Does liquidity risk affect the performance of banks? Evidence from Egypt

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Does liquidity risk affect the performance of banks? Evidence from Egypt

Dr. Mohsen Ebied Azzam and Dr. Nisreen Mohamed Almaleeh

Abstract

The aim of this study is to examine the effect of liquidity risk on performance measures (e.g., return on equity, return on assets, and earnings per share) of banks listed in Egyptian Stock Exchange throughout the period 2009-2019.Seven hypotheses have been tested depending on different measures of banks' liquidity and measures of performance. Published data of nine Egyptian banks for the study period is used to test the hypotheses. After running correlation analysis, results revealed that deposits to liabilities ratio is significantly associated with return on equity (ROE), cash to assets ratio is positively and significantly associated with return on assets (ROA), and liquid assets to deposits ratio is correlated with bank performance measures. The results of the regression analysis revealed that cash to assets ratio and capital strength ratio have positive and significant impact on the return on assets, deposits to liabilities ratio affects positively and significantly the return on equity, while cash to assets ratio affects positively and significantly earnings per share of banks listed in Egyptian Stock Exchange.

Key words:

Egyptian banks / Profitability measures/ Liquidity measures/ Liquidity risk/ Financial performance/ Shifting Theory.

1. Introduction

The key aim of banking system is to promote organizations' and individuals' savings and efficiently direct them towards new valuable projects, which accelerates the economy growth, generates job opportunities, and improves the living standards and styles (Rose and Hudgins, 2005).Moreover, the banking system achieves several tasks as it makes payments and settlements of business transactions simpler, makes the transfer of goods and services smoother, and helps to establish new industries (Arif and Anees, 2012).Subsequently, the efficiency of banking system is considered as a vigorous requirement of economic stability and economic growth. However, diversification of services rendered by banks creates various risks, including liquidity risk that means not having sufficient cash and borrowing capacity to meet the withdrawals of customers, demands for loans, or other cash needs (Rose and Hudgins, 2005). Hence, banks find themselves forced to borrow emergency funds at higher cost to meet their immediate cash needs, which will result in reducing their earnings. (Chaplin et al., 2000).

Despite being very critical to the evaluation of bank performance, liquidity risk was given little attention compared to other types of risks faced by banks before the last decade. There have been both theoretical and regulatory discussions on main banking risks other than liquidity risk. Basel I and Basel II set out some regulatory standards for managing credit risk, operational risk, and market risk which may transform to liquidity risk (Brunnermeier and Yogo, 2009). In 2010 regulations for managing liquidity risk were introduced by Basel III and liquidity risk has obtained significant attention especially after various economic and banking crises across the world which took place in the last decade (Arif and Anees, 2012).

Referring to the Egyptian banking system, it is regulated by the Central Bank of Egypt and it is considered the principal engine for the economic growth as it is the major lending source for both the public and the private sectors in Egypt. Recently, Egyptian banking system is more liberalized and modernized system, supervised and regulated according to internationally agreed upon standards and there are different types of banks in Egyptian banking sector.

Although liquidity is not a new concept in finance literature, there has not been an agreed-upon definition for it as the concept of liquidity rises from several economic viewpoints (Adler, 2012). Liquidity can be viewed as either market liquidity or funding liquidity and they complement each other, as the easier trading securities is, the easier acquiring funds to trade securities is (Marozva, 2015).

Liquidity risk has two-fold elements which are maturity transformation and inherent liquidity. Maturity transformation is related to the maturity of the assets and the liabilities of a bank, while inherent liquidity refers to the extent to which an asset could be sold without bearing considerable losses (Goodhart, 2008). These two elements are considered to be coiled; banks should not worry about maturity transformation if they possess assets which are sellable without incurring major losses.

Various factors can play an influential role in creating liquidity problems for banks; large-scale withdrawals by depositors may cause a liquidity trap for banks (Kumar, 2008). In addition, the excessive reliance on long-term lending may produce key liquidity problems for banks (Kashyap et al., 2002), banks which rely on long term lending may encounter problems of liquidation during periods of massive liquidity crisis. It has become essential for banks to keep a sound liquidity arrangement. This can be due to several reasons; the risk of insufficient liquidity does not only affect the performance of banks, but it can also affect the bank's reputation (Jenkinson, 2008), in the case of not providing

funds to customers on timely basis, confidence in the bank may be lost. Additionally, a poor liquidity position may put the bank in a situation in which it faces compliance risk as the regulator may impose penalties against the bank (Arif and Anees, 2012).

Recently, liquidity risk has a serious concern because of globalization of the banking industry; greater competition for attracting deposits, wider variety of funding options introduced, and the technological improvements that have altered risk management policies (Akhtar,2007). Although a bank may have good asset quality, sufficient capital, and high earnings, that does not guarantee its success if it does not maintain adequate liquidity (Crowe, 2009).

Turning particularly to Egypt, financial exclusion is extremely high as the Egyptian economy is considered largely as a cash-based economy. Most Egyptians prefer using cash for performing the majority of their activities. But since 2007 Egypt was selected in the financial inclusion global initiative which aims to support access to financial services to those who are excluded from the formal banking sector besides developing new policies for digital finance (Alex Bank, 2017). The transformation to financial inclusion in the Egyptian environment creates urgent need to sound liquidity management to support banks to achieve crucial financial inclusion objectives.

Finding the relation between liquidity risk and banks' performance has been a concern to a lot of accounting researches lately. It was found that liquidity issues may have an effect on both banks' earnings and their capital structure (Arif and Anees, 2012). In addition, a bank may find itself forced to further borrow funds in order to meet customers' demand for liquidity, leading the debt to equity ratio to rise which would have an effect on the bank's capital structure.

The relation between liquidity risk and the bank's performance may occur when banks face a situation in which they are forced to sell a great portion of their illiquid assets to be able to satisfy the demand for funds, causing the fire sale risk to rise. This situation may affect banks' performance in either of two ways; it may oblige the bank to offer price discounts to attract buyers, it also may affect the balance sheets of other banks as they will be obliged to lower the values of their assets at a fire sale price (Goddard et al., 2009).This relationship may also take place at a time of liquidity shortage, when a bank may refuse to lend funds to customers, this can be considered as an opportunity loss for the bank (Diamond and Rajan, 2005). As a result, a bank with liquidity problems may lose many business opportunities which would weaken the bank's competitive advantage in contrast to its competitors.

In the light of the above, the essence of this study's problem is to examine the impact of liquidity on Egyptian banks' performance measures (e.g., return on equity, return on assets (ROA) and earnings per share (EPS)) throughout the period 2009-2019. Subsequently, the major objective of the study is to analyze the linkage among the liquidity ratios and bank performance measures besides inspecting the impact of liquidity ratios on bank performance. Liquidity risk is an increasingly important theme in accounting literature that is related to the banking sector because of its crucial impact on bank profitability especially during financial crises. The rest of this paper is structured as follows; the second section includes related literature review, the third section discusses the hypotheses development, fourth and fifth sections present the research methodology and the research results respectively, and the sixth section discusses the research conclusion.

2. Literature Review

Extant accounting research includes a bunch of theories that explain liquidity risk in banks; these theories were employed by various prior studies to explain how to encounter challenges of liquidity shortages.

Among these theories are the commercial loan theory, the shiftability theory, the income anticipation theory, and the liquidity preference theory. The commercial loan theory, also called traditional or real bills doctrine theory elaborated by Adam Smith in 1776 claims that banks should not grant long-term loans to their customers, they should only finance production processes that have short payback periods to customers. This theory is based on the fact that banks have financial obligations which are payable on demand and cannot be met if banks' assets are tied up for a long period of time (Mitchell, 1923; El-Chaarani, 2019)

Secondly, the Shiftabality theory established by Harold Moulton in 1915 and replaced the commercial loan theory. It postulates that the liquidity of banks depends on marketability or transferability of the assets, banks' ability to efficiently transfer assets in a secondary market without major delay or financial loss is the principal source of liquidity (Alshatti, 2016). Thirdly, the income anticipation theory developed by Herbert Prochnow in 1949 argues that banks should plan liquidation of long-term loans based on the anticipated cash inflows of their customers, regardless of their nature. This theory dominates the previously mentioned theories because it assures a high degree of safety and liquidity (El-Chaarani, 2019).

Lastly, Keynes (1936) presented the liquidity preference theory which suggests that the need to retain cash is affected by speculative, precautionary, and transactions motives, and that interest rate is what is paid as a price for the departure of cash, the theory also points out that interest rate is established by the assessment of the expected needs for cash, and the amount of cash available for satisfying those needs.

For the purpose of achieving this study's objectives, the shiftabality theory was followed. This theory points out that shiftabality, transferability or marketability of banks' assets is the basis for guaranteeing banks' liquidity. So it claims that banks' liquidity is ensured by holding assets that could be sold for cash without major losses. This perspective emphasizes that banks' liquidity can be achieved if it maintains assets ready to be sold provided

that the Market is ready to buy the offered assets for a reasonable discount. In this context, this study employs measures of how fast and easy banks' assets can be transferred into cash. These measures are discussed in the following sections in depth.

As the current study is trying to explore the relationship between liquidity risk and the performance of banks listed in Egyptian Stock Exchange, this section is going to be subdivided into three sections; literature review of liquidity risk measures, literature review of bank performance measures, and literature review of the relationship between liquidity and bank performance.

2.1 Literature Review of Liquidity Risk Measures

Liquidity assesses the aptitude of a financial institution to meet its financial claims at their due date without interrupting the ordinary operations or incurring additional costs. Prior studies have analysed liquidity and found that it can be classified as either structural or operational; Structural liquidity mentions the liquidity in the form of balance sheet items (assets versus liabilities), while operational liquidity presents liquidity in the form of cash flow items (Almeida et el.,2004). A number of studies have suggested that the current ratio and the working capital can be used as proxies of liquidity (Eljelly, 2004), the higher the current ratio is, the higher the level of bank liquidity. On the other side, working capital measures the absolute difference between the current assets amount and the amount of current liabilities. Therefore, it should be related to the size of the firm (Samiloglu and Demirgunes, 2008).

However, both working capital and liquidity ratios have been criticized as measures of liquidity for various reasons, this have led researchers to adopt other liquidity measures which indicates cash availability (Eljelly, 2004). The cash gab which determines `the time between cash expenditures and cash receipts from the sale of products and services, has been introduced as a replacement or a supplement to the

working capital or current ratio as a measure of liquidity risk (e.g., Brown 2000; Baser et. al., 2016).

Another considerable amount of literature investigating liquidity risk in financial institutions focused on the use of some other liquidity ratios. Numerous studies used the liquid assets to total assets ratio (Barth et al., 2002), the liquid assets to deposits ratio (Chen et al.,2018), and the liquid assets to customer and short-term funding (Kosmidou et al,2005). The higher the value of these ratios is, the more liquid banks are, and hence they are less exposed to liquidity risk.

2.2 Literature Review of Bank Performance Measures

Various studies were conducted with the purpose of identifying the core determinants of bank performance: they reached to different conclusions which show that the factors of bank performance are multiple ranging from firm-specific to macro-economic variables (Marozva,2015). A number of authors have considered capital adequacy, credit risk, deposit growth, business risk, market concentration, size of the bank, GDP, or inflation as determinants of bank performance (Flamini et. al.,2009; Akhtar et. al.,2011)

A considerable amount of literature has employed profitability measures as an indicator of bank performance (Curak et. al.,2012; Adusei, 2015). Return on assets or return on average assets is used to illustrate the aptitude of the management in producing profits from the assets owned by the bank. Whereas, return on equity or return on average equity indicates the return which shareholders acquire on their equity. Additionally, earnings per share is commonly used to estimate bank performance (Rose and Hudgins, 2005).

Moreover, the net interest margin was seriously employed by a set of prior research to assess the bank performance (e.g. Nguyen, 2012; Aysen, 2013; Ghosh, 2016) as the net interest margin measures the gap between the debit and credit interest. CAMEL model that refers to capital

adequacy, assets quality, management, earnings and liquidity is considered as the widespread model employed by regulators to evaluate bank performance (e.g., Sufian and Habibullah, 2010; Khrawish, 2011; Kouser and Saba, 2012). Another set of studies employed non-financial measures to evaluate banks' performance. Ho (2008) reported that performance of banks can be assessed by the efficiency and the effectiveness of achieving objectives. While Liu et. al. (2007) asserted that banks' performance can be evaluated by a group of factors including quality of services and products, customers' satisfaction, market share, and efficient human resources management.

2.3 Literature Review of the Relationship Between Liquidity and Bank Performance

A few studies were carried out to examine the effect of liquidity on the performance of banks. Until now, the debate about this impact is still taking place as some writers reported a positive linkage between liquidity and bank performance; others found a negative relationship, while others found mixed results or no relationship at all.

As for the first group of studies which found a positive association between liquidity and bank performance, Kosmidou et. al. (2005) concluded that there is a significant positive relation between the ratio of liquid assets to customer and short-term funding and return on assets of banks and the existence of significant positive relationship between liquidity and bank profits. These results are in line with those of (Kosmidou, 2008) which was carried out on Greek banks and proved that less liquid banks have lower return on assets. Similarly, Ifeacho and Ngalawa (2014) concluded that liquidity has a positive effect on both return on equity and return on assets. Similarly, Olagunju et.al. (2012) reported a positive association between liquidity risk and bank profitability. Moreover, they concluded that there is a bi-directional association between liquidity and profitability as each of them is significantly influenced by the other.

In same vein, Ayunku (2017) evaluated the linkage between the management of liquidity and the performance of banks in Nigeria throughout the period 2005-2014. The results indicated that return on assets has a positive but insignificant association with liquidity ratio. Therefore, the study concluded that monetary authorities should employ appropriate liquidity ratios to promote the liquidity profile of banks. Additionally, Ghurtskaia and Lemonjava (2018) inspected the association between bank profitability ratios and liquidity ratios and the results indicated that there is a positive association between liquidity ratios and profitability of banks.

Similarly, Onyekwelu et al. (2018) scrutinized the effect of liquidity on banks' financial performance during 2007-2016.Data of five banks were gathered and analysed by regression analysis. Results revealed that liquidity positively and significantly affects banks' profitability and that liquidity also has a positive and significant effect on return on capital employed. Recently, Quarshie and Djimatey (2020) examined 180 annual reports of banks in Ghana throughout the period 2006-2015 to explore the linkage between financial performance and liquidity trends. The results revealed that banks' financial performance during the study period was quite intermittent. For instance, the year 2006 recorded the lowest performance, representing 6.74% and 0.83% for (ROE) and (ROA) individually whilst 2014 was highest point, registering a return on equity of 24.23% and a return on assets of 4.57%.

A second group of authors reported that there is a negative association between liquidity and performance of banks. Molyneux and Thornton (1992) attributed this inverse association to the fact that banks are obliged to hold a portion of liquid assets by authorities. Also, it was found that liquidity problems may have an effect on banks' earnings and capital, which may lead to bankruptcy (Marozva, 2015).

Mishra and Pradhan (2019) scrutinised the effect of liquidity management on the profitability of Nepalese banks. The return on assets and return on equity were tested as the dependent variables whereas the independent variables were the capital ratio, total deposits, current ratio, liquid asset ratio, quick ratio and investment ratio. This study was based on secondary sources of data and data were collected for 18 commercial banks. The result revealed that capital ratio is positively connected with return on assets. Likewise, investment ratio and current assets ratio are associated positively with return on equity and return on assets. However, liquid asset ratio is related inversely to return on equity and return on assets. The regression results showed that coefficients are positive for current assets ratio and liquid asset ratio with return on equity.

Sahyouni and Wang (2019) investigated the effect of liquidity creation on bank performance in Syrian banks between through the period 2004-2016.The results showed that the connection between liquidity creation and bank profitability is negative (e.g., return on assets) during the time of war; while before the war this connection was not significant. Recently, Shaibu and Okafor (2020) examined the linkage between liquidity and profitability of banks using data of ten banks through the period 2006-2016.The empirical results showed that the relationship between cash to total asset ratio and liquid asset to total assets with profitability is positive and significant, and that the relationship between cash to total deposit ratio and profitability is negative and significant. It was also concluded that the current ratio and loans to total deposits had a positive and insignificant relationship with profitability.

A third group of authors found that there is a combination of both negative and positive relationships between liquidity and bank performance, For instance, Chen et. al. (2018) found that liquidity risk has a positive relationship with the net interest margin and a negative association with both return on average assets and return on average equity. They concluded that banks incur higher funding costs in the market if they hold more illiquid assets; this is due to the fact that they will have to raise funds from the market to fill the funding gap.

Similarly, Bordeleau and Graham (2010) found a nonlinear association between liquidity and profitability; they concluded that the more liquid assets a bank holds, the more profitable it is, to a specific degree beyond which additional liquid assets will decrease profitability. Other studies such as Naceur& Kandil (2009) revealed that liquidity does not affect either return on assets or return on equity significantly. In the same context, Said and Tumin (2011) indicated that liquidity does not have any impact on bank performance. Also, Khalid et al., (2019) examined the linkage between the degree of liquidity and financial performance in 31 commercial banks during the period 2010-2017.Their results showed that liquidity has not a significant influence on return on equity and return on assets. In view of all that has been mentioned so far, one may suppose that conclusions concerning the impact of liquidity on banks' performance is still ambiguous and requires further research, especially in the Egyptian banks context which was not given enough attention in prior literature.

3. Hypotheses Development

After the banking crises which took place in the last decade, liquidity risk has caught the attention of both accounting researchers and regulatory authorities. Liquidity risk is believed to have an overwhelming impact on the performance of banks; it may also affect a bank's capital and earnings adversely. In the absence of proper liquidity management plans, banks may find themselves facing severe consequences; this fact caused both financial institutions and regulatory authorities to become increasingly cautious about the liquidity positions of banks.

Deposits are known to be considered very crucial to banking business; banks' operations are funded mostly depending on deposits. In the case of savers withdrew their deposits from the bank, a liquidity trap will be created, and the bank will be forced to borrow additional funds with higher costs prevailing in the market in order to be able to continue its operations. On the other hand, enough deposits will help the bank to avoid such problem. Accordingly, the percentage of deposits to total liabilities of a bank may have an effect on its financial performance; this discussion postulates the following hypothesis:

H1: *The deposits to liabilities ratio is associated significantly with the return on equity of banks listed in Egyptian Stock Exchange*.

Banks try to retain sufficient funds in order to meet the unexpected withdrawals made by depositors, but maintaining a high level of cash is very expensive for a bank due to the fact that maintaining large cash amounts may make the bank lose numerous investment opportunities available at the market; unused money creates opportunity costs, as this money can be used to settle high-interest debts, invest in shares, make acquisitions, or increase the amount of dividends paid to shareholders. Accordingly, banks should manage their asset portfolio carefully in order to encounter liquidity needs while seeking the highest returns from any assets acquired. This discussion leads to the following hypothesis.

H2*: There is a positive and significant association between the percentage of cash to total assets and return on assets of banks listed in Egyptian Stock Exchange*.

In the banking system, most of the current assets held by a bank are funded with deposits, these deposits in turn are mostly current i.e., they can be called any time. This condition refers to a liquidity gap which will cause liquidity risk. (Goodhart, 2008). This conjecture tries to tie the sources and uses of funds through using the liquid assets to deposits ratio in order to examine its effect on the performance of banks through the following third hypothesis:

H3: *The liquid assets to deposits ratio is negatively associated with the performance measures of banks listed in Egyptian stock Exchange.*

Prior research argued that liquidity ratios impact bank performance especially profitability ratios. For instance, Rasul (2013) concluded that return on assets stands for a positive and insignificant linkage with liquidity ratios of Islamic banks. Moreover, Ngyuen and Leader (2014) found that the association between liquid assets to deposits ratio and short-term financing and return on assets is positive and insignificant which indicates that liquidity does not affect bank's performance. Ismaulina and Zulfadhli (2017) examined the effect of capital adequacy, liquidity and

operational efficiency on return on assets of Islamic banks during the period 2008-2015, their results indicated that return on assets is influenced positively and insignificantly by liquidity.

Mishra and Pradhan (2019) scrutinized the influence of liquidity on profitability in the private sector banks in India, their results showed that there is a negative significant influence of liquidity measures on return on assets and the cash to deposits ratio. Doan and Bui (2020) inspected the impact of liquid assets to assets and loans to deposits ratios on return on assets using the data of 26 banks in Vietnam throughout the period 2013-2018, their results revealed that return on assets is negatively affected by liquid assets to assets ratio, while it is positively influenced by loans to deposits ratio.

Mahmood et. al., (2019) examined the impact of the ratio of liquid assets to total assets and the ratio of total credit to deposits on the return of assets and return on equity using data of 18 banks in Tunisia during the period 2000-2017.The results indicated that return on assets is affected positively and significantly whereas return on equity is influenced negatively and significantly. Accordingly, the fourth hypothesis can be divided as follows:

H4a: *Cash to assets impacts positively and significantly return on assets of listed banks in Egyptian Stock Exchange.*

H4b: *Capital strength impacts positively and significantly return on assets of listed banks in Egyptian Stock Exchange.*

A bunch of research examined the relationship between the ratio of liquid assets to total assets and the ratio of liquid assets to deposits and their impact on return on assets. In this context, Mwangi (2014) found that there is a negative linkage between liquid assets to total assets ratio and liquid assets to deposits ratio from one side and return on assets form other side. Results of regression analysis revealed that liquid assets to deposits ratio impacts return on assets negatively and insignificantly. Thus, the fifth hypothesis can be divided to the following sub-hypotheses:

H5a: *There is a negative significant impact of the ratio of liquid assets to total assets on the return on assets.*

H5b: *There is a negative significant impact of the ratio of liquid assets to deposits on the return on assets.*

Prior research examined the impact of liquidity ratios on return on equity. Alshatti (2015) indicated that liquidity ratios significantly affect return on equity. In same vein, results that were reported by Alali (2019) revealed that liquidity ratios can explain about 16.7% of changes on return on equity. Based on these results, the sixth hypothesis is stated as follows:

H6: *There is a positive and significant impact of the percentage of deposits to liabilities on return of equity*.

Nabeel and Hussain (2017) examined liquidity management influence on profitability throughout the period 2006-2015.The results showed that capital adequacy ratio and quick ratio have a positive impact on profitability determinants of banks, especially earnings per share (EPS) and return on assets (ROA). Therefore, results showed that liquidity management has positive influence on banks profitability.

H7: *Cash to total assets ratio positively and significantly impacts earnings per share.*

4. Research Methodology

4.1 Sample and Data

The sample comprises of nine banks listed in Egyptian Stock Exchange (EGX) which are Commercial International Bank (CIB), Abu Dhabi Islamic Bank (ADIB), Export and development Bank (EBE), Al Baraka Bank (AB), Egyptian Gulf Bank (EGB), Suez Canal Bank (SCB), Housing and Development Bank (HDB), Qatar National Bank (QNB) and Credit Agricole Egypt (CAE). One bank was excluded as its financial statements were presented in dollars. Data was collected from the financial statements of these banks throughout the period 2009-2019.

4.2 Variables

The study employs three dependent variables which are return on assets (ROA), return on equity (ROE) and earnings per share (EPS); three explanatory variables which are liquid assets to deposits (LTD), liquid assets to assets (LTA) and cash to assets (CTA); and five control variables which are logarithm of total assets (SIZE), capital strength (CS), deposits to liabilities ratio (DTL), deposits to assets ratio (DTA), and liabilities to assets ratio (LITA).

4.3 Model Specification

The main aim of this study is to examine the impact of liquidity risk on banks' financial performance considering a set of control variables included in the following models.

$$ROA_{i,t} = \alpha + \beta 1\ LTD_{i,t} + \beta 2\ LTA_{i,t} + \beta 3\ CTA_{i,t} + \beta 4\ SIZE_{i,t} + \beta\ 5\ CS_{i,t} + \beta 6\ DTL_{i,t} + \beta 7\ DTA_{i,t} + \beta 8\ LITA_{i,t} + \varepsilon_{i,t} \quad \ldots\ldots(\mathbf{1})$$

$$ROE_{i,t} = \alpha + \beta 1\ LTD_{i,t} + \beta 2\ LTA_{i,t} + \beta 3\ CTA_{i,t} + \beta 4\ SIZE_{i,t} + \beta\ 5\ CS_{i,t} + \beta 6\ DTL_{i,t} + \beta 7\ DTA_{i,t} + \beta 8\ LITA_{i,t} + \varepsilon_{i,t} \quad \ldots.(\mathbf{2})$$

$$EPS_{i,t} = \alpha + \beta 1\ LTD_{i,t} + \beta 2\ LTA_{i,t} + \beta 3\ CTA_{i,t} + \beta 4\ SIZE_{i,t} + \beta\ 5\ CS_{i,t} + \beta 6\ DTL_{i,t} + \beta 7\ DTA_{i,t} + \beta 8\ LITA_{i,t} + \varepsilon_{i,t} \quad \ldots.(\mathbf{3})$$

Where α refers to the model constant and i, t refers the bank i in year t. $\beta 1$ till $\beta 8$ represent the model coefficients, and other variables were explained as mentioned above.

5. Results and Discussion

5.1 Descriptive Statistics

Table 1 shows main descriptive statistics especially the mean, standard deviation, skewness, kurtosis and the range, and minimum and maximum values of the variables. It is noticeable that the average of return of assets is 5.9% which is more than the average of banks in Ghana that equals 2.9% (Quarchie and Djimatey, 2020) and less that the average of banks in India that equals 158.9% and 175% according to Mishra and Pradhan (2019) and Abdullah and Jahan (2014) respectively. The minimum value of the average of return on assets equals - 0.59 and it appears in ADIB which means that the bank has losses and the maximum value of (ROA) is 3.248 and it appears in EBE that took the first position by 0.418 where SCB came in the last position by 0.005 throughout the period 2009-2019.Moreover, the standard deviation of return of assets equals 0.345 which goes in line with the values that were reported in prior research especially Mishra and Pradhan (2019) and Kaur and Sharma (2017) as the standard deviation in their samples was 0.470 and 0.467 individually[1].

[1] Appendix No. 1 presents more details regarding descriptive statistics of (ROA) according each bank in the sample.

As shown in table 1 the average of return on equity of banks is 14.1% which goes in line with the ratio of banks in Ghana that equals 14.5% (Quarchie and Djimatey, 2020). Whilst this average is less than the average of banks in India that equals 189.2% (Abdullha and Jahan,2014). According to this ratio, ADIB has the worst return during the period 2009-2019 by -35.7% on one hand and on the other hand, CIB has the highest via the period 2009-2019 by 45.9%. In addition, the maximum value equals 234.7% which was realized by CIB and the minimum value equals -263.2% which took place in ADIB. The standard deviation, skewness and kurtosis are 0.425, -1.690 and 26.975 respectively.

Table 1: Descriptive Statistics

	N	**Range**	**Min.**	**Max.**	**Mean**	**STD**	**Skewness**	**Kurtosis**
ROA	99	3.307	-.059	3.248	.059	.345	8.588	77.349
ROE	99	5.070	-2.632	2.437	.141	.425	-1.690	26.975
EPS	99	18.040	-4.270	13.770	2.334	2.533	1.561	6.477
DTL	99	9.323	.000	9.323	1.090	1.391	5.417	28.760
LTD	99	2994.805	.041	2994.84	37.583	9.289	88.931	2994.805
LTA	99	21.203	.059	21.262	.463	2.193	9.044	85.022
CTA	99	7.943	.000	7.943	.18319	.857	8.289	72.021
CS	99	26.011	.008	26.019	.448	2.725	8.850	81.745
Size	99	8.382	18.299	26.681	24.193	1.224	-1.300	6.251
LITA	99	192.325	.090	192.415	3.583	20.323	8.676	78.822

The results in table 1 shows that the average of earnings per share in Egyptian pound in the sample equals 2.334 and the maximum value is 13.770 that was achieved by HDB and a minimum value of – 4.270 that was realized by ADIB because of its accumulated losses in the study's period. Moreover, the standard deviation, skewness and kurtosis are 3.533, 1.561 and 6.477 respectively.

Additionally, the results in table 1 indicate that the average of liquid assets to deposits in the sample is 37.58. The minimum value is 0.041 that appeared in SCB whilst the maximum value is 2994.846 that appeared in CAE. The results reveal that there is a gap amongst the banks regarding liquid assets to deposits. Moreover, the values of standard deviation, skewness and kurtosis are 9.289 and 88.931 respectively[2].

Table 1 also shows that the average of liquid assets to assets is 0.463 which is consistent with the values in prior research (e.g. Mwangi, 2014) by 0.331. Analysis of this ratio reveals that CIB has the lowest value of liquid assets to assets ratio throughout the period 2009-2019 by 0.59 and on the contrary, EBE has the maximum value of liquid assets to assets by 21.262.

Finally, the results in table 1 shows that the average of capital strength is 0.448 and that the ratio of equity to assets is approximately 45% and this percentage is less than the percentage of Pakistani commercial banks that equals 51% (Gul et al.,2011). The minimum and maximum value of capital strength is 0.008 and 26.019 respectively that appeared in CIB and EBE individually. Moreover, standard deviation of capital strength, skewness and kurtosis are 2.725, 8.850 and 81.745 individually. In the same vein, table 1 shows that the average of bank size throughout the study's period is 24.193 whilst the average of liabilities to assets is 3.583.

5.2 Correlation coefficients

Table 2 presents the Pearson correlation coefficients amongst variables. The results reveal that deposits to liabilities ratio is associated significantly with return on equity by 0.328** which leads to the support of the first hypothesis that claims that deposits to liabilities ratio is significantly associated with the return on equity of banks listed in

[2] Appendix No. 2 presents more details regarding descriptive statistics of (LTD) according each bank in the sample.

Egyptian Stock Exchange. Moreover, the results disclose that correlation coefficient between cash to assets ratio and return on assets is 0.997** which proves the existence of positive and highly significant relationship between cash to assets ratio and return on assets that was postulated in the second hypothesis.

On the contrary, liquid assets to deposits ratio is related negatively with return on assets, return on equity and earnings per share, as the correlation coefficients are - 0.017, - 0.032 and - 0.032 respectively. This result is consistent with prior research (e.g., Mwangi, 2014). One plausible explanation is higher percent of liquid assets to deposits increase the opportunity cost of keeping highly liquid assets that impact negatively bank performance. Subsequently, this result supports our third conjecture that there is a negative relationship between liquid assets to deposits ratio on one hand and the three bank performance measures on the other hand.

Table 2: Correlation coefficients matrix

	ROA	ROE	EPS	LTD	LTA	CTA	SIZE	CS	DTL	DTA	LITA
ROA	1										
ROE	.031	1									
EPS	.009	.457**	1								
LTD	-.017	-.032	-.032	1							
LTA	.995**	-.007	-.027	-.009	1						
CTA	.997**	-.005	-.027	-.013	.990**	1					
SIZE	-.579**	.240*	.491**	.047	-.577**	-.607**	1				
CS	.998**	-.004	-.023	.017	.998**	.994**	-.584**	1			
DTL	-.022	.328**	-.036	-.096	-.019	-.021	.038	-.025	1		
DTA	.998**	-.005	-.027	-.022	.996**	.997**	-.593**	.998**	.004	1	
LITA	.998**	-.006	-.024	-.016	.997**	.996**	-.590**	.998**	-.028	.998**	1

**. Correlation is significant at the 0.01 level *. Correlation is significant at the 0.05 level

5.3 Regression coefficients

As shown in table 3, results of stepwise regression indicate that return on assets in listed banks in Egyptian Stock Exchange can be predicted according to several independent variables which are percentage of cash to assets , capital strength, bank size, percentage of liquid assets to deposits and percentage of liquid assets to total assets as the adjusted R^2 equals 99.8% at the level of 1% , that means that cash to assets, capital strength, size, liquid assets to deposits and liquid assets to total assets can explain approximately 99.8% of changes on bank's performance measured by return on assets.

Specifically, these results reveal that the bank size impacts positively bank's return on assets as the regression coefficient amounts to 0.007 with high significance at the level of 1%. This result is inconsistent with prior research especially Parvin et al. (2019) who referred to a positive and insignificant relationship between return on assets and bank size. Moreover, this result is inconsistent with Hakimi and Zaphdoudi (2017) who indicated that there is a negative correlation between bank's performance proxied by net interest margin and the bank's size by -0.323 and a negative insignificant impact of the size on bank's performance. In the same context, the results indicate that cash to assets and capital strength impact positively return on assets with high significance and their coefficient are 0.153 and 0.112 respectively. Subsequently, fourth hypothesis is accepted.

Table 3: stepwise regression of predicting ROA

	Coefficient	Sig.	Tolerance	VIF
Constant	- 0.179	0.000	-	-
CTA	0.153	0.000	0.759	1.318
CS	0.112	0.000	0.216	4.630
Size	0.007	0.000	0.598	1.673
LTD	- 0.003	0.000	0.671	1.491
LTA	- 0.040	0.002	.285	3.511
Model parameters				
Adjusted R^2	99.8%	-	-	-
F	11103	-	-	-
Sig.	0.000	-	-	-

On the other hand, the results in table 3 refer to a negative and highly significant impact of liquid assets to deposits ratio and liquid assets to total assets ratio on banks return on assets with regression coefficients of -0.003 and -0.040 individually at the level of 1%. This result is consistent with prior research that supports a negative linkage between liquid assets on the return of assets (e.g., Sayilgan et al., 2009; Mwangi, 2014). Accordingly, the fifth conjecture established on the existence of a negative and significant impact of liquidity risk measures especially liquid assets to deposits and liquid assets to total assets on return on assets as a bank performance measure is accepted.

Table 4: stepwise regression of predicting ROE

	Coefficient	Sig.	Tolerance	VIF
Constant	- 0.181	0.019		
DTL	0.098	0.001	0.999	1.001
Size	0.079	0.017	0.999	1.001
Model summary				
Adjusted R^2	14.2%	-	-	-
F	9.111	-	-	-
Sig.	0.000	-	-	-

Table 4 shows that the percentage of deposits to liabilities affects positively and significantly the return on equity as the regression coefficient is 0.098 at a significance level of 1%. Likewise, bank size impacts positively and significantly the return on equity with a coefficient of 0.079 at a significance level of 1%. Adjusted R^2 of regression model is 14.2 % at the level of 1%, that means that independent variables can explain nearly 14.2% of changes in return on equity. This result is consistent with Alali (2019) who reported that there is a statistical and significant effect of bank liquidity on the return on equity as liquidity ratios in Jordanian commercial banks can interpret approximately 16.7% of changes in return of equity (ROE). Based on the discussion above, the sixth hypothesis that refers to a positive and significant impact of the percentage of deposits to liabilities on return of equity is accepted.

Table 5: stepwise regression of predicting EPS

	Coefficient	Sig.	Tolerance	VIF
Constant	- 35.492	0.000		
Size	1.554	0.000	0.631	1.583
CTA	1.267	0.000	0.631	1.583
	Model summary			
Adjusted R^2	34.3%	-	-	-
F	26.625	-	-	-
Sig.	0.000	-	-	-

Table 5 shows that the percentage of cash to assets (CTA) affects positively and significantly earnings per share as its coefficient is 1.267 at a significance level of 1% Likewise, bank size impacts positively and significantly earnings per share as its coefficient is 1.554 at significance level 1%. Adjusted R^2 of the regression model is 34.3 %. Based on these results; we accept the seventh hypothesis that claims that there is a positive and significant impact of the percentage of cash to assets on earnings per share (EPS).

6. Conclusions

Profitability and liquidity can be considered as useful tools for efficient and effective banking sector management, this is because the two variables portray the strength of the banks. Liquidity reflects the bank's ability to finance assets' expansion and to pay the obligations when they are due without incurring significant losses. Moreover, managing liquidity in banks efficiently helps to ensure that banks are able to meet the demand for cash which is considered uncertain and often is subject to other external factors. Accordingly, liquidity management is a key factor in the operations of banks and it is considered fundamental for the survival and success of banks.

In the light of the above, this study examined the liquidity risk ratios and their relationship with main measures of bank's performance, especially return on assets (ROA), return on equity (ROE) and earnings per share (EPS). Then it examined the impact of liquidity ratios on banks' performance. Data of nine banks listed in Egyptian Stock Exchange were gathered throughout the period 2009-2019. Pearson correlation was utilized and it came to several key results. **Firstly**, deposits to liabilities ratio is associated significantly with return on equity (ROE). **Secondly**, cash to assets (CTA) ratio is associated positively and significantly with return on assets (ROA). **Thirdly**, liquid assets to deposits ratio (LTD) is correlated negatively with bank performance measures (e.g., ROA, ROE and EPS). Stepwise regression analysis revealed that cash to assets ratio and capital strength ratio impact positively and significantly the return on assets, deposits to liabilities ratio affects positively and significantly the return on equity whilst cash to assets ratio affects positively and significantly earnings per share of listed banks in Egyptian Stock Exchange.

Taken together, the above findings create core support for the conceptual premise that proper liquidity management can have a tremendous impact on the profitability of banks, especially in Egypt where the banking system is still going under major reforms and where the plan of economic reform is still being implemented, and achieving its objectives cannot take place unless the Egyptian banking sector is strong and sound. However, caution must be applied in interpreting those findings, as they might not be generalized to the entire Egyptian banking sector due to the number of banks included in the sample, or the study period. Accordingly, further work is required by changing the banks included in the sample, employing other measures of liquidity and profitability, or studying this association in the light of the plan of financial inclusion.

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Appendix No. 1 Descriptive Statistics of return on assets

	N	Range	Min.	Max.	Mean	STD	Skewness	Kurtosis
Sample	99	3.307	-.059	3.248	.059	.345	8.588	77.349
CIB	11	.010	.020	.031	.025	.002	.061	-.268
ADIB	11	.077	-.059	.018	-.009	.0302	-.705	-1.613
EBE	11	3.240	.009	3.248	.418	1.002	2.738	7.596
Baraka	11	.009	.007	.016	.010	.003	.658	-.956
EGB	11	.018	.001	.019	.011	.005	-.489	.428
SCB	11	.041	.000	.041	.005	.012	2.781	8.274
HDB	11	.058	.012	.070	.025	.016	2.176	5.172
QNP	11	.009	.021	.031	.023	.002	1.650	2.885
CAE	11	.021	.011	.032	.018	.007	.786	-.305

Appendix No. 2 Descriptive Statistics of liquid assets to deposits

	N	Range	Min.	Max.	Mean	STD	Skewness	Kurtosis
Sample	99	2994.805	.041	2994.846	37.583	9.289	88.931	2994.805
CIB	11	.226	.069	.295	.17896	.067255	-.308	.209
ADIB	11	.317	.115	.432	.20772	.093819	1.509	2.384
EBE	11	.224	.088	.312	.17747	.067198	.730	.172
Baraka	11	.389	.077	.466	.20070	.132625	.977	-.173
EGB	11	.220	.106	.326	.21597	.071137	.141	-1.170
SCB	11	5.417	.041	5.458	.78945	1.557124	3.249	10.675
HDB	11	.581	.145	.726	.31387	.165884	1.711	3.285
QNP	11	.138	.089	.227	.15034	.043832	.366	-1.006
CAE	11	2994.626	.220	2994.846	336.01829	906.35625	3.037	9.446

هل تؤثر مخاطر السيولة على أداء البنوك؟ دليل من مصر

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الملخص

تهدف الدراسة لاختبار مدى تأثير مخاطر السيولة على عدة مقاييس لأداء البنوك المقيدة في البورصة المصرية أهمها العائد على حقوق الملكية والعائد على الأصول ونصيب السهم من الأرباح خلال الفترة من ٢٠٠٩إلى ٢٠١٩.ولقد تم اختبار سبعة فروض رئيسية بناء على مجموعة متنوعة من مقاييس مخاطر السيولة ومجموعة متنوعة أخرى لمقاييس أداء البنوك كما تم استخدام البيانات المنشورة لتسعة بنوك لاختبار فروض الدراسة وأسفرت نتائج تحليل الارتباط عن وجود علاقة ارتباط معنوية بين معدل الودائع للالتزامات والعائد على حقوق الملكية. كما كشفت النتائج عن وجود علاقة ارتباط طردية معنوية بين معدل النقدية للأصول والعائد على الأصول، بالإضافة لوجود ارتباط بين معدل الأصول السائلة للودائع وأداء البنوك. كما أظهرت نتائج تحليل الانحدار عن وجود تأثير طردي معنوي لكل من معدل النقدية للأصول ومعدل كفاية رأس المال على العائد على أصول البنك، بالإضافة لوجود تأثير طردي معنوي لمعدل الودائع للالتزامات على العائد على حقوق الملكية، ووجود تأثير طردي معنوي لمعدل النقدية للأصول على نصيب السهم من الأرباح وذلك بالتطبيق على البنوك المقيدة في البورصة المصرية خلال فترة الدراسة.

الكلمات الدالة:

البنوك المصـــرية، مقاييس الربحية، مقاييس الســيولة، مخاطر الســيولة، الأداء المالي، نظرية التحول.