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Bank Specific and Macroeconomic Determinants of Liquidity: Evidence from Palestine

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ABSTRACT

The purpose of this paper is to investigate the impact of key bank specific and macroeconomic factors on bank liquidity for commercial banks operate in Palestine. Data are collected from the audited financial statements of the local and foreign commercial banks, association of banks in Palestine and the annual reports of Palestinian Monetary Authority (PMA). Research sample covers the periods from 2010 to 2019 by utilizing 110 bank year observations for commercial banks operate in Palestine. The study utilizes panel data regression analysis in order to explore the impact of the explanatory variables on bank liquidity. The estimation results reveal that bank size, capital and inflation rate have statistically significant association with bank liquidity with different signs. On the other hand, profitability, Z score, the growth rate of gross domestic product, funding costs and unemployment rate are not statistically significant (in at least three models). To the best of author's knowledge, the present study is the first empirical study to explore the determinants of commercial bank liquidity in Palestine. The findings are expected to provide reference and guidance to Palestine Monetary Authority (PMA) in setting policies and procedures in relation to bank liquidity management and to help banks to manage liquidity risk and determine appropriate liquidity situations.

INTRODUCTION

Bank liquidity can be defined as the ability of banks to fund increases in their assets and meet liabilities as they mature without bearing unacceptable losses. Banks are exposed to liquidity risk due to their primary role in transformation of short run deposits into long term loans (Basel Committee, 2008). Liquidity is essential to banks to enable them to provide cash on demand and credit required by clients. Lack of bank liquidity in difficult circumstances may lead to insolvency. Therefore, in Basel III accord, the Basel Committee on Banking Supervision revised and improved risk management practices of banks and renewed liquidity management by introducing "Liquidity Coverage Ratio" (LCR) and "Net Stable Funding Ratio" (NSFR). The main goal for LCR is to ensure that the bank keeps sufficient level of unencumbered, high quality liquid assets in order to meet liquidity needs for a 30 calendar day under significantly severe

liquidity situations specified by supervisors. The NSFR is designed to make sure that long run assets are financed with a minimum amount of stable obligations with regard to liquidity risk profiles (Basel Committee on Banking Supervision, 2010).

Bank liquidity and liquidity risk are significant and valid issues as banks should have a well-defined management policy in relation to liquidity. Furthermore, banks must establish liquidity control strategy that indicates specific rules for management of assets, liabilities and liquidity as well (Malik and Rafique, 2013). Maintaining adequate and optimum level of liquidity by banks is dependent on different factors; mainly banks specific and macroeconomic determinants (Bunda and Desquilbet, 2008; Berger and Bouwman, 2009; Vodova, 2011; Munteanu, 2012; Cucinelli, 2013; Fu et al., 2015; Moussa, 2015; Al-Harbi, 2017). Bank specific factors include; bank size, capital adequacy, profitability, bank risk, funding cost, quality of assets and others. Macroeconomic determinants of liquidity comprise inflation rate, gross domestic product (GDP), unemployment rate, financial crises periods, lending rates in addition to other determinants. Studies conducted in different economic environments investigate the impact of different internal bank variables and macroeconomic variables on bank liquidity (Cihak and Hesse, 2010; Munteanu, 2012; Malik and Rafique, 2013; Vodova, 2013; Fu et al., 2015; Al-Harbi, 2017). In Palestine, however, to the author's knowledge, there is no empirical research that has yet investigated that impact of bank specific and macroeconomic factors on bank liquidity for commercial banks. There are several political and economic challenges facing Palestinian Monitory Authority (PMA) as a regulatory body besides local and foreign banks as well. Among these significant challenges are: (1) the absence of a Palestinian local currency due to the political situation which makes it difficult to formulate monetary policy, and (2) the dependence of the existing multi-currency system on monetary policies adopted by currency issuing countries mainly the United States, Jordan and Israel, which might have negative effect on the liquidity situations for banks. In its financial stability report, the (PMA) points out that banks operate in Palestine are exposed to public sector and this constitutes a significant risk for banking sector, particularly due to direct government borrowings from the banking sector as well as borrowing by employees working in the public sector (Economic Forecast Report, PMA, 2018). In addition, bounced checks experienced a % 20.8 increase in number and a %38.8 increase in value in 2017 over 2016 in all currencies (Economic Forecast Report, PMA, 2018). These challenges and risks together could have significant impact on the liquidity situations for the domestic as well as the foreign banks operate in Palestine. The aim of this paper is, therefore, to explore determinants of liquidity of local and foreign commercial banks operate in Palestine. In particular, this manuscript aims to seek the answers to the following questions:

Q1: What are the most significant interbank factors that affect liquidity of commercial banks operate in Palestine?

Q2: What are the most significant macroeconomic liquidity determinants of commercial banks operate in Palestine?

The remainder of the paper is organized as follows: section 2 describes literature review and development of hypotheses, banking system in Palestine is presented in section 3, section 4 presents methodology including data, variables and model specification, empirical results and discussions are described in section 5. Finally, conclusions that have been drawn from the results of the study, policy implications and limitations are presented in the last section.

1. LITERATURE REVIEW AND DEVELOPMENT OF HYPOTHESES

Banks play a crucial role in the economies by providing cash to investors and borrowers constantly. The liquidity situation of banks has received substantial attention by researchers and policy makers as well, especially at the time of global economic crises that rocked the business world and resulted in the collapse of banks with severe liquidity problems. Keeping adequate and optimum level of liquidity by bank is dependent on bank specific and macroeconomic factors (Berger and Bouwman 2009; Cihak and Hesse, 2010; Munteanu, 2012; Distinguin et al. 2013; Cucinelli, 2013; Malik & Rafique, 2013; Vodova, 2013; Fu et al., 2015; Moussa 2015; Al-Harbi, 2017; Shah et al., 2018;). Based on prior empirical research, following is the details of interbank and microeconomic factors that have impact on bank liquidi-

ty. These determinants are denoted as bank size, profitability, capital structure, funding cost, bank risk, gross domestic product, unemployment rate, and inflation.

1.1 Bank Liquidity and Size

Several studies that examine the impact of bank size on liquidity in various economic environments reveal mixed results. Many studies investigate bank size among several specific factors as an independent variable, while others include it as control variable. Some studies state that a positive relationship exists between size and bank liquidity (Berger and Bouwman, 2009; Cucinelli, 2013; Moussa, 2015; Al-Harbi, 2017). On the contrary, other studies point out that bank size is negatively related to liquidity (Singh and Sharma, 2016). The study of Dinger (2009) reveals that that smaller banks in Eastern Europe tend to hold more liquidity than larger ones. Vodova (2011) points out that the association between bank size and liquidity is overall ambiguous. The findings are in line with "too big to fail" hypothesis which states that if large banks are seeing themselves "too big to fail", they will be less motivated to hold liquidity since they relied on government intervention. The author recommends that banks should be broken down into groups according to their size; big, medium, and small in order to predict determinants of liquidity separately. Accordingly, the hypothesis is stated as follows:

H1: Bank size has positive and statistically significant effect on bank liquidity.

1.2 Bank Liquidity and Profitability

Current literature examines extensively the relationship between profitability and liquidity (Delechat et al., 2012; Cucinelli, 2013; Singh and Sharma, 2016). While profitability is significant to banks to forecast long term survival, growth and reliability of the bank liquidity are important to ensure short term existence. A trade-off exists between profitability and liquidity. Thus, holding more liquid assets implies less profitability. Therefore, high liquid assets held by bank indicates lower profitability since the bank is less risky.

Bonfim and Kim (2011) point out that profitability has an ambiguous relationship with liquidity risk for European and North American banks. Other group of studies examine profitability as one important micro-economic independent variables that affect bank liquidity. The study of Delechat et al. (2012) reveal that bank profitability in Central America is negatively associated with liquidity buffers. The study of Sahyouni and Wang (2019) also report a significant and negative association between performance and liquidity creation in banks across 18 MENA countries. In contrast, other studies show that profitability has positive impact on liquidity which is inconsistent with finance theory (Vodova, 2013; Singh and Sharma, 2016). Hence, there could be a negative association between profitability and bank liquidity. Therefore, the hypothesis is stated as follows:

H2: Bank profitability has negative and statistically significant effect on bank liquidity.

2.3 Bank Liquidity and Capital

Prior research investigates the association between capital and liquidity in banks and provides different results whether this relationship is positive or negative. A group of studies support "Financial Fragility Crowding out Hypothesis" and reveal that increased bank capital restrains liquidity creation (Diamond and Rajan, 2001). The capital requirements might be costly to banks as in some situations the bank uses reserve to provide fund to withdrawers. Diamond and Rajan (2001) argue that bank capital has negative impact on liquidity and reduces credit available to borrowers since it results in a fragile capital structure that enables depositors to withdraw cash when needed and, therefore, commits banks to create more liquidity. Distinguin et al., (2013) investigate the association between regulatory capital buffer and liquidity for U. S and European and publicly traded commercial banks and question whether banks keep or enhance their regulatory capital buffer when they face lower liquidity. The results reveal

that banks reduce regulatory capital when they finance illiquid assets with liquid liabilities or when they face higher illiquidity according to the Basel III accords. Another studies indicate that higher bank capital enhances liquidity creation by improving banks' risk-bearing abilities which is in line with "Risk absorption hypothesis". For example, Berger and Bouwman (2009) point out that the impact of bank capital and liquidity creation is positive for large banks giving support to "Risk Absorption Hypothesis", while it is negative for small banks which is consistent with "Financial Fragility Crowding out Hypothesis". Vodova (2011) states that higher bank capital adequacy ratio increases liquidity arguing that banks with high capital adequacy should be liquid. Thus, capital ratio is an indicator of bank's financial strength and is considered an important determinant of liquidity risk. Accordingly, the hypothesis is written as follows:

H3: Bank capital has positive and significant effect on bank liquidity.

2.4 Bank Liquidity and Funding Cost

Prior research examines funding cost as one of the interbank determinants of bank liquidity. Funding cost is measured as the ratio of interest expense resulted from external funding to total liabilities (Munteanu, 2012). The study of Ferrouhi and Lehadiri (2014) point out that external funding to total liabilities are positively associated with Moroccan bank's liquidity. Munteanu, (2012) also finds that funding costs has positive relationship with bank liquidity in Romania for the periods 2002-2010. The association however, is not statistically significant. These results imply that banks tend to hold more liquid assets as their external funding costs increases. However, increase in funding cost can lead to liquidity risk if banks fail to manage their liquid assets properly. This is because banks with higher interest expenses will distribute the funds back to debtors in the form of loans. Accordingly, the hypothesis is formed as follows:

H4: Funding costs of bank has positive and significant impact on bank liquidity.

2.5 Bank Liquidity and Bank Risk

Extent literature provides evidence that Z sore of banks is a significant factor that influences liquidity (Munteanu, 2012; Fu et al., 2015). Z score is a measure of bank risk representing a proxy of bank stability and solvency. Z score is calculated as the sum of equity to total assets percentage and return on assets divided by standard deviation of return on assets ratio (Cihak and Hesse, 2010). Z score is consisted of accounting measures of leverage, profitability in addition to volatility of bank (Fu et al. (2015). Berger and Bouwman, (2009) indicate that bank liquidity is negatively associated with Z score for small banks in U.S. Moreover, Munteanu, 2012 also points out that Z score has significant impact on bank liquidity in crises years (2008-2010) due to troubled loans that may cause loss in unfavourable market conditions. Fu et al. (2015) find that fragile banks have lower liquidity due to poor performance in generating expected returns to shareholders and, therefore, reports a significant negative relationship between Z score and liquidity. In the light of previous research, the hypothesis is stated as follows:

H5: Bank risk has negative and significant impact on bank liquidity.

2.6 Bank Liquidity and Gross Domestic Product

Gross Domestic Product (GDP) is regarded as a significant macroeconomic indicator for country's financial health. Prior relevant research investigates GDP as one important macroeconomic determinants of liquidity in banks. Literature provides mixed results for the impact of GDP on banks liquidity. During the boom in the economy, investments are expected to grow, which triggers demand on loans. Borrowers are expected to demand more loans to finance their investments during expansion. Accordingly, banks face shortage in liquidity due to the increasing demand on loans. This is supported by Vodova, (2011) who states that the rate of GDP has negative impact on liquidity in Czech Commercial Banks. Studies

conducted in different economic environment reveal similar results (Dinger, 2009 in Central and Eastern Europe; Vodova 2013 in Hungary; Singh and Sharma, 2016 in India). Munteanu (2012) finds that there is no statistically significant association between the growth rate of GDP and liquidity in Romanian banks. Trenca et al. (2012) examine the effect of several macroeconomic factors on bank liquidity in Italy, Cyprus, Greece, Portugal, Spain, and Croatia and find that GDP has the lowest impact on bank liquidity comparing with other factors. Dabiri et al. (2019) also report similar results and indicate that liquidity is not related to GDP in Islamic Malaysian banks. The results of other studies reveal that GDP has positive impact on bank liquidity (Bunda & Desquilbet 2008; Moussa, 2015). Accordingly, the hypothesis is written as follows:

H6: Gross domestic product has negative and significant impact on bank liquidity.

2.7 Bank Liquidity and Unemployment

Previous research includes unemployment rate as one of the significant macroeconomic determinants that has impact on bank liquidity. Trenca et al. (2012) indicate that macroeconomic factors are external factors that entity management has no control over, but may have important influence on banking industry. The study includes unemployment rate in addition to inflation rate, public deficit and GDP. The study concludes that unemployment rate has statistically positive significant effect on bank liquidity. The results also reveal that inflation rate and liquidity rate in previous period have the greatest effect on bank liquidity. Munteanu, (2012) provides similar findings and points out that unemployment rate has positive relationship with bank liquidity for Romanian commercial banks. Shah et al. (2018) examine factors affecting liquidity in Pakistan and find that the demand for loans will decrease as unemployment rate raises and, therefore, unemployment is negatively associated with liquidity applying the first measure (liquid assets/total assets), while its insignificant in relation to the second measure of bank liquidity (total loans/total deposits). Several other studies find no significant relationship between unemployment and liquidity of banks (Vodova, 2011; Ferrouhi and Lehadiri, 2014; Singh and Sharma, 2016;). Therefore, the hypothesis is stated as follows:

H7: Unemployment rate has negative and significant impact on bank liquidity.

2.8 Bank Liquidity and Inflation

Basically, inflation is a decrease in the purchasing power of people that resulted from an increase in general price levels of goods and services. Inflation could be harmful to economy as it leads to diminishing of real income of households. Furthermore, inflation may have negative impact on the ability of borrowers to pay back loans and accordingly influences bank liquidity. Vodova (2011) provides evidence that high inflation rate influences Czech commercial banks negatively. Other studies on the effect of inflation rate on bank liquidity support Vodova's findings and suggest that bank liquidity decreases due to high inflation rate (Malik and Rafique, 2013; Chagwiza, 2014). Moreover, Dabiri et al. (2019) show that price level has negative and statistically significant association with bank liquidity in short and long run in Malaysian Islamic banks. On the contrary, other empirical studies in this area indicate that banks liquidity is positively associated with high inflation rate (Trenca et al., 2012; Moussa 2015; Singh and Sharma 2016). Munteanu (2012) also state that high inflation has positive impact on Romanian commercial banks during financial crises (2008-2010), while it has negative effect for the periods between 2002-2007. Accordingly, the hypothesis is as follows:

H8: Inflation rate has negative and significant impact on bank liquidity.

3. BANKING SYSTEM IN PALESTINE

In April 1994 the Palestinian National Authority (PNA) and Israel signed Paris Protocol on Economic Relations as part of Oslo Accords. Following that, the Palestinian Monetary Authority (PMA) was established by a presidential Decree No (184) in order to regulate and implement banking and monetary policies and maintain financial stability to protect banking sector. The PMA is responsible for designing and execution of monetary policies, regulating and supervision of banks and other lending institutions operating in Palestine, in addition to development and implementation of efficient payment system (PMA, 2019). The banking system in Palestine constitutes PMA, local banks, foreign banks, money changers institutions, and specialized lending institutions. The PMA has a mission of keeping financial stability and developing a sound and secure banking system. Further, PMA ensures monetary stability by keeping inflation under control and achieves financial inclusion. There are 7 local banks in Palestine including four commercial banks and three Islamic banks having headquarter in Palestine in addition to eight foreign banks operate in Palestine and their headquarters are outside Palestine as in April 2018. In addition, there are (292) money changers including individuals and companies and six specialized lending institutions (PMA, 2019). There are many external and internal challenges influencing the economic situation in Palestine. External challenges include the occupation and the restrictions imposed over the years in addition to obstacles on the freedom of movement of goods and people. Internal challenges also include: (1) the absence of a local currency which makes it difficult to formulate monetary policy, (2) the dependence of the existing multi-currency system on monetary policies adopted by currency issuing countries mainly the United States, Jordan and Israel, and (3) the weak role of the private sector as an important force for growth (PMA, 2019). These challenges especially the absence of local currency and multi-currency system weakens the role of PMA in its ability to control monetary policies.

3. METHODOLOGY

3.1 Data

Primarily, the 14 local and foreign banks in Palestine constitute the population of the study. The sample which is investigated is composed of (4) local commercial banks and (8) foreign commercial banks as of April 2020. The (3) Islamic banks are excluded since they have special characteristics. Necessary data are collected from the audited financial statements of the local commercial banks, association of banks in Palestine and the annual reports of PMA, covering the periods from 2010 to 2019 by utilizing 110 bank year observations for commercial banks. Table 1 presents local and foreign banks operate in Palestine.

Table 1. Banks Operate in Palestine Broken Down into Local and Foreign Banks

Bank Type	*Bank Name*	*Number of Branches*	*Established Year*
Local Commercial Banks	Bank of Palestine P.L.C	73	1960
	Palestine Investment Bank	20	1995
	Al Quds Bank	39	1995
	The National Bank	28	2006
Local Islamic Banks	Palestine Islamic Bank	45	1997
	Arab Islamic Bank	25	1996
	Safa Bank	9	2016
Foreign Commercial Banks	Cairo Amman Bank	22	1986
	Arab Bank	32	1994
	Bank of Jordan	38	1994
	Egyptian Arab Land Bank	7	1994
	Jordan Ahli Bank	10	1995
	Housing Bank for Trade & Finance	15	1995
	Jordan Commercial Banks	7	1994

Source: PMA (2019)

3.2 Measurement of Variables

The underlying objective of the current study is to investigate the determinants of liquidity creation in commercial banks operate in Palestine. The variables used in the present study are largely adopted from prior related research. The study dependent variable is liquidity in commercial banks in Palestine. For the purpose of this study 4 different liquidity measures were used. L1 which is defined as liquid assets to total assets. Liquid assets are consisted of cash and cash equivalents, and other financial assets expected to be converted into cash within 3 months or on demand. L1 ratio provides information about market liquidity, the higher the ratio, the higher the capacity to absorb liquidity shocks by bank (Malik and Rafique, 2013; Vodova, 2011). The second liquidity measurement is L2 which is calculated by dividing liquid assets to deposits (Bunda and Desquilbet, 2008). This ratio provides indicator for bank liquidity assuming that the bank is not able to borrow cash in case of liquidity shortage. L2 value points out increased sensitivity related to withdrawals of deposits (Vodova, 2011). L3 is measured by dividing loans to total assets (Vodova, 2011; Roman and Sargu, 2014). This ratio indicates the portion of the total assets which is tied up in illiquid loans for the bank. High L3 ratio indicates less liquidity for the bank. L4 is defined as loans to deposits and borrowings. (Bunda and Desquilbet, 2008; Vodova, 2011). The ratio indicates that the portion of liquid assets available to depositors and borrowers, and the higher the ratio the less liquidity of bank. Definition of the dependent variable is illustrated in Table 2.

Table 2. Dependent Variable Definition

Dependent Variable	*Proxy*	*Definition*	*Literature*
Liquidity 1	L1	Liquid assets / total assets	Vodova (2011), Malik and Rafique (2013), Roman and Sargu (2014).
Liquidity 2	L2	Liquid assets / deposits	Bunda and Desquilbet (2008).
Liquidity 3	L3	Loans / total assets	Trenca et al. (2012), Roman and Sargu (2014).
Liquidity 4	L4	Loans / deposits & borrowing	Bunda and Desquilbet (2008), Shah et al. (2018).

Source: compiled by the author

Independent variables of the study are broken down into two main groups namely bank specific variables and macroeconomic variables. The bank specific factors comprise bank size, profitability, capital adequacy, funding costs and bank risk. For the purpose of measuring the independent variables for interbank variables, the following indicators are used: logarithm of total assets to measure bank size (Malik and Rafique, 2013), return on assets for bank profitability (Roman and Sargu, 2014; Shah et al., 2018), equity to total assets ratio to measure capital adequacy (Cucinelli, 2013), interest expense to total liabilities to measure funding cost (Munteanu, 2012; Shah et al., 2018), and Z score which is the sum of return on assets and equity to assets divided by the standard deviation of the return on assets to measure bank risk (Munteanu, 2012).

To measure macroeconomic factors, the following indicators are used: growth rate of gross domestic product for gross domestic products (Singh and Sharma, 2016; Shah et al., 2018), unemployment rate to measure unemployment (Shah et al., 2018), and inflation rate as an indicator for inflation (Chagwiza, 2014). Definitions of the independent variables are displayed in Table 3.

Table 3. Independent Variables Definition

Variable	*Proxy*	*Definition*	*Estimated Impact*	*Literature*
Bank Size	TOA	Logarithm of total assets	+	Malik and Rafique (2013), Aldeen et al. (2020)
Profitability	ROA	Net income / total assets	-	Roman and Sargu (2014), Shah et al. (2018)
Capital	CAP	Equity / total assets	+	Cucinelli, (2013), Malik and Rafique (2013)
Funding cost	FC	Interest expenses / total	+	Munteanu (2012), Shah et al. (2018)

		liabilities		
Bank risk	Z score	Return on assets + equity to assets divided by the standard deviation of the return on assets	-	Cihak and Hesse (2010), Munteanu (2012), Fu et al. (2015)
Gross Domestic Product	GDP	Growth rate of gross domestic product	-	Trenca et al. (2012), Munteanu (2012), Singh and Sharma (2016), Shah et al. (2018)
Unemployment	UNE	Unemployment rate	-	Singh and Sharma (2016), Shah et al. (2018)
Inflation	INF	Inflation rate	-	Munteanu (2012), Malik and Rafique (2013), Chagwiza (2014)

Source: compiled by the author

3.3 Model Specification

The study employs panel data fixed effects regression analysis for the purpose to exploring the association between bank specific and macrocosmic factors and liquidity. A balanced panel data model is utilized in this study because it gives more power to statistical tests by increasing number of observations. Moreover, panel data make control for individual heterogeneity and accordingly the risk of getting biased findings is minimized. To choose between different panel regression models (pooled OLS, Fixed Effects, and Random Effects), a number of statistical tests are performed. Fixed effects model is tested using Redundant Fixed Effects Test and Wald test. The results show that there is a significant fixed effect as the null hypothesis (parameters for explanatory variables are zero) is rejected for the four models (significant at < 1%) as displayed in Table 4. Therefore, fixed effects model is more appropriate than pooled OLS.

Table 4. Results of Redundant Fixed Effects Test and Wald test

Model	*Redundant Fixed Effects Test (Cross-section Chi-square)*	*Wald Test (Chi-square)*
	Statistic	Statistic
Model 1	120.576579*	107.7076*
Model 2	142.021944*	100.2237*
Model 3	169.913361*	138.9635*
Model 4	205.004490*	146.2532*

Note: * denote significant at the 0.01 level

Source: calculations made by the author

To test for random effects model, Breusch and Pagan's Lagrange Multiplier (LM) test is conducted and the null hypothesis (variances across entities is zero) is rejected (at < 1%). Hence, there is a significant random effects for the four models and there is no need to run a Pooled OLS (Table 5).

Table 5. Results of Breusch and Pagan's Lagrange Multiplier (LM)

Model	*Statistic*	*Probability*
Model 1	108.2769	0.0008*
Model 2	104.3755	0.0018*
Model 3	115.8890	0.0001*
Model 4	106.7868	0.0011*

Note: * denote significant at the 0.01 level

Source: calculations made by the author

In order to decide between random effects and fixed effects, a Hausman test was performed and the results are displayed in Table 6. The aim of Hausman test is to explore if there are no differences between the coefficient estimators of the random and fixed effects models. As can be observed from Table 6, the test fails to reject the null hypothesis (at <1% and <5%), which indicates that the random effects panel regression is the most appropriate model in this study.

Table 6. Results of Hausman test

Variable	*Fixed Effects*	*Random Effects*	*Difference*	*Probability*
Model 1				
TOA	-0.166976	-0.123634	0.000567	0.0687
ROA	0.141583	0.239885	0.010786	0.3439
CAP	-0.461910	-0.406487	0.001242	0.1158
FC	8.309820	5.409475	2.703491	0.0777
Z score	-0.000060	-0.000306	0.000000	0.5834
GDP	0.523681	0.521723	0.000659	0.9392
UNE	-0.185812	-0.164749	0.003877	0.7352
INF	1.018614	1.425609	0.046733	0.0597
Model 2				
TOA	-0.211019	-0.185049	0.001019	0.4160
ROA	0.458885	0.513616	0.017394	0.6782
CAP	0.010507	0.081819	0.002025	0.1130
FC	12.297889	10.802652	4.759878	0.4931
Z score	0.001236	0.001102	0.000000	0.8200
GDP	1.130974	1.112873	0.001112	0.5872
UNE	0.189666	0.203910	0.006369	0.8583
INF	1.364761	1.588547	0.083274	0.4380
Model 3				
TOA	0.105791	0.087057	0.000161	0.1395
ROA	0.597751	0.562715	0.002321	0.4671
CAP	0.166676	0.164472	0.000275	0.8943
FC	1.868285	2.950494	0.729662	0.2052
Z score	-0.002943	-0.002642	0.000000	0.1881
GDP	-0.353975	-0.361300	0.000160	0.5623
UNE	-0.527592	-0.506137	0.000879	0.4692
INF	-1.400918	-1.555752	0.012971	0.1740
Model 4				
TOA	0.164062	0.126145	0.000238	0.0141
ROA	1.169239	1.026219	0.003336	0.0133
CAP	0.096318	0.100097	0.000397	0.8496
FC	-1.091723	1.157361	1.077264	0.0302
Z score	0.000370	0.000525	0.000000	0.5769
GDP	-0.502358	-0.530316	0.000233	0.0671
UNE	-0.511747	-0.490001	0.001272	0.5421
INF	-1.448335	-1.792727	0.019202	0.0129
Note: Significance level at 0.01				

Source: calculations made by the author

Accordingly, the basic random effects regression model is specified as follows:

$$L_{it} = \beta o + \beta X_{it} + \ldots B_{kit} + U_i + \varepsilon_{it} \quad (1)$$

Where L*it* represents liquidity ratio for bank *i* in time *t*, βo is the constant, β*Xit* is the independent variable for bank *i* in time *t*, the U_i represents random effects, and ε_{it} is estimation of error. Therefore, four empirical models are estimated as below:

$$L_1 it = \beta o + \beta_{1it} SIZE + \beta_{2it} ROA + \beta_{3it} CAP + \beta_{4it} FC + \beta_{5it} Z\ score + B_{6it} GDP + \beta_{7it} UNE +$$

β_{8it} INF + U_i + ε_{it} (2)

L_2it = βo+ β_{1it}SIZE + β_{2it}ROA + β_{3it} CAP + β_{4it} FC+ β_{5it} Z score + B_{6it} *t* GDP + β_{7it} UNE +

β_{8it} INF + U_i + ε_{it} (3)

L_3it = βo + β_{1it}SIZE + β_{2it}ROA + β_{3it} CAP + β_{4it} FC+ β_{5it} Z score + B_{6it} *t* GDP + β_{7it} UNE +

β_{8it} INF + U_i + ε_{it} (4)

L_4it = βo + β_{1it}SIZE + β_{2it}ROA + β_{3it} CAP + β_{4it} FC+ β_{5it} Z score + B_{6it} *t* GDP + β_{7it} UNE +

β_{8it}INF + U_i + ε_{it} (5)

Where:

L_1it: Dependent variable (liquidity 1) where *i* = bank and *t* = time;
L_2it: Dependent variable (liquidity 2) where *i* = bank and *t* = time;
L_3it: Dependent variable (liquidity 3) where *i* = bank and *t* = time;
L_4it: Dependent variable (liquidity 4) where *i* = bank and *t* = time;
SIZE: Size of bank;
ROA: Return on assets;
CAP: Bank capital;
FC: Funding costs;
Z score: Z score for bank;
GDP: Gross domestic product;
UNE: Unemployment rate;
INF: Inflation rate;
U_i: Random effect for subject i; and
ε_{it} :Error term.

4. EMPIRICAL RESULTS AND DISCUSSIONS

4.1 Descriptive Statistics

Table 7 illustrates descriptive statistics for the dependent and independent variables of the study including 110 observations for each variable. The table shows that the highest mean value is (32.071) for Z score while return on assets (ROA) has lowest mean value for (0.00845). The standard deviation is used for the purpose of measuring dispersion in the data. Z score has the highest value of standard deviation and accordingly the highest variations (30.1215), while funding cost (FC) has the lowest variations as of (0.00456). In addition, Z score has maximum value of (106.244) and minimum value of (-90.215).

Table 7. Descriptive Statistics for Dependent and Independent Variables

Variable	*Observations*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
L1	110	0.53778834	0.230876268	0.255413	1.793639
L2	110	0.69513647	0.333035518	0.301071	2.401557
L3	110	0.37504128	0.156405437	0.014200	0.730650
L4	110	0.47034585	0.203553597	0.024042	1.084727
TOA	110	19.940953	1.0179968	18.2580	22.3094
ROA	110	0.00845768	.019282205	-.154540	0.050489
CAP	110	1.1614352	0.241634632	-1.268191	0.521017
FC	110	0.00820851	.004565459	.001052	.067522

Z score	110	32.0712941	30.131597981	-90.214957	106.244423
GDP	110	0.05480000	0.034988	-.002000	0.122000
UNE	110	0.249300	.021209	0.20900	0.2840
INF	110	0.26950	0.26791	-.0220000	.098900

Source: calculations made by the author

4.2 Unit Root Test

Unit root test is applied to check for stationarity of details for panel data. It is necessary to test stationarity of all variables in the econometric model to ensure that variables have unit root and non-stationary (Gujarati and Porter, 2009). The ADF – Fisher Chi-square test is utilized to check unit root of data. The findings of unit root test for all variables are shown in Table 8. The unit root test is estimated based on individual data series with intercept and time trend component. The results reveal that all variables (except GDP) are stationary in first level. Therefore, the null hypothesis is rejected (non-stationarity) at 1%. This indicates that all variables (except GDP) are stationary, implying that data series are stationary after the first difference at the 1% significance level.

Table 8. Unit Root Test using ADF – Fisher Chi-square

Variable	*The equation contains an intercept only*	*The equation contains intercept and trend*
	Statistic	Statistic
L1	68.997 *	58.808*
L2	72.580 *	57.083 *
L3	72.053 *	46.655 *
L4	76.500 *	50.727 *
TOA	65.450*	47.489 *
ROA	99.462 *	79.599 *
CAP	74.205 *	72.081 *
FC	90.891 *	63.413 *
Z score	116.917 *	72.613 *
GDP	32.240	13.290
UNE	55.986 *	48.943 *
INF	117.314 *	84.124 *

Note: ADF – Fisher Chi-square unit root test H0. *indicate significance at 1%

Source: calculations made by the author

4.3 Multicollinearity Analysis

To examine whether the independent variables of the study are dependent on each other or not, multicollinearity analysis is utilized. In the multiple regression model, multicollinearity exists whenever two or more of the independent variables are highly associated or correlated (Gujarati and Porter, 2009). To test the multicollinearity among the predictors, Variance Inflation Factor (VIF) test and Correlations Matrix are used. In the multiple regression model, the multicollinearity among explanatory variables is considered serious when the VIF exceeds threshold of 5. Table 9 illustrates VIF and Tolerance (inverse of VIF) for the independent variables of the study. As can be observed from the table, the VIF for all of the explanatory variables is less than 5, the highest VIF is (2.971) and this indicates that there is no multicollinearity problem in the regression model.

Table 9. Variance Inflation Factor (VIF) for the Independent Variables

Independent Variable	*VIF*	*Tolerance*
TOA	2.024	0.490
ROA	1.326	0.754
CAP	2.971	0.337

FC	2.090	0.478
Z score	1.934	0.517
GDP	2.243	0.446
UNE	2.319	0.431
INF	2.622	0.381

Source: calculations made by the author

Correlation coefficients among the explanatory factors were also utilized. As can be noticed from Table 10, no high correlations exist between the independent variables. The correlations among the independent variables are not regarded harmful until they exceed 0.80 or 0.90. This conclusion accordingly suggests that multicollinearity problem among the explanatory variables does not exist.

Table 10. Correlation Coefficients among the Independent Variables

	TOA	*ROA*	*CAP*	*FC*	*Z score*	*GDP*	*UNE*	*INF*
TOA	1							
ROA	0.327	1						
CAP	-0.588	-0.370	1					
FC	-0.433	-0.359	0.280	1				
Z score	-0.360	0.096	0.655	0.037	1			
GDP	-0.172	-0.051	-0.070	0.129	-0.026	1		
UNE	0.121	-0.124	-0.042	0.305	0.008	-0.665	1	
INF	-0.234	0.071	0.116	0.401	-0.054	0.399	-0.187	1
Crises	-0.195	-0.011	0.106	0.374	-0.065	0.254	0.076	0.685

Source: calculations made by the author

4.4 Regression Analysis

Based on the findings of the Hausman test, the present study applies a random effects panel regression model and the results are displayed in Table 11.

In model (1) liquidity is measured as liquid assets to total assets. The values of Adjusted R^2 and F-statistic are (0.474) and (12.482) respectively, which indicates the fitness of the model. The results reveal that bank size measured at ln of total assets is negatively and significantly related to liquidity ($P < 0.05$). These results are consistent with Vodova (2013) who reports negative association between bank size and liquidity and in line with "too big to fail" hypothesis which indicates that if large banks are seeing themselves as "too big to fail", they will be less motivated to hold liquid assets. Profitability measured at ROA is found to have positive but insignificant association with bank liquidity. This result is not consistent with finance theory which assumes that a trade-off exists between profitability and liquidity and holding more liquid assets implies less profitability. The results are consistent with Singh and Sharma (2016), who provide evidence that profitability has positive impact on liquidity. Capital variable measured at equity to total assets has also negative and significant impact on bank liquidity which is in line with "Financial Fragility Crowding out Hypothesis" (Diamond and Rajan, 2001; Distinguin et al., 2013). It seems that banks in Palestine tend to reduce capital when they face higher illiquidity situations. However, this is inconsistent with Vodova (2011) and Vodova (2013) who provide evidence that bank with sufficient capital adequacy ratio should be liquid. Coming to funding costs, the results show that it is positively associated with bank liquidity. However, it is not significant and gives support to Munteanu (2012) and Ferrouhi and Lehadiri (2014). These results may indicate that banks tend to increase liquidity as their external financing costs increases. Z scores is found to have negative effect on bank liquidity as expected giving support to Berger and Bouwman (2009); and Fu et al. (2015). These results raise a question about the significance of Z score as a measure of risk on bank liquidity, especially for fragile banks. In regard with the impact of macroeconomic variables on banks' liquidity, the estimation findings reveal that the growth rate of gross domestic products has positive association with liquidity which is affirmed by Bunda and Desquilbet (2008) and Moussa (2015). However, other prior studies reported negative relationship be-

tween gross domestic product and liquidity suggesting that during expansion investments are expected to grow which increases demand on borrowings and, therefore, bank's liquidity decreases (Vodova, 2011; Singh and Sharma, 2016). Unemployment rate negatively influences bank liquidity which is in harmony with Shah et al. (2018). Inflation rate explanatory factor is positively related to bank liquidity and statistically significant. This supports the results of Vodova (2011) who points out that inflation rate has negative relationship with bank liquidity in Czech assuming that inflation reduces liquidity by deteriorating overall macroeconomic environment. Contrary to this, the findings of Singh and Sharma (2016) show that inflation has positive impact on bank liquidity.

Using the liquidity measure liquid assets to deposits (model 2) reveals similar results regarding bank size in comparison with model 1. The bank size has negative and statistically significant relationship with bank liquidity. Moussa (2015) applies the same liquidity indicator and find a negative relationship between bank size and liquidity, however the relationship is not statistically significant. This is inconsistent with the study of Vodova (2011) who uses similar liquidity ratio and indicates that bank liquidity is going up in relation with the size of the bank. Profitability and capital are found to have positive but insignificant relationship with bank liquidity with is contrary to Moussa (2015) who reports negative significant relationship between profitability and capital and liquidity for Tunisian banks. The positive relationship between capital and liquidity enforces "Risk Absorption Hypothesis" indicating that higher bank capital ratio increases liquidity through improving banks' risk-bearing abilities (Berger and Bouwman 2009). Furthermore, the results could indicate that banks are not under capitalization. Funding costs, growth rate of gross domestic product and inflations rate have positive and statistically significant relationship with bank liquidity. Moreover, Z score and unemployment rate are found to have positive but statistically not significant association with bank liquidity.

When loans to total assets indicator is used to measure liquidity (model 3), the findings show that size is correlated positively and significantly with bank liquidity which is in line with Al-Harbi (2017) but doesn't support "too big to fail" hypothesis. The effect of profitability on banks' liquidity is positive and insignificant which is similar to the results of the prior two models. This gives merit to Al-Harbi (2017). The results also show that capital has positive and significant impact on liquidity. The positive effect of capital to total assets ratio is in harmony with the assumption that a bank with sufficient capital should be liquid as expected and comes in line with Vodova (2013). However, the results of Roman and Sargu, (2014) show a negative and significant link between liquidity and capital and argue that shareholders put pressure on the bank management in order to enhance profitability if they are required to increase their participation. Funding costs is positively and insignificantly related to bank liquidity. The effect of Z score on bank liquidity is negative and significant which highlights the importance of stability for liquidity creation. Banks are likely to be exposed to potential losses due to unfavorable market conditions as a result to loan impairment (Munteanu, 2012). In relation to impact of macroeconomic factors (growth rate of gross domestic products, unemployment rate, and inflation), the results show negative link between these factors and bank liquidity. Consistent with financial notion, the impact of inflation rate is statistically significant as assumed in the current study. In the high inflation periods bank loans are most likely to impair and this accordingly limits banks' ability to create liquidity. However, Trenca et al. (2012) and Al-Harbi (2017) find positive link between inflation rate and bank liquidity.

In the last model, loans to deposits plus borrowings ratio was applied to measure bank liquidity. The model has a good explanatory power (R square =0.544). Based on regression results, size is positively and significantly related to bank liquidity which is in accordance with current study's assumption. The positive coefficient of size indicates that size is a significant determinant of bank liquidity creation in Palestine which is not in harmony with "too big to fail hypothesis' and contradicts Bunda and Desquilbet (2008). Contrary to the present study's expectation, profitability has positive and significant link with liquidity which is also contrary to finance theory. It seems that banks tend to hold more liquidity as profitability increases by either increase in loans or decrease in deposits and borrowings. The level of liquidity remains almost at the same or slightly decreases in relation to profitability which is in line with Vodova (2013). The coefficient of capital is positive but not statistically significant. This result enforces the assumption that higher equity to assets ratio is accompanied with higher bank liquidity, and solvent bank is liquid as indicated by Bunda and Desquilbet (2008) and Vodova (2013). The funding costs parameter estimate is positive but insignificant similar to the results of model 1 and 3. This can be explained by

bank's sensitivity to types of funding and funding costs as this liquidity indicator (loans to deposits and borrowings) measures. Bank's liquidity is vulnerable to the selected funding sources and costs of funding. The impact of Z score on bank liquidity is positive but statistically insignificant contrary to expectations. The results also reveal that the impact of growth rate of gross domestic products on liquidity is negative. These results enforce Vodova (2013). The negative coefficient of growth rate of gross domestic products may indicate that banks hold more liquidity as they don't expect government to deal with liquidity crises in the future as pointed out by Bunda and Desquilbet (2008). The influence if inflation rate and unemployment rate on bank liquidity is negative as expected. In this model, the macroeconomic factors are inversely related to bank liquidity. It seems that banks hold higher liquidity levels during economic downturn as lending decreases.

Table 11. Regression Results for Models of the Study

Variable	*Model 1*		*Model 2*		*Model 3*		*Model 4*	
	Coefficient	*Prob.*	*Coefficient*	*Prob.*	*Coefficient*	*Prob.*	*Coefficient*	*Prob.*
SIZE	-0.123634	0.0000*	-0.185049	0.0000*	0.087057	0.0001*	0.126145	0.0000*
ROA	0.239885	0.6867	0.513616	0.5509	0.562715	0.1659	1.026219	0.0479*
CAP	-0.406487	0.0007*	0.081819	0.6321	0.164472	0.0441*	0.100097	0.3326
FC	5.409475	0.1488	10.80265	0.0498*	2.950494	0.2604	1.157361	0.7288
Z score	-0.000306	0.6752	0.001102	0.3109	-0.002642*	0.0000*	0.000525	0.4406
GDP	0.521723	0.1539	1.112873	0.0361*	-0.361300	0.1439	-0.530316	0.0920
UNE	-0.164749	0.7886	0.203910	0.8183	-0.506137	0.2249	-0.490001	0.3547
INF	1.425609	0.0022*	1.588547	0.0190*	-1.555752	0.0000*	-1.792727	0.0000*
Constant	3.000471	0.0000	4.077364	0.0000	-1.151432	0.0073	-1.898841	0.0007
R Square	0.473578		0.490729		0.560344		0.543724	
Adjusted R Square	0.435637		0.454025		0.528657		0.510840	
F-statistic	12.48217		13.36983		17.68377		16.53425	
Prob. (F-statistic)	0.000000		0.000000		0.000000		0.000000	

Note: * denote significant at the 0.05 level

Source: calculations made by the author

CONCLUSIONS

This manuscript, to the best of author's knowledge, is the first to investigate the determinants of liquidity in local and foreign commercial banks operate in Palestine. Four different liquidity indicators are employed to measure the dependent variable in separate empirical model for each. The study considers five interbank factors and three macroeconomic factors and six of them were statistically significant in some models. Based on the empirical findings, it can be concluded that bank size, capital, inflation rate and Z score are the most significant determinants of bank liquidity in Palestine in different signs. In the other direction, profitability, the growth rate of gross domestic products, funding costs and unemployment rate are not statistically significant (in at least three models).

The current study contributes to the literature as it is a stepping attempt to explore factors affecting liquidity in commercial banks in Palestine, which is useful to banks in Palestine to manage liquidity risk and determine appropriate liquidity situations. For example, negative relationship between liquidity and profitability implies that banks are encouraged to invest liquid cash in order to increase profitability, especially that customer deposits for banks in Palestine reached $ 13.118 billion in 2017, which was an increase of %11.7 compared to prior year (PMA, 2019). In addition, the findings are expected to provide reference and guidance to PMA and regulators in setting policies and procedures in relation to bank liquidity management to ensure that banking sector in Palestine is regulated properly. For example, the accumulation of bad loans has negative impact on banks' risk profiles and liquidity because it is likely to reduce banks' ability to meet their liabilities. Therefore, PMA has to monitor banks' loan policies and take actions regarding nonperforming loans. Further future research is needed to consider other important

interbank and macroeconomic factors that may have effects on bank liquidity in Palestine such as financial crises periods, growth rate, interest rate on loans and monetary policy interest rate.

This study is subject to common limitations of empirical research. However, a specific limitation is that the scope of this paper is limited to examine the determinants of liquidity for the commercial banks operate in Palestine in the period 2008-2017. The period beyond 2017 is not included due to major mergers and acquisitions. Moreover, the three Islamic banks are excluded since they have special characteristics

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