

**FACTORS AFFECTING LIQUIDITIES OF BANKS:
EVIDENCE FROM THE PRIVATE BANKS OF
ETHIOPIA**

BY

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EVIDENCE FROM THE PRIVATE BANKS OF
ETHIOPIA**

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Declaration

I, Zagwe Birhan, hereby declare that the thesis work entitled “*Factors affecting liquidities of banks: evidence from the private banks of Ethiopia*” submitted by me for the award of the degree of Masters of Science in Accounting and Finance of Addis Ababa University at Addis Ababa, Ethiopia, is my original work and it has never been presented in any university. All sources and materials used for this thesis have been duly acknowledged.

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This is to certify that the thesis prepared by Zagwe Birhan entitles: *Factors affecting liquidities of banks: evidence from the private banks of Ethiopia* and submitted in partial fulfillment of the requirements for the degree of masters of Science in accounting and finance compiles with the regulations of the university and meets the accepted standards with respect to originality and quality.

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Chair of Department or Graduate Program Coordinator

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List of Abbreviation and Acronyms

AB:	Abbay Bank
AIB:	Addis International Bank
AIB:	.....	Awash International Bank
BG:	.....	Breusch-Godfrey
BIB:	.....	Berhan International Bank
BOA:	.....	Bank of Abyssinia
BUIB:	.....	Buna International Bank
CAR:	.....	Capital Adequacy Ratio
CBB:	.....	Construction and Business Bank
CBE:	.....	Commercial Bank of Ethiopia
CBO:	.....	Cooperative Bank of Oromia
CLRM:	.....	Classical Linear Regression Model
CPI:	.....	Consumer Price Index
DB:	.....	Dashen Bank
DEP:	.....	Dependency on External Funds
DGB:	.....	Debut Global Bank
ENTB:	.....	Innat Bank
GDP:	.....	Gross Domestic Product
INF:	.....	Inflation Rate
IRM:	.....	Interest Rate Margin
LG:	.....	Loan Growth
LIB:	.....	Lion International Bank
LIQ:	.....	Liquidity
MoFED:	.....	Ministry of Finance Economic Development
NBEB:	.....	National Bank of Ethiopia Bill
NBE:	.....	National Bank of Ethiopia
NIB:	Nib International Bank
UB:	United Bank
USD:	US Dollar
WB:	Wugagen Bank
ZB:	Zemen Bank

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Abstract

The purpose of this research was to see how the NBE bill purchase requirement affects Ethiopian private commercial Banks liquidity. This study categorizes the independent factors into bank specific factors and macroeconomic factors. The bank specific factors include capital adequacy, net interest margin, credit risk, bank size and Loan Growth while the macroeconomic factors include National bank Bill. The panel data used for the sample of ten private commercial banks in Ethiopia from 2011 to 2016 year and estimate using Radom Effect Model (REM), data presented by using descriptive statistics and the balanced correlation and regression analysis for liquidity ratios conducted. The study shows that R-squared statistics and the adjusted-R squared statistics of the model are 80.18% and 76.88% respectively. This indicates that the changes in the independent variables (capital adequacy, credit risk, net interest margin, loan growth, and exposure to NBE bill) collectively explain 76.88% of the changes in the dependent variable (liquidity) and the remaining 23.12% of changes is explained by other factors which are not included in the model. Thus these variables collectively, are good explanatory variables of the liquidity of commercial banks Ethiopia.

Keywords: *Ethiopian commercial banks, NBE bill purchase requirement, liquidity ratios, and panel data regression analysis.*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Banks are financial institutions that play intermediary role in the economy through channeling financial resources from surplus economic units to deficit economic units Diamond and Dybvig (1983). In turn, banks facilitate the saving and capital formation in the economy. Bank for International Settlements /BIS (2008) defines liquidity as the ability of bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses. Hence, liquidity risk arises from the fundamental role of banks in the maturity transformation of short-term deposits into long-term loans. Therefore, banks have to hold optimal level of liquidity that can maximize their profit and enable them to meet their obligation.

Bank liquidity simply means the ability of the bank to maintain sufficient funds to pay for its maturing obligations Diamond and Dybvig (1983). It is the bank's ability to immediately meet cash, cheques, other withdrawals obligation and legitimate new loan demand while abiding by existing reserve requirements Diamand and Rajan (2001). When a bank does not have enough liquidity to fulfill its obligation, the bank is said to face liquidity risk. The Basel Committee (2009) explained that the viability of commercial banks depends on the liquidity position of the bank. Diamond and Dybvig (1983) were the first to provide the evidence on the importance of role of the bank in the creation of liquidity. In addition, the optimal level of liquidity is strongly linked to effective banking operations if liquidity is not generated properly, which can lead to insolvency (in case of low liquidity) and low profitability (in the case of high liquidity) and finally destroyed shareholders value and may be harmful to other banks and because of the contagion effect Diamond and Dybvig (1983).

Banks behavior in pooling and allocating funds determines the level of liquidity. Afterward, banking liquidity influence monetary policy. In addition, volatility in a bank's liquidity could induce systemic risk of the banking system Crowe (2009). Therefore, it is necessary to understand the determinants of banking liquidity. By understanding the determinants of banking liquidity, as the monetary authorities, central bank determines proper monetary policy, particularly in prevailing or managing banking crisis. Due to the unexpected shock and grievous

loss in financial markets, determining liquidity is vital for a better understanding of the concepts of liquidity risk in relation with other financial risk. Then, without hesitation financial organization liquidity is utterly crucial to the economic excellence of a country. For aforementioned reason, any bank operating in Ethiopia shall statutorily require to comply with the reserve and liquidity requirement directive of the National Bank of Ethiopia (NBE) as a means of effectively managing the liquidity positions of banks. As a matter of fact, the first strategy to liquidity management in Ethiopia is compliance with these statutory reserve requirement and liquidity ratios as stipulated by the NBE directives. To this regard, strategic measures have been employed by the NBE to improve banking system liquidity & stability and a steady flow of credit to the real sector of the economy includes the continuous reduction of the statutory reserve requirement and liquidity ratio. For instance, NBE has reduced statutory reserve requirement from 15% to 10% and then to 5% and liquidity ratio requirement from 25% to 20% and then to 15% under Directives No. SBB/45/2008, SBB/46/2012 & SBB/55/2013 and Directives No. SBB/44/2008, SBB/45/2012 & SBB/57/2014, respectively.

As liquidity problems of some banks during global financial crisis showed, liquidity is very important for functioning of financial market and the banking sector (Vodova, 2013). In the context of Ethiopia, to the knowledge of the researcher, Eden (2014) examine the impact of NBE regulations on private banks' performance through the significant regulatory variables explaining the NBE directives, using bank-specific and macroeconomic variables as control variables. Balanced fixed effect panel regression was used for the data of six private commercial banks in the sample that covered the period from 2004 to 2013. The results of panel data regression analysis showed that NBE Bill and Credit cap had negative and statistically significant impact on banks profitability but reserve requirement had negative and insignificant impact on profitability. While measuring banks' cost of intermediation through Net Interest Margin three of the regulatory variables (i.e. NBE Bills, Reserve requirement and credit cap) had negative and statistically significant effect on net interest margin. Nigist (2015) also studied the determinants of commercial banks liquidity in Ethiopia. The study covered the data of ten commercial banks in Ethiopia from the period 2007-2013. The study used fixed effect panel regression model for nine variables of the study which were both macroeconomic and firm specific variables. Data was analyzed by using both descriptive statistic and inferential statistics/multiple regression model. The result of the study confirmed that banks' liquidity was highly affected by firm

specific variables as compared to macroeconomic variables. Therefore it will be very interesting to examine the effect of national bank bill purchase requirement on the liquidity of commercial banks. This study will inform banks and regulators how the NBE bill purchase requirement affects the liquidity which is very important to the wellbeing of their operation as well as the economy as a whole in the country. This chapter consists of eight sections that include: statement of problem, the research objective, research question and hypothesis, scope of the study, significance of the study and organization of the study.

1.2 Statement of the problem

Banking industry in Ethiopia has its own unique features that distinguish them from other countries financial market. One of the features that the regulation of the country does not allowed foreign nations or organization to fully or partially acquire share of Ethiopian banks. The Ethiopian financial sector is largely bank-based as the secondary market is still not established in the country and as such the process of financial intermediation in the country depends heavily on banks. In fact the banking sector in Ethiopia is currently acts as the link that holds the country's economy together. Hence, keeping their optimal liquidity for banks in Ethiopia is very important to meet the demand by their present and potential customers. Studies made by Eden (2014) examined the impact of NBE regulations on private banks performance through the significant regulatory variables explaining the NBE directives, using bank-specific and macroeconomic variables as control variables.

In the context of Ethiopia, to the knowledge of the researcher related study conducted by Alemayehu (2016) made a study on the significant factors which explain the Ethiopians commercial bank liquidity by using panel data for the sample of eight commercial banks in Ethiopia from 2002 to 2013 year and estimated using Fixed Effect Model (FEM). The study revealed that capital strength and profitability had statistically significant and positive relationship with banks' liquidity. On the other hand, loan growth and national bank bill had a negative and statistically significant relationship with banks' liquidity. However, the relationship for inflation, non-performing loans, bank size and gross domestic product were found to be statistically insignificant.

In light of the above facts and research gaps, (i.e. no study is made to show the effect of national banks bill purchase requirement on the liquidities of private banks specifically) the purpose of this study was to see the effect of NBE Bill purchase requirement. To this end, this study tried to provide information about how the bill purchase requirement affects the liquidity of commercial banks for series of 6 Years (2011-2016). The research is basically concentrated on the data available in financial statements of banks and other documents.

1.3 Research question

- What is the effect of the requirement of NBE bill purchase on the liquidity of private commercial banks in Ethiopia?

1.4 Objectives of the Study

1.4.1 General objective

In the context of the problems highlighted above, the broad objective of the study was to examine the effect of National Bank of Ethiopia Directive on liquidity of private commercial banks.

1.4.2 Specific objective:

The specific objectives of the study are

- 1) To examine the effect of credit risk on liquidity of private commercial banks in Ethiopia
- 2) To study the effect of capital adequacy on liquidity of private commercial banks in Ethiopia
- 3) To scrutinize the effect of loan growth on liquidity of private commercial banks in Ethiopia
- 4) To analyze the effect of net interest margin on liquidity of private commercial banks in Ethiopia
- 5) To inspect the effect of bank size on liquidity of private commercial banks in Ethiopia
- 6) To investigate the effect of national bank bill purchase requirement on liquidity of private commercial banks in Ethiopia

1.5 Significance of the Study

The study identifies and draws conclusions about the effect of NBE bill purchase on liquidity of Ethiopian private commercial banks. This will be used as an input to the management of the banks and policy maker. There is no sufficient research in Ethiopia with the objective of investigating the effect of NBE bill purchase on liquidity of private commercial banks in Ethiopia. As a result, this study makes a number of contributions to other researchers as a source

of reference and as a stepping stone for those who want to make further study on the area afterwards. It gives the researcher the opportunity to gain deep knowledge on the impact of national bank regulations on banks performance.

1.6 Scope of the study

The study focused on ten private commercial banks registered by the National Bank of Ethiopia and that have at least 6 years' experience. These banks are selected since the directive was issued in April, 2011. Geographically, the study was conducted in Addis Ababa where all banks have their headquarters. This research is limited to determine the effect of NBE bill purchase on liquidity of private commercial banks in Ethiopia based on the recent 6 years Audited financial statement issued by each banks started from 2011 to 2016.

1.7 Limitation of the study

All private commercial banks included in this study are operated more than ten years and had more experience on the handling of liquidity problem. Therefore the effect of NBE bill on the liquidity of lately established private banks not similar to private banks included in this study.

CHAPTER TWO

LITERATURE REVIEW

2.1. Theoretical Literature

2.1.1 The Need for Liquidity

According to Anyanwu (1993) liquidity simply means the ability to convert an asset to cash with minimum delay and minimum loss/cost. In the portfolio of commercial banks, liquidity assets play a very crucial role because banks operate largely with the funds borrowed from depositors in form of demand and time deposits. These liquidity assets are the essential balance sheet items which have the capacity to maintain the confidence of depositors which is the most valuable intangible asset of the commercial banking business (Spindt, 1980).

According to Nwankwo (1991), adequate liquidity enables a bank to meet three risks. First is the funding risk – the ability to replace net outflows either through withdrawals of retail deposits or nonrenewal of wholesale funds. Secondly, adequate liquidity is needed to enable the bank to compensate for the non-receipt of inflow of funds if the borrower or borrowers fail to meet their commitments. The third risk arises from calls to honour maturity obligations or from request for funds from important customers. Adequate liquidity is also needed to avoid forced sale of asset at unfavorable market conditions and at heavy loss. Adequate liquidity serves as vehicle for profitable operations especially to sustain confidence of depositors in meeting short run obligations. Finally, adequate liquidity guides against involuntary or non-voluntary borrowing from the regulatory authorities where there is a serious liquidity crises, the bank is placed at the mercy of the Central Bank, and hence the control of its destiny may be handed over. Having adequate or sufficient liquidity to meet all commitments at all times at normal market rates of interest is indispensable for both large and small banks (Nwankwo, 1991). Liquidity is the life blood of a banking setup.

2.1.2 Theories of Liquidity and Liquidity Management

The liquidity management theory focuses on the liability side of bank balance sheet. This contends that supplementary liquidity could be derived from the liabilities of a bank. According

to Nwankwo (1991) the theory argues that since banks can buy all the funds they need, there is no need to store liquidity on the asset side (liquidity asset) of the balance sheet.

2.1.2.1 Anticipated Income Theory

This theory holds that a bank's liquidity can be managed through the proper phasing and structuring of the loan commitments made by a bank to the customers. Here the liquidity can be planned if the scheduled loan payments by a customer are based on the future of the borrower. According to Nzotta (1997) the theory emphasizes the earning potential and the credit worthiness of a borrower as the ultimate guarantee for ensuring adequate liquidity. Nwankwo (1991) posits that the theory points to the movement towards self-liquidating commitments by banks.

2.1.2.2 Shiftability Theory

This theory posits that a bank's liquidity is maintained if it holds assets that could be shifted or sold to other lenders or investors for cash. This point of view contends that a bank's liquidity could be enhanced if it always has assets to sell and provided the Central Bank and the discount Market stands ready to purchase the asset offered for discount. Thus this theory recognizes and contends that shiftability, marketability or transferability of a bank's assets is a basis for ensuring liquidity. This theory further contends that highly marketable security held by a bank is an excellent source of liquidity. Dodds (1982) contends that to ensure convertibility without delay and appreciable loss, such assets must meet three requisites. Liability Management Theory Liquidity management theory according to Dodds (1982) consists of the activities involved in obtaining funds from depositors and other creditors (from the market especially) and determining the appropriate mix of funds for a particular bank. This point of view contends that liability management must seek the answer the following questions how do we obtain funds from depositors? How do we obtain funds from other creditors? What is the appropriate mix of the funds for any bank? Management examines the activities involved in supplementing the liquidity needs of the bank through the use of borrowed funds.

2.1.2.3 Commercial Loan Theory

This theory has been subjected to various criticisms by Dodds (1982) and Nwankwo (1992). From the various points of view, the major limitation is that the theory is inconsistent with the demands of economic development especially for developing countries since it excludes long term loans which are the engine of growth. The theory also emphasizes the maturity structure of

bank assets (loan and investments) and not necessarily the marketability or the shiftability of the assets. Also, the theory assumes that repayment from the self-liquidating assets of the bank would be sufficient to provide for liquidity. This ignores the fact that seasonal deposit withdrawals and meeting credit request could affect the liquidity position adversely. Moreover, the theory fails to reflect in the normal stability of demand deposits in the liquidity consideration. This obvious view may eventually impact on the liquidity position of the bank. Also the theory assumes that repayment from the self-liquidating assets of a bank would be sufficient to provide for liquidity. This ignores the fact that seasonal deposit withdrawals and meeting credit request could affect the liquidity position adversely.

2.1.3 Liquidity and its implication

Liquidity can be defined as the ability of a financial institution to meet all legitimate demands for funds (Yeager and Seitz, 1989). Also the Basel Committee on Banking Supervision (2008) defines liquidity as the ability of bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses, besides the Basel define liquidity as a bank's ability to accommodate decreases in its liabilities and its ability to fund increases in its assets.

Hence, bank needs to hold liquid assets to meet the cash requirements of its customers if the institution does not have the resources to satisfy its customers' demand, then it either has to borrow on the interbank market or the central bank. It follows therefore that a bank unable to meet its customers' demands leaves itself exposed to a run and more importantly, a systemic lack of confidence in the banking system (Moore, 2009).

As of Alger et al. (1999) the asset is liquid if it can be sold quickly without significant losses but what determine the liquidity of an asset is still a disputed issue among theorists. As of the conventional wisdom found in the bank management literature, an asset is liquid if it is widely known to have low risk (such as government debt) and if it has a short maturity this implies that asset's price is less sensitive to interest rate movement, making large capital losses unlikely (Garber and Weisbrod, 1992; Hempel et al., 1994). According to that definition, the typical bank liquid asset includes cash, reserves representing an excess of reserves required by law (i.e., funds held in the account at the central bank), securities (e.g., government debt, commercial paper), and interbank loans with very short maturity (one to three days).

Bordo et al. (2001), suggest two explanations on the cause of liquidity runs on deposit money banks. Their explanation indicated that runs on banks are a function of mob psychology or panic, such that if there is an expectation of financial crisis and people take panic actions in anticipation of the crisis, the financial crisis becomes inevitable. Bordo et al. (2001) also asserts that crises are an intrinsic part of the business cycle and result from shocks to economic fundamentals. When the economy goes into a recession or depression, asset returns are expected to fall. Borrowers will have difficulty in repaying loans and depositors, anticipating an increase in defaults or nonperforming loans, will try to protect their wealth by withdrawing bank deposits. Banks are caught between the illiquidity of their assets (loans) and the liquidity of their liabilities (deposits) and may become insolvent.

2.1.4 Measurement of Liquidity in Commercial Banking

As of Nwankwo (1991) the ability of banks to meet their financial obligation is usually measured by examining their balance sheet and relating same to its current assets to some or all of their current liabilities. Fundamentally, a firm's liquidity rests not so much on its balance sheet as on whether or not it is doing well and earning money. A strong balance sheet with a large current ratio simply postpones liquidity problems for a short while if the firm is losing money. Therefore, the complexity of devising an appropriate measure arises from the uncertainties surrounding both size of the prospective needs for liquidity at any given time, and the availability of sources of liquidity sufficient to meet them. There is also the impact of active asset and liability management on liquidity management. An accurate measurement of liquidity therefore requires going beyond the technical liquidity indicated by the stock flow approach to an assessment of the stock of circumstances under which a bank could come under pressure likely to affect worthiness in the market place. Liquidity can be measured either as a stock at a point in time or as a flow over time. The most widely used is the stock approach. One of these is the loan/deposit ratio which is the most popular and commonly used measure in commercial banking. According to Nwankwo (1991), under this measure, all bank loans are lumped together on the basis that they are the most liquid of all bank assets. These are then compared with the total deposit as a proxy for the liquidities that banks could be called upon honor. An increase in the ratio indicates a less liquid position and vice versa.

2.1.5 Determinants of Bank Performance

There are various studies that were conducted to identify the main determinants of bank performance, and different authors came with different conclusions Shimels (2016). This implies that the determinants of bank performance are many and they range from firm specific to macro variables. In the study by Azam and Siddiqui (2011) the main determinants considered were capital adequacy, credit risk, liquidity, deposit growth, Gross Domestic Product (GDP), and inflation. For Sub Saharan Africa Flamini, McDonald and Schumacher (2009) highlight credit risk, capital size, market power, GDP and inflation as the main determinants of bank profitability. In Saudi Arabia, Ahmed and Khababa (1999) are of the view that business risk, market concentration, market size and size of the bank are the main determinants of bank profitability.

2.1.5.1.1 Capital adequacy and bank liquidity

Capital is one of the bank specific determinants of liquidity and could be defined as common stock plus surplus plus undivided profits plus reserves for contingencies and other capital reserves; besides a bank's loan loss reserves also serves as a buffer for absorbing losses, a broader definition of bank capital include this account (Patheja, 1994). Banks capital plays a very important role in maintaining safety and solidarity of banks and the security of banking systems in general as it represents the buffer gate that prevents any unexpected loss that banks might face, which might reach depositors funds given that banks operate in a highly uncertain environment that might lead to their exposure to various risks and losses that might result from risks facing banks (Mohd and Fakhris, 2013).

Opposing to the standard view of liquidity creation in which banks create liquidity by transforming liquid liabilities into illiquid assets, the recent theories indicate that banks can create more or less liquidity by simply changing their funding mix on the liability side (Diamond and Rajan, 2000; Gorton and Winton, 2000).

2.1.5.1.2 Non-performing loans and bank liquidity

Nonperforming loan is a loan that is not earning income and full payment of principal and interest is no longer anticipated; principal or interest is 90 days or more delinquent; or the maturity date has passed and payment in full has not been made (Hou, 2004). Also it could be a

loan that is outstanding in both principal and interest for a long time contrary to the terms and conditions contained in the loan contract. Hence, nonperforming is any loan facility that is not up to date in terms of payment of both principal and interest contrary to the terms of the loan agreement. Therefore, the amount of nonperforming loan measures the quality of bank assets; besides large amount of nonperforming loans (NPL) leads the banking sector to efficiency problem and the banking system into failure.

As found by a number of economists that failing banks tend to be located far from the most-efficient frontier because banks do not optimize their portfolio decisions by lending less than demanded (Barr et al., 1994). Bloem and Gorter (2001) indicated that, though issues relating to non-performing loans may affect all sectors, the most serious impact is on financial institutions such as commercial banks and mortgage financing institutions which tend to have large loan portfolios; besides, the large bad loans portfolios will affect the ability of banks to provide credit. Since large amount of nonperforming loans could result in loss of confidence on the part of depositors and foreign investors who may start a run on banks, it leads to liquidity problems. Therefore, the amount of nonperforming loans has a negative impact on banks liquidity.

2.1.5.1.3 Size and bank liquidity

As to Estrada (2011) as size grows it will help them to overwhelm the risk which is similar to economies of scale but also it should be noted that as a firm grow it may leads to failures. There was an argument concerning to the size of bank, „,too big to fail“ argument which indicated that large banks would benefit from an implicit guarantee, thus decrease their cost of funding and allows them to invest in riskier assets (Iannotta et al., 2007). Hence, “too big to fail” status of large banks could lead to moral hazard behavior and excessive risk exposure. If big banks are seeing themselves as “too big to fail”, their motivation to hold liquid assets is limited, therefore in case of a liquidity shortage; they rely on a liquidity assistance of Lender of Last Resort (Vodová, 2011).

Therefore, large banks are likely to perform higher levels of liquidity creation that exposes them to losses associated with having to sale illiquid assets to satisfy the liquidity demands of customers; hence, there can be positive relationship between bank size and illiquidity. However, since small banks are likely to be focused on traditional intermediation and transformation activities (Rauch et al., 2008; Berger and Bouwman, 2009) they do have small amount of

liquidity. Size is measured in the natural logarithm of total assets (Poorman and Blake, 2005; Shen et al., 2010). Hence, there can be negative relationship between bank size and illiquidity whereas as per this argument there was positive relationship between bank size and liquidity.

2.1.5.1.4 Loan growth and bank liquidity

Since lending is the principal business activity for most commercial banks the loan portfolio is typically the largest asset and the predominate source of revenue (Comptroller's Hand book, 1998). However, it is one of the greatest sources of risk to a banks safety and soundness because loans are illiquid assets; increase in the amount of loans means increase in illiquid assets in the asset portfolio of a bank.

In practice the amount of liquidity held by banks is heavily influenced by loan demand that is the base for loan growth. If the demand for loans is weak, then the bank tends to hold more liquid assets (i.e. short term assets), whereas if demand for loans is high they tend to hold less liquid assets since long term loans are generally more profitable (Pilbeam, 2005). Hence, the growth in loans and advances has negative impact on banks liquidity.

2.1.5.2 Macro-economic Factors

2.1.5.2.1 Real GDP growth and bank liquidity

As of the profile of bank liquidity, Macroeconomic context is likely to affect bank activities and investment decisions (Pana et al., 2009; Shen et al., 2010). And hence GDP growth is one of the macroeconomic variables that could affect banks liquidity. For instance, the demand for differentiated financial products is higher during economic boom and may improve bank ability to expand its loan and securities portfolios at a higher rate. At the same time, economic downturns are exacerbated by the reduction in bank credit supply; hence on the basis of these arguments, one can expect that banks to increase their transformation activities and their illiquidity during economic booms (Pana et al., 2009; Shen et al., 2010).

As of the theory of bank liquidity and financial fragility, the relationship between banks' liquidity preference and the business cycle is fundamental to explain the inherent instability of the capitalist system as an endogenous market process (Minsky, 1982). In periods of economic expansion which are characterized by high degree of confidence of the economic units about their profitability; there is a rise in the level of investment, so economic units decrease their

liquidity preference, preferring more risky capital assets with higher return. In this environment, economic units are more likely to hold less liquid capital assets and to incur short-term debt with higher interest rates (Painceira, 2010).

In line with the above argument the „loan able fund theory of interest“ states that the supply for loan (i.e. illiquid assets for banks) increases when the economy is at boom or going out of recession (Pilbeam, 2005). Banks hoard liquidity during periods of economic downturn when lending opportunities may not be as good and they run down liquidity buffers during economic expansions when lending opportunities may have picked up. Thus, it can be expected that higher economic growth make banks run down their liquidity buffer and induce banks to lend more (Aspachs et al., 2005). Therefore, the growth of gross domestic product has negative relationship with liquidity of banks.

2.1.5.2.2 Inflation rate and bank liquidity

Central banks care about the welfare effects of changing the inflation target (Huybens and Smith, 1999). Existing monetary theories generally agree that inflation increases the opportunity cost of holding liquidity and thus distorts the allocation of resources which require liquidity in transaction; besides, a growing theoretical literature also describes mechanisms whereby even predictable increases in the rate of inflation interfere with the ability of the financial sector to allocate resources effectively. Specifically recent theories emphasize the importance of informational asymmetries in credit markets and demonstrate how increases in the rate of inflation adversely affect credit market frictions with negative repercussions for financial sector (both banks and equity market) performance and therefore long-run real activity (Huybens and Smith, 1999).

The features of these theories indicated that there is an informational friction whose severity is endogenous and hence an increase in the rate of inflation drives down the real rate of return not just on money but on assets in general. As of Huybens and Smith (1999) the implied reduction in real returns worsen the credit market frictions which leads to the rationing of credit, hence credit rationing becomes more severe as inflation rises. As a result the financial sector makes fewer loans, resource allocation is less efficient, and intermediary activity diminishes with adverse implications for capital/long term investment. Besides, the amount of liquid or short term assets

held by economic agents including banks will rise with the rise in inflation. Therefore, there is a positive relationship between the increase in inflation rate and banks liquidity.

2.1.5.2.3 Interest rate margin and Banks liquidity

Interest rate margin is the amount of interest rate paid by borrowers that force liquidity holders to part it. According to the liquidity preference theory (Keynes, 1936), lenders need high interest rate which includes the interest rate margin/ liquidity premium in order to lend. The basic idea underlining this theory is that lenders of funds prefer to lend short, while borrowers generally prefer to borrow long. Hence borrowers are prepared to pay interest rate margin/ a liquidity premium to lenders to induce them to lend long (Pilbeam, 2005). The size of interest rate margin/ liquidity premium increases with the time to maturity. Therefore, as they got higher premium, lenders give up their liquid money.

According to Keynes (1964) liquidity preference theory, in the general theory, consists in the statement that “the rate of interest at any time being the reward for parting with liquidity is a measure of the unwillingness of those who possess money to part with their liquid control over it; the rate of interest is the price which equilibrates the desire to hold wealth in the form of cash with the available quantity of cash”. Hence, higher interest rate margin/higher liquidity premium will force banks to lend more and reduce their holding of liquid assets. Interest rate margin is the difference between the gross cost paid by a borrower to a bank and the net return received by a depositor (Brock and Suarez, 2000). Therefore, there is a negative relationship between interest rate margin and banks liquidity.

2.1.6 Bank Liquidity on Bank Performance

There are a very limited number of studies that were specifically carried out to investigate the impact of liquidity on bank performance. Surprising most of these few studies were done on manufacturing companies. Therefore, most of the studies reviewed in this study were mainly focused on finding determinants of bank profitability, of which liquidity was one of the determinants of profitability. Some writers found a positive relationship; some found a negative relationship while others found both results and a few found no relationship at all. The debate is still rampant. Bourke (1989) in his study on performance of banks in twelve countries in Europe, North America and Australia found evidence that there is a positive relationship between liquid assets and bank profitability. These results seem counterintuitive, as it is expected that illiquid

assets have a higher liquidity premium and hence higher return. Kosmidou, Tanna, and Pasiouras (2005) realised that the ratio of liquid assets to customer and short term funding is positively related to ROA and statistically significant. Also, they found a significant positive relationship between liquidity and bank profits. Kosmidou (2008) examined the determinants of performance of Greek banks during the period of EU financial integration (1990-2002) using an unbalanced pooled time series data set of 23 banks and found that less liquid banks have lower ROA. This is consistent with their previous findings like Bourke (1989) who found out that there is a positive relationship between liquidity risk and bank profitability. Recently, Olagunju, David and Samuel (2012) found out that there is a positive significant relationship between liquidity and profitability. They concluded that there is a bi-directional relationship between liquidity and profitability where the profitability in commercial banks is significantly influenced by liquidity and vice-versa. On the contrary, Molyneux and Thornton (1992) recognized that there is inverse relationship between bank profitability and liquidity. They attributed this to the fact that banks hold liquid assets as an obligation to the requirements imposed by the authorities. However, if the author is to view this relationship from the context that banks hold liquid assets as mandated by the central bank or any other authorities, then the author may miss the argument as banks also hold liquid assets for other reasons. Assuming that banks only hold liquid assets as a requirement is, in itself, perfidious or a deliberate ignorance of knowledge of how banks function. Tobin (1958) advocated that liquidity is held for transaction purposes and for investments reasons. Tobin's proposal was a simplification of Keynes' liquidity preference theory. Keynes (1936) argued money is demanded for transaction, speculative, and precaution purposes. Therefore it can be firmly said without any prejudice that liquid assets over and above mandatory requirements are held for transaction, speculative and precautionary purpose. Some authors found mixed results of both negative and positive relationship. Shen, Chen, Kao, and Yeh (2010) assert that in market-based financial system liquidity risk is positively related to net interest margin an indication that banks with high levels of illiquid assets receive higher interest income. Conflicting to their earlier establishment on the relationship with net interest margin, they realised that liquidity risk is negatively related to return on average assets and also inversely related to return on average equity. They pointed out that banks incurred higher funding cost in the market if they have illiquid assets as they had to raise the money in the market to meet the funding gap. They also discovered that there is no relationship between liquidity risk and

performance in a bank based financial system as the banks play a major role in financing; therefore they are not affected by liquidity risk. Demirgüç-Kunt and Huizinga (1999) had inconclusive results; they found a positive relationship between loans to total assets and the net interest margins. They also established an inverse relationship between the net interest margin and before tax profits. Ben Naceur and Kandil (2009) in their analysis of cost of intermediation in the post capital regulation period which included; higher capital-to-assets ratios, an increase in management efficiency, an improvement of liquidity and a reduction in inflation found out that Banks' liquidity does not determine returns on assets or equity significantly.

Therefore conclusions about the impact of banks' liquidity on their profitability remain ambiguous and further research is required.

2.2 Empirical Review

Georgios et al (2009) have studied “Bank supervision, regulation, and efficiency: Evidence from the European Union.” by taking for a sample of 22 EU countries, Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, France, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and UK over 2000–2008. They have used non-parametric Data Envelopment Analysis (DEA) technique to capture information about banks’ efficiency, In addition to the traditional approach. They have employed generalized linear models and a truncated regression model combined with bootstrapped confidence intervals using a recently developed econometric framework by Simar and Wilson (2007). Also they have conducted a sensitivity analysis using fractional log it estimator to crosscheck the results. Their evidence suggests that there is a strong link between various forms of banking regulation and supervision and bank efficiency. The effect on bank efficiency appears to change with the type of regulation, indicating that strengthening official supervisory power or increasing capital requirements can have a discernible positive impact on bank efficiency while restrictions on bank activities and excessive private monitoring can adversely affect the efficient operation of banks. Where the level of bank performance was measured by two accounting ratios namely costs of intermediation (proxied by net interest margins) and cost effectiveness (the cost-to-income ratio). The regulatory and supervision variables used are CAPRQ, is an index of capital requirements accounting for both overall and initial capital stringency. The official supervisory power variable, SPOWER, measures the ability of supervisory authorities to take specific action in banking decisions to prevent and correct problems. ACTRS, measures the degree to which banks may engage in real estate investments, insurance underwriting and selling, brokering and dealing in securities and all aspects of the mutual fund industry, and the variable PRMONIT measures the degree of information that is released to officials and the public, auditing related requirements and whether credit ratings are required. The bank specific variables were includes three key bank-specific variables: size, measured as the natural logarithm of banks’ total assets (LNTA); liquidity, that is captured by a crude ratio between total loans and total deposits (LIQ); and finally capitalization, proxies by the equity to assets ratio (EQAS). The vector of control variables contains measures of risk, market and economic conditions, and institutional environment. The probability of risk of

insolvency is proxy by the Z score; higher values of the Z-score are associated with lower probabilities of failure. Thus, the more volatile the asset returns, the lower the Z-score.

To account for market condition used as structural indicator, the Herfindahl index, which is measured as the sum of squared market shares (in terms of total assets) of each bank in the sample. Since the macroeconomic environment is also likely to impact on banks' efficiency levels, they also include the average annual growth rate of GDP per capita (GDPGR). The study revealed that there is a strong link between various forms of banking regulation and supervision and bank efficiency. The effect on bank efficiency appears to change with the type of regulation, indicating that strengthening official supervisory power or increasing capital requirements can have a discernible positive impact on bank efficiency while restrictions on bank activities and excessive private monitoring can adversely affect the efficient operation of banks.

Pavla Vodova (2011) aimed to identify important factors affecting commercial banks liquidity of Czech Republic. In order to meet its objective the researcher considered bank specific and macroeconomic data over the period from 2001 to 2009 and analyzed them with panel data regression analysis by using EViews7 software package. The study considered four firm specific and eight macroeconomic independent variables which affect banks liquidity. The expected impact of the independent variables on bank liquidity were: capital adequacy, inflation rate and interest rate on interbank transaction/money market interest rate were positive and for the share of non-performing loans on total volume of loans, bank profitability, GDP growth, interest rate on loans, interest rate margin, monetary policy interest rate/repo rate, unemployment rate and dummy variable of financial crisis for the year 2009 were negative whereas, the expected sign for bank size was ambiguous (+/-). The dependent variable (i.e. liquidity of commercial banks) was measured by using four liquidity ratios such as liquid asset to total assets, liquid assets to total deposits and borrowings, loan to total assets and loan to deposits and short term financing. The study by Vodova (2011) revealed financial crisis, higher inflation rate and growth rate of gross domestic product have negative impact on bank liquidity. In contrast that bank liquidity was positively related to capital adequacy, interest rates on loans, share of non-performing loans and interest rate on interbank transaction. The relation between the size of the bank and its liquidity was ambiguous as it was expected. The study also found that unemployment, interest

margin, bank profitability and monetary policy interest rate have no statistically significant effect on the liquidity of Czech commercial banks.

Samy & Mohammed (2008) also examine the influence of bank regulations, concentration, financial and institutional development on commercial bank margin and profitability across a broad menu of Middle East and North Africa (MENA) countries. They cover period from 1989 to 2005 and control for a wide array of macroeconomic, financial and bank characteristics. This study find the regulatory variable (reserve requirement and coverage to deposit to capital ratio) aand institutional variable (concentration) seem to have an impact on bank performance as the results suggest that corruption increases the cost efficiency and net interest margins while an improvement of the law and order variable decreases the cost of efficiency without affecting performance.

Wilber Chagwiza (2011) made a study on Zimbabwe, regarding the commercial banks liquidity and its determinants. The main objective of his study was to identify the determinants of liquidity in Zimbabwean commercial banks. The data cover the period from January 2010 to December 2011. He uses regression analysis and his study revealed that higher bank's capital, total assets volume, higher lending rates, and positive country's GDP increases the bank's liquidity position in Zimbabwe. In other words, there is a positive link between bank liquidity and capital adequacy, total asset volumes, gross domestic product and bank rate. In other way the study revealed the adoption of multi-currency, inflation rate and business cycle have a negative impact on liquidity. It seems the banks size and their liquidity is positively correlated and the most recent studies made by Laurine (2013) again in Zimbabwe regarding Zimbabwean Commercial Banks Liquidity Risk Determinants after Dollarization. The aim of his paper was that empirically investigating the determinants of Zimbabwean commercial banks liquidity risk after the country adopted the use of multiple currencies exchange rate system and to attain the intended objective panel data regression analysis was used on monthly data from the period of March 2009 to December 2012. The result of the study revealed that capital adequacy and size have negative and significant influence on liquidity risk whereas spread; non-performing loans have a positive and significant relationship with liquidity risk. Reserve requirement ratios and inflation were also significant in explaining liquidity during the studied period.

Fadare (2011), on the banking sector liquidity and financial crisis in Nigeria with the aim of identifying the key determinants of banking liquidity in Nigeria, and assessing the relationship between determinants of banking liquidity and financial frictions within the economy. It was employed a linear least square model and time series data from 1980 to 2009. The study found that only liquidity ratio, monetary policy rate and lagged loan to deposit ratio were significant for predicting banking sector liquidity. Secondly, it showed that a decrease in monetary policy rate, liquidity ratios, volatility of output in relation to trend output, and the demand for cash, leads to an increase in current loan to deposit ratios; while a decrease in currency in circulation in proportion to banking sector deposits; and lagged loan to deposit ratios leads to a decline in current loan to deposit ratios. Generally, the result suggested that during periods of economic or financial crises, deposit money banks were significantly illiquid relative to benchmarks, and getting liquidity monetary policies right during these periods is crucial in ensuring the survival of the banking sector.

Eden (2014) examines the impact of NBE regulations on private banks performance through the significant regulatory variables explaining the NBE directives, using bank-specific and macroeconomic variables as control variables. Balanced fixed effect panel regression was used for the data of six private commercial banks in the sample covered the period from 2004 to 2013. The results of panel data regression analysis showed that NBE Bill and Credit cap had negative and statistically significant impact on banks profitability but reserve requirement had negative and insignificant impact on profitability. While measuring banks cost of intermediation through Net Interest Margin three of the regulatory variables (i.e. NBE Bills, Reserve requirement and credit cap) had negative and statistically significant effect on net interest margin.

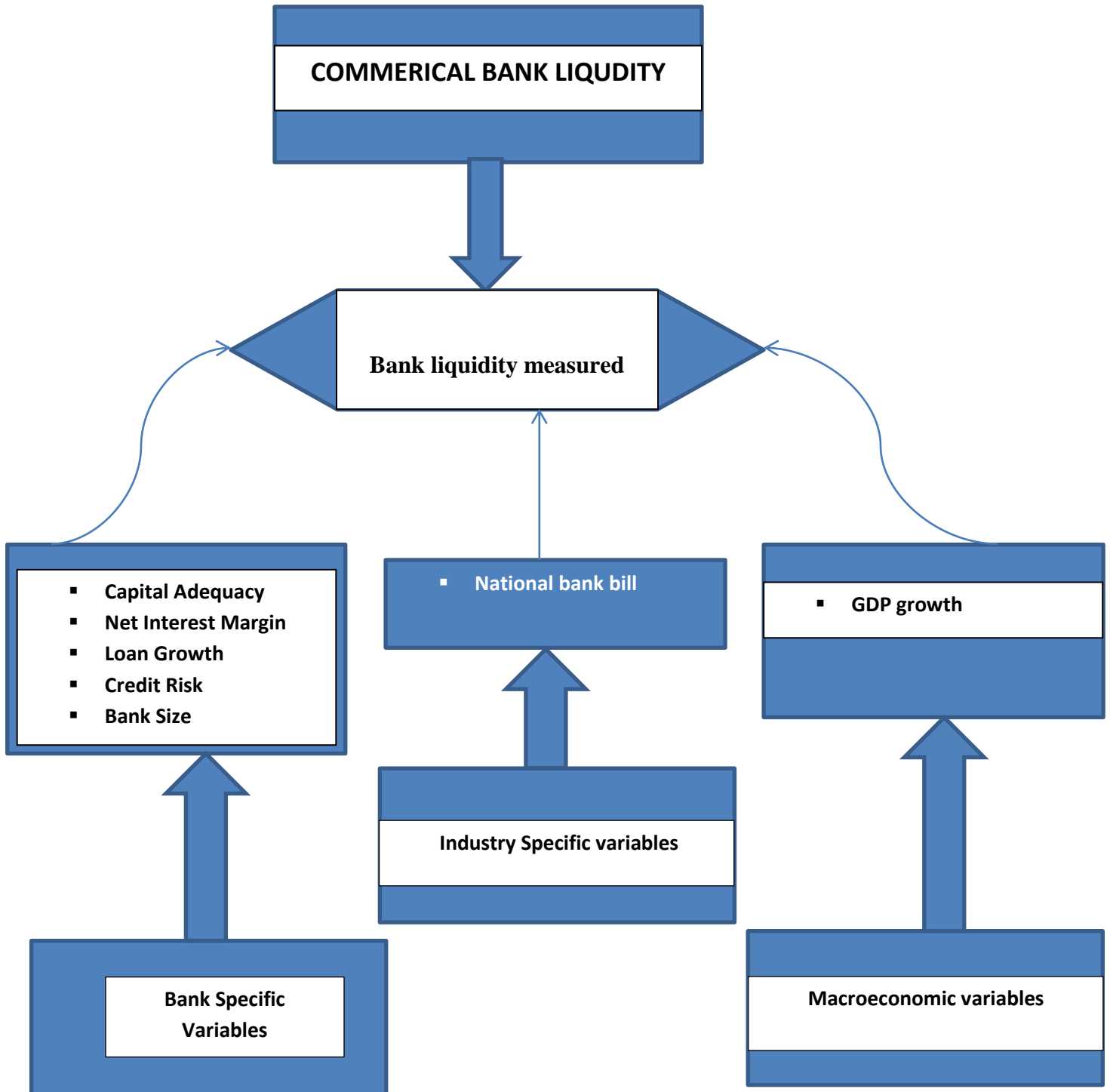
Nigist (2015) identified the determinants of commercial banks liquidity in Ethiopia. In the study data covered the period from 2007-2013 for the sample of ten commercial banks in Ethiopia and secondary data are used. Both bank specific and macroeconomic variables were analyzed by employing the balanced panel fixed effect regression model and the result of the study revealed that capital adequacy, profitability, and real GDP growth rate have negative and statistically significant impacts on liquidity of Ethiopian commercial banks while bank size has positive and statistically significant impact on liquidity. Whereas nonperforming loan, loan growth, inflation

rate, and interest rate margin were found to be statistically insignificant/ has no any impact on liquidity of Ethiopian commercial banks for the tested period.

Alemayehu (2016) made a study on the significant factors which explain the Ethiopians commercial bank liquidity. The study categorized the independent factor in to bank specific factor and macroeconomic factor the bank specific factors include Bank Size, Capital Adequacy, Profitability, Non-Performing Loans, and Loan Growth while the macroeconomic factors include Gross Domestic Product, General Inflation and National bank Bill. The study uses panel data for the sample of eight commercial banks in Ethiopia from 2002 to 2013 year and estimated using Fixed Effect Model (FEM), data was present by using descriptive statistics and the balanced correlation and regression analysis for liquidity ratios was conducted. The findings of the study show that capital strength and profitability had statistically significant and positive relationship with banks' liquidity. On the other hand, loan growth and national bank bill had a negative and statistically significant relationship with banks' liquidity. However, the relationship for inflation, non-performing loans, bank size and gross domestic product were found to be statistically insignificant.

2.3 Conceptual Framework

Figure2. 1 Relation between liquidity and its determinants



2.4 Summary on the Literature Review and Knowledge Gaps

In line with the above theoretical as well as empirical reviews, liquidity is important to all business expressly for banking industry since their function is creation of liquidity both on the asset and liability side of their balance sheet. It also revealed that banks liquidity can be affected by different factors such as bank specific, macroeconomic and regulatory factors.

State intervention in the financial sector has served many purposes. As per the theoretical and empirical review of literatures there are different rules and regulations which are imposed on banks activity and of course the regulations which exist in one country is not similar with that of the others even though there are international regulations in which all of the banks in every country should obey, each and every country have their own regulations which is issued by the central bank for the purpose of controlling the economic activity of the countries. While this study will focus on the effect of National Bank directives specifically Bill purchase requirement.

In Ethiopia Eden (2014) examine the impact of NBE regulations on private banks performance through the significant regulatory variables explaining the NBE directives, using bank-specific and macroeconomic variables as control variables. Balanced fixed effect panel regression was used for the data of six private commercial banks in the sample covered the period from 2004 to 2013. The results of panel data regression analysis showed that NBE Bill and Credit cap had negative and statistically significant impact on banks profitability but reserve requirement had negative and insignificant impact on profitability. While measuring banks cost of intermediation through Net Interest Margin three of the regulatory variables (i.e. NBE Bills, Reserve requirement and credit cap) had negative and statistically significant effect on net interest margin. Nigist (2015) also study the determinants of commercial banks liquidity in Ethiopia. The study covered the data of ten commercial banks in Ethiopia from the period 2007-2013. The study used fixed effect panel regression model for nine variables of the study which were both macroeconomic and firm specific variables. Data was analyzed by using both descriptive statistic and inferential statistics/multiple regression model. The result of the study confirmed that banks liquidity was highly affected by firm specific variables as compared to macroeconomic variables. The rationality behind was that among macroeconomic variables that chosen for this study, GDP growth rate was the only macroeconomic variable that statistically affected liquidity of Ethiopian

commercial banks at 5% significance level. The rest three variables were go to firm specific variables. Accordingly, Bank size has positive and statistically significant impact on liquidity while capital adequacy, profitability and GDP have negative and statistically significant impact on liquidity. The coefficient of capital adequacy was opposite to the hypotheses of the study whereas bank size, dependency on external funds, profitability, and GDP growth rate were in line with the hypotheses of the study. Loan growth and interest rate margin have positive relationship with liquidity but has no any impact on liquidity of banks/ insignificant whereas inflation rate and nonperforming loan have negative relationship with liquidity but their values were statistically insignificant/not different from zero. The coefficient of loan growth, inflation rate, and interest rate margin were opposite to the hypotheses of the study whereas the coefficient of nonperforming loan was in line with the hypotheses of the study. However, the finding of this study revealed that these variables have no any power in explaining liquidity of Ethiopian commercial banks for the tested period. Alemayehu (2016) like Nigist (2015) made a study on the significant factors which explain the Ethiopians commercial bank liquidity by using panel data for the sample of eight commercial banks in Ethiopia from 2002 to 2013 year and estimated using Fixed Effect Model (FEM) and the study revealed capital strength and profitability had statistically significant and positive relationship with banks' liquidity. On the other hand, loan growth and national bank bill had a negative and statistically significant relationship with banks' liquidity. However, the relationship for inflation, non-performing loans, bank size and gross domestic product were found to be statistically insignificant.

Therefore, this study will conduct to fill the knowledge gap since most of the previous study focus in the impact of NBE directives on the profitability of private commercial banks and general factors affecting the liquidities no any study conducted specifically to see the impact of NBE bill purchase requirement in the liquidity of private commercial banks. My study will fill the gap by focusing in the impact of national bank directives specifically bill purchase requirement in liquidity and by checking the consistency of the result of the above studies and by examining the impact of National bank Directive (the requirement of purchasing NBE bill) on liquidity of private commercial banks in Ethiopia.

CHAPTER THREE

3.1 Research Design and Methodology

3.1.1 Research Method adopted

In order to achieve the objective stated in the preceding section, considering the nature of the problem and the research perspective this study will use quantitative approach.

3.1.2 Research Design

Explanatory research design was used in this research because the study identifies explanatory variables and the liquidity of commercial banks in Ethiopia.

3.1.3 Data Collection Methods

The researcher reviewed journal articles and annual reports pertaining to the commercial banks in Ethiopia. Data was collected from secondary resources. The secondary data were used in this paper include six years annual reports of ten commercial banks from year 2011 to year 2016 periods from National Bank of Ethiopia (NBE).

Secondary Data

Secondary data was collected by the researcher to analyze and meet the requirements of the various research objectives. In this study, literature reviews present the relationship between the dependent variable and the independent variables. While the dependent variable is liquidity ratio and the independent variables consist of Capital Adequacy, net interest margin, bank size, credit risk, and Loan Growth while the macroeconomic factors include National bank Bill. The main sources of secondary data for this research will be taking from articles, online information, journals and books which are relevant to explain the factors affecting bank's liquidity.

Type of data	Source
Macroeconomic factors	
National bank bill	NBE
Bank's specific factors	
net interest margin	Bank's annual reports
credit risk	Bank's annual reports
Capital adequacy	Bank's annual reports
Bank size	Bank's annual reports
Loan Growth	Bank's annual reports

3.1.4 Population and sampling procedure

Population of the study: The study population/participants are all private banks in Ethiopia. According to NBE (2012/13), report there are sixteen private banks in the year 2012/13 such as Dashen Bank S.C (DB), Awash International Bank S.C (AIB), Wogagen Bank S.C (WB), United Bank S.C (UB), Nib International Bank S.C (NIB), Bank of Abyssinia S.C (BOA), Lion International Bank S.C (LIB), Cooperative Bank of Oromia S.C (CBO), Berehan International Bank S.C (BIB), Buna International Bank S.C (BUIB), Oromia International Bank S.C (OIB), Zemen Bank S.C (ZB), Addis International Bank S.C (AIB), Abay Bank S.C (AB), Enat Bank S.C (EB) and Debub Global Bank S.C (DGB)

Sampling Frame: From the total population for the study purpose the researcher used sample of ten private banks. These private commercial banks were selected due to their market share, total assets and profit. As NBE (2013/14) annual report stated that these ten private commercial banks together accounted for 90% of the market share based on their number of branch, annual profit and capital. Sample size is ten, which includes, Dashen Bank S.C (DB), Awash International Bank S.C (AIB), Wogagen Bank S.C (WB), United Bank S.C (UB), Nib International Bank S.C (NIB), Bank of Abyssinia S.C (BOA), Cooperative Bank of Oromia(s.c.) (CBO), Lion International Bank(LIB), Oromia International Bank (OIB) and Zemen Bank (ZB). The study covers six year data since the directive started from the budget year 2011. Hence, the researcher employed purposive sampling method to draw the sample from the population and meet the study objective. The matrix for the frame is 6*10 that includes 60 observations.

3.1.5 Data analysis

To achieve objective of the study, the study mainly concentrated on quantitative analysis. Hence, the researcher used econometric model to identify and measure the effect of national bank bill purchase requirement on liquidity and used Ordinary Least Square (OLS) method using Eviews-9 econometric software package for the study. According to Brooks (2008) regression is concerned with describing and evaluating the relationship between a given variable (usually called the dependent variable) and one or more other variables (usually known as the independent variables). Thus, the researcher adopted panel data regression model to examine the effect of national bank bill purchase requirement on liquidity. As stated by Brooks (2008) panel data is favored for situation often arises in financial modeling where we have data comprising

both time series and cross-sectional elements. In addition, we can address a broader range of issues and tackle more complex problems with panel data than would be possible with pure time-series or pure cross-sectional data alone. Accordingly, the study model focused on panel data technique that comprises both cross sectional elements and time-series elements; the cross-sectional element is reflected by the different Ethiopian private banks (ten) and the time-series element is revealed by the period of study (2011-2016). Therefore, the collected panel data is analyzed using descriptive statistics, correlations and multiple linear regression analysis. The rationale for choosing Ordinary Least Square (OLS) is that, if the Classical Linear Regression Model (CLRM) assumptions hold true, then the estimators determined by OLS will have a number of desirable properties, and are known as Best Linear Unbiased Estimators (Brooks, 2008). Diagnostic checking is done to test whether the sample is consistent with the following assumptions. According to Brooks (2008), the assumptions of ordinary least squares are:

I. The errors have zero mean ($E(u_t) = 0$)

II. variance of the errors is constant ($\text{Var}(u_t) = \sigma^2 < \infty$)

III. Covariance between the error terms over time is zero ($\text{cov}(u_i, u_j) = 0$ for $i \neq j$)

IV. Test for Normality ($u_t \sim N(0, \sigma^2)$)

V. Multicollinearity Test

If all the above assumptions are consistent with the sample, E-view result will be accurate and reliable. The following tests are done in this research to test the above assumptions.

The errors have zero mean ($E(u_t) = 0$)

Rely on Brooks (2008), the first assumption required is that the average value of the errors is zero. In fact, if a constant term is included in the regression equation, this assumption will never be violated.

II. Variance of the errors is constant ($\text{Var}(u_t) = \sigma^2 < \infty$) (heteroscedasticity)

According to Brooks (2008), the variance of the errors is constant this is known as the assumption of homoscedasticity. If the errors do not have a constant variance, they are said to

be heteroscedastic. If heteroscedasticity occur, the estimators of the ordinary least square method are inefficient and hypothesis testing is no longer reliable or valid as it will underestimate the variances and standard errors. There are several tests to detect the Heteroscedasticity problem, which are Park Test, Glesjer Test, Breusch-Pagan-Goldfrey Test, White's Test and Autoregressive Conditional Heteroscedasticity (ARCH) test. In this study, the popular white test was employed to test for the presence of heteroscedasticity. The hypothesis for the Heteroscedasticity test was formulated as follow;

H₀: There is no Heteroscedasticity problem in the model.

H₁: There is Heteroscedasticity problem in the model.

$\alpha = 0.05$

Decision Rule: Reject H₀ if p-value is less than significance level. Otherwise, do not reject H₀.

III. Covariance between the error terms over time is zero ($cov(u_i, u_j) = 0$ for $i \neq j$) (Autocorrelation)

According to Brooks (2008), when the error term for any observation is related to the error term of other observation, it indicates that autocorrelation problem exist in this model. In the case of autocorrelation problem, the estimated parameters can still remain unbiased and consistent, but it is inefficient. The result of T-test, F-test or the confidence interval will become invalid due to the variances of estimators tend to be underestimated or overestimated. Due to the invalid hypothesis testing, it may lead to misleading results on the significance of parameters in the model. Therefore, the study test for the existence of autocorrelation, the popular Durbin–Watson test and Breusch-Godfrey test were employed.

H₀: There is no autocorrelation problem in the model.

H₁: There is autocorrelation problem in the model.

$\alpha = 0.05$

Decision Rule: Reject H0 if p-value less than significance level. Otherwise, do not reject H0.

VI. Normality ($u_t \sim N(0, \sigma^2)$)

As per Brooks (2008) normality tests are used to determine if a data set is well-modeled by a normal distribution. With the normality assumption, ordinary least square estimation can be easily derived and would be much more valid and straight forward. This study used Jarque Bera Test (JB test) to find out whether the error term is normally distributed or not. The hypothesis for the normality test was formulated as follow:

H₀: Error term is normally distributed

H₁: Error term is not normally distributed

$\alpha = 0.05$

Decision Rule: Reject H0 if p-value of JB tests less than significance level. Otherwise, do not reject H0

IV. Multicollinearity

According to Brooks (2008), Multicollinearity will occur when some or all of the independent variables are highly correlated with one another. If the multicollinearity occurs, the regression model is unable to tell which independent variables are influencing the dependent variable. This study used high pair-wise correlation coefficients method to test the presence of multicollinearity problem in a regression model, because it shows the correlation of independent variables between each other one by one. Malhotra (2007) stated that multicollinearity problems exists when the correlation coefficient among explanatory variables should be greater than 0.75. However, Brooks (2008) mentioned that if the correlation coefficient along with the independent variables is 0.8 and above,

multicollinearity problems will be existed.

Model Specification Test

According to Brooks (2008), Specification error occurs when omitting a relevant independent variable, including unnecessary variable or choosing the wrong functional form, so that regression model will be wrongly predicted. If the omitted variable is correlated with the included variable, the estimators are biased and inconsistent. If the omitted variable is not correlated with the included variable, the estimators are unbiased and consistent. Ramsey RESET test was used to see whether the developed model is correctly regressing.

H₀: the model is correctly specified

H₁: the model is not correctly specified

$\alpha = 0.05$

Decision Rule: Reject H₀ if p-value is greater than significance level. Otherwise, do not reject H₀.

3.1.6 Model Specification

According to Brooks (2008), it is very easy to generalize the simple model to one with k regressors (independent variables). $Y_i = \beta_1 + \beta_2 x_{1i} + \beta_3 x_{2i} + \dots + \beta_k x_{ki} + \epsilon_i$, $i = (1, 2, \dots, i)$. So, Where Y_i is the i th observation of the dependent variable, X_{1i}, \dots, X_{ki} are the i th observation of the independent variables, β_0, \dots, β_k are the regression coefficients, ϵ_i is the i th observation of the stochastic error term.

Accordingly, to test the effect of bill purchase requirement on the liquidity of private commercial banks, the researcher estimated a panel data regression model in the following form.

Model used to show the relationship between liquidity and NBE bill purchase

$$LQ_t = \beta_0 + \beta_1 CAR_{i,t} + \beta_2 BSIZE_{i,t} + \beta_3 LG_{i,t} + \beta_4 CR_{i,t} + \beta_5 NIM_{i,t} + \beta_6 GDP_{i,t} + \beta_7 NBEB_{i,t} \dots$$

Source: developed by researcher mainly based on vodova (2011) and shimels (2016)

Table3. 1 Description of variables used in regression model

Variable	Descriptions	A prior Assumption
Dependent LQ_{i,t}	is a measure of bank liquidity and Calculated as total loan /total Deposit .The ratio indicate what percentage of deposit of I's bank tied up with in loan at time t	NA
Independent CAR_{i,t}	is the capital adequacy of i th bank at time t. the proxy is the ratio of total bank capital to total assets.	Positive
BSIZE_{i,t}	the proxy used to measure bank size will be the natural logarithm of the total asset.	Positive
LG_{i,t}	is the loan growth of i th bank at time t. The proxy is the Percentage change in loan. $LG = (L_t - (L_{t-1})) / (L_{t-1})$ L is total loan and advance to the customer	Negative
CR_{i,t}	is the credit risk of i th bank at time t.and it measure the asset quality of Banks The proxy is ratio of provision for loan or advance to total loan.	Negative
NIM_{i,t}	is the net interest margin of i th bank at time t. the proxy is The ratio of (II-IE)/TI.	Negative
NBEB_{i,t}	It measures the exposure level to government bill which will be used to finance mega project like the millennium dam of i th bank at time t the proxy is log of total NBE bill	Negative/Positive

3.1.7 Study Variables

3.1.7.1 Dependent Variable

Liquidity

The two approaches to measure liquidity risk of banks are by liquidity gap/flow approach and liquidity ratio/stock approach. The liquidity gap approach adapts the variation between assets and liabilities both currently and future periods. A positive liquidity gap means for deficit, requiring for liabilities to be increased (Bessis, 2009). The liquidity gap treats liquid reserves as a reservoir: the bank computes the required liquidity by comparing inflows and outflows during a specified period. On the other hand, liquidity ratio uses various ratios to identify liquidity tendency. The various ratios label for immediate viable source of funding. This indeed entitles portfolio of assets that can be sold off without any concern and also adequate amounts of stable liabilities. Most importantly, ready credit line with other financial institutions. Various authors like Moore (2010) and Rychtárik (2009) have also provided similar understandings with liquidity ratios such as liquid assets to total assets, liquid assets to deposits and short term financing, loans to total assets and loans to deposits and short term borrowings (as cited by Vodová, 2013). To sum up, the stock approach employs various balance sheet ratios to identify liquidity trends. The flow approach, in contrast, treats liquid reserves as a reservoir: the bank assesses its liquidity risk by comparing the variability in inflows and outflows to determine the amount of reserves that are needed during a period. Although both approaches are intuitively appealing, the flow approach is more data intensive and there is no standard technique to forecast inflows and outflows. As a result, the stock approaches are more popular in practice and in the academic literature (Crosse and Hempel 1980). As per Crosse and Hempel (1980), the two most popular stock ratios are the loan-to-deposit ratio and the liquid asset to total assets ratio, where the higher the loan-to-deposit ratio (or the lower the liquid asset to total assets ratio) the less able a bank to meet any additional loan demands. Both indicators have their short-comings: the loan-to deposit ratio does not show the other assets available for conversion into cash to meet demands for withdrawals or loans, while the liquid assets ratio ignores the flow of funds from repayments, increases in liabilities and the demand for bank funds. Therefore, the researcher will adapt the ratio of loan to deposit based on stock approach

3.1.7.2 Analysis of Independent Variables

The independent variables used in this study includes: capital adequacy ratio, bank size, loan growth, credit risk, interest rate margin, and National bank bill. The descriptive analyses of each independent variable are discussed here below.

Capital Adequacy Ratio (CAR)

Capital of banks includes; common stocks, surplus funds, undivided profit, reserve for contingencies and other capital reserves. As it was discussed in the literature review part, there are two opposing theoretical views regarding to the relationship between banks liquidity and capital adequacy. These are financial fragility-crowding of deposit hypothesis and risk absorption hypothesis. The first argument suggests that there is negative relationship between capital adequacy and bank liquidity whereas, the second argument is opposing to this. This study considered the second hypothesis since it has been used by various empirical studies reviewed under this study (i.e Diamond and Dybvid 1983) and Nigist (2015). The proxy for capital adequacy used in this study was the ratio of equity to total assets as of (Gorton and Winton 2000; Berger and Bouwman 2009).

H1: Capital adequacy has positive and significant impact on banks liquidity

Bank Size (BSIZE)

Bank size measures its general capacity to undertake its intermediary function. As it was stated in the literature review part there was two opposing arguments both theoretically as well as empirically regarding to the relationship between bank liquidity and size. The first view was too big to fail which considers negative relationship between size and liquidity whereas; the traditional transformation view suggested positive relationship. Therefore, this study supported the second argument that was positive impact of bank size on liquidity. The proxy for bank size used in this study was the natural logarithm of total assets as of (Poorman and Blake 2005; Shen et al. 2010).

H2: Bank size has positive and significant impact on liquidity.

Loan Growth Rate (LG)

Provision of loan is one of the major functions of banks by which banks create liquidity to the external public. Generally loans are considered as illiquid assets and generate higher revenue to banks. Therefore, the increase in loan means increase in illiquid assets and decrease in short term/liquid assets. As it was made by various empirical studies; this study expected a negative relationship between banks loan growth and liquidity. The proxy for loan growth was the percentage change in loan as per (Pilbeam 2005; Vodová 2011).

H3: Loan growth has negative and significant impact on banks liquidity

Credit Risk (CR)

The proxy for credit risk was the provision for loan or advance over total loan as Shimels (2016). Credit risk measures the asset quality of the bank.

H4: credit risk has negative and significant impact on banks liquidity

Net Interest Margin (NIM)

According to Keynes (1964, p. 167), liquidity preference theory, in the general theory, consists in the statement that “the rate of interest at any time, being the reward for parting with liquidity, is a measure of the unwillingness of those who possess money to part with their liquid control over it. Hence, higher interest rate margin/higher liquidity premium will force banks to lend more and reduce their holding of liquid assets. Interest rate margin is the difference between the gross cost paid by a borrower to a bank and the net return received by a depositor (Brock and Suarez 2000). As the proportion of liquid assets increases, a bank’s liquidity risks decrease, leading to a lower liquidity premium component of the net interest margin (Angbazo 1997 and Drakos 2003). This indicates that liquidity and liquidity premium component of interest rate margin goes in opposite direction. Thus, the variable is expected to exhibit negative relationship with bank liquidity.

H5: Net interest Margin has negative and significant impact on banks liquidity

National bank bill (NBEB)

Apparently, national bank bills can seriously affect a bank's liquidity. Government regulation which forced private banks exclusively to make investment on bonds that amounts 27% of the total loans provided by the banks to customers is currently affecting the Ethiopian private banks liquidity since huge amount of loan able funds tied up in this bond (NBE Bills). Study presents a negative or positive impact of NBEB on bank liquidity.

H6: National Bank Bill has negative/positive and significant impact on banks liquidity

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

This chapter deals with the results and analysis of the findings and it contains three sections. The first section presented descriptive and correlation analysis on variables of the study; the second section presented fulfillment of the classical linear regression model (CLRM) assumptions; the third section laid down the results of regression analysis that constitute the main findings of this study.

4.1 Descriptive statistics

Table 4.1 provides a summary of the descriptive statistics of the dependent and independent variables for ten private commercial banks from the year 2011 to 2016 with a total of 60 observations. The table shows the mean, minimum, maximum, standard deviation and number of observations for the dependent variable Liquidity (LQ) and independent variables (Capital Adequacy ratio, credit risk, loan growth, Net interest margin and bill purchased)

Table4. 1 Descriptive statistics

	CAR	CR	LG	NIM	NBEB
Mean	0.139782	0.021948	0.323718	0.456422	8.840445
Median	0.129054	0.017910	0.256120	0.466551	8.856493
Maximum	0.195243	0.096840	0.859005	0.720639	9.453558
Minimum	0.090794	0.000000	-0.108742	0.110593	8.147002
Std. Dev.	0.027257	0.019021	0.230659	0.132295	0.313655
Observations	60	60	60	60	60

Source:- annual report of sample private commercial banks computed using E-views 9

Table 4.1 presents a summary of the descriptive statistics of the independent variables for ten private commercial banks for a period of six (6) years from 2011-2016 with a total of 60 observations. Key figures, including mean, maximum, minimum and standard deviation value were reported

As indicated in the above table the mean value of capital adequacy was 13.97% which was above the statutory requirement of 8% set by NBE with directive No. SBB/50/2011 based on Basel II recommendation. The standard deviation of CAR 2.7% indicated that the dispersion of minimum value 9.07% and maximum value 19.52% from the mean. Therefore, achieving high level of capital adequacy ratio is the sign of having more capital to hedge against the risk. The variable, Credit risk or quality of asset was measured by the ratio of provision for loan or advance to loan. The mean value 2.19% indicate that private commercial banks held 2.19% provision of their credit portfolio which is lower than the minimum provision required for healthy loan. The minimum and the maximum value are 0.00% and 9.6% with lower variability 1.9%. Thus, costs related to default risk are not severe in the period under consideration. Loan growth is measured as the annual percentage change in total loans or advances and this showed a mean of 32.37%. This indicates that, on average, loan growth rate was 32.37% during the six year period and growth in loan for the sample period are ranged from -10.87% to 85.90% with standard deviation of 23.06%. The 23.06% of standard deviation indicates the existence of high variation in growth rate among private commercial banks in Ethiopia. NIM records a minimum of 11.03% and maximum of 72.06% with a mean value of 45.64% and variability of 13.22% in the period under consideration. Exposure of private commercial banks in NBE bill is measured by natural logarithm of total bill purchased by private banks. With reference to table 4.1 the mean value of NBE bill purchased by private commercial banks was 8.84. The natural logarithm of total bill purchased by private commercial banks range from 8.14 to 9.45 with standard deviation of 31.36%.

4.2 Correlation Analysis

Correlation measures the degree of linear association between variables. Values of the correlation coefficient are always ranged between +1 and -1. A correlation coefficient of +1 indicates that the existence of a perfect positive association between the two variables, while a correlation coefficient of -1 indicates perfect negative association. A correlation coefficient of

zero, on the other hand, indicates the absence of relationship (association) between two variables (Brooks, 2008).The table below shows the correlation matrix among dependent and independent variables.

Table4. 2 Correlation Analysis of Variables

	LQ	CAR	CR	LG	NIM	NBEB
LQ	1.000000					
CAR	0.152889	1.000000				
CR	-0.389454	0.084904	1.000000			
LG	0.215119	-0.066233	-0.268904	1.000000		
NIM	0.502791	-0.014165	-0.420823	-0.303598	1.000000	
NBEB	0.354868	-0.191083	-0.182006	-0.444423	0.503238	1.000000

Source:- annual report of sample private commercial banks computed using E-views 9

The correlation result in Table 4.2 shows capital adequacy, loan growth, net interest margin and national bank bill purchase requirement have positive correlation with liquidity. It refers that when these capital adequacy, loan growth, net interest margin and national bank bill purchase increases, the liquidity of commercial banks will be go up. However, credit risk has negative correlation with liquidity which indicates that while credit risk decreases, at the same time liquidity of Ethiopian private commercial banks will be increase.

The coefficient estimates of correlation in the above table shows 0.152889, 0.215119,0502791, 0.354868 and -0.389454 for capital adequacy, loan growth, net interest margin, national bank bill purchase and credit risk respectively. This implies that capital adequacy, loan growth, net interest margin and national bank bill purchase are highly positively correlated with liquidity. However, credit risk has -0.389454 coefficient number which is lower estimate of negative correlation contrast to the above variables.

4.3 Regression model tests

For valid hypothesis testing and to make data available for reliable results, the test of assumption of regression model is required. Accordingly, the study has gone through the most critical regression diagnostic tests consisting of normality, multicollinearity, heteroskedasticity, autocorrelation and model specification tests accordingly.

4.3.1 Model Selection (Random Effect versus Fixed Effect Models)

As Brooks (2008) referring on his book, there are broadly two classes of panel estimator approaches that can be employed in financial research: fixed effects models and random effects models. The choice between both approaches is done by running a Hausman test. To conduct a Hausman test the number of cross section should be greater than the number of coefficients to be estimated. Thus, to determine whether the fixed effects models and random effects models this study run the Hausman test. The hypothesis for the model selection test was formulated as follow;

H₀: Random effects model is appropriate.

H₁: Fixed effects model is appropriate.

$\alpha = 0.05$

Decision Rule: Reject H₀ if P value is less than significant level 0.05. Otherwise, do not reject H₀.

Table4. 3 Hausman Test

Correlated Random Effects - Hausman Test
Equation: EQ01
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	4.016002	5	0.5471

Source:- annual report of sample private commercial banks computed using E-views 9

The Hausman model selection test for this study has a p-value of 0.5471 for the regression models. Thus, the null hypothesis which is random effect model appropriate was not rejected there for the research used random effect model.

4.3.2 Tests for the Classical Linear Regression Model (CLRM) assumptions

To maintain the data validity and robustness of the regressed result of the research, the basic classical linear regression model (CLRM) assumptions must be tested for identifying any misspecification and correcting them so as to augment the research quality (Brooks,2008). There are different CLRM assumptions that need to be satisfied and that are tested in this study, which are: errors equal zero mean test, heteroscedasticity, autocorrelation, normality, multicollinearity and model specification test.

I. The errors have zero mean ($E(u_t) = 0$)

This part shows the test for the assumptions of classical linear regression model (CLRM) namely the error have zero mean, heteroscedasticity, autocorrelation, normality and multicollinearity. Relay on Brooks (2008), the first assumption required is that the average value of the errors is zero. In fact, if a constant term is included in the regression equation, this assumption will never be violated. Hence, study's regression model has included a constant term, so that this assumption was not violated.

II. Test for heteroskedasticity assumption($\text{var}(u_t) = \sigma^2 < \infty$)

As indicated by Brooks (2008), this assumption requires that the variance of the errors to be constant. If the errors do not have a constant variance, it is said that the assumption of homoscedasticity has been violated. This violation is termed as heteroscedasticity. In this study test was used to test for existence of heteroscedasticity across the range of explanatory variables.

H₀: The variance of the error is homoscedasticity

H₁: The variance of the error is heteroscedasticity

Table4. 4 Heteroskedasticity Test

Heteroskedasticity Test: White

F-statistic	1.795782	Prob. F(7,51)	0.1084
Obs*R-squared	11.66670	Prob. Chi-Square(7)	0.1121
Scaled explained SS	5.202132	Prob. Chi-Square(7)	0.6353

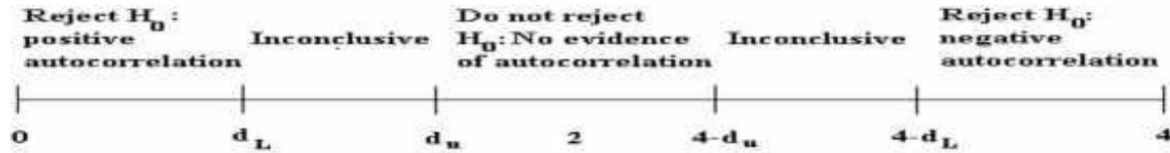
Source:- annual report of sample private commercial banks computed using E-views 9

In this case, both the F- statistic and R-squared versions of the test statistic give the same conclusion that there is no evidence for the presence of heteroscedasticity, since the p-values are considerably in excess of 0.05 and also the third version of the test statistic, ‘Scaled explained SS’, which as the name suggests is based on a normalised version of the explained sum of squares from the auxiliary regression, suggests also that there is no evidence of heteroscedasticity. Thus, the conclusion of the test has shown that no evidence of heteroscedasticity and the null hypothesis is accepted.

III. Test for autocorrelation assumption ($cov(u_i, u_j) = 0$ for $i \neq j$)

This assumption stated that the covariance between the error terms over time (or cross sectionals, for that type of data) is zero. In other words, it is assumed that the errors are uncorrelated with one another. If the errors are not uncorrelated with one another, it would be stated that they are auto correlated or that they are serially correlated (Brooks, 2008). The study used both Durbin-Watson (DW) and Breusch-Godfrey test for the existence of autocorrelation. In addition, lagged value of a variable (LQ (-1)) is used in this research in order to adjust the autocorrelation. As per Brooks (2008) lagged the value is simply the value that the variable took during a previous period. So from the regression result DW is 1.96 it is closed to two.

Table4. 5 Rejection and non-rejection regions for Durbin-Watson Test



Therefore, to test for autocorrelation, the DW test critical values were used. Then, relevant critical lower and upper values for the test are $d_L = 1.25$ and $d_U = 1.6$ respectively. The values of $4 - d_U = 4 - 1.96 = 2.75$; $4 - d_L = 4 - 1.6 = 2.04$.

The Durbin-Watson test statistic of 1.96 is clearly found on the non-rejection region so that there is no evidence for the presence of autocorrelation.

Another test for the existence of autocorrelation is by using Breusch-Godfrey test.

H_0 : The errors are uncorrelated with one another

H_1 : The errors are correlated with one another

Table4. 6 Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.038758	Prob. F(2,49)	0.9620
Obs*R-squared	0.093188	Prob. Chi-Square(2)	0.9545

Source: - annual report of sample private commercial banks computed using E-views 9

Both versions of the test; F- statistic and R-squared version of the test indicate that the null hypothesis of no autocorrelation should not be rejected, since the p-values are considerably in excess of 0.05. The conclusion from both versions of the test described that the null hypothesis of no autocorrelation is not rejected.

IV. Test of normality ($ut \sim N(0, \sigma^2)$)

As stated by Brooks (2008), if the residuals are normally distributed, the histogram should be bell-shaped and the Bera-Jarque statistic would be significant. This means that Jarque Bera formalizes this by testing the residuals for normality and testing whether the coefficient of

skewness and kurtosis are ≈ 0 and ≈ 3 respectively. Normality assumption of the regression model can be tested with the Jarque- Bera measure. Skewness measures the extent to which a distribution is not symmetric about its mean value and kurtosis measures how it is fat the tails of the distribution. If the Jarque Bera value is greater than 0.05, it's an indicator for the presence of normality (Brooks, 2008).

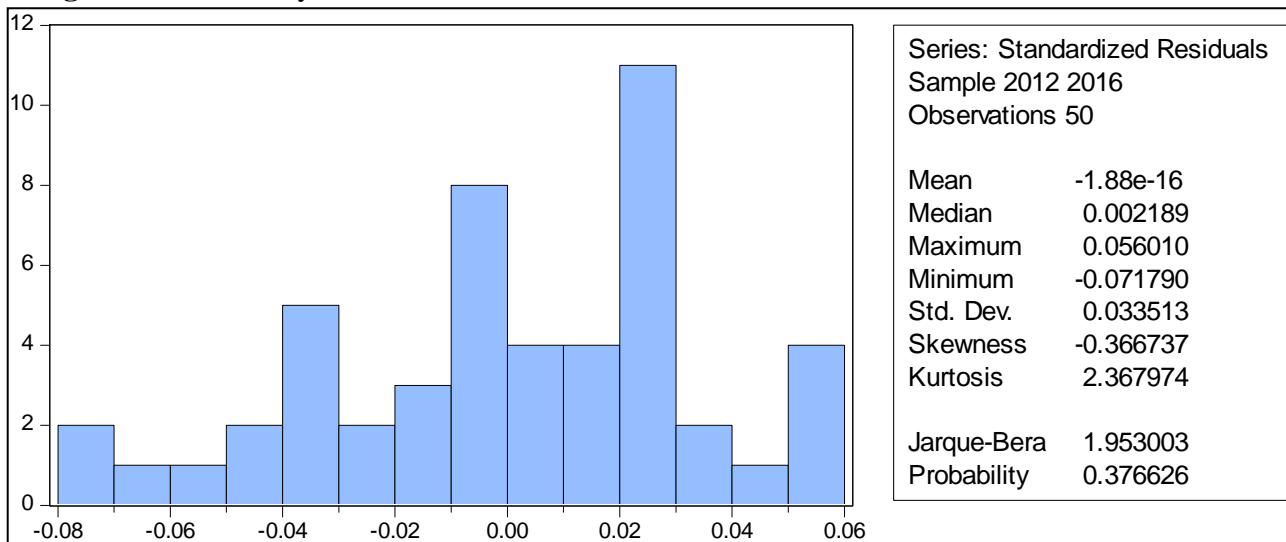
In addition, it is quite often the case that one or two very extreme residuals cause a rejection of the normality assumption. Such observations would appear in the tails of the distribution, which enters into the definition of kurtosis, to be very large. Such observations that do not fit in with the pattern of the remainder of the data are known as outliers. If this is the case, one way to improve the chances of error normality is to use dummy variables (Brooks, 2008). In line with this, the study included two dummy variables (DUM47) to adjust the normality distribution. Thus, the figure below shows the result of normality by including one dummy variable.

The hypothesis for the normality test was formulated as follow:

H₀: Error term is normally distributed

H₁: Error term is not normally distributed

Figure4. 1 Normality Test Result



The above diagram witnesses that normality assumption holds, i.e., the coefficient of kurtosis was close to 3, skewness was zero implying that the data were consistent with a normal distribution assumption. Based on the statistical result, the study failed to reject the null hypothesis of normality.

V. Test for multicollinearity

As referred by Brooks (2008), an implicit assumption that is made when using the OLS estimation method is that the explanatory variables are not correlated with one another. If there is no relationship between the explanatory variables, they would be said to be orthogonal to one another. However, a problem occurs when the explanatory variables are very highly correlated with each other, and this problem is known as multicollinearity

Malhotra (2007) stated that multicollinearity problems exists when the correlation coefficient among explanatory variables should be greater than 0.75. However, Brooks (2008) mentioned that if the correlation coefficient along with the independent variables is 0.8 and above, multicollinearity problems will be existed.

Table4. 7 Correlation Matrix between independent variables

	CAR	CR	LG	NIM	NBEB
CAR	1.000000				
CR	0.084904	1.000000			
LG	-0.066233	-0.268904	1.000000		
NIM	-0.014165	-0.420823	-0.303598	1.000000	
NBEB	-0.191083	-0.182006	-0.444423	0.503238	1.000000

The method used in this study to test the existence of multicollinearity was by checking the Pearson correlation between the independent variables. The correlations between the independent variables are shown in table 4.8 above. All correlation results are below 0.75, which indicates that multicollinearity is not a problem for this study.

VI. Model Specification test

According to Brooks (2008), further implicit assumption of the classical linear regression model is that the appropriate ‘functional form’ is linear. This means that the appropriate model is assumed to be linear in the parameters and that in the bivariate case, the relationship between dependent and independent can be represented by a straight line. Model specification error occurs when omitting a relevant independent variable and including unnecessary variable.

Therefore, in order to select a correct estimated model, the researcher had carry out the Ramsey-RESET Test to check on the model specification. The hypothesis for the model specification test was formulated as follow;

H₀: The model specification is correct.

H₁: The model specification is incorrect.

Table4. 8 Result of model specification Test: Ramsey-RESET test

Ramsey RESET Test

Equation: EQ01

Specification: LQ C CAR CR LG NIM NBEB

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.228072	53	0.2248
F-statistic	1.508161	(1, 53)	0.2248
Likelihood ratio	1.683511	1	0.1945

From table 4.9, it can be concluded that this research do not reject null hypothesis (H₀), since the p value of f statistic is 0.2248, which is greater than significance level of 0.05. Thus, it can be concluded that the model specification is correct from year 2011 to 2016. Overall reliability and validity of the model was enhanced further by the Prob (F-statistic) value of 0.000000.

4.4 Analysis of Regression

This section presents the empirical findings from the econometric output on effect of national bank of Ethiopia directives which is bill purchase requirement on the liquidity of private commercial banks. Table 4.10 below reports regression results between the dependent variable (LQ) and explanatory variables. Under the following regression outputs the beta coefficient may be negative or positive; beta indicates that each variable's level of influence on the dependent variable.

Regression result

Empirical model: the empirical model used in the study in order to identify the effect of bill purchase requirement on the profitability of private commercial banks are:-

$$LQ_t = \beta_0 + \beta_1 CAR_{i,t} + \beta_2 BSIZE_{i,t} + \beta_3 LG_{i,t} + \beta_4 CR_{i,t} + \beta_5 NIM_{i,t} + \beta_6 GDP_{i,t} + \beta_7 NBEB_{i,t} \dots\dots\dots$$

Source: developed by researcher mainly based on Timbergen(1956),Aneke(1999) and Shimels (2016)

Table4. 9 Regression result

Dependent Variable: LQ
Method: Panel EGLS (Cross-section random effects)
Date: 12/18/17 **Time:** 13:17
Sample (adjusted): 2012 2016
Periods included: 5
Cross-sections included: 10
Total panel (balanced) observations: 50
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.695003	0.214296	-3.243192	0.0023
CAR	0.843071	0.213883	3.941745	0.0003 **
CR	0.122658	0.379201	0.323466	0.7479
LG	0.199312	0.033422	5.963442	0.0000 **
NIM	0.131439	0.05932	2.215737	0.0322 **
NBEB	0.087403	0.02297	3.805079	0.0005 **
DUM815	0.193943	0.040141	4.831483	0.0000
LQ(-1)	0.446346	0.089091	5.010004	0.0000

Effects Specification			
		S.D.	Rho
Cross-section random		0.00781	0.0502
Idiosyncratic random		0.033986	0.9498
Weighted Statistics			
R-squared	0.801818	Mean dependent var	0.520924
Adjusted R-squared	0.768788	S.D. dependent var	0.07338
S.E. of regression	0.035284	Sum squared resid	0.05229
F-statistic	24.275190	Durbin-Watson stat	1.79906
Prob(F-statistic)	0.000000		

N.B:- **and * indicate that significant at 1% and 5% significance level respectively.

Thus, based on the result in above Table, the following model was developed to examine the effect of financial risk on insurance performance.

$$LQ = -0.695003 + 0.843071CAR + 0.122658CR + 0.199312LG + 0.131439NIM + 0.087403NBEB + \varepsilon$$

This section discusses in detail the analysis of the results for each explanatory variable and their effect on the liquidity of private commercial banks in Ethiopia. Furthermore, the discussion analyzed the statistical findings of the study in relation to the previous empirical evidences. Hence, the following discussions present the interpretation on the random effects model regression results.

The R-squared statistics and the adjusted-R squared statistics of the model was 80.18% and 76.88% respectively. This indicates that the changes in the independent variables (capital adequacy, credit risk, liquidity, loan growth, and exposure to NBE bill) collectively explain 76.88% of the changes in the dependent variable (liquidity) and the remaining 23.12% of changes is explained by other factors which are not included in the model. Thus these variables collectively, are good explanatory variables of the liquidity of commercial banks Ethiopia. The null hypothesis of F-statistic (the overall test of significance) that the R₂ is equal to zero was rejected at 1% as the p-value was sufficiently low. Prob (F-Statistic) 0.000000 indicates strong statistical significance, which enhanced the reliability and validity of the model.

4.4.1 Determinants of banks liquidity-Discussion

Liquidity defined as Loan/ Deposit ratio. Consequently the result has to be interpreted in reverse: positive sign of the coefficient means negative impact and conversely.

4.4.1.1 Capital adequacy and liquidity

Capital adequacy which was measured by the ratio of equity to total asset was statistically significant variable that affected liquidity of Ethiopian commercial banks at 1% significant level with the p-value of 0.0003 And has a negative coefficient value of -0.843071 which indicated that when the ratio of capital to total asset rises by 1%, the liquidity of Ethiopian commercial banks decreases by 84.30%, holding other variables constant. This finding was opposite to the hypotheses of this study (H1) and in line with the findings of Vodová (2012); Subedi and Neupane (2011); Laurine (2013) and Shimels (2016). The negative and statistically significant impact of capital adequacy on liquidity of Ethiopian commercial banks were supported the arguments of the financial fragility-crowding out hypotheses. According to this argument, bank capital tends to impede liquidity creation through two distinct effects: the financial fragility structure and the crowding-out of deposits. The financial fragility structure is characterized by lower capital, tends to favor liquidity creation; this theory was supported by (Diamond and Rajan 2001), and hence they model a relationship bank that raises funds from investors to provide financing to an entrepreneur. The entrepreneur may withhold effort, which reduces the amount of bank financing attainable. More importantly, the bank may also withhold effort, which limits the bank's ability to raise financing. A deposit contract mitigates the banks holdup problem because depositors can run on the bank if the bank threatens to withhold effort and therefore maximizes liquidity creation. Providers of capital cannot run on the bank, which limits their willingness to provide funds, and hence reduces liquidity creation. Thus, the higher a bank's capital ratio, the less liquidity it will create.

The second theory was concerned to a higher capital ratio may reduce liquidity creation through the crowding out of deposits. This argument was supported by Gorton and Winton (2000), and they stated that deposits are more effective liquidity hedges for investors than investments in equity capital. Thus, the finding of this study revealed that higher capital ratios shift investors' overall liquidity for investors. Therefore, the hypotheses stated; there was positive and statistically significant relationship between capital adequacy and banks liquidity was rejected.

4.1.1.2 Credit risk and Liquidity

From the regression result of credit risk (CR) has a negative relationship with commercial banks liquidity by a coefficient estimate of 0.122658. This means that keeping other independent variables constant and when one percent increases in Credit risk, as a result it affect liquidity of Ethiopian commercial banks by 12.26% and the p value of CR is 0.7479 reveals that it is statistically insignificant at 10% significance level and the result doesn't supported the workable hypothesis that Credit risk has negative and statistically significant effect on commercial banks liquidity for the period of 2011 to 2016. The result is inconsistent with prior studies of Mistre (2015) and shimels (2016) it has positive and statistically significant effect on commercial banks liquidity.

4.1.1.3 Loan growth and liquidity

Loan growth of i^{th} bank at time t was used as a proxy for loan growth and which has coefficient of 0.199312. The negative impact of loan growth on liquidity of Ethiopian commercial banks was in line with to the hypotheses of this study (H3). Besides, the negative impact of loan growth on liquidity of banks" was statistically significant with the p-value of 0.0000 and it was in line with the findings of Mekibib (2016). The negative impact of loan growth on liquidity was based on the argument that, when loans & advances of a bank increases, the amount of illiquid asset in the total asset portfolio would also increases and leads to reduction on the level of liquid asset position of the bank. This negative sign of the coefficient indicates an inverse relationship between loan growth and liquidity. According to the regression result, a one percent change in the loan growth rate, keeping other things constant, had resulted in 19.93% change on the level of liquidity of commercial banks. Therefore, the study will not to reject the third hypothesis saying, loan growth has negative and significant impact on bank's liquidity.

4.1.1.4 Net Interest margin and liquidity

The researcher find net interest margin had a negative and statistically significant impact on the liquidity of private commercial banks at 1% level of significance, which was in line with the researcher prior expectation. As indicated in the Table 4.9 the coefficient estimates of net interest margin was 0.131439 with a p-value of 0.0322 This implied that, holding other variables constant a unit increase in net interest margin would lead to 13.14% unit declines in liquidity of

private commercial banks. This is logical: increase in interest margin stimulates bank to focus more on lending activity and as a result, the share of liquid assets is decreasing. This supported by Angbazo 1997, Drakos 2003 and Shimels (2016) where their studies reveal that when a bank needs to sacrifice liquidity to achieve a higher profitability which in turn increases the liquidity risk and liquidity ratio. Liquidity need is actually a constraint for a bank from investing all its cash as profit comes from either bank lending activities or by investing it. Hence, the hypotheses stated; there was negative and statistically significant relationship between NIM and banks liquidity should not be rejected.

4.1.1.5 NBE Bill

As indicated in the Table 4.9 the coefficient estimates of NBE bill is 0.087403 with p-value of 0.0005. This means holding other factors constant, a 1% increase investment in NBE Bill would lead a decline in liquidity by 8.74% and the p-value of NBE bill (i.e. 0.0005) reveals that it is statistically significant at 1% level of significance. Therefore, reject the second null hypothesis and accept the alternative hypothesis. This finding was in line with the findings of Tesfaye (2014) and Shimels (2016).

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

The preceding chapter presented the results and discussion, while this chapter deals with conclusion and recommendations based on the findings of the study. Accordingly this, chapter is organized into two subsections.

5.1 Conclusion and recommendation

5.1.1 Conclusion

The major theme of the study was to assess the effect of sector specific policy measures on bank performance. The study has taken one of the top policy issues; the requirement to purchase government securities, and analyzed its impact on liquidity measure. It has used panel data from 2011-2016 of ten private banks with a total of 60 observed variables. Data were presented by using descriptive statistics, balanced correlation and regression analysis liquidity ratios were conducted. Before performing OLS regression the researcher uses model specification test to select the appropriate model for regression analysis. Based on the result of model specification test, the researcher had used the random effect model. Furthermore, the models were tested for the classical linear regression model assumptions and the results showed that all the tests are satisfactory in all regressions. The result shows that requirement of purchasing NBE bill had negative and significant impact on the liquidity position of private commercial banks in Ethiopia. The magnitude of the impact of NBE bill is relatively severe to result in liquidity risk. This requirement has also been applied at the time when the commercial banks have concentrated on capital investment from their own capital and to fulfill the capital requirement set by NBE. Such a move coupling with purchasing requirement of NBE bill have highly magnified the liquidity problem of private commercial banks in Ethiopia.

Hence, the Banks cost related to bill purchase to some extent seems covered by the borrowers but the increase in rate has not resulted in materialized high default risk. In general, the result of the study shows that the effect of the policy measure is mitigated by the excess liquidity standing of banks during the policy formulation, the limited but likely possibility to expand to other fee generating services, stable liability prices and banks discretion to adjust their asset prices. However, the decline trend in the share of loans from the total asset could have negative effect on the long run but to some extent tone down by the maturity of part of the bills in few

years' time. The study focused on historical impact of (if any) of the bill measure and it can serve as a initial work to further pursue on the impact of policy measures on the long run performance of Banks.

5.1.2 Recommendation

The banks must have extended their outreach to unreached of people by openings up more and more branches every year throughout the country, and have significantly improved their banking services by introducing new products and services like Agent Banking to serve unreached ones for collecting more fund from the public and promote people to make deposit by different mechanisms like: giving incentive for deposit made with certain time and use good advertisement mechanism to show the importance of saving money.

Private commercial banks should minimize their capital investment until NBE taking corrective action and making big deal with fixed time depositors to extend the maturity date instead of making aggressive competition by paying higher interest for shortly maturing fixed time deposit because this create maturity mismatch between their asset and liability. The researcher also recommends private commercial banks to use different mechanisms such as shortening asset maturities, improving the average liquidity of assets, issuing more equity, reducing contingent commitments, and obtaining liquidity protection in order to improve their liquidity position depending on the nature, severity and duration of the liquidity shock and potential sources of funding.

Due to limited studies done in Ethiopia, more researchers are encouraged to conduct research on liquidity issues faced by banks in Ethiopia. This would actually benefit the policy makers to setup a better new policy. Researchers have examined the relationship between dependent variable (bank liquidity) and independent variables (capital adequacy, credit risk, loan growth, Net interest margin, and national bank bill). Therefore, future research is recommended to use more challenging independent variables (for example, short-term monetary interest rate, political influence, government implications, and others) to explain the dependent variable of bank liquidity.

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APPENDICES

Appendix 1: Descriptive Analysis

	<i>CAR</i>	<i>CR</i>	<i>LG</i>	<i>NIM</i>	<i>NBEB</i>
<i>Mean</i>	0.139782	0.021948	0.323718	0.456422	8.840445
<i>Median</i>	0.129054	0.017910	0.256120	0.466551	8.856493
<i>Maximum</i>	0.195243	0.096840	0.859005	0.720639	9.453558
<i>Minimum</i>	0.090794	0.000000	-0.108742	0.110593	8.147002
<i>Std. Dev.</i>	0.027257	0.019021	0.230659	0.132295	0.313655
<i>Skewness</i>	0.465931	2.280067	0.724130	-0.383232	-0.514585
<i>Kurtosis</i>	2.008894	9.020537	2.735639	2.894047	2.689912
<i>Jarque-Bera</i>	4.626649	142.6042	5.418359	1.496732	2.888365
<i>Probability</i>	0.098932	0.000000	0.066591	0.473139	0.235939
<i>Sum</i>	8.386949	1.316883	19.42306	27.38529	530.4267
<i>Sum Sq. Dev.</i>	0.043834	0.021346	3.139007	1.032623	5.804384
<i>Observations</i>	60	60	60	60	60

Appendix 2: Hausman Test

Correlated Random Effects - Hausman Test

Equation: EQ01

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	4.016002	5	0.5471

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
CAR	0.649646	0.763043	0.123809	0.7472
CR	-0.217889	-0.047232	0.071445	0.5232
LG	0.202657	0.202411	0.000168	0.9848
NIM	0.326529	0.300425	0.002535	0.6041
NBEB	0.118786	0.116034	0.000515	0.9034

Cross-section random effects test equation:

Dependent Variable: LQ

Method: Panel Least Squares

Date: 12/18/17 Time: 13:06

Sample: 2011 2016

Periods included: 6

Cross-sections included: 10

Total panel (balanced) observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.780123	0.358344	-2.177020	0.0348
CAR	0.649646	0.489696	1.326629	0.1913
CR	-0.217889	0.568288	-0.383412	0.7032
LG	0.202657	0.041121	4.928309	0.0000
NIM	0.326529	0.093216	3.502940	0.0011
NBEB	0.118786	0.039520	3.005671	0.0043

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.685641	Mean dependent var	0.570660
Adjusted R-squared	0.587841	S.D. dependent var	0.078717
S.E. of regression	0.050536	Akaike info criterion	-2.919931
Sum squared resid	0.114926	Schwarz criterion	-2.396345
Log likelihood	102.5979	Hannan-Quinn criter.	-2.715128
F-statistic	7.010605	Durbin-Watson stat	1.586140
Prob(F-statistic)	0.000000		

Appendix 3: Test of Heteroskedasticity

Heteroskedasticity Test: White

F-statistic	1.795782	Prob. F(7,51)	0.1084
Obs*R-squared	11.66670	Prob. Chi-Square(7)	0.1121
Scaled explained SS	5.202132	Prob. Chi-Square(7)	0.6353

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 12/18/17 Time: 13:10

Sample: 2 60

Included observations: 59

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002296	0.003783	0.607012	0.5465
CAR^2	0.024794	0.025696	0.964896	0.3392
CR^2	0.006137	0.125449	0.048922	0.9612
LG^2	0.001844	0.001274	1.446872	0.1541
NIM^2	-0.000754	0.002167	-0.347773	0.7294
NBEB^2	-4.27E-05	4.57E-05	-0.933570	0.3549
DUM47^2	-0.002943	0.001645	-1.789256	0.0795
LQ(-1)^2	0.005636	0.002247	2.507873	0.0154

R-squared	0.197741	Mean dependent var	0.001409
Adjusted R-squared	0.087627	S.D. dependent var	0.001552
S.E. of regression	0.001482	Akaike info criterion	-10.06470
Sum squared resid	0.000112	Schwarz criterion	-9.783002
Log likelihood	304.9087	Hannan-Quinn criter.	-9.954738
F-statistic	1.795782	Durbin-Watson stat	1.847910
Prob(F-statistic)	0.108399		

Appendix 4: Test of autocorrelation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.038758	Prob. F(2,49)	0.9620
Obs*R-squared	0.093188	Prob. Chi-Square(2)	0.9545

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 12/18/17 Time: 13:12

Sample: 2 60

Included observations: 59

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.004732	0.214038	-0.022110	0.9824
CAR	0.004658	0.207471	0.022453	0.9822
CR	0.002753	0.381712	0.007212	0.9943
LG	0.001509	0.035856	0.042090	0.9666
NIM	0.000427	0.055591	0.007683	0.9939
NBEB	0.000748	0.022853	0.032752	0.9740
DUM47	-0.002625	0.047316	-0.055486	0.9560
LQ(-1)	-0.005672	0.090423	-0.062727	0.9502
RESID(-1)	0.034466	0.180163	0.191307	0.8491
RESID(-2)	-0.028159	0.148688	-0.189383	0.8506
R-squared	0.001579	Mean dependent var		4.05E-17
Adjusted R-squared	-0.181804	S.D. dependent var		0.037853
S.E. of regression	0.041151	Akaike info criterion		-3.389892
Sum squared resid	0.082975	Schwarz criterion		-3.037767
Log likelihood	110.0018	Hannan-Quinn criter.		-3.252437
F-statistic	0.008613	Durbin-Watson stat		1.966432
Prob(F-statistic)	1.000000			

Appendix 5: Model Specification test

Ramsey RESET Test

Equation: EQ01

Specification: LQ C CAR CR LG NIM NBEB

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.228072	53	0.2248
F-statistic	1.508161	(1, 53)	0.2248
Likelihood ratio	1.683511	1	0.1945

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.004574	1	0.004574
Restricted SSR	0.165308	54	0.003061
Unrestricted SSR	0.160734	53	0.003033

LR test summary:

	Value	df
Restricted LogL	91.69242	54
Unrestricted LogL	92.53417	53

Unrestricted Test Equation:

Dependent Variable: LQ

Method: Least Squares

Date: 12/18/17 Time: 13:14

Sample: 1 60

Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.525101	1.818188	0.838802	0.4053
CAR	-1.028818	1.515382	-0.678917	0.5001
CR	-0.236032	0.535248	-0.440977	0.6610
LG	-0.264800	0.376562	-0.703204	0.4850
NIM	-0.379081	0.542340	-0.698973	0.4876
NBEB	-0.138563	0.202315	-0.684885	0.4964
FITTED^2	2.061599	1.678728	1.228072	0.2248

R-squared	0.560344	Mean dependent var	0.570660
Adjusted R-squared	0.510571	S.D. dependent var	0.078717
S.E. of regression	0.055070	Akaike info criterion	-2.851139
Sum squared resid	0.160734	Schwarz criterion	-2.606799
Log likelihood	92.53417	Hannan-Quinn criter.	-2.755564
F-statistic	11.25811	Durbin-Watson stat	1.228648
Prob(F-statistic)	0.000000		

Appendix6: Raw data used for analysis

BANK	Year	CAR	CR	LG	LQ	NBEB	NIM
1	2011	0.12052	0.037723	0.281799	0.477535	8.952068	0.257988
1	2012	0.12576	0.027801	0.394155	0.559956	8.820261	0.464598
1	2013	0.116185	0.023632	0.406404	0.574775	8.964222	0.468504
1	2014	0.117475	0.023224	0.190552	0.556378	9.113393	0.5139
1	2015	0.126339	0.017698	0.367699	0.62878	9.184404	0.494937
1	2016	0.1263	0.015493	0.240528	0.627787	9.393424	0.558601
2	2011	0.12052	0.020293	0.233892	0.514631	9.022985	0.290942
2	2012	0.12576	0.021944	0.304486	0.565164	8.952972	0.370685
2	2013	0.116185	0.022979	0.089803	0.546534	9.067315	0.400063
2	2014	0.117475	0.021111	0.088463	0.533309	9.235884	0.361146
2	2015	0.126339	0.01711	0.20186	0.571971	9.20116	0.404187
2	2016	0.1263	0.017347	0.101082	0.548308	9.453558	0.391889
3	2011	0.090794	0.073006	0.097674	0.518808	8.809311	0.458946
3	2012	0.11003	0.029094	0.18473	0.546977	8.79873	0.561235
3	2013	0.109018	0.021721	0.213633	0.532355	8.79308	0.631613
3	2014	0.13559	0.018573	0.098182	0.54021	8.830754	0.481118
3	2015	0.132471	0.015918	0.166807	0.53114	9.054777	0.577321
3	2016	0.126243	0.011733	0.3567	0.573446	9.313735	0.546224
4	2011	0.165903	0.047518	0.16914	0.466283	8.843571	0.300221
4	2012	0.192177	0.024921	0.252386	0.604179	8.881701	0.425046
4	2013	0.176107	0.0229	0.317948	0.607231	8.833018	0.530259
4	2014	0.185988	0.016983	-0.01256	0.539949	9.050404	0.512561
4	2015	0.176085	0.012663	0.341111	0.615131	9.034161	0.543419
4	2016	0.173312	0.010244	0.236219	0.677545	9.162005	0.572767
5	2011	0.116675	0.028561	0.265369	0.52527	8.868562	0.399255
5	2012	0.125382	0.023809	0.252321	0.590475	8.8058	0.505519
5	2013	0.120384	0.019034	0.158654	0.57335	8.83402	0.537605
5	2014	0.132639	0.01462	0.080762	0.531411	9.073062	0.642188
5	2015	0.117419	0.012377	0.356171	0.574043	9.046418	0.593022
5	2016	0.120006	0.013175	0.24308	0.646081	9.177218	0.610009
6	2011	0.164622	0.04298	0.083948	0.514294	8.811575	0.397729
6	2012	0.184631	0.027991	0.360391	0.618063	8.844984	0.463968
6	2013	0.182177	0.025738	0.227527	0.665541	8.889308	0.579657
6	2014	0.182777	0.021081	0.220896	0.682512	9.03679	0.57958
6	2015	0.164226	0.016536	0.274847	0.705337	8.980984	0.639048
6	2016	0.159061	0.019169	0.089634	0.604682	9.197334	0.720639
7	2011	0.149411	0.018123	0.677249	0.545142	8.241048	0.110593
7	2012	0.11721	0.018231	0.568707	0.55469	8.529216	0.18355

7	2013	0.151937	0.093376	0.259854	0.5	8.338785	0.160656
7	2014	0.167284	0.09684	0.040702	0.430221	8.613273	0.266804
7	2015	0.156838	0.058544	0.654141	0.564217	8.691412	0.344827
7	2016	0.135886	0.038808	0.508577	0.593038	8.739036	0.322588
8	2011	0.098361	0.020356	0.116477	0.39697	8.283735	0.348993
8	2012	0.113593	0.014663	0.735369	0.487491	8.147002	0.460938
8	2013	0.106438	0.017308	0.524927	0.465845	8.435615	0.362288
8	2014	0.148279	0.009879	0.751923	0.668624	8.823004	0.411431
8	2015	0.123102	0.005483	0.801866	0.891151	8.699924	0.518123
8	2016	0.114907	0.006152	-0.10874	0.696501	9.235632	0.703877
9	2011	0.195243	0.014993	0.16	0.514264	8.259054	0.429825
9	2012	0.179456	0.015735	0.433283	0.550374	8.247224	0.422235
9	2013	0.184228	0.013067	0.360879	0.617759	8.285953	0.46888
9	2014	0.173817	0	0.184473	0.573502	8.716431	0.503731
9	2015	0.140297	0	0.837119	0.635181	8.783312	0.413534
9	2016	0.131769	0	0.520095	0.679458	8.949117	0.493098
10	2011	0.150866	0.010687	0.794521	0.429227	8.221943	0.239669
10	2012	0.157158	0.012922	0.535878	0.475201	8.400184	0.385057
10	2013	0.140118	0.015019	0.588469	0.523934	8.587431	0.488889
10	2014	0.121749	0	0.584481	0.505995	8.917498	0.307207
10	2015	0.103304	0	0.859005	0.645679	8.868001	0.593865
10	2016	0.116823	0	0.097514	0.552632	9.079945	0.658244