Bank liquidity management and potential impact of macroprudential liquidity measures

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July 31, 2017

Teaser: I investigate how Slovenian banks manage their liquidity risk. For most of the banks in Slovenia, there is evidence of cointegration between assets and liabilities with residual maturity within thirty days (including liquid assets irrespective of their contractual maturity and liabilities with no-written maturity). I interpret the existence of cointegration as the bank tendency to maintain a minimum liquidity buffer. On average, the adjustments to the liquidity ratio are skewed toward the asset side. Moreover, the size of the liability-based adjustment varies with the structure of the liabilities. This has important policy implications, if the objective of the financial regulator is to reduce banks' dependence on less stable sources of funding.

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[A] Introduction

Since 2015, the liquidity coverage ratio (LCR) introduced by the Basel Committee on Banking Supervision (BCBS) has become obligatory. Given the phasing-in period, the LCR has been fully implemented only since January 2018, while the proposal to introduce a net

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stable funding ratio (NSFR) as obligatory microprudential tool has been put forward by the European Commission in November 2016. The introduction of the LCR has prompted increasing interest in the effects of liquidity regulation on bank behaviour. On top of the newly introduced LCR, banks in Slovenia are required to comply with a liquidity requirement (KL1) since September 2001 (in the form of recommendation since 1 January 2018). Accordingly, the ratio between assets and liabilities with residual maturity within 30 days (including assets easily convertible into cash and sources of funding from which money can be withdrawn without notice) should be greater than or equal to one: $KL1 \geq 1$. Banks are required to report daily the changes occurred in their liquidity ratio KL1.

The present paper exploits this database in order to understand how Slovenian banks (adjust their assets and liabilities in order to) comply with the liquidity regulation. In particular, the following research questions are addressed:

- are the adjustments to the liquidity ratio biased toward the asset or the liability side of a bank balance sheet?
- do the adjustments depend on the degree of reliance on wholesale funding?
- do the adjustments depend on the degree of reliance on sight deposits?

To my knowledge, this is the first paper that investigates how Slovenian banks comply with the liquidity regulation. Moreover, this paper extends the methodology in Duim and Wierts 2016, in order to examine whether the role of asset-based and liability-based adjustments to the liquidity ratio varies with the composition of liabilities.

[A] Overview of data and models

In order to investigate how Slovenian banks manage their liquidity risk and comply with the liquidity regulation, I use data on bank-specific assets and liabilities that constitute, respectively, the numerator (KL1num) and denominator (KL1den) of the liquidity ratio known as KL1. The sample period is July 2002-June 2014, unless differently stated.

Using the Im-Pesaran-Shin panel unit root test (Im et al. 2003) and Pedroni's cointegration test[1] (Pedroni 2001), I find evidence that, for most of the banks in the sample (twelve out of nineteen banks), numerator and denominator of KL1 are not only integrated of the same order but also cointegrated (Table 1-3). Therefore, I estimate the cointegrated relationship between these two variables. I interpret the existence of such cointegrated relationship as the existence of a long-run equilibrium level of liquidity at bank level.

Given the existence of cointegration, I estimate an error-correction model (ECM) in order to assess whether banks are more incline to adjust their assets (asset-based adjustment) or their liabilities (liability-based adjustment) in order to cope with liquidity shocks in an attempt to converge toward the bank-specific long-run equilibrium level of the liquidity ratio. Moreover, I estimate threshold error-correction models accommodating the possibility that the mechanism of adjustment to the liquidity ratio may vary with a) the sign of the deviation from the long-run equilibrium level of liquidity (surplus versus deficit), b) the degree of reliance on wholesale funding and c) the degree of reliance on sight deposits.

In order to estimate the error-correction models, I follow the two-step procedure by Engle and Granger 1987. Moreover, I impose panel restrictions on the error correction coefficients.

Table 1. Panel unit-root test

The table shows the results of the panel unit-root test based on the Im-Pesaran-Shin (IPS) method, which assumes the existence of unit root under the null hypothesis. The appropriate number of lags is selected by Schwarz information criterion (SIC). *** denotes 1% significance level. Based on individual unit root tests (Table 2), 7 out of 19 banks are excluded. Banks are not excluded in presence of a unit root in both numerator and denominator of KL1 at 10% significance level (Table 2).

	Assets in liquidity buffer (KL1num)		Liabilities in liquidity buffer (KL1den)	
	Level	First difference	Level	First difference
Full sample (19 banks)				
# obs.	2343	2332	2327	2320
Test statistic	-8.8***	-55.4***	-0.17	-49.39***
p-value	(0.000)	(0.000)	(0.43)	(0.000)
Only banks with unit root in numerator and denominator of KL1 (12 banks)				
# obs.	1578	1568	1567	1558
Test statistic	-0.22	-44.41***	0.91	-39.44***
p-value	(0.41)	(0.000)	(0.82)	(0.000)

[1] In order to control for cross-sectional dependence, I first subtract from the numerator and denominator of KL1 the cross-sectional means for each period. This is equivalent to controlling for cross-sectional dependence (at least to some extent) via time effects, as suggested by Pedroni 2001.

Table 2. Intermediate unit-root results

The table shows the individual augmented Dickey-Fuller (ADF) test results for all individual time series. The null hypothesis of a unit root (non-stationarity) is tested against the alternative that there is no unit root. The results in the table show that the null hypothesis cannot be rejected for all nineteen pairs of series. In particular, the results indicate that for most of the banks in the sample, namely twelve out of nineteen, both the series of the numerator and denominator of KL1 are integrated at order 1. The appropriate number of lags is selected by SIC. *, **, *** denote 10, 5 and 1% significance level, respectively.

Bank	assets in KL1		liabilities in KL1		Bank	assets in KL1		liabilities in KL1	
	p-value	lag	p-value	lag		p-value	lag	p-value	lag
1	0.324	3	0.0375**	3	11	0***	0	0.9976	1
2	0.0347**	0	0.8494	2	12	0.0824*	0	0.0699*	3
3	0.5631	0	0.8791	2	13	0.5382	0	0.3238	0
4	0.3095	1	0.7031	1	14	0.5719	0	0.4662	7
5	0.5351	1	0.6341	2	15	0.5364	1	0.7989	0
6	0.2949	4	0.4214	1	16	0.1319	1	0.4274	2
7	0.6443	4	0.4954	4	17	0.3204	0	0.8385	4
8	0.705	0	0.5103	0	18	0.7681	1	0.8006	1
9	0.0411**	3	0.3653	2	19	0.0003***	0	0.0334**	0
10	0.0039***	2	0.0036***	2					

Table 3. Cointegration test results

The table shows the results of Pedroni's cointegration test, after subtracting the cross-sectional means from each observation for the numerator and denominator of KL1, respectively. The null hypothesis of no cointegration is tested against the alternative that a cointegrating vector exists for each bank. The table shows panel statistics (left part) and group statistics (right part). The appropriate number of lags for each time series is selected by SIC. *** denotes 1% significance level.

	within dimension	p-value		between dimension	p-value
Panel v-Statistic	2.67***	0.004	Group rho-Statistic	-9.02***	0.000
Panel rho-Statistic	-9.08***	0.000	Group PP-Statistic	-7.49***	0.000
Panel PP-Statistic	-6.30***	0.000	Group ADF-Statistic	-6.39***	0.000
Panel ADF-Statistic	-6.50***	0.000			

Notes: The panel-statistics approach pools over the "within" dimension. It tests the null hypothesis that the first-order autoregressive coefficient on the residuals is the same for each individual bank. The group statistics approach pools over the "between"dimension. It allows the autoregressive coefficient to differ for each bank.

[A] Results

Estimation results (Table 4-6) show that banks converge toward the bank-specific long-run equilibrium level of the liquidity ratio through the two channels of asset-based and liability-based adjustment. The overall adjustment is faster in case of liquidity deficit than in case of liquidity surplus: 39%(=|-0.23|+0.16) of liquidity deficit is corrected in the next month, while only 18% of liquidity surplus is corrected in the subsequent month. On average, the adjustment is biased toward the asset side.

The adjustment through the liability channel becomes faster in presence of greater reliance on wholesale funding. In contrast, the higher the bank reliance on sight deposits, the slower is the adjustment through the liability channel. Overall, the liquidity risk management of a bank

seems to be dependent on its structure of liabilities. The liability-based adjustment is faster when banks face an increasing reliance on wholesale funding than on sight deposits. Moreover, an increase in the reliance on wholesale funding (sight deposits) is associated with a faster (slower) overall adjustment to the liquidity ratio.

Table 4. (Asymmetric) Adjustment Coefficients

The table shows the error correction terms from the GLS results for the (threshold) vector error correction model for twelve banks over the period July 2002 –Dec 2013. ***, **, * denote significance at 1, 5 and 10% significance level, respectively.

	Asset-based adjustment		Liability-based adjustment	
symmetric	ρ^{LA}	-0.20***	ρ^{LL}	0.09*
asymmetric	$\rho^{LA}_{deficit}$	-0.23***	$\rho^{LL}_{deficit}$	0.16***
	$\rho^{LA}_{surplus}$	-0.18***	$\rho^{LL}_{surplus}$	0.01

Table 5. Adjustment Coefficients in the model that controls for wholesale funding

The table shows the error correction terms from the GLS results for the threshold vector error correction model where the variable responsible for the discontinuity in the error correction coefficient is wholesale funding. Estimation period July 2002 –Dec 2013. ***, **, * denote significance at 1, 5 and 10% significance level, respectively. Big (small) volume means above (below) the average volume over the sample period.

Volume of wholesale funding	Total wholesale funding		Wholesale funding maturing within 30 days	
	Adjustment		Adjustment	
	asset-based	liability-based	asset-based	liability-based
small	-0.07**	0.10***	-0.11***	0.08***
big	-0.14***	0.13***	-0.09**	0.19***

Table 6. Adjustment Coefficients in the model that controls for sight deposits

The table shows the error correction terms from the GLS results for the (threshold) vector error correction model where the variable responsible for the discontinuity in the error correction coefficient is the volume of sight deposits. ***, **, * denote significance at 1, 5 and 10% significance level, respectively. Big (small) volume means above (below) the average volume over the sample period.

Volume of sight deposits	Estimation period July 2002-Dec 2013		Estimation period Jan 2007-Sep 2011	
	Adjustment		Adjustment	
	asset-based	liability-based	asset-based	liability-based
small	-0.13***	0.13***	-0.22***	0.14***
big	-0.19**	0.07	-0.16***	0.10**

[A] Interpretations of the results and conclusions

The findings suggest that, on average, it is probably easier and more cost-efficient for banks to increase the share of liquid assets than increasing the average maturity of their liabilities. However, the results also suggest that it might be easier for banks to lengthen the maturity of their liabilities when there is abundant wholesale funding with respect to the case when sight deposits represent a relatively high share of total liabilities. A reason could be that the interest rate spread between term and sight deposits that banks need to offer to depositors as an incentive to switch from sight to term deposits might be too large. If this is the case, in presence of higher dependence on sight deposits, it is cost-efficient for banks to limit the liability-based adjustment that would alter the term structure of deposits.

The documented evidence that the mechanism of adjustment to the liquidity ratio varies with the structure of liabilities has relevant policy implications. For instance, if the financial regulator wishes to limit the bank reliance on sight deposits, he needs to raise the risk weight on sight deposits significantly, otherwise banks will not find convenient to increase the spread between term and sight deposits. More in general, increasing the liquidity requirement in an attempt to limit the bank dependence on less stable sources of funding may have a limited effectiveness if banks react mainly by increasing their liquid assets.

Moreover, the macroprudential policy maker should take into account the negative consequences of banks increasing their liquid assets. For instance, banks may concentrate their pool of liquid investments in few liquid assets. This occurrence increases the probability of asset fire sales in the event that a liquidity shock hits many banks contemporaneously and they need to liquidate their position on the same assets. In contrast, measures that target more explicit the structure of the liabilities would be more effective in tackling the liquidity-funding risk.

References

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