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DETERMINANTS OF NET INTEREST MARGINS: EVIDENCE FROM COMMERCIAL BANKS OF ETHIOPIA

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Abstract

The banking system took a lion's share in the financial intermediation process between savers and borrowers in the country Ethiopia among other financial institutions. In this study, the main objective was to recognize the determinants of net interest margins (NIM) of commercial banks of Ethiopia. All seventeen commercial banks had taken for the study. The panel data from audited financial statements over periods 2013 to 2020 was gathered. The CAMELS framework was used to assess banks' internal factors and respective ratios were calculated for each variable. Then the fixed-effect regression model was used to estimate the variables. The findings of the study revealed that among six hypotheses, five of them were rejected. Hence, Capital Adequacy, Management Efficiency, Earning Capability, Liquidity, and Sensitivity to market risk were measured by total debt to total equity, non-interest expense to general expense, net interest income to total assets, liquid assets to total assets, and interest expense to total deposits respectively were the determinants of NIM of commercial banks of Ethiopia in the periods the study had been conducted.

Keywords: determinants, net interest margins, profitability, Commercial banks, Ethiopia

1. Introduction

The banking sector is always paramount important in the development of a country worldwide. Banks are financial intermediaries who channel and facilitate the smooth flow of funds from households, businesses, and governments with surplus funds to other households, businesses, and governments those face scarcity of funds. As the banks are dominant in financial institutions, their performance should be effectively measured and evaluated every time. It is also indispensable to sustain a successful structure for bank supervision and banking policy because any failure in a banking firm may perhaps lead to financial insecurity and interruption of the economy (Puspitasari, Sudiyatno, Hartoto, & Widati, 2021). Banks' financial performance in terms of Profitability is proxied by return on assets (ROA), return on equity (ROE), and net interest margin (NIM) (Ong & Teh, 2013), (Leykun, 2016). The NIM can be considered as one of the prominent indicators in the management of assets and liabilities of financial institutions including banks. The management of the quality of assets and liabilities is the internal management process that emphasizes on achievement of the financial objectives of the banks. The major objectives of the banks incorporate maximization of profits through capital adequacy, ensuring liquidity, increasing shareholders value, and lowering interest rate risks (Saksonova, 2014).

NIM is a measure of the profitability of banks by the combined effect of various internal factors like capital adequacy, asset quality, management efficiency, earning capability, liquidity, and sensitivity to the market risk which are known as CAMELS analysis (Yuksel, Dincer, & Hacıoglu, 2015). CAMELS analysis created by the supervisory authorities in the United States defines the performance of the banks by analyzing their financial statements. Under this framework many factors were considered by various scholars and researchers so far; however, in this study, each element is represented by one proxy variables to determine NIM. Capital adequacy represented by total debt to total equity ratio (TDTE), asset quality represented by loan loss

provision to total loan (Loan_LPTL), management efficiency represented by non-interest expense to general expense (Non_IEGE), earning capability represented by net interest income to total asset (Net_IITA), liquidity represented by liquid assets to total assets (Liq_ATA) and sensitivity to the market risk represented by interest expense to total deposit (IETD).

In the country Ethiopia, the banking sector nowadays becomes growing fast and increasing in numbers and branches countrywide. Only in the years 2019/2020 more than twenty new banks have been under establishment and some have gotten licensed and entered into operation while the others have been in process. When all banks entered the economy, the number of banks in Ethiopia will become more than double the current number of banks available in the country. In the study periods there were seventeen commercial banks had been operating in the country out of the seventeen banks sixteen banks were privately owned while only one bank was public. The banks are unequivocally paramount important for countries economic development (Kalpana & Rao, 2007) of any economy and the same for Ethiopian economy as well. They play a great role in circulating the financial resources in the economic sectors of countries. Therefore, its healthiness is very important to the well-being of the general economy at large (Mohanty, 2017). In this study, the objective is to identify the determinants of NIM of commercial banks of Ethiopia considering after rehearsing the empirical evidence of the previous studies.

2. Literature Review

The NIM is considered a helpful instrument for tracking the profitability of banking. The investment and lending activities of banks over certain periods indicate that the interest rate spread between loans and deposits. The spread means the difference between the debtors' interest rate and the creditors' interest rate (Salwa & Chahrazed, 2010). The transaction costs and taxes of banks were borne directly to borrowers and depositors (Demirgüç-kunt & Huizinga, 1999). The determinants of NIM conducted by various researchers so far; however, they have many outputs. Generally, they classify the determinants of NIM into three broad factors; they are bank-specific (internal factors), industry-specific factors, and macroeconomic factors. Among these factors, some studies suggest that macroeconomic factors are most determinants of NIM whereas other studies argue that the bank-specific and industry-specific factors have crucial effects on the determination of NIM (Kansoy, 2012). Nevertheless, this study focused only on bank-specific factors under the CAMELS. The reason behind the ignorance of macroeconomic variables was that the same value for all cross-sections may have some sort of prohibition in the estimation of parameters (Yaffee, 2016). The bank-specific factors are the internal factors of the banks that are under the control of bank managers. The variables under CAMELS are controllable by the management of banks (Fani, Khan, Kumar, & Kumar, 2018). The internal drivers of the profitability of banks can be defined as the factors that are affected by banks' management decisions. All the operation results of banks are affected by the quality of management and such quality is reflected in operating parameters (Ahmad, 2019), (Ali, Akhtar, & Ahmed, 2011).

The Net Interest Margins (NIM) (Gul, Irshad, & Zaman, 2011) is defined as the difference between the amounts earned from interest income generated by banks or financial institutions' assets and the amounts disbursed to depositors or lenders as interest expenses for the banks' or financial institutions' liabilities to total assets. It implies that how effective the banks' investment decisions are, as it is compared to the debts the banks hold. The higher value of NIM shows the higher the profitability of banks and the safer the banks are; however, it reflects riskier in lending measured by loan loss provision (Ongore, 2013). NIM can be calculated as follows (Bothra P., 2015);

$$\text{NIM} = \frac{\text{Interest Earned} - \text{Interest Expense}}{\text{Total Assets}} \times 100\%$$

Capital adequacy is the first factor under the CAMELS framework which determines the banks' performance (Ab-rahim, Kadri, & Dee, 2018) measured by total debt to equity ratio. This ratio appraises the capital condition of banks as well as it is expected to absorb any potential losses and risks like market and credit (Aguenaou S, Lahrech A, & Bounakaya S, 2017). It measures the banks' degree of leverage. If this ratio increases, the protection of banks for creditors is lesser and lesser.

Asset quality is an important factor in determining the profitability of the banks. If the credit quality of the banks is poor (credit risk), the negative effect reveals immediately on profitability. A higher ratio of Loan_LPTL (Almarzoqi & Ben Naceur, 2015) is associated with lower credit quality and higher credit risk. Since doubtful accounts increase as consequence, the loan loss provision also increases to cover expected credit losses. Moreover, the evolution of impairment losses on loans and receivables are factors affecting asset quality (de Barona & Barona, 1991). As per the study conducted in the Jordan banking sector, higher in NIM tends to be associated with banks' strategies in extending loans while preserving the low levels of non - performing loans and lower leverage ratios (Khrawish, Al-Abadi, & Hejazi, 2008).

Management efficiency is sound management of the overall efficiencies of all factors of CAMELS. It is the most important factor behind overall performance banks and it can be expressed by varieties of variables in literature (Yuksel et al., 2015), (Kiran, 2018) that encompasses the assessment of the banks' system of management, the system of control mechanism, norms of

organizational discipline, quality and size of staff and branches (Lelissa, 2014a); however, to determine the soundness of management in this study non-interest expenses to general expense (Lelissa, 2014b) used to understand the efficiency of management’s control over operating and overhead expenses.

Earning capability measures how the assets of banks are efficient to yield profit. Though different studies done on the earning capability have been described by various sub-factors so far, in this study net interest income to total assets was used (Nair & Asghede, 2015).

Liquidity (Doliente, 2005) is measured by liquid assets to total assets ratio and which measures the overall liquidity (M. Reddy & Prasad, 2011) of banks that guarantee banks to fulfill their financial obligations so that they can minimize the liquidity risk problems. It is also needed to meet bank’s deposit obligations like withdrawal of their funds or granting of loan services to creditors with available liquid funds. The higher the ratio the safer a bank is (S. Reddy, 2019).

Sensitivity to market risk this ratio according to (Baral, 2007. p.45) explained as;

“Commercial banks are increasingly involved in diversified operations such as lending and borrowing, a transaction in foreign exchange, selling off assets pledged for securities, and so on. All these are subject to market risks like interest rate risk, foreign exchange rate risk, and financial asset and commodity price risk. The health of financial institutions more sensitive to market risk is more hazardous than that of less sensitive. Foreign exchange risk, interest rate risk, equity price risk, and commodity price risk are the indicators of sensitivity to market risk”.

The above explanation by Baral also supported by variety of the scholars such as (FDIC, 2018). However, this study focuses only on interest expense to total deposit (IETD) (Guan, Liu, Xie, & Chen, 2019) excluding external factors such as Bank size, bank age, GDP, Inflation, and interest rate (Alper & Anbar, 2011) (Ali et al., 2011) (Personal & Archive, 2011) (Sulub, 2014).

Table 1: Summary of the empirical review

| CAMELS or internal factors (independent variables) | Proxy variable Ratio (%) | Notation of variables | Expected coefficient sign |
|----------------------------------------------------|-----------------------------------------|-----------------------|---------------------------|
| Capital adequacy | Total Debt to Equity | TDTE | +/- |
| Asset quality | Loan loss provision to total loan | Loan_LPTL | - |
| Management efficiency | Non-interest expense to general expense | Non_IEGE | - |
| Earning capability | Net interest income to total assets | Net_IITA | + |
| Liquidity | Total liquid assets to total assets | Liq_ATA | - |
| Sensitivity to market risk | Interest expense to total deposits | IETD | - |
| Net Interest margin (NIM) | Dependent variable which | | |

The empirical results from various studies summarized hereafter; the study conducted by (Assfaw, 2015) on six private commercial banks of Ethiopia, the capital adequacy and management efficiency were determined financial performance measured by ROA, ROE, and NIM but asset quality did not significantly determine (Ani, W. Uchenna, Ugwunta, 2012). According to (Rani & Lemma, 2017) capital adequacy and earnings ratios determine NIM but management efficiency, liquidity did not. According to the study conducted by (Ram & Mesfin, 2019) from Ethiopian selected 13 commercial banks from 2010 to 2017 entitled determinants of net interest margin, on factors in bank-level, industry level, and macroeconomic level. The results he found were from the bank level what was said internal factors in this study were capital adequacy, asset quality, management soundness, earning capability, and liquidity position were the determinants of NIM. However, such factors were measured by Capital to total asset proxy for capital adequacy, total loan and advance to total deposit proxy for management soundness, Interest income to total income proxy for earning capability. In cases of Asset quality and Liquidity position, he has used the same variables such as Loan loss provision to total loan and a liquid asset to total assets.

Hypothesis

Based on the summary of previous studies and basic concepts of profitability of banks, the following hypotheses were originated as follows;

- Ho1: Capital adequacy in terms of TDTE has a positive and insignificant effect on NIM.
- Ho2: Asset quality in terms of Loan_LPTL has a negative and insignificant effect on NIM.
- Ho3: Management Efficiency in terms of Non_IEGE has a negative and insignificant effect on NIM.
- Ho4: Earning capability in terms of Net_IITA has a positive and insignificant effect on NIM.
- Ho5: Liquidity in terms of LATA has a positive and insignificant effect on NIM.

Ho6: Sensitivity to market risk in terms of IETD has a negative and insignificant effect on NIM.

3. Methodology

Panel data of eight years throughout 2013 to 2020 was collected from seventeen Ethiopian commercial banks. The data was quantitative and fully secondary data that type taken from audited financial statements of the banks. The financial statements include statements of position (Balance sheets) and profit and loss statements (Income statements). To conduct data analysis, a panel data regression model was employed due to the data nature of the study. The cross-sectional time-series estimation helps contain the severity of multicollinearity variables Panel data models are regressed using either pooled ordinary least square or fixed effects or random effects estimators. In so doing, the fixed effects estimator fit and appropriate based on the Hausman test.

To keep the robustness of estimated outputs a fixed-effect model is helpful. The FE model formulation implies that differences across groups can be captured indifferences in the constant term. It also allows the unobserved individual effects to be correlated with the included variables (Zhou & Wong, 2008). The FEs or (least squares dummy variable) model is a model that would have constant slopes but intercepts that differ according to cross-sectional unit the banks in this case. Though there are no significant temporal effects, there are significant differences among banks in this type of model. While the intercept is a cross-section (banks) specific and in this case differs from bank to bank, it may or may not differ over time (Yaffee, 2016). Heteroskedasticity models are usually fitted with estimated or feasible generalized least squares (EGLS or FGLS). The Eviews version 10 Software was used for data analysis.

Model specification

$$NIM = f(CAMELS) \text{-----Eq1}$$

$$Y_{it} = \alpha + \beta_1 X_{it} + \dots + U_{it} \text{-----Eq2}$$

Where;

α - intercept (constant term), β - slope coefficient, y- dependent variable, x- independent variables i-cross section, t- time series, u- error term

The final Panel model after substituting variables in the model look like the following;

$$NIM_{it} = \alpha + TDTE_{it} + \beta_2 Loan_LPTL_{it} + \beta_3 Non_IEGE_{it} + \beta_4 Net_IITA_{it} + \beta_5 Liq_ATA_{it} + \beta_6 IETD_{it} + U_{it} \text{-----Eq3}$$

4. Result and Discussion

Descriptive statistics

From the descriptive statistics table 2, the maximum and minimum values of NIM are 0.1785 and 0.0103 respectively with the mean value of 0.0821 (i.e. 8.21%) and a standard deviation of 0.0208. The mean, median, maximum, minimum, and standard deviations of all independent variables were described in table 2.

Table 2: Descriptive statistics

| | NIM | TDTE | Loan_LPTL | Non_IEGE | Net_IITA | Liq_ATA | IETD |
|-----------|--------|--------|-----------|----------|----------|---------|--------|
| Mean | 0.0821 | 6.6386 | 0.0053 | 0.6085 | 0.0388 | 0.4048 | 0.0365 |
| Median | 0.0831 | 6.1443 | 0.0040 | 0.6051 | 0.0391 | 0.4146 | 0.0333 |
| Maximum | 0.1785 | 22.885 | 0.0787 | 0.9598 | 0.0598 | 0.8746 | 0.1113 |
| Minimum | 0.0103 | 0.0513 | -0.0013 | 0.1473 | 0.0037 | 0.1153 | 0.0034 |
| Std. Dev. | 0.0208 | 3.3630 | 0.0081 | 0.1124 | 0.0101 | 0.1589 | 0.0172 |

Source: Own calculation

Correlation matrix

Correlation between variables was assessed using the output of the correlation matrix of the data shown in table 3. There was a negative correlation between NIM and Loan_LLPTL, Liq_ATA, and IETD but there was a positive correlation between NIM and TDTE, Non_IEG, and Net_ IITA. The correlation between independent variables was ranged from -0.2822 to 0.2985 which indicated that there were no strong correlations between them since correlation approaches zero it is said to be a weak correlation.

Table 3: Correlation matrix and Variance Inflation Factor (VIF)

| | | | | | | | | |
|-----------|---------|---------|-----------|----------|----------|---------|------|------------|
| | NIM | TDTE | Loan_LPTL | Non_IEGE | Net_IITA | Liq_ATA | IETD | (VIF)=1.58 |
| NIM | 1 | | | | | | | |
| TDTE | 0.3617 | 1 | | | | | | 1.050183 |
| Loan_LPTL | -0.0724 | 0.0088 | 1 | | | | | 1.077199 |
| Non_IEGE | 0.1750 | -0.1412 | 0.1453 | 1 | | | | 1.481217 |
| Net_IITA | 0.5781 | 0.1484 | -0.1609 | 0.0702 | 1 | | | 2.050064 |
| Liq_ATA | -0.0762 | -0.2237 | 0.1249 | 0.2985 | -0.1246 | 1 | | 1.264280 |
| IETD | -0.1200 | -0.2733 | -0.0593 | -0.2822 | 0.0521 | -0.1129 | 1 | 2.550304 |

Source: own calculation

Random Effect Vs Fixed Effect Accepted

The Hausman specification test is the conventional test of whether the fixed or random effects should be used for the study. Here the null hypothesis is “Random effect model is appropriate”. After the test of Hausman test, the null hypothesis became rejected and the alternative hypothesis that is “fixed effect model is appropriate” was accepted. Therefore, the fixed-effect model was more powerful and parsimonious for the estimation of the data.

Table 4: Correlated Random Effects - Hausman Test

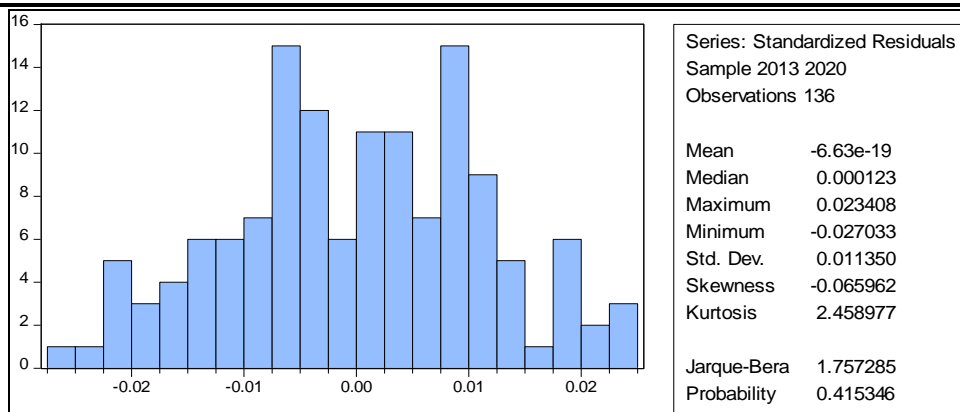
| | | | | |
|-----------------------------------|-------------------|--------------|--------|--|
| Test cross-section random effects | | | | |
| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. | |
| Cross-section random | 24.236542 | 6 | 0.0005 | |

Source: Own calculation

Variance Inflation Factor (VIF) Test

To check the multicollinearity problem in this study, three signs of indicator of multicollinearity were checked and proved that there was no multicollinearity problem among explanatory variables. Signs of multicollinearity problems indicators are (1) if a correlation between independent variables is high enough it could cause a problem of multicollinearity. The threshold for correlation figure is not fixed yet; however, some suggest 7.5, others suggest 8.0 and others also suggest 8.85 and so on (Hair, 2006), (Brooks, 2008), (Smith, Koper, Francis, & Fahrig, 2009) however; in this study correlation was less than 0.6 which is revealed in table 3, (2) VIF is a test used to evaluate multicollinearity in the regression model. It is used to identify the correlation between explanatory variables and to measure the strength of that correlation, if VIF is greater than 10% and which is shown in table 3, and (3) if a majority of variables are insignificant but R-square is very high value but in this case, the majority of variables were significant as it is indicated in regression output in table 5. Hence, by the three aforementioned results, the independent variables have no chance of multicollinearity problem.

A normality test: The residuals should be normality distributed so that the histogram becomes bell-shaped and Jarque-Bera should be insignificant (Mohanty, 2017). Hence, Jarque-Bera statistics had a p-value greater than 5% indicating that the data fitted to the assumption of normality shown in graph 1.



Graph1: Histogram for normality test

Regression Result and Discussion

The output of the regression model shown in table 5 would be discussed hereafter:

The coefficient of determination of the model test showed that R^2 is 90.10% and the adjusted R^2 is 88.18%. The NIM was 88.18% influenced by all independent variables, while 11.82% was influenced by other factors which were not included in the model. To test the goodness of fit of the data to the model applied since prob (F-statistics) 0.000000 value revealed that the p-value was significance at 1% significant level. Therefore, the validity and reliability of the model was boosted.

The majority of independent variables such as Non_IEGE, Net_IITA, Liq_ATA, and IETD had a positive impact on NIM and they were significant at a 1% significant level. Any increases in these variables would increase the NIM of the banks in the periods the study was conducted. The Net_IITA and IETD variables took great share of influence on NIM because 1% increases in these variables will increase the NIM by 83.59% and 23.33% respectively. The Non-IEGE and Liq-A contributed relatively lesser impact on NIM since 1% increases in these variables will increase NIM by 2.125 and 1.41% respectively. The TDTE and Loan_LPTL had a negative relation on NIM but only TDTE was significant at a 1% level of significance; meaning increases in TDTE ratio would decrease the profitability in terms of NIM. Increases of 1% in this ratio will decrease the NIM by 0.18%. Even though, Loan_LPTL had negative relation with NIM, it was insignificant to impact the NIM even at a 10% significant level.

Hence, the null hypotheses such as Ho1, Ho3, Ho4, Ho5, and Ho6 were rejected, instead alternative hypothesis was accepted. Meaning, Capital adequacy, Management Efficiency, Earning capability, Liquidity, and Sensitivity to market risk were the determinants of NIM measured by TDTE, Non_IEGE, Net_IITA, Liq_ATA, and IETD variables respectively for the Ethiopian commercial banks based on the data collected for the periods of 2013 to 2020. Regarding the sign coefficients, of Net_IITA, TDTE and IETD were the same as prior expectation, while Non_IEGE, Liq_ATA, and IETD were against..

Regression output is shown as follows;

$$NIM = 0.035470 - 0.001837 TDTE - 0.137595 Loan_LPTL + 0.021246 Non_IEGE + 0.835914 Net_IITA + 0.014128 Liq_ATA + 0.233314 IETD$$

Table 5: Regression output

| Dependent Variable: NIM | | | | |
|-------------------------|-------------|--------------------|-------------|----------|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 0.035470 | 0.006824 | 5.198046 | 0.0000 |
| TDTE | -0.001837 | 0.000391 | -4.695389 | 0.0000 |
| Loan_LPTL | -0.137595 | 0.088397 | -1.556561 | 0.1224 |
| Non_IEGE | 0.021246 | 0.007644 | 2.779413 | 0.0064 |
| Net_IITA | 0.835914 | 0.083691 | 9.988145 | 0.0000 |
| Liq_ATA | 0.014128 | 0.004461 | 3.167109 | 0.0020 |
| IETD | 0.233314 | 0.066102 | 3.529587 | 0.0006 |
| Weighted Statistics | | | | |
| R-squared | 0.901062 | Mean dependent var | | 0.179037 |
| Adjusted R-squared | 0.881800 | S.D. dependent var | | 0.089766 |
| S.E. of regression | 0.012406 | Sum squared resid | | 0.017391 |
| F-statistic | 46.77864 | Durbin-Watson stat | | 1.962584 |
| Prob(F-statistic) | 0.000000 | | | |

5. Conclusion

The objective of this study was the assessment of the determinants of NIM of commercial banks in Ethiopia. Had been having all commercial banks of the country and was taking eight years of data from financial statements of the banks assessed CAMELS components. Fixed effect model was applied and the CAMELS factors regressed against NIM.

The dependent variable was explained 88.18% by the independent variables and the remaining 11.82% of the dependent variable was explained by some factors other than the explanatory variables used in the study. The test of hypotheses, a p-value of individual independent variables t-statistics were determined the significant level at 5%. Thus, all independent variables except Loan_LPTL were significant. Hence, there was no sufficient evidence revealed to accept all null hypotheses (Ho1, Ho3, Ho4, Ho5, and Ho6) except hypothesis Ho2. Meaning, Capital adequacy, Management Efficiency, Earning capability, Liquidity, and sensitivity to market risk were determinants of NIM measured by TDTE, Non_IEGE, Net_IITA, Liq_ATA, and IETD variables respectively. The asset quality measured by loan loss provision to total loan was not considered as determinants of NIM of the banks over the periods the study was conducted. Regarding the coefficients sign, TDTE, Loan_LPTL, and Net_IITA were according to the prior expectation while the remaining was against.

Finally, the researcher of this study recommends the banks' managers should focus on the asset quality of the banks. The performance of this variable can be improved if it could be properly managed since all the CAMELS components are internal factors that the banks' managers can control their performance.

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