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       NEED/IMPORTANCE OF THE STUDY

       STATEMENT OF THE PROBLEM

       OBJECTIVES

       HYPOTHESES

       RESEARCH METHODOLOGY

       RESULTS & DISCUSSION

       FINDINGS

       RECOMMENDATIONS/SUGGESTIONS

       CONCLUSIONS

       SCOPE FOR FURTHER RESEARCH

       ACKNOWLEDGMENTS

       REFERENCES

       APPENDIX/ANNEXURE

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BOOKS

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

JOURNAL AND OTHER ARTICLES

- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

UNPUBLISHED DISSERTATIONS AND THESES

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, KurukshetraUniversity, Kurukshetra.

ONLINE RESOURCES

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WEBSITES

- Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

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IMPACT OF LIQUIDITY ON PROFITABILITY OF PUBLIC SECTOR BANKS IN INDIA: A STUDY OF SBI & BOB

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ABSTRACT

The recent crisis has underlined the importance of sound bank liquidity management. In response, regulators are devising new liquidity standards with the aim of making the financial system more stable and resilient. In this paper, the analysis is being made on the impact of liquid asset holdings on bank profitability for a sample of State Bank of India (SBI) and Bank of Baroda (BOB). Results suggest that profitability is improved for banks that hold some liquid assets, however, there is a point at which holding further liquid assets diminishes a banks' profitability, all else equal. Moreover, empirical evidence suggests that this relationship varies depending on a banks business models and the state of the economy. These results are particularly relevant as policymakers devise new standards establishing an appropriate level of liquidity for banks. While it is generally agreed upon that banks undervalued liquidity prior to the recent financial crisis, one must also consider the tradeoff between resilience to liquidity shocks and the cost of holding lower-yielding liquid assets as the latter may impact banks' ability to generate revenues, increase capital and extend credit.

KEYWORDS

Liquidity Management, Profitability, Financial Development, SBI, BOB, Economic Growth, Financial System Regulation and Policies.

INTRODUCTION

L iquidity was an instrumental factor during the recent financial crisis. As uncertainty led funding sources to disappear, many banks quickly found themselves short on cash to cover their obligations as they came due. In extreme cases, banks failed or were forced into mergers. As a result, in the interest of broader financial stability, substantial amounts of liquidity were provided by authorities in public sector banks including State Bank of India (SBI) and Bank of Baroda (BOB).

In the aftermath of the crisis, there is a general sense that banks had not fully appreciated the importance of liquidity risk management and the implications of such risk for the bank itself, as well as the wider financial system. As such, policymakers have suggested that banks should hold more liquid assets than in the past, to help self-insure against potential liquidity or funding difficulties. This has led to a desire for common measures and standards for liquidity risk, culminating in ongoing work by the Basel Committee on Banking Supervision.

Since liquid assets such as cash and government securities generally have a relatively low return, holding them imposes an opportunity cost on a bank. In the absence of regulation, it is reasonable to expect banks will hold liquid assets to the extent they help to maximize the banks profitability. Beyond this, policymakers have the option to require larger holdings of liquid assets, for instance, if it is seen as a benefit to the stability of the overall financial system. That said, the aim of this paper is not to establish the ideal level of liquid asset holdings, but rather to help distinguish empirically, whether SBI and BOB holding of liquid assets have a significant impact on their profitability.

In short, while controlling for other factors, this paper finds evidence, based on public sector banks like SBI and BOB from financial year 2002-03 to 2010-11, that profitability is improved for banks that hold some liquid assets, however, there is a point at which holding further liquid assets diminishes a banks' profitability, all else equal. These findings are conceptually in line with relevant literature and are consistent with the idea that the opportunity cost of holding low-return assets eventually outweighs the benefit of any increase in the bank's liquidity resiliency as perceived by funding markets.

In the context of this relationship, estimated results suggest some evidence of further positive benefit to hold additional liquid assets for institutions that follow a less traditional, more market-based banking model. Likewise, there is a similar estimated benefit to hold more liquid assets when economic conditions deteriorate.

The result of this paper sets forth this evidence, beginning with some facts and regulatory context. This is followed by a brief description of the relevant literature and the empirical framework as applied in this paper. Finally, the empirical results are presented and policy implications are drawn.

FACTS AND REGULATORY CONTEXT

As shown in Figure 1, public sector banks in India like SBI and BOB had been holding a declining share of their balance sheet in liquid assets, such as cash and government securities, prior to the onset of the recent financial crisis. Indeed, in reaction to the funding and liquidity pressures experienced during the crisis, banks, in aggregate, began to hold considerably more liquid assets. While there was an opportunity cost of holding liquid assets given their relatively low return, banks and supervisors recognized the operational benefits of additional liquidity, along with the benefits in terms of market perception. A relatively strong liquid asset pool could represent a more robust bank to investors and funding markets.

FIGURE-1: LIQUID ASSETS AS A PERCENTAGE OF TOTAL ASSETS
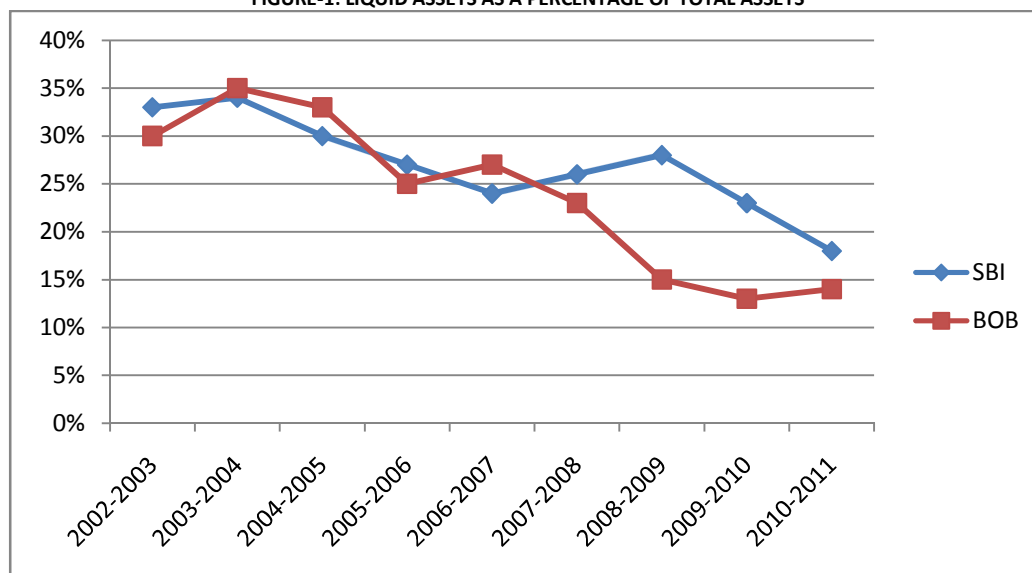
Source: Self Analysis

In fact, it was during the crisis that authorities in SBI and BOB saw the need for a consistent standard to monitor and improve bank liquidity. As such, the G20 recommended that the Basel Committee on Banking Supervision (BCBS) establish "a global framework for promoting stronger liquidity buffers at financial institutions". This framework, published in March 2011 and subject to an observation period over coming years, would include, among other things, a requirement that internationally-active banks hold enough liquid assets to cover their net cash outflows over a 30-day stress scenario. In broad terms, this regulatory standard is meant to ensure banks are self-insured to withstand a specified idiosyncratic and market-wide liquidity shock. Not surprisingly, however, the calibration of such a standard is a key to its impact on banks and the financial system as a whole. For reasons such as this, it is crucial to understand the impact that a change in bank's liquid asset holdings has on its stability and profitability.

Figure 2 presents historical data on a weighted average of return on equity (ROE) for SBI and BOB since 2010-11. Of note, SBI experienced considerable losses throughout the financial crisis, while those in BOB generally did not. Combining the information in both Figure 1 and Figure 2, it is unclear through visual observation what the impact, of additional liquid assets has been on the profitability of SBI and BOB. As such, this paper takes an empirical approach to investigate this question while controlling for other relevant factors.

FIGURE-2: RETURN ON EQUITY

Source: Self Analysis

LITERATURE AND EMPIRICAL FRAMEWORK

A broad literature exists surrounding the analysis of liquidity holdings for firms. While a very limited number of studies appear to include liquidity as an explanatory variable for bank profitability, this relationship is not the focus of those papers and the empirical results are mixed. To our knowledge, there is no existing empirical work directly focusing on the specific question considered in the current paper: whether banks' holdings of liquid assets have a significant impact on their profitability. However, we are able to draw on relevant concepts in some related literature dealing with the impact of capital on bank profitability and of the impact of liquid assets on bank credit risk.

Berger (1995) analyses the statistical relationships between bank earnings and capital for Indian banks over the period of 1983-1989 and finds that, contrary to what one might expect in situations of perfect capital markets with symmetric information, there is a positive relationship between capital and return on equity. This result, according to the author, is consistent with the "expected bankruptcy cost hypothesis." More specifically, Berger's results suggest that banks with higher levels of capital see their funding costs decrease to such an extent that it more than offsets the cost of issuing additional capital. While Berger (1995) applies the concept of the "expected bankruptcy cost hypothesis" in the realm of capital, it is also conceptually applicable to the impact of liquid assets on profitability, whereby banks holding more liquid assets benefit from a superior perception in funding markets, reducing their financing costs and increasing profitability.

At the same time, a recent paper by Morris and Shin (2010) develops a model where the total credit risk of a bank is decomposed into "insolvency risk" and "illiquidity risk". The model provides a formula for "illiquidity risk" and the authors show that an increase in the liquidity ratio of a bank decreases the probability of an "illiquid" default.

These two concepts can be drawn together in the context of the current paper. If an increase in the relative liquid assets holdings of a bank decreases its probability of default, and if the "expected bankruptcy cost hypothesis" is indeed correct, then holdings of liquid assets should exhibit a positive relationship with bank profits. At the same time, holding liquid assets imposes an opportunity cost on the bank given their low return relative to other assets, thereby having a negative effect on profitability. Thus, overall, we expect liquid assets to exhibit a non-linear relationship to bank profitability in which increasing liquid assets would improve a bank's profitability through the "expected bankruptcy cost hypothesis", as long as the marginal benefit of holding additional liquid assets outweighs the opportunity cost of their low relative return.

Concurrently, the impact of liquid assets on profitability can be affected by other factors such as the bank's business model, or exogenous economic conditions. This idea is, in fact, analogous to existing literature on international reserve holdings. This literature has argued that emerging market economies accumulate reserves to self-insure against capital flow volatilities and sudden stops (Aizenman and Marion 2003; Stiglitz 2006). Furthermore, recent work by Jeanne and Rancière (2009) suggests that the optimal level of a small country's international reserves increases with the amount of short-term debt the country has, and with the probability of a sudden stop. Clear parallels can be drawn between this literature and the need for banks to self-insure against liquidity and funding shocks, as illustrated by the recent financial crisis.

Therefore, in our framework, we suppose that the impact on profitability of a bank's holdings of liquid assets depends on the amount of funding that comes due in the short-term and on the general state of the economic cycle. The latter can be interpreted as a proxy for the likelihood of a "sudden stop" or freeze in funding markets. All else equal, if a bank is more reliant on short-term funding, it may need to hold more liquid assets in order to maximize profits. Likewise, if the economic cycle is in a downturn and investors interpret this as an increase in the likelihood of a freeze in funding markets, banks would likely need to increase their holdings of liquid assets in order to maximize profits.

DATA AND EMPERICAL ESTIMATION

The econometric framework is presented in Equation (1). In short, the dependent variable, profitability, is regressed against a non-linear expression of relative liquid asset holdings, as well as a set of control variables, X.

$$\pi_{i,t} = \alpha_0 + \alpha_1 la_{i,t-1} + \alpha_2 la^2_{i,t-1} + \alpha_3 la_{i,t-1} \cdot stfunding_{i,t} + \alpha_4 la_{i,t-1} \cdot gdp_{i,t} + X\beta + u_{i,t} \quad \ldots\ldots\ldots(1)$$

More specifically, to test for the key relationship of interest between liquid assets and profitability (π), Equation (1) expresses the liquid asset ratio (la) as a nonlinear polynomial of order two, as well as the product of real GDP growth (gdp), and a proxy for short-term funding reliance (stfunding), respectively. Moreover, since creditors must first observe the relative liquidity of a bank before adjusting their views on its credit risk, all liquid asset terms are lagged by one period.

To more clearly illustrate the form of the estimated relationship between liquid assets and profitability, Equation (2) presents the marginal impact on profits of the liquid assets ratio. As noted above, this relationship is a function of the liquid assets ratio, a measure of short-term funding reliance and general macroeconomic conditions. Indeed, setting Equation (2) equal to zero allows one to solve for the reduced-form profit-optimizing level of the liquid assets ratio, given by Equation (3).

$$\frac{\partial \pi_{i,t}}{\partial la_{i,t-1}} = \alpha_1 + 2 * \alpha_2 la_{i,t-1} + \alpha_3 stfunding_{i,t} + \alpha_4 gdp_{i,t} = 0 \ldots\ldots\ldots\ldots (2)$$

$$la^*_{i,t-1} = \frac{-(\alpha_1 + \alpha_3 stfunding_{i,t} + \alpha_4 gdp_{i,t})}{2 * \alpha_2} \quad \ldots\ldots\ldots\ldots (3)$$

DATA

TABLE- A.1: VARIABLE DEFINITIONS AND DESCRIPTIVE STATISTICS

Symbol	Definitions	Sample Mean	Standard Deviation
ROE	Pre-tax annualized return on total shareholders' equity	0.1799	0.1276
ROA	Pre-tax annualized return on total assets	0.0154	0.008578
gdp	Quarter-over-quarter growth rate of real GDP	0.01194	0.007913
cpi	Quarter-over-quarter growth rate of core CPI (core inflation rate)	0.005988	0.006014
Unemployment	Unemployment rate	5.3539	1.1353
Leverage	Ratio of total assets to total shareholders' equity	12.6958	4.6222
Tier-1	Tier 1 capital ratio (Tier 1 capital as a share of risk-weighted assets - Basel I definition for SBI; For BOB Basel I definition until 2007Q1 and Basel II definition from 2007Q2 on)	0.09673	0.02262
la	Liquid assets as a share of total assets	0.1926	0.09320
Mkt_income	Trading and investment banking related revenues as a share of gross income (interest income and non-interest income)	0.03394	0.05570
Repos	Reverse repurchase agreements as a share of total liabilities	0.07928	0.06322

The above table i.e. **Table- A.1** provides a summary of the variables used for empirical estimation, along with their definitions and some descriptive statistics. Of note, the dependent variable, profitability (π), is measured as return on equity or return on assets as noted, and relative liquid assets (la), are measured as the ratio of cash, government-issued and government-guaranteed securities and interbank deposits relative to a bank's total assets. Note that, because of accounting differences in the netting of derivatives on the balance sheet between SBI and BOB, we imperfectly adjust BOB total assets, as used in the liquid assets ratio, using the impact of master netting agreements.

Control variables include quarterly growth in real GDP, unemployment and core inflation, as well as a measure of balance sheet leverage, measured as the ratio of assets to shareholders' equity.

With respect to the short-term funding variable, ideally, one wants to measure a bank's reliance on relatively flighty short-term funding. Unfortunately, available data are not as granular as desired, since they cover all types and sources of funding coming due within one year. There may be very significant differences in the stability of various sources of short-term funding. For instance, insured retail demand deposits are likely to be much more stable than short-term market funding. To address this data issue, we assume that a bank's business model and the structure of its short-term versus long-term funding are related and use the former as a proxy. Indeed, sample correlations between the market-related proportion of a bank's income and measures of the term of funding are positive and statistically significant at the 1% level.

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BASELINE RESULTS

TABLE-A.2: ESTIMATION RESULT WITH BANK AND TIME FIXED-EFFECTS – RETURN ON EQUITY

Variables	ROE
unemployment	-0.0397***
gdp	3.132***
$cp1_{t-1}$	-0.0286
la_{t-1}	0.695***
la^2_{t-1}	-1.006***
$la_{i,t-1}mkt\_income_{i,t}$	1.783**
$la_{i,t-1}gdp_{i,t}$	-16.98***
$leverage_{t-1}$	0.00747***
Observations	2875
R-squared	0.580
R-bar	0.562
p-value of Hansen's J- Statistic	0.373
p-value of under identification LM statistic	0.000

Table- A.2 presents the baseline estimation results in which return on equity is regressed on the liquid asset ratio (in level form and as a product of GDP growth and a product of market income share), along with the control variables for GDP growth, inflation and balance sheet leverage. Note that the estimation gives an adjusted R-squared (around 0.58) that is in line with the current literature, and also shows desirable characteristics with respect to the instrumental variables used.

Turning to the key results, the estimated relationship between liquid assets and bank profitability is as expected. Coefficients for the liquid assets ratio, its square, its product with GDP growth, and its product with a proxy for reliance on short-term funding are all statistically significant at the 1% level. As expected, we find evidence of a non-linear relationship between profitability and liquid asset holdings. More specifically, as illustrated in Figure 3, the negative coefficient on α2 indicates that profitability is maximized, according to this reduced-form model, at $la^*_{i,t-1}$. In other words, the relationship takes the form of a downward-concave parabola and to the extent the relationship is relatively flat around the maximum ($la^*_{i,t-1}$), the cost associated with holding more or less liquid assets will be limited in range around the maximum. Estimation also suggests a negative coefficient, as anticipated, for the interaction term with GDP growth and a positive coefficient for the product with the proxy for reliance on short-term funding.

FIGURE-3
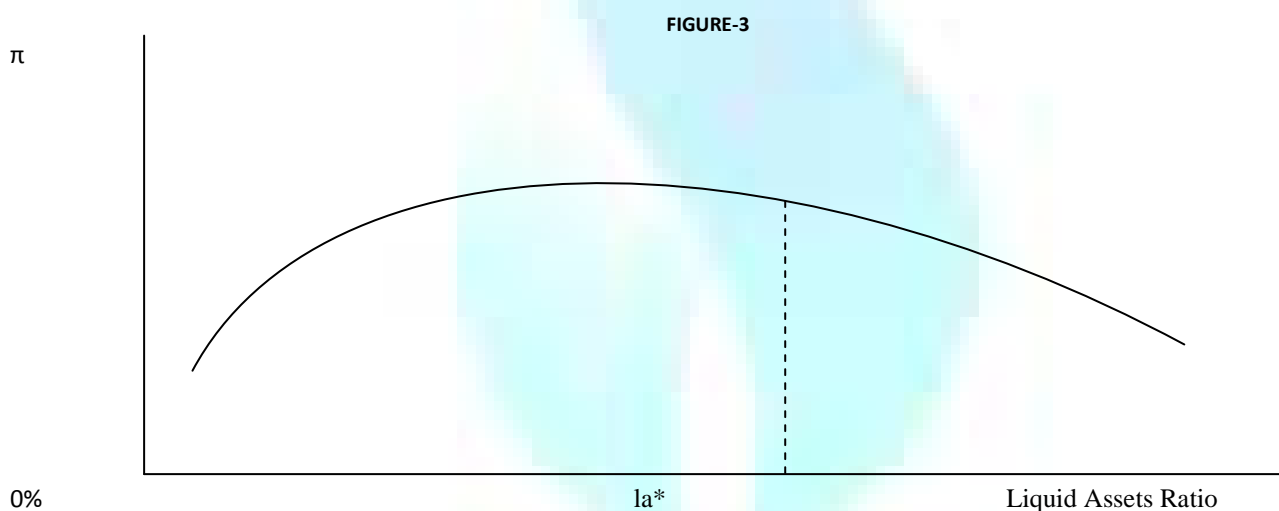
Taken together, these results suggest that, all else equal, profitability is improved for banks that hold some liquid assets, however, there is a point at which holding further liquid assets diminishes a banks' profitability, all else equal. This finding is consistent with the idea that funding markets reward banks for holding some liquid assets, but at some point this benefit is outweighed by the opportunity cost of holding such low-yielding assets. At the same time, as macroeconomic conditions deteriorate, increasing the likelihood of market illiquidity, the reduced-form profit optimal level of liquid assets $la^*_{i,t-1}$ increases (recall Equation (3) above), confirming the intuition. Likewise, as a bank increases its reliance on capital market- related revenues, the estimated reduced form profit-optimal level of liquid assets also increases. In short, profit incentives should encourage banks to hold more liquidity in times of weak economic growth or when they maintain a less-traditional business model.

Estimated coefficients on the macroeconomic control variables are generally in line with the existing literature. GDP growth is estimated to have a positive and statistically significant impact on bank profitability, while the level of unemployment, through a higher probability of default on loans, has a negative impact. Meanwhile, the lagged rate of inflation exhibits a negative and statistically significant relationship with profitability.

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TABLE-A.3: ESTIMATION RESULTS WITH DUMMY VARIABLE- RETURN IN EQUITY AND RETURN ON ASSETS

Variables	ROE	ROA
unemployment	-0.0388***	-0.00331***
gdp	3.171***	0.350***
$cp1_{t-1}$	0.00381	0.0221
la_{t-1}	0.748***	0.0678***
CAD * la_{t-1}	-0.413*	-0.0293*
la^2_{t-1}	-1.090***	-0.0862***
$la_{i,t-1}mkt\_income_{i,t}$	1.837**	0.100**
$la_{i,t-1}gdp_{i,t}$	-16.60***	-1.782***
$leverage_{t-1}$	0.00783***	-0.000298**
Observations	2875	2875
R-squared	0.580	0.788
R-bar	0.562	0.779
p-value of Hansen's J- Statistic	0.542	0.237
p-value of under identification LM statistic	0.00602	0.00602

To test whether BOB's profitability exhibits a different relationship toward holdings of liquid assets relative to SBI, we introduce a dummy variable for BOB interacted with the liquid assets ratio. Equations (1), (2) and (3) above become Equations (4), (5) and (6), with CAD representing a dummy variable taking the value of one for BOB and zero for SBI. Estimation results are presented in Table A.3 with column one corresponding to the baseline specification.

$$\pi_{i,t} = \alpha_0 + \alpha_1 la_{i,t-1} + \alpha_2 la^2_{i,t-1} + \alpha_3 la_{i,t-1}.stfunding_{i,t} + \alpha_4 la_{i,t-1}.gdp_{i,t} + \alpha_5 la_{i,t-1}.CAD + X\beta + u_{i,t} \qquad\text{.................................(4)}$$

$$\frac{\partial \pi_{i,t}}{\partial la_{i,t-1}} = \alpha_1 + 2*\alpha_2 la_{i,t-1} + \alpha_3 stfunding_{i,t} + \alpha_4 gdp_{i,t} + \alpha_5 CAD = 0 \text{ ..... (5)}$$

$$la^*_{i,t-1} = \frac{-(\alpha_1 + \alpha_3 stfunding_{i,t} + \alpha_4 gdp_{i,t} + \alpha_5 CAD)}{2*\alpha_2} \qquad\text{................... (6)}$$

Coefficients for the interactive dummy variable are estimated to be negative and statistically significant in the baseline specification. This result is robust with respect to the use of return on assets as the dependent variable, as shown in column 2 of Table A.3. In general, these findings suggest that, ceteris paribus, the level of liquid assets required to maximize profits is lower for BOB than in SBI. However, this result may primarily reflect data issues. As mentioned previously, accounting differences tend to inflate total assets for BOB, relative to their SBI. Although an attempt has been made to reduce this divergence, the adjustment is imperfect and such structural dissimilarities could still exaggerate differences in the estimated impact of liquid assets on profitability in BOB relative to SBI. Moreover, the sample period used for estimation is significantly influenced by the recent financial crisis. Over this period, BOB generally performed better than SBI, producing comparatively more profits for a given level of liquid assets. Nonetheless, setting aside data concerns, this result could reflect differences in market perception across BOB and SBI. More specifically, investors and fund providers could demand that SBI holds additional liquid assets in comparison to BOB due to unobserved structural factors.

CONCLUSION

This paper presents empirical evidence regarding the relationship between liquid asset holdings and profitability for SBI and BOB over the period of 2002-03 to 2010-11. In short, results suggest that a nonlinear relationship exists, whereby profitability is improved for banks that hold some liquid assets, however, there is a point beyond which holding further liquid assets diminishes a banks' profitability, all else equal. Conceptually, this result is consistent with the idea that funding markets reward a bank, to some extent, for holding liquid assets, thereby reducing its liquidity risk. However, this benefit is can eventually be outweighed by the opportunity cost of holding such comparatively low-yielding liquid assets on the balance sheet.

At the same time, estimation results provide some evidence that the relationship between liquid assets and profitability depends on the bank's business model and the risk of funding market difficulties. Adopting a more traditional business model allows a bank to optimize profits with a lower level of liquid assets. Likewise, when the likelihood of funding market difficulties is low, banks need to hold less liquid assets to optimize profits.

Although, to our knowledge, there is no existing literature addressing these specific issues, the empirical results presented in this paper are in line with similar concepts in the broader literature related to capital, credit risk and international reserves.

From a policy perspective, the results of this paper are highly relevant, particularly given ongoing regulatory reform following the recent financial crisis. As policymakers devise new standards establishing an appropriate level of liquidity for banks, helping to ensure adequate stability for the overall financial system, the empirical results of this paper suggest they should bear in mind the trade-off between resilience to liquidity shocks and the cost of holding lower-yielding liquid assets. While holding liquid assets will make banks more resilient to liquidity shocks, thus reducing the negative externalities they might impose on other economic agents, holding too many may impose a significant cost in terms of reduced profitability. Indeed, as retained earnings are the primary means of organic capital generation, low profits may prevent banks from expanding and extending additional credit to the real economy. These benefits and costs are equally applicable both for individual institutions and the financial system as a whole.

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