RESEARCH ARTICLE

Impact of liquidity risk on the performances of Sri Lankan commercial banks

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Abstract: This study investigates the impact of liquidity risk on the performance of commercial banks in Sri Lanka by analysing secondary panel data of six systemically important banks in the Sri Lankan financial system from 2006 to 2016. The objective of this study is to identify the significant liquidity risk factors and the impact of them on both top line and bottom line performance indicators of commercial banks. Researchers find that liquidity gap and non-performing loan ratio are the significant proxies for liquidity risk. Multiple regression analysis reveals that liquidity risk negatively and significantly affects bottom lines Return on Average Assets (ROAA) and Return on Average Equity (ROAE), whilst positively affects the top line Net Interest Margin (NIM) of the commercial banks. The findings of this study suggest that expenses of the banks should be controlled with better liquidity management to enhance bottom line performances.

Keywords: Liquidity gap, non-performing loan, bank performances, panel regression.

INTRODUCTION

Financial system stability means a safe and secure financial system which is able to withstand against external and internal shocks. A stable financial system creates a favorable environment for depositors and investors, and subsequently, encourages financial institutions and markets to function effectively and efficiently, which eventually promotes investment and economic growth of a country. Therefore, safeguarding the financial system of a country involves identifying and addressing potential vulnerabilities and risks to the financial system.

The banking system is a key engine of growth and main lender to public and private sectors, similar to other countries like Pakistan (Arif & Nauman Anees, 2012), India and Bangladesh. The Central Bank of Sri Lanka regulates all the banks and other financial institutions in Sri Lanka under the Banking Act No. 02 of 2005. Banks play a central role in providing liquidity and maintaining the payment system. The Sri Lankan banking system consists of 26 Licensed Commercial Banks (LCB) and 07 Licensed Specialised Banks (LSB). LCBs and LSBs account for more than 58.8 percent of the total assets of the financial system in Sri Lanka. LCBs are broader than LSBs in scope, as the latter is not authorised to accept demand deposits or deal in foreign currency. LCBs have a 51 percent share of the assets of the financial system as a whole and 86 percent of the assets of the banking sector as of December 2016, whereas the market share of LSBs remains at 14 percent (Sri Lanka, Central Bank, 2018). These statistics clearly indicate that the commercial banks play a vital role in the economy (Jenkinson, 2008). They facilitate payments and the smooth transfer of goods and services, and they match savers who may lack detailed knowledge of borrowers and who want to be able to withdraw their money at short notice, with borrowers

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who often wish to repay their loans over a longer-term horizon. This maturity transformation performed by banks is essential to allow capital to be invested in a productive way to support economic growth.

Above statistics prove that even though many banks exist in Sri Lanka, the stability of the financial system primarily depends on the performance of six largest LCBs. Therefore, they are often termed as Systemically Important Banks (SIBs). When stabilising the financial system of the economy, the banks face many risks due to their nature of banking businesses as credit risk, liquidity risk, market risk and operational risk. Therefore, this research examines the factors of liquidity risk and evaluates the impact of liquidity risk on the performance of the commercial banks in Sri Lanka from 2006 to 2016.

Liquidity risk arises from maturity mismatches where liabilities have a shorter tenor than assets. A sudden rise in the demand of borrowers above the expected level can lead to a shortage of cash or liquid marketable assets (Oldfield & Santomero, 1997). The liquidity crisis in a banking institution could lead to insolvency and bank runs. Consequently, minimising the liquidity risk is one of the most important aspects of asset and liability management of banks.

Arif & Nauman Anees (2012) conclude that liquidity risk, as measured by liquidity gap and non-performing loans, negatively affects banks profitability significantly, using the sample of 22 banks of Pakistan. Further, evidences from Kenya suggest that net stable funding ratio, as a proxy for liquidity risk, inversely affects the return on equity while liquidity coverage ratio does not significantly influence the financial performance of commercial banks (Muriithi & Waweru, 2017). Jara-Bertin *et al.* (2014) also confirm the negative relationship as they find that bank performance negatively relate to credit risk, liquidity risk and operational inefficiencies.

However, some studies present a positive relationship between the bank liquidity risk and the performance of the banks, which is contradictory to the above findings. The study conducted by Lartey *et al.* (2013) evidences that there is a very weak positive relationship between the liquidity and the profitability of the listed banks in Ghana. A study on the performance of banks in twelve countries in Europe, North America and Australia by Bourke (1989) also finds that there is a positive relationship between liquid assets and banks' profitability. Further, Noman *et al.* (2015) confirm the same. Another analysis finds that there is a negative and significant influence of Capital Adequacy Ratio on Return on Equity while there is a positive and significant impact on Return on Asset from the Current Ratio (Iqbal *et al.*, 2015).

Literature reveals that there are mixed results of both negative and positive relationships between liquidity risk and the performance of the banks. In addition to that, many researchers use bottom line performance indicators as a proxy for profitability and liquid assets ratios as a proxy for liquidity risk. Shen *et al.* (2001) employ alternative liquidity risk measures except liquidity ratios, to investigate the impact of liquidity risk on profitability of commercial banks with an unbalanced panel data set of 12 advanced economies. They use panel data instrumental variables regression with two-stage least squares (2SLS) estimators to estimate bank liquidity risk and performance model. This study suggests that liquidity risk is the endogenous determinant of bank performance and the causes of liquidity risk include components of liquid assets and dependence on external funding, supervisory and regulatory factors and macroeconomic factors. It also reveals that liquidity risk may lower bank profitability measured by Return on Average Assets (ROAA) and Return on Average Equity (ROAE) because of the higher cost of funds, but increase net interest margins which is a top line performance indicator of banks.

Net Interest Margin (NIM) measures the cost of financial intermediation and a reliable indicator of asset and liability management and hence it directly affects the cost of borrowing and lending within the financial system. However, NIM is a top line performance indicator and it only considers the direct cost (interest) bearing on main income sources and generally used by the company when making pricing strategies. Return on Average Assets (ROAA) and Return on Average Equity (ROAE) are derived from net profit after all the expenses incurred in running the business including overhead expenses are excluded. Therefore, ROAA and ROAE are the bottom line performance indicators of the company. Some of the previous studies mentioned above indicate that the liquidity risk negatively affects the bottom line performance indicators while positively affecting the top line performance indicators. Therefore, it requires the special consideration about the transactions occurred in between top and bottom line performance indicators.

Liquidity versus Profitability is a common topic in the finance literature. However, past research evidence contradictory findings, as some researchers find negative and some researchers find positive relationships, while others find mixed relationship between the liquidity risk and financial performance of commercial banks. Therefore, it is very important to identify the effects of the liquidity risk on different types of performance indicators of the banks when taking decisions in order to minimise the risk and maximise the profitability of the banks. This paper attempts to identify the factors of liquidity

risk and their impact on the performances of Sri Lankan commercial banks. Further, contemporary banking industry works hard to achieve lower cost to income ratio since it is difficult to drive their profitability with less net interest margins with the intense competition. Therefore, this study compels to investigate the impact from liquidity on the bottom line and top line separately, with the purpose of examining the nature of the above problem. Ultimately, the findings of this study provide the necessary direction to mitigate liquidity risk factors in order to execute a right strategy and improve the performances of banks.

Despite the regulatory enforcements such as Basal Code, banks across the world are inclined to confront liquidity problems which lead to deteriorate the performances. Liquidity risk not only affects the performance of a bank but also its reputation (Jenkinson, 2008). The global financial crisis evidenced this phenomenon. Since liquidity factors differently affect the performance indicators of a bank, it is still valid to identify significant liquidity risk factors on different performance levels. Therefore, this study investigates the problem of whether liquidity risk factors compromise the performance indicators of commercial banks.

Accordingly, the researchers set the following objectives of this study.

1. To identify the significant liquidity risk factors which affect the banks' performances;

2. To analyse the impact from liquidity risk factors on bottom line performance indicators of banks;

3. To analyse the impact from liquidity risk factors on top line performance indicators of banks.

The study involves six systemically important banks in Sri Lanka from 2006 to 2016 using a panel data regression model in order to achieve the above objectives. Researchers find that liquidity gap and non performing loan ratio have significant influence on the bank performances. Further, liquidity risk negatively affects the bottom line performances as given in many contexts (Arif & Nauman Anees, 2012; Jara-Bertain *et al.*, 2014; Muriithi & Waweru, 2017). However, liquidity risk positively affects the Net Interest Margin (NIM) which is a top line performance.

The remainder of the paper proceeds as follows. Section 2 presents the methodology of the empirical analysis. Section 3 presents the empirical results and discussion of the findings. Section 4 concludes. Appendices record the robustness of the models used in the analysis.

METHODOLOGY

Sample and Data

This study employs quantitative approach to analyse the secondary data and test the hypotheses. The target population of this study is the total of 26 commercial banks in the Sri Lankan financial system. Researchers focus only on the six systemically important banks in Sri Lanka according to the Central Bank of Sri Lanka, which include two state banks and four largest domestic private commercial banks, as the purposive sample. The annual financial statements of the selected commercial banks are the source of data used for this study. Therefore, this research is solely based on secondary data. The nature of data is panel data and the researchers developed the cross-sections (6 banks) and annual time series data (2006-2016) into balanced panel data yielding 66 observations.

Variables

The purpose of this study is to examine the effect of liquidity risk on the performance of commercial banks in Sri Lanka. Therefore, researchers use the liquidity risk as the independent variable and performances of the banks as the dependent variable, mainly. Deposits to Total Assets (DTA), Cash Reserves to Total Assets (CRTA), Liquidity Gap (LG), Non-Performing Loan Ratio (NPLR) are proxies for liquidity risk (see Jeanne & Svensson, 2007; Gatev & Strahan, 2006; Holmstrom & Tirole, 2000; Goodhart, 2008; Akhtar, 2007).

Return on Average Assets (ROAA), Return on Average Equity (ROAE), Net Income (NI) and Net Interest Margin (NIM) are proxies for the performances of banks (see Noman *et al.*, 2015; Iqbal *et al.*, 2015; Bourke, 1989; Sehn *et al.*, 2001). NIM is a top line performance and the balance represents the bottom line performance.

The researchers also use a dummy variable in the fixed effect model to address the endogeneity problem since they are interested in identifying the bank characteristics particularly related to their performances. There can be an effect from the global financial crisis which occured during the period from the end of 2007 to 2009 and therefore, the performances can be affected differently. Hence, another dummy variable for time effect is also used as one of the control variables in this study in order to identify whether there is any impact from the financial crisis on the performances of the banks. Accordingly, the researchers assign binary numbers for time periods; 1 for the periods of 2008 and 2009, and 0 for other time periods, in order to identify the time impact.

Research Model

The researchers test the Hausman specification test in order to choose the relevant model as fixed effects or random effects. Table 1 presents the Hausman test result for each dependent variable. According to the results of Hausman tests, the probability value of chi-square for ROAA and NI are greater than 5% significance level, which suggest that there are no evidences to reject the null hypothesis of Hausman test and thus, researchers suggest random effects model for ROAA and NI. However, the probability value of chi-square for ROAE and NIM are less than 5% significance level, which suggest that there are no evidences to accept the null hypothesis of Hausman test. Therefore, analysis considers the fixed

effects model for ROAE and NIM. Generalised Least Squares estimation technique is used as ordinary least square assumptions are violated. The regression models under the random effect capture both time and entity impact from the disturbance term and fixed effects models employ separate dummy variable for time impact and entity impact.

Researchers develop the following panel regression models for each dependent variable in order to achieve the research objectives given after Hausman and robustness tests. All robustness tests, including Homoscedasticity, Autocorrelation and Multicollinearity results are presented as Appendices.

Table 1: Hausman tests results

Variables	Chi-Square Statistic	Chi-Sq. d.f	Probability
ROAA	9.292	4	0.054
NI	6.732	4	0.151
ROAE	15.029	4	0.005
NIM	9.883	4	0.042

$$ROAA_{it} = \beta_0 + \beta_1 DTA_{it} + \beta_2 CRTA_{it} + \beta_3 LG_{it} + \beta_4 NPLR_{it} + \varepsilon_t \qquad (1)$$

$$NI_{it} = \beta_0 + \beta_1 DTA_{it} + \beta_2 CRTA_{it} + \beta_3 LG_{it} + \beta_4 NPLR_{it} + + \varepsilon_t \qquad (2)$$

$$ROAE_{it} = \beta_0 + \beta_1 DTA_{it} + \beta_2 CRTA_{it} + \beta_3 LG_{it} + \beta_4 NPLR_{it} + \beta_5 D_i + \beta_6 D_t + \varepsilon_t \qquad (3)$$

$$NIM_{it} = \beta_0 + \beta_1 DTA_{it} + \beta_2 CRTA_{it} + \beta_3 LG_{it} + \beta_4 NPLR_{it} + \beta_5 D_i + \beta_6 D_t + \varepsilon_t \qquad (4)$$

Note: Here, *ROAA* = Return on Average Assets; *ROAE* = Return on Average Equity; *NIM* = Net Interest Margin; *NI* = Net Income; β_0 = Intercept; β = parameter for independent variables; *DTA* = Deposits to Total Assets; *CRTA* = Cash Reserves to Total Assets; *LG* = Liquidity Gap; *NPLR* = Non-Performing Loans Ratio; *D* = the Dummy variable for time impact and entity impact; i = entity; t = time and ε = the error term.

Hypotheses of the Study

In line with the objectives in this study, the researchers test a series of hypotheses as follows. First, researchers examine the impact of the liquidity risk factors on the bottom line performances such as ROAA, NI and ROAE using the models in equations (1), (2) and (3). Thus, the liquidity risk factor parameters: β_1 to β_6, are tested with sub hypotheses as in hypothesis (A).

$H_{10}: \beta_1$ to $\beta_6 = 0$ vs. $H_{11}: \beta_1$ to $\beta_6 \neq 0$ (A)

This hypothesis tests whether there is no significant statistical relationship between liquidity risk factors and the bottom line performances of the banks.

Then, the model in equation (4) analyses the impact of the liquidity risk factors on the top line performance (NIM) by testing the sub hypotheses given in hypothesis (B).

$H_{20}: \beta_1$ to $\beta_6 = 0$ vs. $H_{21}: \beta_1$ to $\beta_6 \neq 0$ (B)

Method of Data Analysis

Researchers run the panel multiple regression with the Generalised Least Square (GLS) estimation technique using Econometrics Views and STATA software.

FINDINGS AND DISCUSSION

Descriptive Statistics

Descriptive statistics provide the readers with a comprehensive idea about the data. Table 2 illustrates descriptive statistics of liquidity risk factors and performance indicators of systemically important commercial banks in Sri Lanka.

Table 2: Descriptive Statistics

Variable[1]	ROAA	ROAE	NIM	NI	CRTA	DTA	LG	NPLR
Mean	0.012	0.194	0.040	0.105	0.041	0.752	-0.348	0.060
Median	0.012	0.183	0.041	0.108	0.041	0.753	-0.348	0.043
Maximum	0.021	0.475	0.054	0.172	0.063	0.843	-0.193	0.292
Minimum	0.001	0.022	0.027	0.006	0.022	0.652	-0.545	0.016
Std. Dev.	0.004	0.081	0.008	0.041	0.010	0.043	0.073	0.048

ROAE = return on average equity; ROAA = return on average assets; NIM = net interest margin; NI = net income; CRTA = cash reserves to total assets; DTA = deposits to total assets; LG = liquidity gap; NPLR = non-performing loan ratio.

The mean value of ROAE, ROAA, NI and NIM are significantly positive, which suggests that the systemically important banks record a healthy profitability. However, standard deviation of ROAE is relatively higher compared to other performance indicators, suggesting that degree of financial leverage can be significantly different among the banks. Standard deviation of liquidity gap is higher compared to other liquidity factors suggesting that there are variances in maturity mismatches between assets and liabilities among the selected banks.

Estimation of the Research Model

Here, the empirical results of each model selected for the dependent variables are presented.

Estimated Model for ROAA

The estimated model for ROAA is as follows.

$$ROAA_{it} = 0.010 + 0.001DTA_{it}$$
$$- 0.055CRTA_{it} - 0.019LG_{it} - 0.043NPLR_{it}$$

Table 3: Random Effect Model for ROAA

Variable	Coefficients	t-statistic	Prob.
DTA	0.001	0.088	0.930
CRTA	-0.055	-1.380	0.173
LG	-0.019**	-3.205	0.002
NPLR	-0.043***	-4.969	0.000

Note: *** Significant at 1% level , ** Significant at 5% level and * Significant at 10% level

Table 4: Random Effect Model for NI

Variable	Coefficients	t-statistic	Prob.
DTA	-0.074	-0.567	0.573
CRTA	-0.806*	-1.963	0.054
LG	-0.116	-1.885	0.064
NPLR	-0.526***	-6.138	0.000

Note: *** Significant at 1% level , ** Significant at 5% level and * Significant at 10% level

Table 5: Fixed Effect Model for ROAE

Variable	Coefficients	t-statistic	Prob.
C	0.030	0.194	0.847
DTA	0.118	0.501	0.615
CRTA	0.580	1.191	0.239
LG	-0.160*	-1.687	0.097
NPLR	-0.314**	-2.214	0.031
D1(Bank dummy 1)	0.053**	2.291	0.026
D2(Bank dummy 2)	0.098**	3.052	0.004
D3(Bank dummy 3)	-0.013	-0.912	0.366
D4(Bank dummy 4)	-0.046**	-2.558	0.013
D5(Bank dummy 5)	0.011	0.877	0.385
D7	-0.014	-1.076	0.287

Note: *** Significant at 1% level , ** Significant at 5% level and * Significant at 10% level

The adjusted R^2 for the above model, 0.414 suggests that 41 percent variation in ROAA is explained by the given variables. F-test assumes the null hypothesis as none of the factors of liquidity risk is related to the profitability of the banking system. There are no evidences to accept the null hypothesis since F value equals 12.4809 and corresponding p value is less than 1%. Therefore, at least one of the factors of liquidity risk in the model relates to the performance of the banks. The estimates of the regression coefficients, t-statistics and p-values are also given in Table 3. Based on the results, only the liquidity gap and non-performing loans ratio significantly affect the ROAA of the banks negatively since t values are greater than two and p value is significant at 5% level with the negative coefficients.

Estimated Model for NI

The model for NI can be estimated as follows.

$$NI_{it} = 0.1866 - 0.074DTA_{it}$$
$$- 0.806CRTA_{it} - 0.116LG_{it} - 0.526NPLR_{it}$$

The adjusted R^2 value for NI model, 0.448 suggests that 44.8 percent of the variability in NI of banks is explained by the fitted model. According to the t-statistics and *p*-values given in the Table 4, only the non-performing loans ratio and cash reserves to total assets significantly impact the net income of the banks inversely.

Estimated Model for ROAE

The estimated model for ROAE is given below.

$$ROAE_{it} = 0.030 + 0.118DTA_{it} + 0.580CRTA_{it}$$

$$- 0.160LG_{it} - 0.314NPLR_{it} + 0.053D1_i$$

$$+ 0.098D2_i - 0.013D3_i - 0.046D4_i + 0.011D5_i - 0.014D7_t$$

The adjusted R^2 value for the ROAE model, 0.5661 suggests that 56.61 percent of the variability in ROAE of banks is determined by the fitted model. The non-performing loans ratio and liquidity gap significantly affect the ROAE of the banks other than the dummy variables which stand for entity impact.

The t-statistic value for NPLR is 2.214, which is statistically significant at 5% level. The t-statistic value for LG is 1.687, which is statistically significant at 10% level. The estimated coefficient of both NPLR and LG are negative which indicate that there is a negative impact on ROAE from non-performing loan ratio and liquidity gap. The fixed effect model of panel data helps to find the entity impact on the performance of the banks. D1, D2, D3, D4, and D5 represent five systemically important banks. Intercept represents another private bank. Only t-statistic of D1, D2 and D4 are significant at 5% level. Therefore, it suggests that the behavior and individual characteristics of Bank 1, 2 and 4 have impacts on the performance of their own bank (Table 5).

D1 and D2 stand for two state banks which have the highest amount of total assets than all other banks in the banking system and hence, the firm sizes of them are very high. The relationship between size and bank performance is significantly positive based on the findings of Shen *et al.* (2001) and this study confirms that with the coefficients of D1 and D2. However, D4 stands for a private bank which reflects a negative impact from the firm characteristics on the ROAE. It indicates that the size and behavior of certain banks negatively affect their performances of the banks.

The study conducted by Barth *et al.* (2004) documents that it is possible to observe that wider the range of activities, greater will be the profit opportunities for banks (Barth *et al.*, 2004). However, banks may systemically fail to well manage a diverse set of financial activities beyond traditional banking, and hence, profitability would be lower due to the fact that administration and other cost of the bank commensurate with the diverse set of activities.

Estimated Model for NIM

The model for NIM can be estimated as follows.

$$NIM_{it} = 0.007 + 0.043DTA_{it} - 0.003CRTA_{it}$$

$$- 0.011LG_{it} + 0.066NPLR_{it} - 0.014D1_{it}$$

$$- 0.008D2_{it} - 0.009D3_{it} - 0.005D4_{it} - 0.005D5_{it} + 0.002D7_{it}$$

The adjusted R^2 value for the NIM model, 0.7294 indicates that 72.94 percent of the variation in NIM of banks is determined by the fitted model. Table 6 further discloses that only the non-performing loans ratio and debt to total assets significantly affect the NIM of the banks other than certain dummy variables for banks.

Table 6: Fixed Effect Model for NIM

Variable	Coefficient	t-statistic	Prob.
C	0.007	0.430	0.669
DTA	0.043*	1.861	0.068
CRTA	-0.003	-0.040	0.968
LG	-0.011	-1.129	0.264
NPLR	0.066**	3.985	0.000
D1	-0.014***	-7.525	0.000
D2	-0.008**	-3.483	0.001
D3	-0.009***	-4.910	0.000
D4	-0.005**	-2.458	0.017
D5	-0.005**	-2.697	0.009
D7	0.002	1.492	0.142

Note: ***Significant at 1% level, **Significant at 5% level and *Significant at 10% level.

The estimated coefficient of NPLR is positive and the corresponding t-statistic value is greater than two with a *p*-value less than 0.05. The estimated coefficient of DTA is also positive and the corresponding t-statistic value is closer to two with a *p*-value less than 0.1. Therefore, the researchers document that there is a positive significant relationship between NPLR and the NIM as well as DTA and NIM of the banks. Furthermore, the coefficients of all dummy variables are negative and statistically significant other than the intercept, suggesting that the individual characteristics and behavior of banks negatively affect the NIM which is a top line performance of selected banks.

DISCUSSION

The findings of the study prove that there is no significant impact from deposits to total assets as a proxy for liquidity risk on the performance of commercial banks at 5% of significance level. This outcome contradicts with the research findings of Arif & Nauman Anees (2012) and Diamond & Rajan (2001), who conclude that there is a positive significant relationship between deposits and performance of the banks. Holmstrom & Tirole (2000) argue that maintaining a high level of cash reserves within the banks will reduce the performance of the banks due to the fact that if the banks hold cash within the banks, they cannot invest, lend to the public or use for alternative investments to earn profits. This view also does not comply with this study as it reveals that the deposits to total assets does not have a significant impact on performances of systemically important banks in Sri Lanka. It suggests that administration and management of the assets have an impact rather than just having the assets in their portfolio.

In the case of banking institutions, it is of paramount importance to ensure that their current assets be matched with the current liabilities. A bank with low liquidity is prone to have untimed operational misadventure and it cannot fulfill its short-term obligations to customers (Awojobi *et al.*, 2011). This leads to the liquidity gap and it has a negative significant relationship with the performance of the banks, eventually. This condition is consistent with the findings of this study; if the banks heavily depend on the external funding, they will face significant liquidity problems. However, banks can reduce their liquidity risk by diversifying their funding sources and holding many liquid assets (Shen *et al.,* 2001).

Due to the substantial liquidity gap, the banks may have to borrow from the repo market even at a higher rate and thus, raising up the cost of banks. This rise in the cost eventually affects the profitability of the banks (Khan & Syed, 2013). Shen *et al.* (2001) document that as borrowings rise, lenders in money market may be concerned about banks' creditworthiness and they may impose higher risk premiums on borrowed funds and thus, increase the cost of funding of banks. It ultimately decreases the banks' bottom line performances.

Furthermore, this study emphasises that the non-performing loan ratio has a negative significant impact on ROAA, ROAE and NI but a positive significant impact on NIM. It is consistent with the finding of Shen *et al.* (2001), which states that the negative significant relationships between non-performing loans and ROAA and ROAE are due to a high cost of funds while positive significant relation with NIM is due to the high-risk premium charged from the customers. The findings of Boahene *et al.* (2012) evidence that the non-performing loans have a positive impact on financial performances of banks which is consistent with this study's findings relating to NIM and NPLR. It indicates that although a bank's risk of customer loan default increases, the bank is capable of improving its top line performances. This may be an indication of having a low quality portfolio of loans which enhance the NIM and eventually erode the bottom line performances due to the administration cost and bad debts (Miller & Noulas, 1997) or banks have charged a premium interest from loans more than the actual default risk by identifying the inherent risk of the facility initially (Maudos & Guevara, 2004).

As a key finding of this study, the liquidity risk positively affects the top line performance indicators, whilst negatively affecting the bottom line performance indicators. Therefore, the managers and the decision-makers of the banks need to pay proper attention to the transactions between the top and bottom line performance indicators. It means decision-makers need to minimise the administration cost, distribution cost, finance and other overhead costs relating to their banking businesses to have a healthy bottom line, given that top line performances are better. This is inevitable since despite the fact that the banks charge a high-risk premium from their customers, they could not control their expenses relating to administration of branch networks, loans recovering cost and other overhead costs. Therefore, the researchers of this study document that even though Sri Lankan banks are capable of managing higher NIM, they confront practical difficulties to end up with healthier ROAA, ROAE and NI due to the liquidity risk.

CONCLUSION

Using panel data of six systemically important banks in Sri Lanka from 2006 to 2016 and panel multiple regression analysis, the researchers find that Non-Performing Loan Ratio is the most significant liquidity risk factor which affects all the performance indicators of the banks. Liquidity gap and cash reserves to total assets factors affect some of the bottom line performances at 5% and 10% significance levels.

The study further reveals that the liquidity gap has a significant negative impact on the bottom line performances of the banks, which means that the higher liquidity gap of the banks will deteriorate the bottom line performance of the banks significantly. In addition, the research concludes that the Non-Performing Loan Ratio negatively and significantly affect the bottom line performances such as Return on Average Assets, Return on Average Equity and Net Income, while positively and significantly affecting the top line performances which is measured by Net Interest Margins of the banks.

Furthermore, fixed effect models employed suggest that other than the liquidity risk, the behavior and individual characteristics of banks also have mixed impacts on the performance of their own banks. State banks have a positive impact on the performances and one private bank has a negative impact from their firm specific characteristics. However, researchers do not find a significant timing impact from the global financial crisis on the performances of the systemically important banks in Sri Lanka.

The principle of increasing risk (Kalecki, 1937) can explain the liquidity and profitability tradeoff which suggest that higher the liquidity lower the profitability, vice versa. Liquidity is necessary for banks to compensate for expected and unexpected balance sheet fluctuations and to provide funds for growth. Liquidity represents a banks' ability to efficiently accommodate the redemption of deposits and other liabilities and to fund increases in loan and investment portfolios. The liquidity risk can adversely affect banks' earnings as explained by Kalecki (1937), since sudden illiquidity increases the cost of additional funding. Therefore, it will become the top priority of the management of a bank to ensure the availability of sufficient funds to meet future demands of depositors and borrowers.

The banks need to control and closely monitor the non-performing loans in order to reduce the Non-Performing Loan Ratio with the purpose of achieving better performance of the banks and there is a timely need for the management of the commercial banks to maintain their liquidity gap at a safe level in order to avoid the negative impact on the performance of the banks. Finally, the decision makers of the commercial banks in Sri Lanka need to maintain proper attention to reduce their recovering and other overhead costs relating to their main banking businesses in order to strike an equal balance between liquidity and both top line and bottom line performances of the banks.

This study concentrates only on the funding liquidity risk and does not consider the market liquidity risk, which can be defined as the risk that a firm cannot easily eliminate without significantly affecting the market price because of inadequate market depth or market disruption (Switzerland, Basel Committee on Banking Supervision, 2008). In addition, the study finds out the mixed relationship between liquidity risk and performance of the banks. Therefore, further research can investigate the impact from market liquidity risk on the performance of the banks and the profit efficiency of top line and bottom line performance indicators of the banks by considering the administration and other overhead costs which erode the bottom line performances specifically.

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APPENDICES

Normality Test for Residuals

Table 7 : Descriptive Statistics for Residuals

	ROAA	ROAE	NIM	NI
Skewness	-0.1938	0.0419	-0.2927	-0.3679
Kurtosis	2.2963	2.5933	2.4422	2.5095
Jarque-Bera	1.7749	0.4743	1.7981	2.1506
Probability	0.4117	0.7889	0.4070	0.3412

As given in Table 7, the skewness of all the variables is not high enough to affect the normality of the data and the kurtosis of the residuals for each dependent variable is positive and close to three. As well as the Jarque-Bera value of all the dependent variables are low and probability value also greater than 0.05. Therefore, normality of residuals for all the dependent variables is confirmed.

Homoscedasticity or Equal Variance of Error Term

Table 8: Breusch-Pagan-Godfrey test

	ROAA	ROAE	NIM	NI
Observed R Square	2.0245	5.3229	1.7553	1.7294
Prob.Chi-Square	0.7312	0.2557	0.7807	0.7854

Table 8 represents the results of Homoscedasticity of dependent variables. The probability value of observed r-square of all the dependent variables is higher than 0.05 which means there is homoscedasticity in the estimated models.

No Autocorrelation between the Disturbances

Table 9: Autocorrelation test

	ROAA	ROAE	NIM	NI
DW Statistic	1.573748	1.657946	1.483722	1.416540

According to Table 9, the Durbin-Watson value of all the models of dependent variables was not equal to or near to two. However, all the values are within the accepted Durbin-Watson ranges of 1.4 of lower limit and 1.7 of upper limit at 5% significance level.

Perfect Multicollinearity

Table 10: Correlation Matrix

	DTA	CRTA	LG	NPLR
DTA	1.000			
CRTA	0.498	1.000		
LG	-0.629	-0.141	1.000	
NPLR	0.066	0.130	0.111	1.000

According to the correlation matrix given in Table10, all the correlation coefficients between independent variables are below 80 percent which suggest that there is no existence of perfect multicollinearity between the independent variables.

Table 11: VIF for Independent Variables

	Centered VIF
DTA	2.341186
CRTA	1.428632
LG	1.828166
NPLR	1.049332

Table 11 confirms the absence of multicollinearity since the centered VIF values for all the independent variables are less than 5.