Liquidity Regulation after Financial Crisis: An Experimental Investigation

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Extended Abstract

The bankruptcy of Lehman Brothers and sale of Bear Sterns at $2 a share were defining elements of the 2007-2008 financial crisis. Both investment banks financed long-term assets with short-term liabilities and despite adequate capitalization neither survived the large outflow of short-term liabilities that initiated the crisis. Lehman and Bear Sterns were not unique among investment banks in their need to shore up crisis-induced liquidity deficiencies. By the end of the crisis all investment banks either went bankrupt, were bought by commercial banks at a heavy discount, or were reorganized as commercial banks to secure the lender-of-last resort insurance from the Fed.

To decrease likelihood of similar future catastrophes, the Basel Committee on Banking Supervision developed in BASEL III a new series of bank liquidity regulations. Prominent among the new requirements is the *liquidity coverage ratio*, which mandates that banks retain cash and near cash assets sufficient to meet crisis level liquidity outflows for one month.

Regulations restricting the use of assets strike at the heart of the business model of banking. An absolute prohibition on the lending renders banks profitless, just as they become fully insulated against illiquidity. A critical empirical question then regards the level of liquidity requirements necessary to maintain the confidence of depositors in a bank's viability.

Intimately tied to the issue of necessary liquidity requirements is a history of financial stability. Since periods of financial stress are usually short, lasting one or two years, and are separated by long stretches of perhaps twenty to forty years of stability, it is important to know if and how the experiences of either financial stability or instability affect liquidity outflows.

This paper reports a laboratory experiment conducted to evaluate interactions between liquidity requirements of varying magnitudes and background conditions, as they impact on bank stability. Our experimental design is based on a laboratory implementation of the seminal Diamond-Dybvig (1983) model of banking by Chakravarty at el. (2014). The baseline treatment has 3 periods. In period 1, ten depositors each deposit $1 in a bank. In period 2, four (automated) depositors experience cash needs and withdraw their deposits early. The bank, aware that four depositors will be 'impatient,' keeps the sum of $4 and a required supplementary buffer on hand, and invests the remainder deposits in a long asset that matures in period 3.

Experiment participants are the six remaining 'patient' depositors, who must choose to either withdraw their deposits in period 2 or 'hold' their deposits in the bank until asset matures in period 3. Participants make decisions simultaneously, and the potential payoffs for 'hold' and 'withdraw' actions are affected by the bank's investment level and the number of other patient depositors who elect to withdraw early. In the event the number of patient withdrawals exceeds the bank's liquid reserve buffer, the bank must fund remaining period 2 withdrawal obligations through the liquidation of investments, which in turn reduce the return from holding deposits until period 3.

Ex ante, participants know the effective liquidation rate λ only probabilistically, with possible realizations being either low, at 20¢ for each dollar invested, or high, at 80¢ for each dollar invested. When λ =20¢ even a single patient withdrawal will render the bank insolvent, reducing the period 3 return for all remaining depositors to 0. On the other the hand, when λ =80¢ the return to holding deposits until maturity exceeds the return from withdrawing early unless nearly all other patient depositors also withdraw.

The experiment consists of a series of twenty period sessions conducted in a 2x3 design, that crosses 'stable' and 'unstable' background conditions with three liquidity buffer requirements. Sessions are divided into two 10 period sequences. Background 'baseline' conditions are induced by varying the probability of a low liquidation value realization in the initial sequence: in the 'stable' baseline sequence the low liquidation condition occurs with a 5% probability. In the 'unstable' baseline sequence the low liquidation condition occurs with an 80% probability.

Each of the terminal 10 period sequences are conducted under 'unstable' conditions, but with variations in the required liquidity buffer. We examine three buffer conditions, LR0, LR1 and LR2, in which banks are required to hold reserve buffers of \$0, \$1 and \$2, respectively. Increases in buffer requirements increase a bank's resilience to early withdrawals by 'patient' depositors, but at the cost of reducing the return to holding deposits until maturity.

Our design allows us to isolate both the effect of liquidity restrictions and initial experience on liquidity outflows: To evaluate the effects of liquidity buffer variations we compare subjects' 'hold' decisions in the second sequence of the LR0, LR1, and LR2 treatments while holding constant subjects' experience in the first sequence. In a similar way we can evaluate the effects of experience, holding liquidity restrictions constant, and comparing 'hold' decisions given stable or unstable baseline conditions.

Experimental results indicate that liquidity restrictions substantially reduce liquidity outflows by increasing the number of depositors choosing to hold from roughly 3 to about 6 after the stable baseline and from roughly 1 to about 5 after unstable baseline. The increase is statistically significant in 4 out of 6 comparisons.

In particular, after the stable baseline, on average 2.98 subjects hold in LR0, 4.47 subjects hold in LR1, and 5.57 subjects hold in LR2. Differences between LR0 and LR2, as well as LR1 and LR2 are statistically significant. However, a high degree of outcome variability in the LR1 treatment renders the differences in the LR0 and LR1 treatments insignificant at conventional significance levels. Following the unstable baseline experience, the average number of subjects choosing to 'hold' varies from 0.98 in LR0, 2.48 in LR1, and 4.73 in LR2. Again, while differences between LR0 and LR2 as well as, LR1 and LR2 are statistically significant, high outcome variability in the LR1 treatment render insignificant the LR0 to LR1 differences.

We also find that background experience with financial stability substantially increases propensity of depositors to hold in the terminal sequences. Given LR0, the stable baseline conditions increase the number of depositors choosing to hold from about 1 to about 3. Similarly in liquidity condition LR1 the number depositors choosing to hold increases from about 2 to about 4 and in liquidity condition LR2, the number of hold decisions increases from about 5 to almost 6. In two of three comparisons, these differences are statistically significant: In the LR0 treatment, 0.98 subjects on average hold after an unstable baseline while 2.98 hold after a stable baseline and in the LR2 treatment, on average 4.73 subjects hold after unstable baseline and 5.75 hold after stable baseline. However, differences in baseline conditions do not significantly affect the incidence of 'hold' decisions in LR1 treatment, despite an average increase in average hold decisions from 2.48 after an unstable baseline condition to 4.47 in the stable baseline condition, again, because of high variability in outcomes across treatments.

Our findings suggest that in the standard Diamond and Dybvig model of banking, sufficiently stringent liquidity requirements can effectively prevent liquidity outflows by patient depositors. Our findings also caution against a relaxing liquidity restriction in times of financial stability. Even though a history of stability reduces the propensity of depositors to 'run' during financial stress, the effects are insufficient to guarantee stability .