DETERMINANTS OF CAPITAL ADEQUACY OF ETHIOPIA COMMERCIAL BANKS

Yonas Mekonnen
Lecturer, Department Of Accounting & Finance,
Jimma University, Ethiopia

Abstract
  The main objective of the study is to investigate empirically the determinants of CAR in Ethiopian commercial banks. The study period covered the year 2004-2013 on which eight banks are selected based on availability of ten years data. The study use secondary data which is gathered from annual reports of the banks under study. Panel data regression is used in this study and analyzes relationships between bank specific variables: SIZE (Bank Size), DEP (Deposit ratio), LNTA (Loan to Total Asset), LIQ (Liquidity Position), ROA (Return on Asset), ROE (Return on Equity), NIM (Net interest margin) and LEV (Leverage) and the dependent variable which is CAR. In order to select the best model that fit for the study Hausman specification test has been made. And based on the result on which the probability is less than 5%, fixed effect model is selected as the best model for the study. The result of the fixed effect model for the study reveals that ROA, DEP and SIZE have a positive effect on capital adequacy and ROE and NIM have a negative effect on capital adequacy but LIQ, LNTA and LEV have no a significant effect on capital adequacy.

Keywords: Capital Adequacy, Commercial banks, Ethiopia

1. Introduction

  The banking sector has been undergoing a complex, but comprehensive phase of restructuring since 1991, with a view to make it sound, efficient, and at the same time it is forging its links firmly with the real sector for promotion of savings, investment and growth. Traditional financial system in Ethiopia has long history and paramount contribution to economic betterment and social wellbeing of the society. Traditional institutions organized with a sense of cooperation and risk sharing has enabled Ethiopians to experience saving and financial management within its cultural context. Eqqub and Edir are some of the informal financial institutions that shaped the social bond and interaction Aychile (2008).

Banks in Ethiopia are mainly developed and start works in 1905, in which the first banks of Abyssinia establish to intermediate the transaction. The first Ethiopian banks the new Bank, Bank of Ethiopia, was a purely Ethiopian institution, and was the first indigenous bank in Africa, and established by an official decree on August 29, 1931 with capital of £750,000.After that period there are few banks that are developed by foreigners like Barclays bank which is established by the British troops and seized its operation in the year 1943 and also there are few foreign banks Banko di Napoli and banco di roma which merged in 1976 with Addis Ababa banks to form the second largest Bank in Ethiopia called Addis Bank with a capital of Eth. birr 20 million and had a staff of 480 and 34 branches. After the fall of the regime of emperor haileselasie I, the government that is led by the military junta has come to power in 1974. The military junta which is called Derg regime follows the socialist ideology in which he controls the whole economy and nationalized all large corporations. Addis Bank and Commercial Bank of Ethiopia S.C were merged by proclamation No.184 of August 2, 1980 to form the sole commercial bank in the country until the establishment of private commercial banks in 1994. Currently banks are in operating different activities after the new reform has been done in the private sector specially the banking sector. The number of the banking sector has started to increase from year to year after the development of the first private bank Awash bank S.C. in 1994. The banking sector plays the major role to increase the economy of the country Saidov (2011). But we can say that this sector has not yet increase in enormous pace in Ethiopia. Banks play unquestionable role in sustainable economic development of a country through providing the required financial services to the economy. Commercial banks, in particular, can be taken as a lung for every business activities. Hence, a well-organized and structured commercial bank services are required to have a better business activity and sustainable economic development. During the last decade, the banking sector of Ethiopia has experienced major transformation in terms of investment and geographic distribution due to the financial sector reform and liberalization act of 84/1994 Hailegiorgis (2012). Currently in Ethiopia 19 banks involve in which 16 are private banks and 3 are public banks. In order to establish banks in Ethiopia the banking sector should maintain a minimum paid-Up capital of eth.birr 500 million and those banks that are in existence and have below the minimum requirement should maintain the minimum paid up capital till June, 2016.

There are many researches work that have been done before by many scholars in the country. But all researches only consider how to measure performance of the banking sector by using ordinary ratio. No research has considered measuring what major factor has an impact to capital adequacy of

commercial banks. Capital base of financial institutions facilitates depositors in forming their risk perception about the institutions. Also, it is the key parameter for financial managers to maintain adequate levels of capitalization. Moreover, besides absorbing unanticipated shocks, it signals that the institution will continue to honor its obligations. For the first time the banks for international settlement which is established after the great depression which has an aim in setting capital adequacy requirements For the central banks Wernz (2014) . After this period Basel accord has set a minimum requirement that all banks to acquire a minimum of 8% to risk weighted asset as bank is obligated to have adequate capital to close the risk that can be happened in which this is called capital adequacy. The minimum capital standards made by the Basel Committee on Banking Supervision in 1988, was designed to increase the safety and soundness of the international banking system and to set a level playing field for banking regulation Karina and Anggono (2014). As Polat and Al-khalaf (2014) state the capital structure and the required level of capital are important topics for any corporation whether they are financial or non-financial. In addition to the importance of structure and the level of capital, the impact of regulations on such variables also cannot be ignored. Through the process of Basel II to Basel III the objective is to Strengthen Bank-level, or Micro-prudential, Regulation through Increase in Regulatory Capital Requirements to 10.5% by 2019 Went (2011).

Therefore by considering capital adequacy of the commercial banks and all aspects this study has mainly focused to give site how ultimately determines and how well the banks can manage with shocks to their balance sheets. And also the study has identified what major factor has an impact to violate capital adequacy of the banking sector by considering annual data from year 2004-2013. Banks Directives No. SBB/50/2011 sub article 4 mentioned that all licensed banks shall at a minimum maintain capital to risk weighted assets ratio of 8% at all times.

Factors that are considered as an explanatory variable are eight bank specific factors such as Return on asset, Return on equity, liquidity position, deposit ratio, loan to total asset, bank size, net interest margin and leverage ratio. The study variables have taken from the study done by Büyükşalvarc and Abdioğlu (2011) in the Turkish banks which has consided the time period from 2006-2010.

2. Objective of the study

The objective of the study is to investigate empirically the determinants of capital adequacy ratio in Ethiopian commercial banks.

The specific objectives of the study include the following

1. To give site how commercial banks in Ethiopia can manage with shocks to their balance sheet
2. To identify what bank specific factor has an impact to violate capital adequacy of the banking sector in Ethiopia

3. Review of related literature

There are different researches that have been done before on capital adequacy in different countries. Theoretical as well as empirical evidence has been presented by the researchers there insights on capital adequacy. A brief overview of the studies focusing on developed factors that may affect capital adequacy.

Ahmet and Hasan (2011), has done study on the Turkish banks to investigate the determinants of Turkish banks' capital adequacy ratio and its impact on financial position of selected 24 banks. The study take nine explanatory variable namely SIZE, DEP, LOA, LLR, LIQ, ROA, ROE, NIM and LEV and dependent variable capital adequacy ratio. In order to see the effect of bank specific variable on capital adequacy ratio multivariate Panel regression model has been applied. Based on the finding Size, DEP, LIQ and NIM have no any significant impact on capital adequacy ratio. But on the other hand LOA, ROE and LEV have a negative impact while LLR and ROA have appositive impact on CAR.

Shingjergji and Hyseni (2015), in there study in the Albanian banks they state that the banking sector occupies 85% of the financial sector which indicate the poor of the capital market. They investigate the factor that affect capital adequacy of Albanian banks after the financial crisis. As dependent variable they use the capital adequacy ratio (CAR) while as independent variables they use: return on assets (ROA), return on equity (ROE), the non-performing loans (NPL) and bank size (Total Assets), equity multiplier (EM) and loan to deposit ratio (LTD). In order to see the relationship ordinary least square regression model has been used. Based on their result find out that profitability indicators such as ROA and ROE do not have any influence on CAR while NPL, LTD and EM have negative and significant impact on CAR in the Albanian banking system and the bank size has a positive impact on CAR meaning that large banks have higher CAR.

Mohammed (2013) investigate the relationship by using Multiple linear regression analysis and pair-wise correlation matrix between capital adequacy and the explanatory variables; profitability (ROA), assets earning quality (NPF), deposits structure (DEP), liquidity (FDR) and operational efficiency (OEOI) of Indonesian Islamic banking. The study result showed that profitability and liquidity are positively related to the capital adequacy requirements. Meanwhile, uncollectable funds measured by nonperforming financing (NPF) is significant but negatively related to the capital adequacy

ratio. On the other hand, depositor's funds and operational efficiency have no significant effect on capital adequacy of Indonesian Islamic banks. The study found that Indonesian Islamic banks have maintained the minimum 8 percent requirement during the financial crisis. Even Indonesian Islamic banks have an excessive fund to meet their obligations and they can protect the owners of capital.

Karina and Anggono (2014), study factors that have impact on capital adequacy for credit risk weighted asset on 19 conventional banks of Indonesia. The analysis has been done by using used multivariate regressions performed by Eviews 8. In order to see the impact on capital adequacy which is the dependent variable 15 explanatory variables has been applied. After looking the multicollinearity problem some variable the researchers are removed this variable and readjust the regression model. The study finding revealed that Risk Weighted Asset for Credit Risk Ratio (RWACR), Loan to Debt Ratio (LDR), and Loan to Asset Ratio LAR has significantly correlated with CAR for credit risk, while NIM (Net Interest Margin), Non-Performing Loan ratio (NPL), Debt to Equity Ratio (DER), Provision of Financial Asset (PROV), and USD Growth Rate Ratio (UGR) has insignificant correlation.

4. Data and methodology
4.1 Data description and variable definition

The purpose of this study is to investigate the determinants of Ethiopian commercial banks capital adequacy ratio and its effect on financial position of the banks in the study. Mainly the data for this study is gathered from audited annual statement of the selected banks. Currently there are 19 banks on which 16 are private and 3 are state owned banks. For the purpose of this study the researcher considers only 8 banks on which those banks that are establish and starts operation before the year 2004. The time period of the study is from period 2004-2013. Panel data methodology is applied and analyzes the relationship between bank specific variables ((bank size (SIZE), Deposit (DEP), loans (LNTA), liquidity (LIQ), profitability (ROA and ROE), net interest margin (NIM) and leverage (LEV) and the dependent variable which is capital adequacy ratio (CAR)).

4.2 Capital adequacy ratio

As stated by *Bokhari and Ali (2013)* CAR makes the banks to ensure their capacity to meet their liabilities and other risks like credit risk, market risk and operational risk.

For this study, the research select formula used by Baral used to check the health of commercial banks and joint venture banks in Nepal in 2005.

Capital Adequacy Ratio (%) = [Paid in Capital + Reserve Funds + Net Profits] x 100
Total Assets - Loan loss Provision - Risk-free Assets*

* Risk free asset – cash on hand, cash at bank, Treasury bill, and trust fund

Capital adequacy ratios are a measure of the amount of a bank's capital expressed as a percentage of its risk weighted credit exposures. According to international standards minimum capital adequacy ratio for the banks are required because they can absorb a reasonable level of losses before becoming insolvent. Applying minimum capital adequacy ratios serves to protect depositors and promote the stability and efficiency of the financial system.

4.3 Explanatory variable and hypothesis
4.3.1   Bank size (SIZE)

The natural logarithm of total asset is used as a proxy of bank's size. The relationship between bank size and capital adequacy it may be positive or negative. According to the result Shingjergji and Hyseni (2015) they found positive relationship between bank size and capital adequacy ratio. On which they state those Albanian banks with higher total asset they tend to have an increase in their capital adequacy.

Hypothesis 1: Bank size has a statistically significant effect on capital adequacy

4.3.2   Deposits (DEP)

Deposit ratio is measured by the amount of total deposits held by a bank to total assets. This rate reflects in what measure the deposits attracted by the bank contribute to financing its assets. Deposit is considered by all banks as it is the simple source of funds compared to borrowing and similar financing instruments Ahmet and Hasan (2011).

Hypothesis 2: Deposit ratio has a statistically significant effect on capital adequacy

4.3.3   Loans (LOA)

Share of loans is a ratio of total loans to total asset. At a bank's level, the loans are assets with risk, and their large share in the bank assets means a growth of the bank's exposure to risks, especially the credit risk. Thus, a high value of the indicator could also mean a possible deterioration of the bank assets' quality with a negative effect upon profitability. On the other side, we consider the fact that the banking loans are the main income source for a bank, thus, a high level of this indicator is expected to have a positive impact up on profitability, since the bank registers a growth of interest income.

Hypothesis 3: share of loan has a statistically significant effect on capital adequacy

4.3.4   Liquidity (LIQ)

To measure the liquidity the researcher use as important variable the ratio of liquid assets to total assets. Generally, the banks that hold a reduced level of liquid assets are confronted with the risk of not being able to finance daily operations. The high liquidity reduces liquidity risks and increases capital (Mohammed T. et.al, 2013). Therefore, this study expects that liquidity may have a positive effect on capital adequacy.

Hypothesis 4: Liquidity position has a statistically significant effect on capital adequacy

4.3.5   Profitability (ROA AND ROE)

For the purpose of the study ROA and ROE are used as a proxy for profitability. The research that is done in the Albanian banks by Shingjergji and Hyseni (2015), profitability has no a significant impact on the capital adequacy of the banks. Ahmet and Hasan (2011), states as profitability and capital adequacy ratio are most likely positively related, because bank is expected to have to increase asset risk in order to get higher returns in most cases. This situation is also supported by the research done by Mohammed T. et al. 2013 on which profitability has a positive significant effect on capital adequacy ratio. Therefore this study expects positive relationship between profitability and capital adequacy.

Hypothesis 5: Profitability (ROA) has a statistically significant effect on capital adequacy

Hypothesis 6: Profitability (ROE) has a statistically significant effect on capital adequacy

4.3.6   Net interest margin (NIM)

Net interest margin is the ratio of net interest income to average earning assets. The ratio is used to determine the ability of banks in terms of management, so that it can generate net income. The greater the ratio, then this will affect the interest income earned on earning assets managed by the bank well Yohanna Karina and Herlanto (2014).

Hypothesis 7: Net interest margin has a statistically significant effect on capital adequacy

4.3.7   Leverage (LEV)

The final factors leverage which proxy by the total equity to total liability. Leverage allows a financial institution to increase the potential gains or losses on a position or investment beyond what would be possible through a direct investment of its own funds whenever an entity's assets exceed its equity base, its balance sheet is said to be leveraged. Ahmet and Hasan, (2011), states that highly leveraged banks hold less equity than low

leveraged banks. Therefore, a positive relationship is expected between leverage and capital adequacy ratio.

Hypothesis 8: leverage has a statistically significant effect on capital adequacy

Table 1: Bank specific variables and predicted signs

Bank specific variables	predicted sign
Bank size (SIZE)	+/-
Deposits (DEP)	+
Loans (LOA)	+
Liquidity (LIQ)	+ and -
Profitability (ROA and ROE)	+
Net interest margin (NIM)	+
Leverage (LEV)	+

4.4 Research model

This research is conducted to investigate the impact of bank specific factor on capital adequacy ratio by using a multivariate panel regression model. This model is useful and suitable because the research is lying to see the concomitant relationship between capital adequacy ratio and bank specific factors. Based on review of different theoretical and empirical review, the study hypothesized CAR and eight bank specific factors namely SIZE, DEP, LOA, LIQ, ROA, ROE, NIM and LEV.

The hypothesized model is represented as follows:
CAR=f (SIZE, DEP, LOA, LIQ, ROA, ROE, NIM, LEV)

This study examined the effects of bank specific variables on capital adequacy ratio based on the following econometric model

$$CAR_{it}=\beta_o+\beta_1SIZE_{it}+\beta_2DEP_{it}+\beta_3LNTA_{it}+\beta_4LIQ_{it}+\beta_5ROA_{it}+\beta_6ROE_{it}+\beta_7NIM_{it}+\beta_8LEV_{it}+\varepsilon_{it}$$

In the above equation β_o is constant and β is coefficient of variables while ε_{it} is the residual error of the regression. All estimation has been performed using econometrical software STATA 12 and ordinary calculation in excel.

4.5 Result and discussion
4.5 Descriptive statistics

The study takes into account eight banks for the last ten years from 2004-2013 in order to see the impact of eight bank specific factors on capital adequacy. The descriptive statistics is summarized under table 2. The descriptive statistics summary shows mean, standard deviation, minimum and maximum value for each dependent and explanatory variable. The total observation for each variable is 80.

The dependent variable CAR which is measured by capital to risk weighted asset show an average of 10.83 % and standard deviation of 3.25 % which is above the standard set by the Basel accord in 1988 as well as the minimum requirement 8% which is set by national bank of Ethiopia. In the last ten years the minimum and maximum CAR is 4.20% and 19.21 %. The minimum 4.20% has occurred because one of the eight banks in the study has scored below the minimum requirements 8% to risk weighted asset. In general Ethiopian banks' capital adequacy has an ability to absorb any shock to their balance sheet. The banks in Ethiopia can also met the requirement that the Basel III set as a proposal that the banks Regulation to Increase in Regulatory Capital Requirements to 10.5% by 2019.

Profitability of Ethiopian banks for this study has been measured by using return on asset and return on equity. The average ROA for the last ten years for Ethiopian banks is 2.69 and standard deviation 0.73%. Profitable firms are stronger to face financial distress and stronger to continue more than unprofitable firms in the future (Michel S. et.al, 2015). The minimum ROA is 0.34 and the maximum is 4.02, this indicates there is gap in profitability between Ethiopian banks. But we can say that most Ethiopian banks are said to be strong in their profitability. The banks can met the minimum standards that is set by the Basel accord which indicate the minimum return on asset to be equal or greater than 1% are banks in better performance. The other measurement used for the study to measure profitability is return on equity. ROE measures how well banks can generate profit by using shareholders equity. The average returns on equity for the last ten years is 25.8 % with standard deviation of 10.4 %. The minimum and maximum ROE is 3.47 % to 70.35 % consequently. This gap also shows Ethiopian banks have gap in using their shareholders equity. The higher the ratio is the better performance of the banking industry.

The average of liquidity ratio which is measured by liquid asset to total asset is 36.36% with standard deviation 10.21%. This shows as there is a gap of liquidity between Ethiopian banks. The higher the liquidity ratio able the banks to absorb liquidity risk that will occur in the daily operation. The minimum and the maximum liquidity ratio is 15.80% to 59.40% consequently in the last ten years for the eight observed banks. Deposit ratio which is measured by total deposits held by a bank to total assets has an average 73 % with standard deviation 9.68%. The deposit ratio has a minimum 44.69 % and maximum value 87.15%. Loan to total asset have average value 48.84% and standard deviation 12.98% which show a high gap in Ethiopian banks. The minimum is 22.45% and the maximum is 72.76%. The higher the ratio shows some of Ethiopian banks have deterioration in their asset. Bank size which is measured by the natural logarithm showed an average of 23.55% and standard deviation 4.02%. The minimum and

maximum is 20.32% and 37.52%. Net interest margin have an average of 4.37% and standard deviation 2.01% which indicate that Ethiopian banks are in good position to control their interest. The minimum and the maximum value is 1.14% and 12% consequently. The last explanatory variable for the study is leverage which is measured by total equity to total liability on which the mean is 13.48% with standard deviation 5.01%. This result indicates that most Ethiopian banks generate their capital from debt rather using their equity. The minimum and maximum leverage ratio ranges in between 4.38% and 25.25%.

Table 2: **Summary of descriptive statistics for dependent and explanatory variable**

Variable	Obs	Mean	Std.Dev.	Min	Max
CAR	80	10.83	3.25	4.20	19.21
ROA	80	2.69	0.73	0.34	4.02
ROE	80	25.8	10.40	3.47	70.35
LIQ	80	36.36	10.21	15.80	59.40
DEP	80	73	9.681	44.69	87.15
LNTA	80	48.84	12.98	22.45	72.76
SIZE	80	23.55	4.02	20.32	37.52
NIM	80	4.37	2.01	1.14	12
LEV	80	13. 48	5.01	4.38	25. 25

Note: CAR *refers to capital adequacy ratio, ROA return on asset, ROE return on equity, LIQ liquidity, DEP total deposit ratio, LNTA total loan to total asset, SIZE Bank Size, NIM net interest margin and LEV total leverage.*

Source: Structured review of financial statements and own computations

4.5.1   Correlation analysis
For expressing the degree of relationship quantitatively between two sets of measures of variables we usually take the help of an index that is known as coefficient of correlation. It is a kind of ratio which expresses the extent to which changes in one variable are accompanied with changes in the other variable. It involves no units and varies from -1 (indicating perfect negative correlation) to + 1 (indicating perfect positive correlation). In case the coefficient of correlation is zero it indicates zero correlation between two sets of measures Sing (2006).

Table 3 below shows how the explanatory variable is related to the dependent variable CAR. According to Andy field, 2006, state that the coefficient of the variable if it is below 0.8 or 0.9 is said the variable are not such highly related with the other variable. The study result shows the relationship between the variable is not as such high. CAR has a negative relationship with ROE, LIQ and DEP And the dependent variable CAR has a positive relationship with ROA, LNTA, BS, NIM and leverage.

Table 3: Correlation matrix

	CAR	ROE	ROA	LIQ	DEP	LNTA	SIZE	NIM	LEV
CAR	1								
ROE	-0.5531	1							
ROA	0.3941	0.363	1						
LIQ	-0.0572	-0.1898	-0.2696	1					
DEP	-0.0718	0.1048	-0.2768	0.2076	1				
LNTA	0.2614	-0.2739	-0.1077	-0.3461	0.2556	1			
SIZE	0.1396	0.1905	0.2898	-0.1405	0.1798	-0.2535	1		
NIM	0.4358	-0.0851	0.3643	-0.1036	0.0021	0.1564	0.268	1	
LEV	0.7907	-0.4002	0.5524	-0.0053	-0.2237	0.0474	0.187	0.5016	1

Source: Structured review of financial statements and own computations

4.6 Tests for the classical linear regression model (CLRM) assumptions

Different tests have been made in order to get a reliable output and to make ready the variable for analysis. Accordingly the following tests have been made.

4.6.1   Test of normality

In order to test the normality of the study variable Sk test have been applied. The result indicates some of the variables are not normally distributed. $P>0.05$ on which the null hypothesis is rejected as the variable are normally distributed.

Table 4: Tests of normality

Skewness/Kurtosis tests for Normality					
Variable	Obs	Pr(skewness)	Pr(Kurtosis)	chi2(2)	Prob>chi2
CAR	80	0.1632	0.4079	2.63	0.2686
ROA	80	0.0004	0.0268	17.48	0.0002
ROE	80	0	0	47.3	0.000
LIQ	80	0.231	0.4235	2.08	0.3543
DEP	80	0.0003	0.1823	14.6	0.0007
LNTA	80	0.807	0.0061	7.59	0.0224
SIZE	80	0	0	65.02	0.000
NIM	80	0.0004	0.0043	20.82	0.000
LEV	80	0.1097	0.3976	3.27	0.1945

Source: Structured review of financial statements and own computations

4.6.2   Test of multicollinearity

There are different methods that will be applied by researchers in order to see if there is multicollinearity problem in the study variable. This study has used VIF (variance inflation factors) test. VIF indicates whether a predicator has a strong linear relationship with the other predicator(s). As there is no hard and fast rule about what value of the VIF should be cause for concern, as Andy field (2006), suggests the value of 10 is a good value at which to worry. Related to the VIF tolerance statistic is its reciprocal (1/VIF)

and Values below 0.1 indicate serious problem as stated by Andy Field (2006). Menard (1995) suggests that values below 0.2 are worthy of concern. Based on the finding in table 5, the study variable have no a multicollinearity problem as the VIF value is below 10 and also the tolerance is above 0.1.

Table5*: Multicollinearity tests*

Variable	VIF	1/VIF
ROA	4.1	0.24395
ROE	3.59	0.27835
LIQ	1.78	0.56142
DEP	1.87	0.53502
LNTA	2.18	0.45905
SIZE	1.61	0.62039
NIM	1.5	0.66596
LEV	4.22	0.23691

Source: Structured review of financial statements and own computations

4.6.3   Test of heteroscedasticity

One of the important assumptions of the classical linear regression model is that the variance of each disturbance term ui, conditional on the chosen values of the explanatory variables, is some constant number equal to $\sigma 2$. This is the assumption of **homoscedasticity,** or *equal* (homo) *spread* (scedasticity), that is, *equal variance Gujirat (2004).*

But if the variance of each disturbance term *ui*, on the chosen values of the explanatory variables is not constant and not equal to $\sigma 2$ Heteroscedasticity will occur. The test statistics give us the information we need to determine whether the assumption of homoscedasticity is valid or not. The Breusch-pagan test for the heteroscedasticity test reveal that in this case as there is no evidence for the presence of heteroscedasticity, since the *p*-values are considerably in excess of 0.05.

Breusch-Pagan / Cook-Weisberg test for *Heteroscedasticity Test*
chi2(1)= 3.25
Prob > chi2= 0.0715

4.6.4   Test for assumption of auto correlation

For any two observations the residual terms should be uncorrelated (or independent). This eventuality is sometimes described as a lack of autocorrelation. This assumption can be tested with the Durbin- Watson statistics on test, which tests for serial correlations between errors. The test statistics can vary between 0 and 4 with a value of 2 meaning that the residuals are uncorrelated. A value greater than two indicates a negative correlation between adjacent residuals, whereas a value below 2 indicates a positive correlation field (2006). As a rule of thumb, values less than 1 or

greater than 3 are definitely cause for concern. Table 7 presents the Durbin-Watson test value for the autocorrelation of residual which is 1.71.Based on the result there is no a problem of serial correlation between errors term.

4.6.5   *Random effect Vs Fixed effect*

Table 6, presents the Hausman specification test which suggests the fixed effects model was better than random effects model as the p-value (0.00), is less than 0.05 for dependent variables which imply that the random effects model should be rejected and thus, the analysis is based on the fixed effects estimates.

Table 6: Hausman test for correlated random effects

Test cross-section random effects	Chi-Sq. Statistic	Chi-Sq. d.f.	Probability
Cross-section random	32.58	8	0.0000

Source: structured review of financial statements and own computations

4.7 Results of regression analysis

The model used to find out and explain the association between the dependent variable and the independent variables was:

$$CARit=βo+β1SIZEit+β2DEPit+β3LNTAit+β4LIQit+β5ROAit+β6ROEit+β7NIMit+β8LEVit+ εit$$

This study used panel data models where the random effect and fixed effect models used to estimate the relationships among variables. An appropriate model for this analysis was selected, by testing random versus fixed effects models. To perform this comparison, the character of the individual effects is tested through the Hausman's specification test. According to Hausman test results shown in table 6, the fixed effects were found to be more appropriate for the model. Thus, the relationship between capital adequacy and the explanatory variables were examined by the fixed effects model in this study.

Table 7: FIXED- EFFECT MODEL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	3.055	0.4306	7.1	0.000
ROE	-0.2236	0.0296	-7.55	0.000
LIQ	-0.01218	0.02056	-0.59	0.556
DEP	0.652	0.0327	1.99	0.050
LNTA	0.0201	0.02059	0.98	0.331
SIZE	0.1412	0.05086	2.78	0.007
NIM	-0.2702	0.1338	-2.02	0.048
LEV	0.0116	0.06599	0.18	0.861
Cons	0.75002	2.18713	0.34	0.733
R-squared	**70.57**			
Adjusted R-squared	**69.95**	Durbin-Watson =**1.71**		
F-statistic	**18.62**			
Prob(F-statistic)	0.000			

Source: structured review of financial statements and own computations

From the result in table 7 above we can reveal that the bank specific variable explain the dependent variable (capital adequacy) on which the values of adjusted R Square is (0.6995). In other words, 69.95 % variability of the capital adequacy ratio can be explained by the bank specific variables such as SIZE, DEP, LNTA, LIQ, ROA, ROE, NIM and LEV. As it can be seen in Table 7, LNTA, LIQ and LEV do not have any effect on capital adequacy ratio and SIZE, DEP, ROA, ROE and NIM have a significant effect on capital adequacy ratio.

Hypothesis 1: Bank size has a statistically significant effect on capital adequacy

The result in table 7 shows that bank size has a positive and significant effect on capital of the banks. A one unit increase in bank size increases the bank's capital by 0.1412 units. This indicates larger banks in Ethiopia have high capital adequacy ratio. There are different researches that have been done in different countries and have result of positive or negative effect on capital adequacy of the banks. The study done by Shingjergji and Hyseni (2015) in the Albanian banks have found that bank size have a positive effect on capital adequacy ratio. Almazari (2013) in his study in the Saudi Arabian banks found that as there is a positive relationship between bank size and capital adequacy. On the hand Bateni et.al.(2014) they found a negative relationship between bank size and capital adequacy in the Iranian banks. The Jim Wong, Ka-fai Choi and Tom Fong (2005) have done research in the Hong Kong banks and their estimation results shows as there is a statistically significant negative relationship between CAR and bank size.

Generally the result of the study relies with the same result with Shingjergji and Hyseni (2015) and Almazari (2013) on which bank size positively affects capital of the banks. Larger banks tend to have high capital compared to the small banks in the country.

Hypothesis 2: Deposit ratio has a statistically significant effect on capital adequacy

The study result shows that as there is a positive and significant effect of deposit ratio in the capital of the banks in Ethiopia. A one unit increase in deposit ratio increases capital of the bank by 0.652 units. This indicate the higher the deposit ratio of the banks the higher the capital adequacy of the banks will be.

Hypothesis3: share of loan has a statistically significant effect on capital adequacy

The study result shows that share of loan has no statistically significant effect on capital adequacy.

Hypothesis 4: Liquidity position has a statistically significant effect on capital adequacy

The study result shows that liquidity position has no statistically significant effect on capital adequacy.

Hypothesis 5 and Hypothesis 6: significant effect between profitability and capital adequacy.

The result above revealed that ROA affect CAR positively and significant at 5% percent. Also the result is the same as I expect initially on which profitability has significant effect on CAR. The coefficient of ROA shows a one unit increase in profitability increases capital by 3.055 units. On the other hand ROE has negative and significant effect on CAR. A one unit increase in profitability decreases the banks' capital by 0.22 units according to the result of fixed effect model. According to the study done by Abusharba (2013);Alsbbagh (2004) profitability has positive effect on capital adequacy on which the study uses ROA to measure profitability. Bokhari and Ali (2009);Büyüksalvar and Abdioğlu (2011) analyzed the determinants of capital adequacy and the result revealed ROE has a negative effect on capital of the banks. Above all the study result also has the same result with those scholars stated above.

Hypothesis 7: Net interest margin has a statistically significant effect on capital adequacy

Based on the result in table 7 above net interest margin is statistically significant and has a negative effect on capital of the banks in Ethiopia. A one unit increases in NIM decrease capital adequacy by 0.2702 units. The greater the focus of management on interest income earned from earnings asset the capital of the banks will be low.

Hypothesis 8: leverage has a statistically significant effect on capital adequacy

The study results above reveal that leverage is not statistically significant in the study area.

5. Conclusion

The main objective of the study is to investigate empirically the determinants of CAR in Ethiopian banks. The study period covered the year 2004-2013 on which eight banks are considered. The study use secondary data which is gathered from the banks in the study balance sheet statement and profit and loss account. Panel data regression is used in this study and analyzes relationships between bank specific variables: SIZE, DEP, LNTA, LIQ, ROA, ROE, NIM and LEV and the dependent variable CAR.

The result reveals that ROA, DEP and SIZE have a positive effect on capital adequacy and ROE and NIM have a negative effect on capital adequacy but LIQ, LNTA and LEV have no a significant effect on capital adequacy.

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