Al-Homaidi, Eissa A.; Tabash, Mosab I.; Farhan, Najib H.; Almaqtari, Faozi A.

Article

The determinants of liquidity of Indian listed commercial banks: A panel data approach

Cogent Economics & Finance

Provided in Cooperation with:
Taylor & Francis Group

Suggested Citation: Al-Homaidi, Eissa A.; Tabash, Mosab I.; Farhan, Najib H.; Almaqtari, Faozi A. (2019) : The determinants of liquidity of Indian listed commercial banks: A panel data approach, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 7, Iss. 1, pp. 1-20, https://doi.org/10.1080/23322039.2019.1616521

This Version is available at:
https://hdl.handle.net/10419/245239

Cogent Economics & Finance

ISSN: (Print) 2332-2039 (Online) Journal homepage: https://www.tandfonline.com/loi/oaef20

The determinants of liquidity of Indian listed commercial banks: A panel data approach

Eissa A. Al-Homaidi, Mosab I. Tabash, Najib H. Farhan & Faozi A. Almaqtari |

To cite this article: Eissa A. Al-Homaidi, Mosab I. Tabash, Najib H. Farhan & Faozi A. Almaqtari | (2019) The determinants of liquidity of Indian listed commercial banks: A panel data approach, Cogent Economics & Finance, 7:1, 1616521, DOI: 10.1080/23322039.2019.1616521

To link to this article: https://doi.org/10.1080/23322039.2019.1616521

Published online: 20 May 2019.

Al-Homaidi et al., *Cogent Economics & Finance* (2019), 7: 1616521
https://doi.org/10.1080/23322039.2019.1616521

cogent economics & finance

FINANCIAL ECONOMICS | RESEARCH ARTICLE

The determinants of liquidity of Indian listed commercial banks: A panel data approach

Eissa A. Al-Homaidi[1], Mosab I. Tabash[2]*, Najib H. Farhan[1] and Faozi A. Almaqtari[1]

Received: 08 February 2019
Accepted: 06 May 2019
First Published: 08 May 2019

*Corresponding author: Mosab I. Tabash, Al Ain University of Science and Technology, Al Ain, United Arab Emirates
Email: mosab.tabash@aau.ac.ae

Reviewing editor:
Stephanos Papadamou, University of Thessaly, Volos, Greece

Additional information is available at the end of the article

Abstract: The objective of this study is to examine the liquidity (LQD) determinants of Indian listed commercial banks. The study has applied both GMM and pooled, fixed and random effect models to a panel of 37 commercial banks listed on the Bombay Stock Exchange (BSE) in India for the period from 2008 to 2017. The banks' LQD was taken as a dependent variable which functioned against both bank-specific and macroeconomic determinants. The results indicated that among the bank-specific factors, bank size, capital adequacy ratio, deposits ratio, operation efficiency ratio, and return on assets ratio are found to have a significant positive impact on LQD, while assets quality ratio, assets management ratio, return on equity ratio, and net interest margin ratio are found to have a significant negative impact on LQD. With respect to macroeconomic factors, the results indicated that interest rate and exchange rate are found to have a significant effect on LQD. The Reserve Bank of India (RBI) should give benchmarks for the above mentioned ratios to achieve smooth LQD of commercial banks in India. The study recommended that bankers should consider assets quality in such a way that improves banks' performance. Finally, the current study provides useful insights for bankers, analysts, regulators, investors, and other interested parties on the LQD of listed commercial banks.

ABOUT THE AUTHORS

Eissa A. Al-Homaidi is a Ph.D. scholar in Aligarh Muslim University, India. His research interests include financial reporting, financial performance, disclosure, corporate governance, goods & service tax (GST), and demonetization.

Mosab I. Tabash is currently working as an Assistant Professor of Finance and Banking at the College of Business, Al Ain University of Science and Technology, UAE. He obtained his Ph.D. from FMS Delhi, University of Delhi. His research interests include Islamic banking and finance, monetary policies, governance, financial performance, investments, and corporate governance.

Najib H. Farhan is a Ph.D. scholar at Aligarh Muslim University, India. His areas of interests are in the field of financial reporting quality, financial performance, working capital, and corporate governance.

Faozi A. Almaqtari is a Ph.D. scholar at Aligarh Muslim University. His research interests include disclosure, corporate governance, demonetization, value relevance of BV and EPS, financial reporting quality and financial performance.

PUBLIC INTEREST STATEMENT

This study investigates the factors that are affecting the liquidity (LQD) of Indian listed banks. The LQD of banks is very important for everybody in any society. The study uses secondary data that were collected from the ProwessIQ database. Different analytical models are used to test the impact of internal and external determinants on the LQD of Indian listed banks. The results indicated that bank size, capital adequacy ratio, deposits ratio, operation efficiency ratio, and return on assets ratio are found to have a significant positive impact on LQD. The results also indicated that interest rate, and exchange rate, are found to have a significant effect on LQD. The study recommended that bankers should consider assets quality in such a way that improves banks' performance.

Subjects: Econometrics; Development Economics; Corporate Finance; Banking

Keywords: banks' liquidity; bank-specific factors; macroeconomic determinants; GMM estimation; India

1. Introduction

As banks have become one of the most vital components of any financial system, ensuring stability of the banking sector has gained significant importance as a policy initiative worldwide. Banking stability as an economic indicator can be used to determine whether an economy is robust enough to withstand both internal and external shocks. Banking stability in itself is a function of several health parameters of individual banks. For example, asset quality, LQD risk, capital adequacy, performance, etc. (Reserve Bank of India, 2013).

LQD in the context of banking may be explained as the capacity of a bank to fund asset growth and meet both expected and unforeseen cash and collateral obligations at sensible cost and without incurring unacceptable losses (Settlements, B. for I, 2008). "Liquidity risk is the bank's inability to meet such obligations as they become due, without adversely affecting the bank's financial condition" (RBI, 2012). According to the guidelines of the Reserve Bank of India (2012), "liquidity is a bank's capacity to fund an increase in assets and meet both expected and unexpected cash and collateral obligations as they become due". "Although Indian banks have largely been able to adhere to the guidelines of the Reserve Bank of India for managing liquidity, factors affecting liquidity in Indian banks remain relatively unidentified owing to a scarcity of studies on management of liquidity in Indian banks" (Bhati & Zoysa, 2012).

Many investigators, such as Ratnovski (2013), report that the primary role of banks as creators of LQD makes them vulnerable to LQD risks. Arif and Nauman Anees (2012) noted that the LQD risk is at a rate of inability of the bank to meet its financial obligations without loss of incurring undesirable expenditure. Such a situation would depend on financial stability. It is better for banks to maintain adequate liquid storage. After putting off the financial reason, assume that bank solvency is the root cause. Basel Committee on Banking Supervision (2010) suggested solvency, LQD formation by banks, and new capital rules such a situation in the future. Mandatory Seals. Matz and Neu (2007) found that LQD management was often considered a secondary risk in banking literature before the global financial crisis. However, after performance, the attention of policymakers and researchers has been drawn. However, it should be noted that subsurface literature on banks' inadequate risk management practices. So, inadequate LQD has gained considerable attention and a major concern for banks (Jenkinson, 2008).

The present study aims to examine the determinants of LQD of Indian listed commercial banks. In the process, it will empirically investigate both internal (bank-specific) and external (macroeconomic) determinants that affect the listed banks' LQD in India. The present study seeks to fill the existing gap by empirically analyzing bank specifics variables such as assets size (LOGA), capital adequacy (CA), deposits (DEP), assets quality (AQ), assets management (AM), profitability (ROA, ROE, NIM), operation efficiency (OPEF), and non-interest income (NII)), and macroeconomic determinants such as (economic activity (GDP), inflation rate (IFR), exchange rate (EXCH), and interest rate (INTRT).

The study is organized in the following manner. Section 2 presents an overview of Indian banking and LQD trends of Indian listed banks. Section 3 discusses the relevant literature of the study. Section 4 explains data and methodology used in the study. Section 5 shows the results of our empirical analysis, and Section 6 conclusion, recommendations, and directions for future research.

cogent economics & finance

2. Overview of indian banking

India has an extensive and large financial system distinguished by diversified financial institutions including both banks and non-banks (Ghosh, 2016). Since the 1990s, the Indian economy had undergone substantial liberalization and policy shifts with the objectives of improving efficiency, profitability, and productivity, thus enhancing businesses to be more competitive (Ghosh, 2016; Rina, 2009). However, due to information asymmetry, the product markets of Indian banks are moderately competitive and less opaque (Sinha & Sharma, 2016). A salient feature of the liberalization reforms was the concentration on enhancing the banking sector competition by expanding the financial system to include entrance of private and foreign banks (Ghosh, 2016). Currently, the Indian banking system comprises of 27 public banks, 26 private banks, 46 foreign banks, 56 regional rural banks, 1,574 urban cooperative banks and 93,913 rural cooperative banks, in addition to cooperative credit institutions, according to information provided by the annual database of the Reserve Bank of India (RBI). 70–73 % of the total assets of the Indian banks are reported by the public sector banks (Ghosh, 2016; Shrivastava, Sahu, & Siddiqui, 2018).

2.1. LQD trend of indian listed banks

Figure 1 shows the LQD trend of Indian listed commercial banks for the period time from 2008 to 2017. It highlights patterns of LQD holdings of nationalized, private and SBI group banks and its associates. It can be revealed that since 2009 SBI group banks have maintained high LQD as compared to public and private sector banks. Further, LQD during (2010 to 2017) was kept high by nationalized banks. Whereas private Banks showed low level of LQD as compared to other groups of banks.

3. Literature review

Spacious studies in different countries of the world have been conducted to investigate the factors that impact a bank's LQD. Previous studies of a bank's LQD can be categorized into three categories. First, empirical studies related to banks' LQD determinants that were investigated in different countries around the world. For example, Trenca, Petria, and Corovei (2015) who studied 6 countries, Roman and Camelia (2015) who studied 27 EU countries and Delechat, Henao, Muthoora, and Vtyurina (2012) who studied 7 Central American countries, Parameswar (2012) who studied 6 countries. Second, studies that compare banks LQD factors among different banks in the same region (e.g. Trenca et al. (2015) who studied country of origin, Parameswar (2012) who studied GCC, Ghenimi, Chaibi, and Omri (2017) who studied MENA region, Roman and Camelia (2015) who studied 27 EU countries, and Delechat et al. (2012) who studied Central America. Finally, studies that investigated banks' LQD determinants and focused only on a single country. For example, Singh and Sharma (2016) and Sopan and Dutta (2018) who studied India, Rashid and Jabeen (2016) and Awais and Khursheed (2016) who studied Pakistan, Munteanu (2012) who studied Romania, Horváth, Seidler, and Weill (2014) who studied Czech Republic, Moussa (2015) who studied Tunisia, Vodová and Republic (2011) who studied Czech Republic, Thi, Diep, and Nguyen (2017) who studied Vietnam, Trabelsi (2015) who studied Kingdom of Bahrain, Cucinelli (2014) who studied Eurozone, Marozva (2015) who studied South Africa) (see Table 1 below).

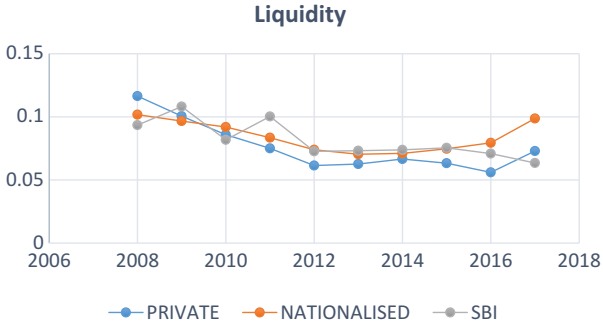

Figure 1. Liquidity of the Indian listed commercial banks.

Source: Authors' calculation.
Note: Liquidity ratio is calculated as liquid assets/total assets.

Table 1. Review of related literature in different countries

NO.	Study by	Variables/Models	Tools and methods of analysis	Sample			
				Sample	Time limit	Data	Country
1	Rashid and Jabeen (2016)	"Operating efficiency, reserves, bank size, deposit ratio, operating efficiency, gross domestic product (GDP), real interest rate (RI), market capitalization market, and market concentration ratio".	Regression analysis	22	2006 to 2012	Secondary	Pakistan
2	Munteanu (2012)	"Liquidity, capital adequacy, assets quality, interbank funding, funding cost, cost to income ratio, interest rate robor, credit risk rate, inflation rate, GDP real growth rate, and unemployment".	Regression Analysis	27	2002 to 2010	Secondary	Romania
3	Ghenimi et al. (2017)	"Liquidity risk, credit risk, capital to asset, credit risk, return on equity, net interest income to earning assets, liquidity gaps, return on asset, size of the bank, liquid assets to total assets ratio, loan growth, crisis dummy, loan assets, efficiency, income diversity, inflation rate, and GDP relative real growth GDP".	Robustness and GMM technical analysis	49	2006 to 2013	Secondary	MENA region
4	Singh and Sharma (2016)	"Liquidity, bank size, profitability, cost of funding, capital adequacy, deposits, GDP, inflation and unemployment".	Regression analysis	59	2000 to 2013	Secondary	India
5	Trenca et al. (2015)	"The share of common shareholders' equity on total assets, the logarithm of total bank assets, return on equity, revisions for loan losses/net loans, gross domestic product growth rate, inflation rate, unemployment rate, and public deficit/surplus".	GMM technical analysis	40	2005q1-2011q4	Secondary	Country of origin)Greece, Portugal, Spain, Italy, Croatia and Cyprus(
6	Horváth et al. (2014)	"Liquidity creation: broad measure, liquidity creation: narrow measure, capital, earnings volatility, credit risk, z-score, nonperforming loans, size, market share, unemployment, and inflation".	GMM technical analysis	31	2000 to 2010	Secondary	Czech

(*Continued*)

Table 1. (*Continued*)

NO.	Study by	Variables/Models	Tools and methods of analysis	Sample			
				Sample	Time limit	Data	Country
7	Roman and Camelia (2015)	"Return on average assets, return on average equity, capital adequacy, bank size, credit risk, liquidity risk, management efficiency, the diversification of business, the market concentration/competition, inflation, and the economic growth".	Regression analysis	-	2004–2011	Secondary	EU 27 countries
8	Awais and Khursheed (2016)	"Return on assets, return on equity, return on investment, current ratio, quick ratio, and liquid ratio".	Regression analysis	22	2009–2013	Secondary	Pakistan
9	Sopan and Dutta (2018)	"Liquidity risk, bank-size, deposit rate, profitability, asset quality, funding cost and the rate of capitalization, growth rate of gross domestic product (GDP) and the inflation rate".	Regression analysis	45	2005 to 2016	Secondary	India
10	Moussa (2015)	"Return on assets, return on equity, interests receivables—interest incurred/total assets, total liquid assets/total asset, total loans/total assets, operating expenses/total assets, financial expenses/total credits, size of the bank, total deposits/total assets, equity/total assets, total loans/total deposits, growth rate of gross domestic product, and rate of inflation".	Regression analysis	18	2000–2010	Secondary	Tunisia
11	Delechat et al. (2012)	"Liquidity ratio, lagged liquidity ratio, capitalization, net interest income to average earning assets, loan-loss reserves ratio, size, foreign ownership, private ownership, real GDP growth, interest rate spread, deposit volatility, inflation volatility, history of banking crisis, credit to- GDP ratio, quality of credit institutions index, deposit dollarization, net international reserves, and lender of last resort".	Regression and GMM technical analysis	100	2006 to 2010	Secondary	Central America

(*Continued*)

cogent economics & finance

Table 1. (*Continued*)

NO.	Study by	Variables/Models	Tools and methods of analysis	Sample			
				Sample	Time limit	Data	Country
12	Vodová and Republic (2011)	"Capital on total assets, non-performing loans on total volume of loans, return on equity, logarithm of total assets, financial crisis, growth rate of gross domestic product growth, inflation rate, interest rate on interbank transactions, interest rate on loans, difference between interest rate on loans, monetary policy interest rate, and unemployment rate".	Regression analysis		2001 to 2009	Secondary	Czech Republic
13	Thi et al. (2017)	"Liquidity, size of bank, return on assets, ratio of total short-term liability to equity, ratio of total loans to total deposits, and capital to asset proportion".	Regression analysis	32	2009–2016	Secondary	Vietnam
14	Trabelsi (2015)	"Liquidity risk, return on assets, return on equity, capital adequacy, financial leverage, bank size, deposits, global financial crisis, and GDP".	Regression analysis	9	2007–2013	Secondary	Kingdom of Bahrain
15	Cucinelli (2014)	"Liquidity risk, bank size, capitalization, assets quality, specialization, dummy crisis, dummy variables linked to the listed or non-listed aspect, growth rate of gross domestic product growth, and inflation rate".	Regression analysis	1080	2006 to 2010	Secondary	Eurozone
16	Marozva (2015)	"Net interest margin, market liquidity risk, credit risk, and funding liquidity risk".	ARDL and Regression technical analysis	-	1998 to 2014	Secondary	South African
17	Parameswar (2012)	"Liquid assets to customer and short-term funding, total capital adequacy ratio, return on average equity, return on average assets, net interest margin, non-performing assets, dummy variable for Oman, dummy variable for Saudi Arabia, dummy variable for Bahrain, dummy variable for United Arab Emirates, Qatar and Kuwait respectively".	Regressions analysis	67	2000 to 2009	Secondary	Gulf Cooperation Council (GCC)

cogent economics & finance

Majority of previous studies measure banks' LQD by liquid assets to total assets (Almaqtari, Al-Homaidi, Tabash, & Farhan, 2018; Delechat et al., 2012; Singh & Sharma, 2016; Sopan & Dutta, 2018). However, banks' LQD studies by previous research examined as a function of both internal and external factors. Internal factors are associated with the direct outcomes of managerial decisions of a bank (e.g. Moussa, 2015; Munteanu, 2012; Roman & Camelia, 2015; Singh & Sharma, 2016; Sopan & Dutta, 2018; Trabelsi, 2015). Several studies which have examined bank specific factors include variables such as bank size, profitability (For example, Moussa, 2015; Roman & Camelia, 2015; Singh & Sharma, 2016; Sopan & Dutta, 2018; Thi et al., 2017; Trabelsi, 2015; Trenca et al., 2015; Yahya, Akhtar, & Tabash, 2017), capital adequacy ratio (For example, Ghenimi et al., 2017; Munteanu, 2012; Roman & Camelia, 2015; Singh & Sharma, 2016; Trabelsi, 2015), deposits ratio (For example, Rashid & Jabeen, 2016; Singh & Sharma, 2016; Sopan & Dutta, 2018; Thi et al., 2017; Trabelsi, 2015), assets quality ratio (e.g. Cucinelli, 2014; Munteanu, 2012; Sopan & Dutta, 2018), assets management ratio, operation efficiency ratio (Rashid & Jabeen, 2016), while macroeconomic factors are economic activity (GDP), inflation rate (For example, Cucinelli, 2014; Ghenimi et al., 2017; Moussa, 2015; Munteanu, 2012; Rashid & Jabeen, 2016; Singh & Sharma, 2016; Sopan & Dutta, 2018; Trenca et al., 2015), exchange rate, and interest rate (e.g. Delechat et al., 2012; Vodová & Republic, 2011).

Although overall studies have been done on banks' LQD factors in different countries, comprehensive empirical evidence from emerging and developing countries are either still yielding ambiguous evidence or mixed results (Singh & Sharma, 2016). With respect to banks' LQD factors studies in the Indian context, there is a lack of studies that examine this issue.

Singh and Sharma (2016) investigated internal and external determinants that determined the Indian commercial banks' LQD. They revealed that bank ownership impacts LQD of commercial banks. They suggested that all bank-specific factors except (cost of funding) and macroeconomic determinants except (unemployment) have a significant impact on commercial banks' LQD. Further, Almaqtari et al. (2018) studied internal and external factors that influence of commercial banks' profitability in India. Sopan and Dutta (2018) investigated the bank-specific factors and macroeconomic factors that influence the banks' LQD in India. Bank-specific determinants contain bank-size, deposit rate, profitability, asset quality, funding cost and the rate of capitalization in a bank. While the macroeconomics factors include GDP and inflation rate. The results indicated that among internal (bank-specific) determinants, the size, profitability level, funding cost, and the quality of assets negatively impact the LQD risk of Indian commercial banks. Whereas, the rate of deposits and the capitalization rate have a positive influence. Amongst the macroeconomic determinants, inflation rate and GDP growth rate have a positive and negative association with bank LQD respectively.

4. Data and methodology

4.1. Data collection and sampling

To conduct this study, data of 37 listed commercial banks have been collected from India. The present study focuses only on listed commercial banks listed on the Bombay Stock Market in India. The sample of this research is based on panel data that consists of 37 listed commercial banks from the population of 42 listed banks for a period from 2008 to 2017. The bank-specific variables such as, assets size, capital adequacy, deposits, assets quality, assets management, profitability, operation efficiency, non-interest income are collected from ProwessIQ database. While the macroeconomic variables such as GDP, exchange rate, interest rate, and inflation rate are collected from World Bank. The criteria for selection of these listed banks are based on the availability of data for the period covered by this research.

In this study, banks' LQD has been used as the dependent variable, while independent variables are classified into two sections as internal and external factors. The internal determinants include: assets size, capital adequacy, assets quality, deposits, assets management, profitability, operation efficiency, non-interest income, while external factors are GDP economic activity, inflation rate, interest rate, and exchange rate.

4.2. Econometric models specification

In this study, a model is developed to identify the association between the LQD of listed commercial banks in India as a dependent variable measured by (liquid assets/total assets) and fourteen independent variables have been categorized into bank-specifies factors (Assets size, capital adequacy, deposits, assets quality, assets management, profitability, operation efficiency, non-interest income) and external factors (economic activity (GDP), inflation rate, exchange rate, and interest rate) as shown in Figure 2.

This study uses the panel data structure model that has been adopted by Chowdhury and Rasid (2017) and Masood and Ashraf (2012) which is defined as follows:

$$\gamma_{nt} = \alpha + \beta x_{nt} + \varepsilon_{nt} \tag{1}$$

Where γ_{nt} indicates the dependent variable (LQD), α, is the intercept term on the independent variables, β is a k × 1 vector of parameter to be predestined, and vector of observations is x_{nt} which is 1 ×k, t = 1,..., T; n = 1,..., N. The workable and operational form, the aforesaid model can be expressed as follows:

$$\text{Lquidity} = f(\text{Bank} - \text{specific}; \text{Macroeconomic variables}) \tag{2}$$

Where LQD is defined by liquid assets/total assets and bank-specific determinants comprise: assets size, capital adequacy, deposits, assets quality, assets management, profitability, operation efficiency, non-interest income, and macroeconomic factors comprise: economic activity, inflation rate, interest rate, and exchange rate.

Expanding the indicators adopted in model 2 will give us the following model:

$$LQD_{it} = \alpha_i + \beta_1 LogAS_{it} + \beta_2 CA_{it} + \beta_3 DP_{it} + \beta_4 AQ_{it} + \beta_5 AM_{it} + \beta_6 ROA_{it} + \beta_7 ROE_{it} + \beta_8 OPEF_{it} + \beta_9 NII_{it} + \beta_{10} NIM_{it} + \beta_{11} GDP_{it} + \beta_{12} IFR_{it} + \beta_{13} INTRT_{it} + \beta_{14} EXCH + \varepsilon_{it} \tag{3}$$

Where LQD = Liquidity ratio; α_i is a constant term; *i*= 1,., N and *t* = 1,., T. all other determinants are as explained in Table 2.

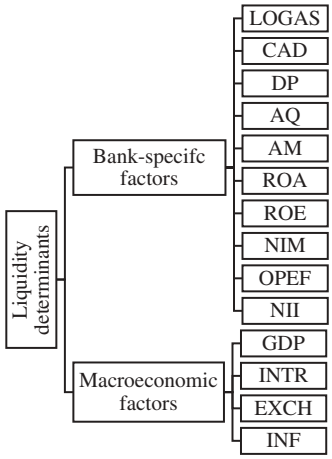

Figure 2. Bank-specific and macroeconomic factors.

Table 2. Definitions of the variables of listed commercial banks liquidity

Variables	Measure	Notation	Prior studies
Dependent variables			
Liquidity	$QD_{it} = \frac{\text{Liquid assets}_{it}}{\text{Total assets}_{it}}$	LQD	Munteanu (2012), Horváth et al. (2014), Cucinelli (2014), Roman and Camelia (2015), Moussa (2015), Singh and Sharma (2016), and Ghenimi et al. (2017), Tabash (2018).
Independent variables (bank-specific)			
Bank size	Natural Logarithm of total assets	LOGA	Delechat et al. (2012), Cucinelli (2014), Roman and Camelia (2015), Trabelsi (2015), Moussa (2015), Ghenimi et al. (2017), and Sopan and Dutta (2018).
Capital adequacy	$CAD_{it} = \frac{Equity_{it}}{Total\ assets_{it}}$	CAD	Munteanu (2012), Parameswar (2012), Munteanu (2012), Roman and Camelia (2015), Trabelsi (2015), Singh and Sharma (2016), and Ghenimi et al. (2017).
Deposits	$DEP_{it} = \frac{Deposit\ s_{it}}{Total\ assets_{it}}$	DP	Singh and Sharma (2016), Moussa (2015), Rashid and Jabeen (2016), Sopan and Dutta (2018), Thi et al. (2017), Trabelsi (2015).
Assets quality	$AQ_{it} = \frac{Loan_{it}}{Total\ assets_{it}}$	AQ	Cucinelli (2014), Munteanu (2012), and Sopan and Dutta (2018).
Assets management	$AM_{it} = \frac{\text{Operating Income}_{it}}{Total\ assets_{it}}$	AM	Rashid and Jabeen (2016).
Profitability	$ROA_{it} = \frac{Net\ profi_{it}}{Total\ assets_{it}} ROE_{it} = \frac{Net\ profi_{it}}{Total\ equity_{it}} ROE_{it} = \frac{\text{Net interest income}_{it}}{Total\ asset\ s_{it}}$	ROA ROE NIM	Marozva (2015), Moussa (2015), Roman and Camelia (2015), Trenca et al. (2015), Trabelsi (2015), Singh and Sharma (2016), Awais and Khursheed (2016), Tabash and Hassan (2017), Ghenimi et al. (2017), Thi et al. (2017), and Sopan and Dutta (2018).
Operation efficiency	$NII_{it} = \frac{\text{Total operating expense}_{it}}{Total\ assets_{it}}$	OPEF	Rashid and Jabeen (2016).
Non-Interest income	$NII_{it} = \frac{\text{Non}-\text{interest income}_{it}}{Total\ assets_{it}}$	NII	Tan and Floros (2012), Wu, Chen and Shiu (2007), and Ahamed (2017).
Independent variables (macroeconomic)			
Economic activity	Annual real GDP growth rate	GDP	Aspachs, Nier, and Tiesset (2005), Dinger (2009), Vodová (2011), Munteanu (2012), Choon, Hooi, Murthi, Yi, and Shven (2013), and Ghenimi et al. (2017).

(*Continued*)

cogent economics & finance

Table 2. (*Continued*)

Variables	Measure	Notation	Prior studies
Inflation rate	Annual inflation rate	IFR	Vodová and Republic (2011), Cucinelli (2014), Trenca et al. (2015), Ghenimi et al. (2017), and Sopan and Dutta (2018).
Exchange rate	Average in a year	EXCH	Delechat et al. (2012), Vodová and Republic (2011), Perera and Wickramanayake (2016), Issah and Antwi (2017), Almaqtari et al. (2018).
Interest rate	Lending interest	INTRT	Ongore and Kusa (2013), Perera and Wickramanayake (2016), Almaqtari et al. (2018), and Aspachs et al. (2005).

Then, following Saona (2016) who used a dynamic model which takes the following form:

$$\text{liquidity}_{it} = \beta_0 + \beta_1 \text{liquidity}_{it-1} + \sum_{j=1}^{10} \delta_j X_{it} \sum_{k=1}^{4} \theta_k Y_t + \eta_i + \mu_t + \varepsilon_{it} \quad (4)$$

Where X_{it}represents the vector of the internal factors of LQD, Y_t is the vector of the external factors of banks η_i, μ_t and ε_{it} measure the individual impact, the temporal impact, and the stochastic error, respectively. Specifically

$$\sum_{j=1}^{10} \delta_j X_{it} = \delta_1 \text{LOGAS}_{it} + \delta_2 \text{CA}_{it} + \delta_3 \text{DP}_{it} + \delta_4 \text{AQ}_{it} + \delta_5 \text{AM}_{it} + \delta_6 \text{ROA} + \delta_7 \text{ROE} + \delta_8 \text{OPEF}_{it} + \delta_9 \text{NII}_{it} + \delta_{10} \text{NIM}_{it} \quad (5)$$

And

$$\sum_{j=1}^{4} \theta_k Y_t = \theta_1 \text{GDP}_{it} + \theta_2 \text{INF}_{it} + \theta_3 \text{INTRT}_{it} + \theta_4 \text{EXCH}_{it} \quad (6)$$

Hausman test has been used to choose the convenient estimation method (fixed or random effects) model. The results indicate that fixed effect is more suitable than the random effect model because the (p-value < 0.05%) is less than 0.05% in this study (see Table 6).

4.3. Measurement of independent variables

With respect to bank specifics, the ones that have been analyzed such as assets size, capital adequacy, deposits, assets quality, assets management, profitability, operation efficiency, and non-interest income have been taken as important attributes and measures of bank specifics. Table 2 summarizes the operational definition and measurement of the independent variables of the study.

5. Data analysis and results

5.1. Descriptive statistics

Table 3 shows the results of descriptive analysis of the current study for the period from 2008 to 2017. Banks' LQD is taken as a dependent variable, while the independent variables are bank-specific and macroeconomic determinants. The bank-specific determinants include: assets size, capital adequacy, deposits, assets quality, assets management, profitability, operation efficiency, non-interest income, economic activity, inflation rate, exchange rate, and interest rate, while macroeconomic variables are economic activity, inflation rate, exchange rate, and interest rate. The maximum value of LQD is 0.33, and the minimum value is 0.00, while the average value of LQD ratio is 8%, and the standard deviation is 0.03. For bank-specific variables, the results show that LOGA is 17.12, the ratio of CA, DP, AQ, AM, ROA, ROE, OPEF, NII, and NIM have maximum values which are 0.07, 0.92, 0.70, 0.11, 2.02, 31.56, 0.14, 1.16, and 261.00, respectively. The minimum values are 9.60, 0.00, 0.52, 0.40, 0.05, −2.04, −38.60, 0.06, 0.00, and 0.00, respectively, the mean values of all bank-specific variables of LOGA, CA, DP, AQ, AM, ROA, ROE, OPEF, NII, and NIM are 13.89, 1, 82, 61, 7, 82, 10.93, 8, 4, and 3.66%, respectively, while the standard deviation values are 1.28, 1, 8, 4, 1, 70, 12.09, 1, 11, and 13.44%, respectively. In the term of macroeconomics, variables reveal that GDP, IFR, INTRT, and EXCH have maximum and minimum values of 10.26, 12.00, 7.78, 66.25 and 3.89, 4.90, 1.06, 42.02, respectively. While the mean value of macroeconomic variables is 7.33, 8.39, 4.63, and 55.77%, while the standard deviation is 1.81, 2.31, 2.25, and 8.81%, respectively.

5.2. Unit root test

Table 4 provides unit root analysis of the variables of the study. Stationarity of the data as an essential step for panel data analysis is confirmed using unit root test. Levin, Lin & Chu t, I'm, Pesaran and Shin W-stat, ADF—Fisher Chi-square and PP—Fisher Chi-square tests are applied to test the stationarity of the variables. The null hypothesis that the variables have unit root problems at the level is accepted leading to replicate the unit root test for all variables at the first difference. The outcome results in rejection of the null hypothesis at the 1st difference, leading to the confirmation that all variables don't have unit root problems at the 1st difference.

Table 3. Descriptive statistics variables

Variables	Ob. No.	Maximum	Minimum	Mean	Std. Dev.
Dependent variable (liquidity)					
LQD	370	0.33	0.00	0.08	0.03
Independent variables (bank specifics determinants)					
LOGA	370	17.12	9.60	13.89	1.28
CA	370	0.07	0.00	0.01	0.01
DP	370	0.92	0.52	0.82	0.08
AQ	370	0.70	0.40	0.61	0.04
AM	370	0.11	0.05	0.07	0.01
ROA	370	2.02	−2.04	0.82	0.70
ROE	370	31.56	−38.60	10.93	12.09
OPEF	370	0.14	0.06	0.08	0.01
NII	370	1.16	0.00	0.04	0.11
NIM	370	261.00	0.00	3.66	13.44
Independent variables (macroeconomics determinants)					
GDP	370	10.26	3.89	7.33	1.81
IFR	370	12.00	4.90	8.39	2.31
INTRT	370	7.78	1.06	4.63	2.25
EXCH	370	66.25	42.02	55.77	8.81

Note: The dependent variable **LQD** is defined as liquid assets to total assets, while independent variables classified into bank-specific factors and macroeconomic determinants. The bank-specific as: **LOGA** is the natural logarithm of total assets, **CAD** is the capital adequacy ratio (%), **ROA** is ratio of bank net profit to total assets, **ROE** is ratio of net profit to shareholders' equity, **AQ** is the asset quality (%), **DEP** is the deposits to total assets, **NII** is the non-interest income ratio, **NIM** is calculated as net interest income/total assets (%), **AM** is the asset management ratio (%), **OPEF** is the operating efficiency ratio (%). The macroeconomic factor as: "**GDP** is the real Gross domestic product, **INF** is annual inflation rate (%), **INTR** is the lending Interest rate (%), **EXCH** is the exchange rate (%)".

5.3. Correlation matrix and multicollinearity diagnostics

Table 5 reveals the association between the dependent and independent variables of the current study from 2008 to 2017. In terms of bank-specific determinants, LQD has a positive association with CA, DP, NIM, and has a negative relationship with LOGA, AQ, AM, ROA, ROE, OPEF, and NII. While in the term of macroeconomic determinants, the result shows that LQD has a positive correlation with GDP, INTRT, and has a negative relationship with IFR and EXCH.

The study further investigates the correlation between the independent variables by using the variance inflation factor (VIF). The findings of the VIF suggests that there is no multicollinearity problem among the independent variables. All values of the VIF are below 6 which indicate that multicollinearity problem between the independent variables is not present in this study. The VIF is depicted in Table 5 (see below).

5.4. Regression analysis

As explained in the fixed effect model in Table 6 for LQD, the results of fixed effect model illustrate that the value of Adjusted R-square is 0.57, which reveals that both internal determinants and external variables contribute about 57% to the LQD.

Among internal determinants, LOGA, AQ ratio, ROE ratio, OPEF ratio, and DP ratio have a significant effect on LQD. AQ ratio, ROE ratio, OPEF ratio, and DP ratio have significant effect at the level of 1% (p value =0.00 < 0.01) while LOGA has significant effect on LQD at the level of 10% (p value =0.00 < 0.10). The coefficient of LOGA, CA ratio, AM ratio, LNAS, and OPEF have a negative effect on LQD, while CA ratio, ROA ratio, ROE ratio, NII ratio, NIM ratio, and DP ratio are found to be

cogent economics & finance

Table 4. Unit root test

1ST Difference

Variables	Levin, Lin & Chu t*	I'm, Pesar an and Shin W-stat	ADF—Fisher Chi-square	PP—Fisher Chi-square
Panel A: Dependent variable (liquidity)				
LQD	0.000	0.129	0.093	0.000
Panel B: Independent variables (bank specific variables)				
LOGA	0.000	0.003	0.000	0.000
CAD	0.000	0.055	0.011	0.000
AM	0.000	0.000	0.000	0.014
ROA	0.000	0.000	0.000	0.000
ROE	0.000	0.000	0.000	0.000
NIM	0.001	0.611	0.597	0.030
NII	0.000	0.004	0.002	0.000
OPEF	0.000	0.000	0.000	0.000
Panel C: Independent variables (macroeconomic variables)				
GDP	0.000	0.000	0.000	0.000
IFR	0.000	0.000	0.000	0.000
INTRT	0.000	0.000	0.000	0.000
EXCH	0.000	0.000	0.000	0.991

Note: The dependent variable **LQD** is defined as liquid assets to total assets, while independent variables classified into bank-specific factors and macroeconomic determinants. The bank-specific as: **LOGA** is the natural logarithm of total assets, **CAD** is the capital adequacy ratio (%), **ROA** is ratio of bank net profit to total assets, **ROE** is ratio of net profit to shareholders' equity, **AQ** is the asset quality (%), **DEP** is the deposits to total assets, **NII** is the non-interest income ratio, **NIM** is calculated as net interest income/total assets (%), **AM** is the asset management ratio (%), **OPEF** is the operating efficiency ratio (%). The macroeconomic factor as: "**GDP** is the real Gross domestic product, **INF** is annual inflation rate (%), **INTR** is the lending Interest rate (%), **EXCH** is the exchange rate (%)".

a negative impact on LQD. The results supported the findings of Singh and Sharma (2016) who found that LOGA and DP ratio have a significant effect on LQD.

The above results consistent with Choon et al. (2013) who suggested that there is a significant association between bank size and LQD. However, the findings of the current study are inconsistent with that of Aspachs et al. (2005) who have suggested that bank size has an insignificant influence on LQD. The findings are inconsistent also with those of Moussa (2015) who has revealed that there is an insignificant effect of deposits on bank LQD and with that of Choon et al. (2013), Moussa (2015), and Shyam Bhati, Zoysa, and Jitaree (2015) who have revealed that there is significant effect among capital adequacy and bank LQD.

In the term of macroeconomics determinants, the findings reveal that only GDP has a significant effect on LQD, while IFR rate, INTRT rate, and EXCH rate have an insignificant impact on LQD. The coefficient of GDP, IFR rate, and INTRT rate have a positive impact on LQD, while EXCH rate has a statistically negative influence on LQD.

The findings supported by Singh and Sharma (2016) who indicated that GDP has a significant effect on LQD. It also supported by Choon et al. (2013), Moussa (2015), and Bunda and Desquilbet (2008) who have indicated that GDP has a positive impact on banks' LQD. It is inconsistent with Valla, Saes-Escorbiac, and Tiesset (2006), Aspachs et al. (2005), and Vodová (2011) who indicated that GDP has a negative association with bank LQD. The findings are consistent with Tseganesh (2012) who revealed that inflation rate has a positive influence on the LQD. It also supports the findings of Horváth et al. (2014) who reported that there is an

Table 5. Correlation analysis

Variables	LQD	LOGA	CA	DP	AQ	AM	ROA	ROE	OPEF	NII	NIM	GDP	IFR	INTRT	EXCH
Liquidity measurement (dependent variables)															
LQD	1														
Independent variables (bank specifics determinants)															
LOGA	−0.05	1													
CA	0.29	−0.61	1												
DP	0.08	−0.13	−0.19	1											
AQ	−0.39	0.22	−0.36	0.25	1										
AM	−0.40	−0.36	0.10	0.04	0.06	1									
ROA	−0.01	−0.08	−0.07	−0.34	0.05	−0.30	1								
ROE	−0.04	−0.06	−0.16	−0.04	0.22	−0.35	0.70	1							
OPEF	−0.33	−0.18	0.05	−0.01	0.02	0.73	−0.45	−0.59	1						
NII	−0.07	−0.16	0.10	−0.09	−0.18	0.23	−0.10	−0.11	0.19	1					
NIM	0.00	−0.02	0.01	0.01	0.00	−0.01	0.06	0.07	−0.03	−0.02	1				
Independent variables (macroeconomics determinants)															
GDP	0.09	−0.06	0.03	0.01	−0.05	−0.35	0.02	0.04	−0.31	−0.01	0.07	1			
IFR	−0.07	−0.11	0.03	−0.01	0.04	−0.19	0.24	0.38	−0.32	−0.15	−0.03	0.11	1		
INTRT	0.12	0.04	0.00	0.03	−0.10	0.08	−0.23	−0.34	0.20	0.09	0.04	0.14	−0.71	1	
EXCH	−0.33	0.35	−0.18	−0.03	0.25	0.29	−0.31	−0.45	0.42	0.20	−0.09	−0.15	−0.32	0.17	1
Diagnostics of multicollinearity															
VIF	3.61	2.30	1.93	1.68	2.53	5.09	5.56	1.75	1.28	1.29	1.50	2.46	2.58	2.15	

Note: The dependent variable **LQD** is defined as liquid assets to total assets, while independent variables classified into bank-specific factors and macroeconomic determinants. The bank-specific as: **LOGA** is the natural logarithm of total assets, **CAD** is the capital adequacy ratio (%), **ROA** is ratio of bank net profit to total assets, **ROE** is ratio of net profit to shareholders' equity, **AQ** is the asset quality (%), **DEP** is the deposits to total assets, **NII** is the non-interest income ratio, **NIM** is calculated as net interest income/total assets (%), **AM** is the asset management ratio (%), **OPEF** is the operating efficiency ratio (%). The macroeconomic factor as: "**GDP** is the real Gross domestic product, **INF** is annual inflation rate (%), **INTR** is the lending Interest rate (%), **EXCH** is the exchange rate (%)".

Table 6. Model estimation results summary

Variables	Pooled			Fixed			Random		
	Coeff.	t-	Prob.	Coeff.	t-	Prob.	Coeff.	t-	Prob.
C	−0.12	−1.38	0.17	0.29	1.93	0.05**	−0.04	−0.50	0.61
Bank specifics variables									
LOGA	0.06	1.43	0.15	−0.29	−1.78	0.08*	0.07	1.09	0.28
CA	0.01	0.80	0.42	0.00	−0.07	0.94	0.00	0.53	0.60
AQ	−0.08	−3.32	0.00***	−0.14	−5.64	0.00***	−0.13	−5.49	0.00***
AM	−0.02	−1.03	0.30	−0.02	−1.00	0.32	−0.01	−1.01	0.31
ROA	0.01	2.89	0.00***	0.01	1.44	0.15	0.01	2.49	0.01***
ROE	0.00	−5.87	0.00***	0.00	−3.55	0.00***	0.00	−5.38	0.00***
NII	0.00	−0.05	0.96	0.00	−0.54	0.59	0.00	−0.40	0.69
NIM	0.00	0.85	0.39	0.01	1.59	0.11	0.01	1.54	0.12
OPEF	−0.13	−7.59	0.00***	−0.06	−2.60	0.01***	−0.09	−4.65	0.00***
DP	0.06	4.01	0.00***	0.16	4.68	0.00***	0.09	4.57	0.00***
Macroeconomics variables									
GDP	0.00	−2.60	0.01***	0.00	−1.95	0.05**	0.00	−2.19	0.03**
IFR	0.00	0.14	0.88	0.00	−0.05	0.96	0.00	−0.12	0.90
INTRT	0.00	1.98	0.05**	0.00	0.54	0.59	0.00	1.55	0.12
EXCH	−0.05	−2.82	0.01***	−0.01	−0.59	0.56	−0.05	−3.24	0.00***
R-squared			0.36			0.64			0.35
Adjusted R-squared			0.33			0.57			0.32
F-statistic			12.39			9.69			12.09
Prob (F-statistic)			0.00			0.00			0.00
Husman test	0.00								

Note: significance at *1**, **5, *10 percent levels.

insignificant influence on the banks' liquid assets. It is inconsistent with the findings of Moussa (2015) and Shyam Bhati et al. (2015) who have revealed that inflation rate has a negative effect on LQD. Supported with Almaqtari et al. (2018) who suggested that LQD ratio has an insignificant effect on banks' profitability measured by ROA. The findings also supported with Al-Homaidi, Tabash, Farhan, and Almaqtari (2018) reported insignificant effect between LQD and banks' profitability measured by ROA and ROE.

The study has used the Hausman test to choose the convenient estimation method (fixed or random effects). The fixed effect regression model is more suitable than the random effects according to the Hausman test because the (p-value<0.05%) is less than 0.05% in this study.

5.5. GMM model estimation

Generalized methods of moments (GMM) is conducted to verify the results of the estimated models above. A two-step system GMM models are applied to control the problems of correlation between the lagged dependent variable and the error term. Chowdhury and Rasid (2017) stated that GMM can solve only the "fixed effect" problems by fixing the problem of correlation between the lagged of the dependent variable and the error term and the indigeneity of some of the explanatory variables. Further, the system GMM tries to deal with weak instrument problems by augmenting instruments.

Table 7. GMM model estimation

Variables	Coeff.	t-	Prob.
Lag LQD	0.747	16.33	0.000***
Bank specifics variables			
LOGA	0.456	2.37	0.023**
CA	0.022	2.16	0.038**
AQ	−0.233	−3.92	0.000***
DP	0.180	3.45	0.001**
AM	−0.798	−3.05	0.004***
OPEF	0.579	2.56	0.015***
ROA	0.008	2.28	0.029**
ROE	−0.001	−2.91	0.006***
NIM	− 0.006	−1.74	0.091*
NII	0.003	0.47	0.641
Macroeconomics variables			
GDP	−0.001	−1.17	0.249
IFR	0.012	1.34	0.188
INTRT	−0.001	−4.45	0.000***
EXCH	0.155	3.18	0.003***
Constant	−0.377	−2.14	0.039
Observations		370	
Hansen test		20.19	
p-value of Hansen test		1.000	
Sargan test		305.71	
p-value of Sargan test		0.414	
Arrellano & Bond test AR (1)		−3.99	
p-value d'AR (1)		0.000	
Arrellano & Bond test AR (2)		0.21	
p-value of AR (2)		0.833	

Note: significance at *1**, **5, *10 percent levels. Generalized Method of Moments (GMM) procedure following Manuel Arellano and Olympia Bover (1995).

The results of GMM in Table 7 confirm that there is no order correlation within the error. The p-value of the Arrellano and Bond test of second-order correlation suggests that there is no significant order correlation in both cases, ROA and ROE. Further, the Sargent test is conducted, which shows that the value of this test is more than 0.05 (LQD = 0.41), which confirms the usage of the dynamic panel data model. The results from the bank-specific determinants indicate that LOGA, CA ratio, AQ ratio, DP ratio, AM ratio, OPEF ratio, ROA ratio, ROE ratio, and NIM ratio have statistically significant impact on LQD, except NII has an insignificant impact on banks' LQD. AQ ratio, AM ratio, OPEF ratio, and ROE ratio have a statistically significant impact on LQD at the level of 1% (P-value < 0.01), while LOGA, CA ratio, DP ratio, and ROA ratio have statistically significant impact on LQD at the level of 5% (p-value<0.05). Only NIM has a statistically significant effect on LQD at the level of 10% (p-value<0.10). The coefficient value of LOGA, CA ratio, DP ratio, OPEF ratio, ROA ratio, and NII ratio have a positive effect on LQD, while AQ ratio, AM ratio, ROE ratio, and NIM ratio have a negative influence on LQD.

The findings are supported by Choon et al. (2013) who revealed that bank size has a significant association with banks' LQD. It is not supported by the findings of Aspachs et al. (2005) who suggested that bank size has an insignificant influence on banks' LQD. It is also Inconsistent with

the findings of Aspachs et al. (2005) who indicated that banks' profitability has an insignificant association with bank's LQD. This argument is also inconsistent with that of Moussa (2015) who found that deposits ratio has an insignificant effect on banks' LQD. Finally, the findings inconsistent with Choon et al. (2013), Delechat et al. (2012), and Bhati and Zoysa (2012) who suggested that capital adequacy ratio has a significant effect on banks' LQD.

In terms of macroeconomic determinants, only INTRT rate and EXCH rate have a statistically significant effect on banks' LQD at the level of 1% (p-value < 0.01), while GDP and IFR have an insignificant impact on LQD. The coefficient of macroeconomic variables reveals that GDP and INTRT rate have a statistically negative impact on LQD, while IFR rate and EXCH rate have positive effects on LQD.

The results are consistent with Bunda and Desquilbet (2008), Dinger (2009), Vodová (2011) and Aspachs et al. (2005) who agreed that GDP has a negative association with banks' LQD. This argument is inconsistent with Moussa (2015) and Choon et al. (2013) who indicated a positive influence of GDP on banks' LQD. It is supported by Tseganesh (2012) who found that inflation ratio has a positive effect on banks' LQD. It is inconsistent with that of Moussa (2015) and Shyam Bhati et al. (2015) who suggested that inflation rate has a statistically negative impact on banks' LQD.

6. Conclusion and recommendations

This study has examined the LQD determinants of Indian listed banks for the period from 2008 to 2017. The research study has used both technical analysis (pooled, fixed, and random effects) and the Generalized Method of Moments (GMM). The sample size of the current study consists of 37 listed banks which were selected among the 42 banks listed on Bombay stock exchange in India. Banks' LQD was used as a dependent variable, while the independent variables were bank-specific determinants and macroeconomic variables. The bank-specific variables included: assets size, capital adequacy ratio, deposits ratio, assets quality ratio, assets management ratio, profitability ratios, operation efficiency ratio, non-interest income ratio, while macroeconomic determinants are an economic activity (GDP), inflation rate, exchange rate, and interest rate.

The findings indicate that among the bank-specific determinants; bank size, capital adequacy ratio, assets quality ratio, deposits ratio, assets management ratio, operation efficiency ratio, return on assets ratio, net interest margin ratio, and return on equity ratio have a significant effect on banks' LQD, except non-interest income which has an insignificant impact on the banks' LQD. Assets quality ratio, assets management ratio, operation efficiency ratio, and return on equity ratio have a statistically significant influence on banks' LQD, while bank size, capital adequacy ratio, deposits ratio, and return on assets ratio have a significant impact on LQD, only net interest margin ratio has a statistically significant impact on LQD. The coefficient value of bank size, capital adequacy ratio, deposits ratio, operation efficiency ratio, return on assets ratio, and non-interest income ratio has a statistically positive effect on LQD, while assets quality ratio, assets management ratio, net interest margin ratio, and return on equity ratio have a statistically negative impact on LQD.

With respect to macroeconomic factors, only interest rate and exchange rate have a statistically significant effect on LQD, while annual real GDP growth rate and inflation rate have an insignificant effect on LQD. The coefficient of macroeconomic variables shown that annual real GDP growth rate and interest rate have a statistically negative effect on LQD, while inflation rate and exchange rate have a positive effect on LQD.

Furthermore, the current research seeks to fill an existing gap in the literature of listed commercial banks' LQD, and provides new empirical evidence using different statistical tools as a methodological contribution, and brings useful insights and empirical evidence on the internal variables and external factors of listed banks' LQD working in India. The results will be very beneficial for bankers, analysts, regulators, investors, and other interested parties to improve their consideration for LQD management of Indian listed banks. The current study also provides new insights into the internal variables

and external determinants of banks' LQD listed on Bombay Stock Exchange in India. Few investigations have investigated this issue in India and to the best of the authors' knowledge, this study is the first attempt to examine this issue using various statistical tools of analysis and panel data of the listed commercial banks in India. Therefore, this research seeks to bridge a present gap in the body of literature on listed commercial banks' LQD in India.

Funding
The authors received no direct funding for this research.

Author details
Eissa A. Al-Homaidi[1]
E-mail: eissa.alhomaidi2020@gmail.com
ORCID ID: http://orcid.org/0000-0002-6230-8276
Mosab I. Tabash[2]
E-mail: mosab.tabash@aau.ac.ae
ORCID ID: http://orcid.org/0000-0003-3688-7224
Najib H. Farhan[1]
E-mail: najib720000@gmail.com
ORCID ID: http://orcid.org/0000-0003-4919-8575
Faozi A. Almaqtari[1]
E-mail: fouzi_gazim2005@yahoo.com
ORCID ID: http://orcid.org/0000-0002-5625-3643
[1] Faculty of Commerce, Aligarh Muslim University, Aligarh, India.
[2] College of Business, Al Ain University of Science and Technology, Al Ain, United Arab Emirates.

Citation information
Cite this article as: The determinants of liquidity of Indian listed commercial banks: A panel data approach, Eissa A. Al-Homaidi, Mosab I. Tabash, Najib H. Farhan & Faozi A. Almaqtari, *Cogent Economics & Finance* (2019), 7: 1616521.

References

Ahamed, M. M. (2017). Asset quality, non-interest income, and bank profitability: Evidence from Indian banks. *Economic Modelling*, *63*, 1–14. doi: 10.1016/j.econmod.2017.01.016

Al-Homaidi, E. A., Tabash, M. I., Farhan, N. H. S., & Almaqtari, F. A. (2018). Bank-specific and macroeconomic determinants of profitability of Indian commercial banks: A panel data approach. *Cogent Economics & Finance*, *6*(1), 1–26. doi:10.1080/23322039.2018.1548072

Almaqtari, F. A., Al-Homaidi, E. A., Tabash, M. I., & Farhan, N. H. (2018). The determinants of profitability of Indian commercial banks : A panel data approach. *International Journal of Finance & Economics*, 1–18. doi:10.1002/ijfe.1655

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29–51. doi:10.1016/0304-4076(94)01642-D

Arif, A., & Nauman Anees, A. (2012). Liquidity risk and performance of banking system. *Journal of Financial Regulation and Compliance*, *20*(2), 182–195. doi:10.1108/13581981211218342

Aspachs, O., Nier, E., & Tiesset, M. (2005). *Liquidity, banking regulation and the macroeconomy: Evidence on bank liquidity holdings from a panel of UK-resident banks*. Unpublished Manuscript (pp. 1–26). UK: BIS.

Awais, M., & Khursheed, A. (2016). Impact of liquidity on profitability: A comprehensive case of Pakistan's private banking sector. *International Journal of Economics and Finance*, *8*(3), 2–7. doi:10.5539/ijef

Basel, I. I. I. (2010). *International framework for liquidity risk management, standards and monitory*. Switzerland: Bank for International Settlements.

Bhati, S., & De Zoysa, A. (2012). An examination of factors affecting liquidity management in Indian financial system. In G. T. Papanikos (Eds.), *Sixth Annual International Conference on Business and Society in a Global Economy* (pp. 21). Athens, Greece: The Athens Institute for Education and Research.

Bhati, S., Zoysa, A. D., & Jitaree, W. (2015). Determinants of liquidity in nationalised banks of India. *In World Finance & Banking Symposium*, Faculty of Business, The University of Wollongong, Australia, 1–11.

Bunda, I., & Desquilbet, J.-B. (2008). The bank liquidity smile across exchange rate regimes. *International Economic Journal*, *22*(3), 361–386. doi:10.1080/10168730802287952

Choon, L. K., Hooi, L. Y., Murthi, L., Yi, T. S., & Shven, T. Y. (2013). *The determinants influencing liquidity of Malaysia commercial banks, and its implication for relevant bodies: Evidence from 15 Malaysia commercial banks*. (pp. 1–96). Malaysia: Faculty of business and finance department of finance. Retrieved from eprints.utar.edu.my/1116/1/BF-2013-1101000.pdf

Chowdhury, M. A. F., & Rasid, M. E. S. M. (2017). Determinants of performance of Islamic banks in GCC countries: Dynamic GMM approach. *Advances in Islamic Finance, Marketing, and Management*, 49–80. doi:10.1108/978-1-78635-899-820161005

Cucinelli, D. (2014). The determinants of bank liquidity risk within the context of Euro Area. *Interdisciplinary Journal of Research in Business*, *2*(10), 51–64.

Delechat, C., Henao, C., Muthoora, P., & Vtyurina, S. (2012). *The determinants of banks' liquidity buffers in Central America*. No.12-301. USA: International Monetary Fund. doi:10.5089/9781616356675.001.

Dinger, V. (2009). Do foreign-owned banks affect banking system liquidity risk? *Journal of Comparative Economics*, *37*(4), 647–657. doi:10.1016/j.jce.2009.04.003

Ghenimi, A., Chaibi, H., & Omri, M. A. B. (2017). The effects of liquidity risk and credit risk on bank stability: Evidence from the MENA region. *Borsa Istanbul Review*, *17*(4), 238–248. doi:10.1016/j.bir.2017.05.002

Ghosh, S. (2016). Does productivity and ownership matter for growth? Evidence from Indian banks. *International Journal of Emerging Markets*, *11*(4). doi:10.1108/IJoEM-05-2015-0096

Horváth, R., Seidler, J., & Weill, L. (2014). Bank capital and liquidity creation: Granger-causality evidence. *Journal of Financial Services Research*, *45*(3), 341–361. doi:10.1007/s10693-013-0164-4

Issah, M., & Antwi, S. (2017). Role of macroeconomic variables on firms' performance: Evidence from the UK. *Cogent Economics & Finance*, *5*(1), 1–18. doi:10.1080/23322039.2017.1405581

Jenkinson, N. (2008). Strengthening regimes for controlling liquidity risk. *Conference on Liquidity and Funding Risk Management*, *London*, 9.

Marozva, G. (2015). Liquidity and bank performance. *International Business & Economics Research Journal*, *14*(3), 453–462.

Masood, O., & Ashraf, M. (2012). Bank-specific and macroeconomic profitability determinants of Islamic banks The case of different countries. *Qualitative Research in Financial Markets*, *4*(2/3), 255–268. doi:10.1108/17554171211252565

Matz, L., & Neu, P. (2007). *Liquidity risk measurement and management: A practitioner's guide to global best practices*. Singapore City: J Wiley.

Moussa, M. A. B. (2015). The determinants of bank liquidity : Case of Tunisia. *International Journal of Economics and Financial Issues*, *5*(1), 249–259.

Munteanu, I. (2012). Bank liquidity and its determinants in Romania. *Procedia - Social and Behavioral Sciences*, *3*(12), 993–998. doi:10.1016/S2212-5671(12)00263-8

Ongore, V. O., & Kusa, G. B. (2013). Determinants of financial performance of commercial banks in Kenya. *International Journal of Economics and Financial Issues*, *3*(1), 237–252. doi:10.15520/jbme.2015.vol3.iss11.158.pp33-40

Parameswar, N. (2012). The determinants of bank liquidity during financial crisis: A comparative study of the GCC banking industry. *Journal of Academy of Business and Economics*, *12*(3), 10–21.

Perera, A., & Wickramanayake, J. (2016). Determinants of commercial bank retail interest rate adjustments: Evidence from a panel data model. *Journal of International Financial Markets, Institutions & Money*, *45*, 1–20. doi:10.1016/j.intfin.2016.05.006

Rashid, A., & Jabeen, S. (2016). Analyzing performance determinants: Conventional versus Islamic Banks in Pakistan. *Borsa Istanbul Review*, *16*(2), 92–107. doi:10.1016/j.bir.2016.03.002

Ratnovski, L. (2013). Liquidity and transparency in bank risk management. *Journal of Financial Intermediation*, *22*(3), 422–439.

Reserve Bank of India (2012). Liquidity risk management by banks. Retrieved from https://rbidocs.rbi.org.in/rdocs/notification/PDFs/CLRMB071112_F.pdf.

Reserve Bank of India. (2013). *Banking stability - A precursor to financial stability (Working Paper No. 01)*. Mumbai. Rabi N. Mishra, S. Majumdar and Dimple Bhandia.

Rina, A. (2009). An economic sociology of informal work: The case of India. In N. Bandelj (Ed.), *Economic Sociology of Work (Research in the Sociology of Work, Volume 18)* (pp. 315–342). UK: Emerald Group Publishing Limited.

Roman, A., & Camelia, A. (2015). The impact of bank-specific factors on the commercial banks liquidity : Empirical evidence from CEE countries. *Procedia Economics and Finance*, *20*(15), 571–579. doi:10.1016/S2212-5671(15)00110-0

Saona, P. (2016). Intra- and extra-bank determinants of Latin American banks ' profitability. *International Review of Economics and Finance*, *45*, 197–214. doi:10.1016/j.iref.2016.06.004

Settlements, B, for I. (2008). Principles for sound liquidity risk management and supervision. Retrieved from https://www.bis.org/publ/bcbs144.pdf.

Shrivastava, R., Sahu, R. K., & Siddiqui, I. N. (2018). Indian ruralmarket: Opportunities and challenges. In proceedings ofnational conference of innovative solutions for rural developmentof Chhattisgarh, 23-24 Feb, India. Published byInternational Journal of Advance Research, Ideas and Innovationsin Technology, accessed by www.ijariit.com/conferences/ncisrdc-2018/

Singh, A., & Sharma, A. K. (2016). An empirical analysis of macroeconomic and bank-specific factors affecting liquidity of Indian banks. *Future Business Journal*, *2*(1), 40–53. doi:10.1016/j.fbj.2016.01.001

Sopan, J., & Dutta, A. (2018). Determinants of liquidity risk in Indian banks: A panel data analysis. *Asian Journal of Research in Banking and Finance*, *8*(6), 47–59. doi:10.5958/2249-7323.2018.00043.3

Tabash, M. I. (2018). An empirical investigation between liquidity and key financial ratios of Islamic banks of United Arab Emirates (UAE). *Business and Economic Horizons*, *14*(3), 713–724.

Tabash, M. I., & Hassan, H. I. (2017). Liquidity, Profitability and Solvency of UAE Banks: A Comparative Study of Commercial and Islamic Banks. *Academy of Accounting and Financial Studies Journal*, *21*(2), 1–15.

Tan, Yong, & Floros, Christos. (2012). Bank profitability and inflation: The case of China. *Journal of Economic Studies*, *39*(6), 675-696. doi: 10.1108/01443581211274610

Thi, N., Diep, N., & Nguyen, T. (2017). Determinants of liquidity of commercial banks in Vietnam in the period. *Determinants of Liquidity of Commercial Banks in Vietnam in the Period 2009-2016*, *5*(6), 2009–2016. doi:10.17354/ijssSept/2017/45

Trabelsi, M. K. (2015). *The impact of liquidity risk determinants on profitability: An empirical study on Islamic banks in the kingdom of Bahrain* (Doctoral dissertation). Universiti Utara Malaysia, Malaysia.

Trenca, I., Petria, N., & Corovei, E. A. (2015). Impact of macroeconomic variables upon the banking system liquidity. *Procedia Economics and Finance*, *32*(15), 1170–1177. doi:10.1016/S2212-5671(15)01583-X

Tseganesh. (2012). *Determinants of banks liquidity and their impact on financial performance: Empirical study on commercial banks in Ethiopia Unpublished* (Ph. D. dissertation). Addis Ababa: Addis Ababa University.

Valla, N., Saes-Escorbiac, B., & Tiesset, M. (2006). Bank liquidity and financial stability. *Banque De France Financial Stability Review*, *9*(1), 89–104.

Vodová, P. (2011). Liquidity of Czech commercial banks and its determinants. *International Journal of Mathematical Models and Methods in Applied Sciences*, *5*(6), 1060–1067.

Vodová, P., & Republic, C. (2011). Determinants of commercial banks' liquidity in the Czech Republic. *Recent Researches in Applied and Computational Mathematics Determinants*, *50*(3), 92–97.

Wu, H., Chen, C., & Shiu, F. (2007). The impact of financial development and bank characteristics on the operational performance of commercial banks in the Chinese transitional economy. *Journal of Economic Studies*, *34*(5), 401–414. doi: 10.1108/01443580710823211

Yahya, A. T., Akhtar, A., & Tabash, M. I. (2017). The impact of political instability, macroeconomic and bank-specific factors on the profitability of Islamic banks: An empirical evidence. *Investment Management and Financial Innovations*, *14*(4), 30–39. doi:10.21511/imfi.14(4).2017.04

***Cogent Economics & Finance* (ISSN: 2332-2039) is published by Cogent OA, part of Taylor & Francis Group.**