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LIQUIDITY BUFFERS
of Australian-owned ADIs[1]

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Liquidity risk has many characteristics prompting the need to manage the exposure via a liquidity buffer. The objective of this paper is to build on the scarce empirical evidence surrounding the determinants of authorised deposit-taking institutions' (ADIs) liquidity buffers. Of particular interest is the question of how macro-economic and ADI-specific factors influence Australian-owned ADIs' holdings of liquid assets.[2] *An earlier version of this paper was presented to the 2012 Australian Centre for Financial Studies' Melbourne Money and Finance Conference.*

Funding liquidity is the ability to meet cash claims as they arise. For banks this is extraordinarily important because of the uncertainty surrounding the nature of their future cash flows. Liquidity buffers serve to insulate banks against this uncertainty by providing access to cash when needed. They are therefore considered a fundamental element of liquidity risk management.

In a broader context, banks that are more self-reliant help to mitigate liquidity contagion, defined herein as the spreading of liquidity problems from one troubled bank to other financial system participants. Liquidity contagion has the potential to quickly exacerbate a bank-specific liquidity problem into a systemic liquidity event. This may loom as a threat to financial stability and, in extreme cases, the viability of the financial system as evidenced by the financial crisis that began in 2007.

Despite the importance of liquidity buffers in mitigating liquidity risk at both the bank- and system-level, little is known about how they relate to the macro economy and to bank-specific factors. Extant regulatory guidance material focuses almost entirely on the size, marketability and composition of ADIs' liquidity buffers, and on the survival periods that form part of scenario modelling. Among the academic literature, much of the work relating to banks' liquidity buffers examines the effect of the lender of last resort. This paper seeks to fill that gap.

Australia provides an ideal setting for such a study for two main reasons. First, the Australian Prudential Regulation Authority (APRA) classifies ADIs as either simple minimum liquidity holdings (MLH) financial institutions (generally credit unions and building societies) or more complex scenario analysis (SA) ADIs for the purpose of liquidity regulation and supervision. This classification provides a non-arbitrary distinction between small and large ADIs which is ideal for testing for differences in their liquidity buffers. Second, Australian ADIs are not subject to a reserve requirement, meaning that changes in an ADI's liquidity buffer will be more sensitive to management's strategic decisions.

Using a balanced panel of 112 Australian-owned ADIs, a generalised method of moments (GMM) model is employed to examine the levels of ADIs' liquidity buffers with respect to various macroeconomic and ADI-specific factors. Strong evidence suggests that SA ADIs build up their liquidity buffers during economic downturns and draw them down in economic upturns. This behaviour may give rise to pro-cyclical effects. There is no evidence that economic growth affects the liquidity buffers of MLH ADIs. In addition, there is strong evidence that both SA and MLH ADIs carry more (less) liquidity when interest rates are low (high), which may have consequences for the transmission of monetary policy. The effect is more pronounced among SA ADIs. Overall, large ADIs are found to carry less liquidity, relative to total assets, than small ADIs.

Background

Liquidity regulation and supervision in Australia

APRA sets out qualitative and quantitative liquidity requirements for ADIs under *Prudential Standard APS 210 Liquidity* (APS 210). ADIs are required to have in place a liquidity risk management framework that includes at a minimum: the liquidity risk tolerance of the ADI; a board-approved liquidity management strategy; policies, procedures and controls for liquidity risk identification, measurement and monitoring; a funding strategy for the group; as well as a contingency funding plan.

The minimum quantitative requirements depend on APRA's classification of ADIs as either MLH or SA. MLH ADIs are required to maintain a minimum holding of 9 per cent of their liabilities in specified liquid assets or, in many cases, more than 9 per cent, as APRA exercises its supervisory discretion. SA ADIs, on the other hand, must consider various scenarios to ensure they can continue to meet their obligations under a range of adverse operating environments.

Policy-oriented work

The Basel Committee on Banking Supervision (BCBS) has traditionally promoted liquidity buffers as a fundamental element of 'better' liquidity risk management and supervision practice. This is highlighted by Principle 1 and Principle 12 of the BCBS' *Principles for Sound Liquidity Risk Management and Supervision* (September 2008). The guidance focuses largely on factors affecting the size of banks' liquidity buffers and the composition of liquidity buffers. Regulators in many jurisdictions have incorporated these principles into their liquidity regulation and supervision practices.

Prompted by the severity of banks' funding and liquidity problems that were brought to light by the global financial crisis, the BCBS have introduced two global liquidity standards: i) the liquidity coverage ratio (LCR); and ii) the net stable funding ratio (NSFR). Of most relevance to this paper, the LCR helps to ensure ADIs can meet their funding demands during a stressed environment lasting one calendar month. It requires ADIs to hold more liquid assets and better quality liquid assets than prior to the crisis. This is the first time minimum quantitative requirements relating to ADI liquidity buffers have been proposed by the BCBS.

Consequences of poor liquidity risk management

The consequences of having or simply being perceived as having insufficient access to cash were highlighted by the events that unfolded throughout the crisis. ADIs that encountered the most severe funding and liquidity problems were those with liquidity buffers that were simply too small to withstand the extent and prolonged duration of the market disruption. A report by the Senior Supervisors Group (SSG 2009) highlights that many firms used metrics such as 'months of coverage' to calculate and maintain a measurable liquidity buffer. This approach is similar to that employed by the ratings agencies. Some institutions also considered the loss of unsecured funding. Nonetheless, many firms found that the 'time-to-funding' measure did not cover the full range of risks to which they were exposed, such as the loss of secured funding and collateral calls to support clearing. In recent academic work, Cornett et al. (2011) report that banks which held more illiquid assets on their balance sheets had less stable sources of funding and were more exposed to off-balance sheet liquidity risk, increased their holdings of liquid assets and reduced lending during the crisis.

The abundance of funding leading up to the crisis may have discouraged ADIs from carrying a larger buffer of high-quality liquid assets. There is also an incentive for ADIs to hold fewer liquid assets since carry costs generally drag on profits. But weaknesses in their approaches to managing liquidity risk are likely to have also contributed. For example, although most ADIs in most jurisdictions are subject to scenario modelling and stress testing requirements for liquidity, many of the models relied on historical data and narrow confidence intervals, and underestimated the extent and prolonged duration of a market disruption.

Academic literature

Aspachs, Nier and Tiesset (2005) examine empirically the determinants of ADIs' liquidity buffers. They use a panel of 59 UK-resident ADIs for which data was collected from the period Q1 1985 to Q4 2003. Their research produced two main findings. First, ADIs' liquidity buffers are inversely related to GDP, increasing in downturns and decreasing in upturns. Second, ADIs are financially constrained with strong evidence suggesting they hoard money as a source of liquidity when current profits are high and future lending opportunities are good. The second finding is consistent with the results of Almeida, Campello, and Weisbach (2004) who report evidence of financing constraints among a panel of US non-financial corporate institutions.

Data

This study uses a balanced panel of 112 Australian-owned ADIs, which consists of nine SA ADIs and 103 MLH ADIs. ADI-specific data is extracted from a number of regulatory reporting forms submitted to APRA on a quarterly basis from June 2002 to March 2012. Economic data is sourced from statistical tables published by the Reserve Bank of Australia (RBA) over the same time period.

A list of the variables used to examine levels of liquidity buffers is presented in Table 1.

TABLE 1: Variables used in regression analysis

Dependent variable	Measure of:	Calculated as:
Liquidity ratio	Buffer of liquid assets	Liquid assets divided by total assets
Independent variables		
Loan growth	Current lending opportunities	Quarter-on-quarter growth in loans to the non-financial sector
Net interest margin	Opportunity cost of holding liquid assets	Net interest income divided by total assets for the reported quarter
Profit/total assets	Profitability as a source of liquidity	Quarterly net profit after tax divided by total assets
Size	Controlling for size	Log total dollar assets
Wholesale funding ratio	Reliance on wholesale funding	The proportion of wholesale funding to total funding liabilities
GDP	Business cycle effect	Quarter-on-quarter growth in output
BBSW	Monetary policy	Three-month bank bill swap rate (BBSW)

TABLE 2: Summary statistics

	Min	Max	Mean	Median	SD	# Obs
Panel A: Scenario Analysis ADIs (n=9)						
Liquidity Ratio	4.62	48.64	16.04	14.35	7.62	360
Loan Growth	-21.46	35.47	3.08	2.91	5.00	360
Net Interest Margin	-2.00	3.15	1.75	1.86	0.65	360
Profit/Total Assets	-1.02	3.01	0.26	0.22	0.36	360
Size (Log Total Assets)	21.53	27.09	24.87	24.81	1.56	360
W/Sale Funding Ratio	45.28	99.62	76.34	79.90	14.05	360
Panel B: Minimum Liquid Holding ADIs (n=103)						
Liquidity Ratio	8.27	63.47	21.65	19.81	8.04	4120
Loan Growth	-30.92	37.48	1.88	1.75	3.62	4120
Net Interest Margin	-4.56	14.45	3.81	0.84	1.12	4120
Profit/Total Assets	-1.63	7.39	0.17	0.15	0.19	4120
Size (Log Total Assets)	14.41	22.95	18.92	18.88	1.55	4120
W/Sale Funding Ratio	4.52	89.54	21.29	19.42	10.73	4120
Panel C: Macro Economic Variables						
BBSW 3M	3.19	7.64	5.33	5.39	1.09	40
GDP (quarterly change)	-0.68	1.73	0.74	0.74	0.53	40

Note: All values reported are in percentages and are based on quarterly observations. The exception is size, which is reported as the log of total dollar assets. Growth variables represent quarter-on-quarter change. Net Interest Margin is annualised in the same manner as APRA's quarterly banking statistics.

Liquid assets consist of cash and liquids and all types of trading and investment securities, such as equities and bonds, as reported on ARF 320 and ARF 323. 'Other deposits' are also included in the numerator for ADIs reporting on ARF 323. This measure is broadly consistent with that described in Kashyap and Stein (2000) and Aspachs et al. (2005).

Net interest margin is annualised, consistent with APRA's approach in its quarterly bank performance statistics and quarterly credit union and building society performance statistics, with the exception that assets are not averaged over the current and preceding quarter.

Wholesale funding consists of all funding other than household/retail deposits as depicted on ARF 320 and ARF 323. Total funding liabilities consist of domestic deposits, short-term debt, long-term debt and equity for ADIs reporting on ARF 323. Foreign liabilities, foreign deposits as well as short- and long-term foreign debt are also included in total funding liabilities for ADIs reporting on ARF 320. Intra-group deposits and deposit liabilities due to overseas operations are not included because they are not reported to APRA prior to 30 September 2003. Outstanding principle balance of securitised assets is not included because it was not reported to APRA prior to 30 September 2006.

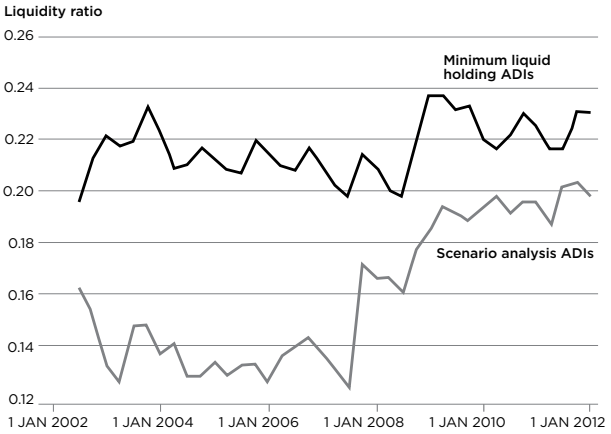
To illustrate some of the differences between MLH and SA ADIs, summary statistics for the variables used in the regression analysis are presented in Table 2. The total number of observations is 4,480 ADI-quarters (360 for SA ADIs and 4,120 for MLH ADIs).

Comparing the means of SA ADIs (Panel A) and MLH ADIs (Panel B) the main observations are as follows.

- On average, SA ADIs have lower levels of liquidity (16 per cent) than MLH ADIs (22 per cent).
- SA ADIs are much larger than MLH ADIs with average assets approximately AUD$63 billion versus AUD$165 million.
- SA ADIs rely much more heavily on wholesale funding (76 per cent) than MLH ADIs (21 per cent).
- SA ADIs exhibit higher quarterly lending growth to the non-financial sector (3.1 per cent) than their MLH counterparts (1.9 per cent) and generate a higher return on assets (0.26 per cent v 0.17 per cent). There is, however, greater variability in SA ADIs' quarterly profits.
- The net interest margin for SA ADIs (1.8 per cent) is considerably lower than that for MLH ADIs (3.8 per cent). Higher average funding costs for SA ADIs accounts for much of this difference.

Figure 1 plots the levels of ADIs' liquidity buffers over the sample period.

FIGURE 1: Average liquidity ratio of SA and MLH ADIs



From 2002 until late 2007 the liquidity buffers of SA ADIs trended slightly downwards from 16 per cent toward 12.5 per cent. On the contrary, MLH ADIs maintained liquidity buffers in the vicinity of 21 per cent. In mid 2007 the liquidity buffers of SA ADIs jumped around 4 per cent (12.5 per cent to 17.5 per cent), with a subsequent increase of approximately 3 per cent (16.5 per cent to 19.5 per cent) in mid 2008. Since then they have continued to increase to around 20 per cent. Over the same period, the liquidity ratios of MLH ADIs have also increased, but to a lesser extent.

Method and results

A one-stage generalised method of moments (GMM) model is employed to examine empirically the determinants of liquidity buffers. The approach is similar to that of Blundell and Bond (1998) in which explanatory variables are first-differenced and used as instruments and parameters are estimated using level moment equations.

The baseline model examines the effect of GDP and short-term interest rates on levels of ADIs' liquidity buffers while controlling for size. It has the form:

$$Liq_{it} = a + I(SA)a + \beta_{SA} I(SA)\Delta GDP_t + \beta_{MLH} I(MLH)\Delta GDP_t + \beta_{SA} I(SA)BBSW_t + \beta_{MLH} I(MLH)BBSW_t + \beta_{size} Size_{it} + \gamma_i + \varepsilon_{it}$$

where:

Liq_{it} is the liquidity buffer of ADI i at time t

a is the intercept term

$I(SA)$ is an indicator variable that is equal to 1 for SA ADIs and 0 otherwise

ΔGDP is the change in GDP from the previous quarter

$I(MLH)$ is an indicator variable that is equal to 1 for MLH ADIs and 0 otherwise

$BBSW$ represents the three-month bank bill swap rate

$Size$ is measured as the log total assets per ADI-quarter

γ are cross-sectional fixed effects

ε is the error term

TABLE 3: Results of baseline (1) and expanded (2) regressions

	Dependent Variable: Liquidity Ratio	
INDEPENDENT VARIABLES		
Intercept	0.4991 (5.01)***	0.7915 (7.27)***
Intercept*SA (Indicator)	0.0440 (1.12)	-0.2045 (-2.60)***
GDP*SA	-1.0673 (-2.18)**	-0.9702 (-2.32)**
GDP*MLH	-0.1320 (-1.01)	-0.0540 (-0.47)
BBSW 3M*SA	-1.1470 (-3.77)***	-0.8813 (-2.55)**
BBSW 3M*MLH	-0.7691 (-5.70)***	-0.4047 (-2.27)**
Net Interest Margin*SA		-0.6329 (-0.59)
Net Interest Margin*MLH		-1.4019 (-198)**
Wholesale Funding Ratio*SA		0.3782 (3.18)***
Wholesale Funding Ratio*MLH		-0.0543 (-0.98)
Loan Growth		-0.3782 (-5.23)***
Profit/Total Assets (quarterly)		-4.6041 (-3.33)***

**** indicates coefficients are significantly different from zero at 1% level, ** at 5% level, and * at 10% level.*

The use of indicator variables in the regression allows for SA ADIs to be compared to MLH ADIs, with different intercept terms and different slope parameters for GDP and interest rates. The use of first-differenced explanatory variables as instruments controls for any ADI-specific fixed effects.

The regression results are presented in column 1 of Table 3.

The results provide strong evidence that SA ADIs' liquidity buffers are affected by both economic growth and the short-term interest rate. First, the negative coefficient on GDP implies that ADIs carry more (less) liquidity, relative to total assets, when economic growth is weak (strong). Second, the negative coefficient on the short-term interest rate implies that SA ADIs carry more (less) liquidity, relative to total assets, when rates are low (high).

For MLH ADIs, the results provide no evidence that their liquidity buffers are affected by economic growth. While there is a significant inverse relationship with the short-term interest rate, the effect is significantly less pronounced than for SA ADIs.

As a check for robustness, the model is expanded to include other factors that may affect the level of ADIs' liquidity buffers. In particular, net interest margin as a measure of the opportunity cost of foregone return, wholesale funding reliance, loan growth to the non-financial sector and net profit after tax are included. The results are presented in column 2 of Table 3.

The effect of economic growth and the short-term interest rate on the liquidity buffers of SA and MLH ADIs remains unchanged. As for the additional control factors there are a number of interesting findings.

First, net interest margin is inversely related to the liquidity buffers of both groups of ADIs, but only significant for MLH ADIs. The negative coefficient implies that ADIs carry less liquidity, relative to total assets, when their net interest margin is high. This is consistent with the predictions of inventory models of optimal liquidity holdings. Second, wholesale funding reliance affects the liquidity buffers of SA ADIs, but not MLH ADIs. The positive coefficient implies that SA ADIs that rely more on wholesale funding carry more liquidity, relative to total assets. This appears prudent from a liquidity risk management perspective. Third, loan growth affects the liquidity buffers of ADIs. The negative coefficient implies that ADIs experiencing higher lending growth will carry less liquidity, relative to total assets. Fourth, profit affects the liquidity buffers of ADIs with the negative coefficient suggesting that higher profits result in less liquidity, relative to total assets. Finally, the negative coefficient on size implies that large ADIs carry less liquidity than small ADIs.

Summary

SA ADIs are found to build up their liquidity buffers during economic downturns and draw them down during economic upturns. This behaviour may give rise to pro-cyclical effects, whereby a reduction in liquidity to fund loans amplifies the upturn and the hoarding of liquidity by not funding loans deepens and lengthens the downturn. No such relationship was evident among MLH ADIs.

Another important finding is that both SA and MLH ADIs carry more (less) liquidity when interest rates are low (high). This implies that when the central ADI seeks to stimulate the economy by reducing interest rates, and increasing money supply, both groups of ADIs respond by carrying more liquid assets.

This result may have been driven by the central bank's actions to reduce interest rates to historic low levels during the early part of the crisis. Further analysis into the supply and demand effects of loan growth is needed to determine if this behaviour mitigates the effect of monetary policy.

In terms of the ADI-specific factors that were examined, net interest margin affects the liquidity buffers of MLH ADIs but not SA ADIs. The negative coefficient implies that MLH ADIs carry less liquidity when opportunities to earn higher returns on loans and other investments are available. Intuitively, this makes sense. Loan growth and profit are both significant and inversely related to ADIs' liquidity buffers. These findings imply that ADIs experiencing higher loan growth and larger profits will carry less liquidity relative to total assets. The positioning of liquidity to account for lending opportunities suggests that ADIs cannot fully rely on external sources of funds to lend optimally over time.

Overall, these findings may prove useful for the future development of liquidity policy at both the ADI- and system-level. Further analysis into the effect of the crisis on ADI liquidity and loan growth is planned. ■

Notes

1. Disclaimer: This paper reflects the author's views and not necessarily the views of APRA. APRA does not accept any responsibility for the accuracy, completeness or currency of the material included in this publication, and will not be liable for any loss or damage arising out of any use of, or reliance on, this publication.

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