Too Big to Care, Too Small to Matter: Macrofinancial Policy and Bank Liquidity Creation

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Introduction

- Banks’ ability to create liquidity through qualitative asset transformation on their balance sheets is the focal point of virtually all theories of financial intermediation.

- To date, only few empirical studies attempt to measure how much liquidity banks actually create and how this process responds to changes in macrofinancial conditions.

- We implement the methodological approach proposed by Berger and Bouwman (2009) to study the dynamics of liquidity creation of U.S. bank holding companies between 1997 and 2015.

- Our analysis focuses on three regulatory and policy innovations arising in the aftermath of the 2007 - 2009 financial crisis:
  - Bank capital regulatory reform;
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  1. Bank capital regulatory reform;
  2. Monetary stimulus through quantitative easing;
  3. Government capital injections implemented through TARP.
Post-Crisis policy developments

1 Reform of bank capital requirements system:
   ▶ Basel III, introduced in 2010, raised the minimum bank capital requirements and introduced new short- and long-term liquidity requirements;
   ▶ Costs of implementation could be as much as 0.8 to 2 percentage points of GDP per year (Oxford Economics, 2013) due to lower lending growth rates (Bridges, et al., 2014);
   ▶ Bank capital and lower funding liquidity risk are, however, positively related to bank survival probability (Berger and Bouwman, 2013, Khan, et al., 2013).

2 Unconventional monetary policy:
   ▶ Conventional monetary policy ceased to be effective in late 2008 when the nominal interest rate reached its zero lower bound;
   ▶ The first two rounds of credit easing reduced long-term Treasury yields by 35 and 45 basis points respectively, equivalent to a 140 basis points and a 180 basis points cuts in federal funds rate (D’Amico, et al., 2012).

3 Large-scale government bank capital support programmes:
   ▶ Troubled Asset Relief Program gave the U.S. government to buy or insure $700bn of assets in healthy and viable banks;
   ▶ TARP-participant banks increased their loan supply by more than 6%, but their loan and securities portfolios became more risky vis-à-vis non-participant institutions (Li, 2013, Black and Hazelwood, 2013, Duchin and Sosyura, 2014).
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1. Classify all assets, liabilities, equity, and off-balance sheet items of an institution as liquid, semi-liquid or illiquid according to how easily they can be transformed into cash to meet liquidity demands;
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\[
\text{LIQUIDITY CREATED} = \frac{1}{2} \times \text{ILLIQUID ASSETS} + 0 \times \text{SEMI-LIQUID ASSETS} - \frac{1}{2} \times \text{ILLIQUID LIABILITIES}
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For example:

- A bank with $1 of illiquid assets (commercial real estate loans) and $1 of liquid liabilities (transaction deposits) creates $1 of liquidity (both claims have a weight of $+\frac{1}{2}$);
- A bank with $1 of liquid assets (tradable securities) and $1 of equity destroys $1 of liquidity (both claims have a weight of $-\frac{1}{2}$).
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Data sample

- **Bank-specific data:**
  - Collected from the Federal Reserve Bank of Chicago’s FR Y9-C reports database;
  - Sample period: 1997:Q1 - 2015:Q4;
  - Sample size: 27,744 bank-quarter observations;
  - The sample corresponds to 30% of observations with no missing values, but 80% of aggregate assets and 86% of the total volume of liquidity creation of the raw sample.

- **Macroeconomic and market data:**
  - Collected from the Federal Reserve Economic Database and Bloomberg;
  - Nominal GDP, M1 money supply, Case-Shiller index, credit spread, TED spread, VIX index, Amihud measure for S&P 500;
  - Term spread constructed by subtracting Wu and Xia’s (2016) shadow policy rate from the yield on 30-year government bonds:
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Aggregate liquidity creation and size of the banking sector

- Total amount of liquidity created increased from $1.4tn in 1997:Q1 to more than $5.1tn in 2015:Q4.
- Aggregate gross total assets increased from $4tn in 1997:Q1 to more than $15tn in 2015:Q4.
- The amount of liquidity creation per $1 of assets responds to changes in macrofinancial conditions. The 2007 - 2009 crisis marks a switch to a low-efficiency regime.
Macrofinancial conditions and bank liquidity creation

- We examine the determinants of bank liquidity creation within a panel regression framework.

- All variables taken in first differences due to persistence in certain macrofinancial time series.

- Key variables of interest:
  - Measuring the impact of bank capital requirements: Tier 1 Ratio, RW Assets Ratio;
  - Measuring the impact of monetary policy: Term Spread;
  - Measuring the effects of TARP funding: TARP dummy variable.

- We estimate the following regression:

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\Delta \text{Normalised Liquidity Creation}_{i,t} = \beta \Delta \text{Tier 1 Ratio}_{i,t} + \\
+ \beta \Delta \text{RW Assets Ratio}_{i,t} + \beta \Delta \text{Term Spread}_{t} + \Delta \mathbf{x}' \beta_{i,t} + TARP_{i,t} + \alpha_i + \epsilon_{i,t} \tag{1}
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Macrofinancial conditions and bank liquidity creation

- The size distribution of the banks is highly skewed.
- The largest 5% of institutions control over 82% of GTA, and create 76% of total liquidity.
- We create subsamples of small and large banks by splitting the sample around the 95th percentile of GTA in each quarter.

Cumulative GTA of banks in the sample as of 2015:Q4

Normalised liquidity creation, banks classified by size
Macrofinancial conditions and bank liquidity creation

Panel regression results for small and large banks for 1997-2008 and 2008-2015

<table>
<thead>
<tr>
<th></th>
<th>Small banks</th>
<th>Large banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>△ Tier 1 Ratio</td>
<td>-0.386*** -0.416***</td>
<td>0.292 -0.320*</td>
</tr>
<tr>
<td></td>
<td>(-3.54) (-11.18)</td>
<td>(0.78) (-1.86)</td>
</tr>
<tr>
<td>△ RWAssets Ratio</td>
<td>0.642*** 0.505***</td>
<td>0.651*** 0.501***</td>
</tr>
<tr>
<td></td>
<td>(18.29) (17.45)</td>
<td>(6.43) (4.37)</td>
</tr>
<tr>
<td>△ Term Spread</td>
<td>0.517*** 0.121*</td>
<td>-0.047 0.157</td>
</tr>
<tr>
<td></td>
<td>(7.99) (1.89)</td>
<td>(-0.14) (0.54)</td>
</tr>
<tr>
<td>△ ln(Assets)</td>
<td>-0.050*** -0.064***</td>
<td>-0.041 -0.112**</td>
</tr>
<tr>
<td></td>
<td>(-3.49) (-5.95)</td>
<td>(-0.89) (-2.19)</td>
</tr>
<tr>
<td>△ Tier 1 Ratio (-1)</td>
<td>0.048 0.019</td>
<td>-0.095 -0.100</td>
</tr>
<tr>
<td></td>
<td>(1.25) (0.89)</td>
<td>(-0.33) (-0.68)</td>
</tr>
<tr>
<td>△ ln(Assets) (-1)</td>
<td>0.014*** 0.017***</td>
<td>0.005 0.005</td>
</tr>
<tr>
<td></td>
<td>(2.56) (3.11)</td>
<td>(0.31) (0.23)</td>
</tr>
<tr>
<td>△ RWAssets Ratio (-1)</td>
<td>0.040*** 0.026*</td>
<td>-0.065 0.098**</td>
</tr>
<tr>
<td></td>
<td>(2.76) (1.74)</td>
<td>(-1.44) (2.38)</td>
</tr>
<tr>
<td>△ ROA</td>
<td>-0.128* 0.086***</td>
<td>-0.592* 0.127</td>
</tr>
<tr>
<td></td>
<td>(-1.86) (2.59)</td>
<td>(-1.99) (0.52)</td>
</tr>
<tr>
<td>△ Amihud Measure</td>
<td>-524.508*** 363.750***</td>
<td>-1141.720 1340.163</td>
</tr>
<tr>
<td></td>
<td>(-2.76) (2.88)</td>
<td>(-1.22) (1.48)</td>
</tr>
<tr>
<td>△ Credit Spread</td>
<td>-0.012 0.133</td>
<td>0.036 -1.036</td>
</tr>
<tr>
<td></td>
<td>(-0.06) (0.76)</td>
<td>(0.03) (-1.41)</td>
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<tr>
<td>△ TED Spread</td>
<td>0.540*** -0.106</td>
<td>0.483 -0.341</td>
</tr>
<tr>
<td></td>
<td>(3.55) (-0.61)</td>
<td>(0.69) (-0.35)</td>
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<td>△ VIX Index</td>
<td>0.000 -0.000**</td>
<td>0.000 -0.000</td>
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<tr>
<td></td>
<td>(0.59) (-2.21)</td>
<td>(0.85) (-0.75)</td>
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<tr>
<td>△ ln(GDP)</td>
<td>-0.066 0.238***</td>
<td>-0.138 0.283</td>
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<td></td>
<td>(-0.44) (4.69)</td>
<td>(-0.58) (1.27)</td>
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<tr>
<td>△ M1/GDP Ratio</td>
<td>-0.268 0.098</td>
<td>-0.226 -0.017</td>
</tr>
<tr>
<td></td>
<td>(-0.65) (0.60)</td>
<td>(-0.17) (-0.05)</td>
</tr>
<tr>
<td>△ ln(CPI)</td>
<td>-0.302*** 0.198*</td>
<td>-0.056 0.215</td>
</tr>
<tr>
<td></td>
<td>(-3.11) (1.91)</td>
<td>(-0.29) (0.50)</td>
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<tr>
<td>△ Case-Shiller Index</td>
<td>0.001*** 0.000</td>
<td>0.001 -0.001*</td>
</tr>
<tr>
<td></td>
<td>(6.00) (0.30)</td>
<td>(1.18) (-1.85)</td>
</tr>
<tr>
<td>TARP</td>
<td>-0.001 (-0.87)</td>
<td>-0.003 (-0.76)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.004* 0.000</td>
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</tr>
<tr>
<td></td>
<td>(1.84) (0.07)</td>
<td>(1.35) (0.51)</td>
</tr>
<tr>
<td>Firm-fixed effects</td>
<td>Yes Yes</td>
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</tr>
<tr>
<td>Observations</td>
<td>12,613 11,792</td>
<td>676 634</td>
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<td>Adjusted $R^2$ (%)</td>
<td>34.5 43.9</td>
<td>27.4 38.6</td>
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The regression results highlight a striking difference between the dynamics of liquidity creation undertaken by small and large banks:

- $\Delta \text{Tier 1 Ratio}$ is significant only for small banks, reflecting higher cost of equity capital for smaller institutions;
- The effects of monetary easing ($\Delta \text{Term Spread}$) and changes in macrofinancial conditions are only pertinent to small banks.

The results demonstrate that the relation between small banks' liquidity creation and the macrofinancial factors changes with the onset of the 2007 - 2009 crisis:

- Quantitative easing may not be as effective in influencing lending behaviour of banks as conventional monetary policy;
- Introduction of stricter capital requirements may adversely affect banks' ability to create liquidity, despite concurrent easing of monetary policy;
- The amount of liquidity creation by small banks becomes positively related to asset market illiquidity ($\Delta \text{Amihud Measure}$) and to the inflation rate ($\Delta \ln(CPI)$) after the crisis.
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The impact of TARP

- The dynamics of normalised liquidity creation exhibit similar patterns when comparing small TARP and small non-TARP banks.
- Following the Crisis, large non-TARP banks promptly restore their liquidity creation to pre-2008 levels.
- Large TARP banks continue to create less liquidity than at any other point during the sample period.
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![Graph showing liquidity creation over time for small and large banks, with shaded areas indicating time periods.]
The impact of TARP

- The average government capital injection amounts to approximately 2% of the receiver’s GTA in the quarter in which it occurs.

- It is unlikely that a small, temporary increase in bank capital results in any long-term impact for the recipient institution.

- Nearly all large TARP institutions in the sample are classified as SIFIs, and participate in the Supervisory Capital Assessment Program.

- Government scrutiny may induce the largest institutions to reduce liquidity creation by diverting their resources towards safer, more liquid assets.

- Some of the large TARP banks in the sample are involved in high-profile legal proceedings, which often result in substantial financial penalties.
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- We perform difference-in-difference analysis on a matched sample of 330 TARP and non-TARP banks to quantify the impact of TARP more precisely.

- We calculate the changes in normalised liquidity creation relative to the 2007:Q4 levels in every quarter an institution is in receipt of TARP funds for each pair of matched banks, and test if the difference in performance of TARP and non-TARP banks is significant.

- To identify any potential long-term effects of regulatory scrutiny, we calculate the changes in normalised liquidity creation in the quarters following the completion of the programme relative to the 2007:Q4 levels, and repeat the analysis.
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### TARP capital support and changes in bank liquidity creation

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<td>−$0.0635</td>
<td>$0.0031</td>
</tr>
<tr>
<td>Non-TARP banks</td>
<td>−$0.0248</td>
<td>−$0.0081</td>
</tr>
<tr>
<td>Difference</td>
<td>−$0.0387***</td>
<td>$0.0112**</td>
</tr>
<tr>
<td>t-statistic</td>
<td>−12.29</td>
<td>2.49</td>
</tr>
</tbody>
</table>
Conclusions

- The amount of liquidity creation by the institutions in the sample increases from $1.4tn to $5.1tn during the period we study.
- To the end of 2015, the amount of liquidity created per $1 of gross total assets of the banks in the sample does not return to its pre-2008 levels.

- The dynamics of liquidity creation undertaken by small and large banks differ greatly.
- The former are more likely to be affected by changes in bank capital requirements regulations and in the stance of monetary policy.
- This suggests some of the macroprudential policies adopted to date impact only small institutions, but fail to influence the key players in the sector.

- Being in receipt of government aid leads to a decrease in liquidity provision by small banks in the short-run, relative to banks not participating in TARP.
- This effect disappears after the completion of the programme.
- In contrast, we document no short-term impact on large institutions supported by TARP, but a very pronounced long-term decrease in their liquidity creation efficiency.
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