seasonal variation and an upward trend. Therefore, seasonal differencing was required to make the series stationary, as depicted in Figures 5 and 6.

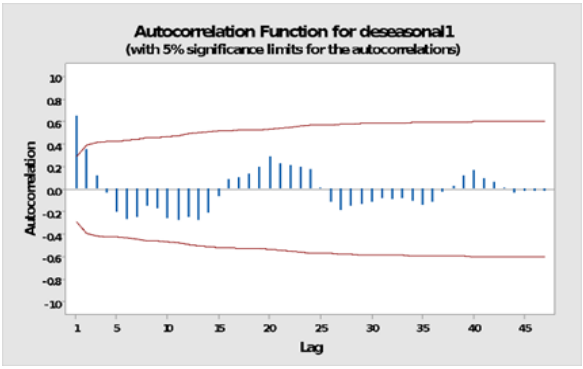

Fig. 5. ACF of first seasonal differenced series

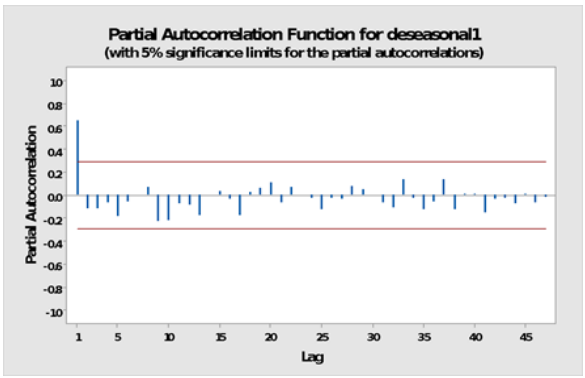

Fig. 6. PACF of first seasonal differenced series

According to Figures 5 and 6, it can be understood that the differenced series is stationary and in the non-seasonal area, both ACF and PACF cut off at lag 1. Therefore, the tentative model is identified as SARIMA (1,0,1) $(0,1,0)_4$. Based on this tentative model, three more sub tentative models were also identified as follows.

SARIMA (2,0,1) $(0,1,0)_4$

SARIMA (2,0,2) $(0,1,0)_4$

SARIMA (1,0,2) $(0,1,0)_4$

Having calculated parameter estimates, Box-Pierce (Ljung-Box) Chi-Square statistic, and correlation matrix and checked the normality of the residuals, it could be concluded that one model is adequate to forecast the profitability to a certain extent.

The model along with its MAPE and AIC values are shown in Table 8.

Table 8. Accuracy Measures for Forecast

Model	MAPE value (%)	Accuracy	AIC
SARIMA $(1,0,0)$ $(0,1,0)_4$	35.6906	64.3094	23.1682

Based on the moderate accuracy it would be possible to use SARIMA (1,0,0) $(0,1,0)_4$ as a useful model to forecast the profitability.

V. CONCLUSION

This study investigated the relationship between market share and profitability of licensed commercial banks in Sri Lanka. From the statistical analysis, it was found that market share significantly contributes to improve the performance of banks. Multiple linear regression proved that there is a positive relationship between profitability and market share. Analysis of Variance was conducted for testing the strength of the model, which concluded that the independent variables (DC and LC) significantly predict the dependent variable. Results further showed that, if the deposits made by customers are increased by 1 unit, the profitability will rise by 6.1% and if the loans granted to customers are increased by 1 unit, the profitability will increase by 10.7%.

Finally, it could be concluded that amount of loans granted to customers (LC) is most effective to influence the profitability of licensed commercial banks in Sri Lanka. The results of this study supported both theoretical and empirical evidence of prior studies as the loans granted to bank customers accounted for increasing the profitability of licensed commercial banks in Sri Lanka. According to the Time series Analysis, SARIMA $(1,0,0)\ (0,1,0)_4$ was found to be a reasonably accurate alternative model to forecast the profitability (Profits After Corporate Tax) of licensed commercial banks with moderate accuracy. These findings would be useful for the Licensed commercial banks to review their strategies for optimizing profitability based on strengthening the loan and deposit customer profiles.

REFERENCES

[1] Buzzell, R. D., Gale, B. T., & Sultan, R. G. M. (1975). Market ShareA Key to Profitibility. Harvard Business Review, 53(1), 1–9

[2] Etale, L. M., Bingilar, P. F., & Ifurueze, M. S. (2016). Market Share and Profitability Relationship: A Study of the Banking Sector in Nigeria. International Journal of Business, Economics and Management, 3(8), 103–112. https://doi.org/10.18488/journal.62/2016.3.8/62.8.103.112

[3] Fidanoski, F., Choudhry, M., Davidovic, M., & Sergi, B. (2016). What does affect profitability of banks in Croatia Competitiveness Review: An International Business Journal. Competitiveness Review: An International Business Journal.

[4] Genchev, E. (2012). Effects of Market Share on the Bank's Profitability. Review of Applied Socio-Economic Research, 3(1), 87–94.

[5] Hirindukawshala, K. (2017). The Factors Effecting on Bank Profitability. International Journal of Scientific and Research Publications, 7(2), 212. www.ijsrp.org

[6] Lee, C. C., & Hsieh, M. F. (2013). The impact of bank capital on profitability and risk in Asian banking. Journal of International Money and Finance, 32(1), 251–281. https://doi.org/10.1016/j.jimonfin.2012.04.013

[7] McGahan, A. M., & Porter, M. E. (1997). How much does industry matter, really?. Strategic management journal, 18(S1), 15-30.

[8] Rumelt, R. P. (1991). How much does industry matter? Strategic Management Journal, 12(3), 167–185. https://doi.org/10.1002/smj.4250120302

[9] Trujillo-Ponce, A. (2013). What determines the profitability of banks? Evidence from Spain. Accounting and Finance, 53(2), 561–586. https://doi.org/10.1111/j.1467-629X.2011.00466.x

[10] Woo, C. Y. (1981). Market Share Leadership--Does It Always Pay Off? Academy of Management Proceedings, 1981(1), 7–11. https://doi.org/10.5465/ambpp.1981.4976490.