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RECIPROCAL DEPOSITS AND INCREMENTAL BANK RISK

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ABSTRACT: Even after controlling for other observable factors, reciprocal deposits are associated with higher bank risk as measured by the probability of failure and the Z-score. These results are consistent with the moral hazard hypothesis and reject the risk substitution hypothesis.

Keywords: reciprocal deposits; bank risk; logit; failure; Z-score

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1. Introduction

The recent legislative mandate for the FDIC to reconsider its definition and pricing of brokered deposits has motivated a fresh need to evaluate the relationship between various forms of funding and the risk posed by a bank to the deposit insurance fund.[1] One category of deposits reported since June 2009 is reciprocal deposits, which enable very large deposit accounts to qualify for complete federal deposit insurance by being exchanged in fully insured amounts with similar funds from other banks via the electronic network of the central provider.[2] Shaffer (2010) reports a preliminary empirical test of the moral hazard hypothesis that reciprocal deposits, by reducing market discipline, permit banks to choose higher levels of risk. He finds that the use of reciprocal deposits was significantly related to higher contemporaneous risk as measured by each of seven financial ratios that prior literature had linked to the probability of bank failure.

However, given that reciprocal deposit data had only recently become available, it was not possible for that study to explore any incremental bank risk remaining after controlling for those other factors. Some observers have argued that reciprocal deposits can reduce a bank's risk by providing a more stable and less costly funding base (ibid.). In that case, it is possible that reduced risk in those dimensions might allow a bank to take more risk in other dimensions (such as the ones measured in Shaffer, 2010) without necessarily increasing its likelihood of failure or its expected cost to the deposit insurance

[1] This requirement is stipulated in Section 1506 of the Dodd-Frank Act; see Adler (2011).

[2] The most common such product is CDARS, offered by Promontory Interfinancial Network, LLC. A similar product has been patented by Intrasweep LLC.

fund. This note addresses that possibility, which I call the "risk substitution" hypothesis. I explore numerous bank failures subsequent to the initial data on reciprocal deposits, as well as a more comprehensive measure of bank risk.

First, I estimate the association between reciprocal deposits and a bank's probability of failure in a standard logit model. Then, I estimate the association between reciprocal deposits and a bank's Z-score, which has been used to measure overall bank risk (Laeven and Levine, 2009; Ariss, 2010). In both models, reciprocal deposits are associated with higher risk even after controlling for the other factors discussed in Shaffer (2010). These results are not consistent with the hypothesis of risk substitution, but provide additional evidence consistent with the moral hazard hypothesis for reciprocal deposits.

2. Data and failure

Standard early warning models of bank failure use a logit regression relating ex ante observable factors to the occurrence of failure over the following several quarters.[3] Here I estimate such a model using financial data from June 2009 (the first available quarter of reciprocal deposit data) and subsequent failures through April 1, 2011.[4] The sample includes U.S. commercial banks chartered before January 2000.[5] Excluded were observations with nonpositive total loans or costs, loans exceeding assets, or equity /

[3] Some studies use a hazard model rather than a logit model, but both types of models have found similar financial ratios to be significant predictors of failure.

[4] This window of 21 months is within the 12- to 24-month failure window used by most early warning studies.

[5] Prior studies have documented abnormal performance for younger banks (De Young and Hasan, 1998; Shaffer, 1998)

assets > 0.4.[6] The final sample includes 5827 banks, of which 902 (or 15.5 percent) used reciprocal deposits and 166 failed.

The ratio of reciprocal deposits to total assets exceeded 40 percent for two banks in this sample, 20 percent for 16 banks, and 10 percent for 61 banks.[7] Of the banks that failed, 42 (or 25.3 percent) used reciprocal deposits as of June 2009, in amounts ranging as high as 43.6 percent of total assets. Thus, the raw data suggest that the use of reciprocal deposits is more common among banks that failed than among the banking industry overall.

The logit model uses the same explanatory variables that Shaffer (2010) discussed and related to prior studies. Table 1 summarizes these variables and their sample statistics. Table 2 reports estimates of two logit regressions relating subsequent failure to reciprocal deposits, both alone and controlling for the other variables discussed above. Given Shaffer's (2010) findings that reciprocal deposits are significantly associated with each of these other explanatory variables, the standard error of the coefficient on reciprocal deposits in the second regression will be inflated by multicollinearity, and we should keep this in mind when interpreting the results.

The findings of Shaffer (2010) predict that we should expect a positive coefficient on reciprocal deposits in the first regression unless the risk substitution hypothesis is not only correct but also strong enough to more than offset the additional risk associated with reciprocal deposits through the channels included in the second regression. The risk substitution hypothesis predicts a negative coefficient on reciprocal deposits in the

[6] Banks were also excluded if they reported equity growth exceeding 100 percent per quarter from the prior December.

[7] The highest ratio in the sample was 44.4 percent.

second regression. Alternatively, the moral hazard hypothesis predicts a positive coefficient on reciprocal deposits in both regressions.

The first regression indicates that reciprocal deposits are associated with a higher probability of failure, significant at the 0.058 level. The magnitude of the estimated effect is such that, relative to the sample mean, a 10 percentage point higher ratio of reciprocal deposits to assets is associated with a 0.0116 higher probability of failure.[8] Relative to the unconditional mean probability of failure within the sample window, this corresponds to a 40 percent increase in the probability of failure, a huge effect.[9]

The second regression indicates that reciprocal deposits are associated with higher risk of subsequent failure at the 0.060 level, even after controlling for a vector of other financial variables known to predict failure, and despite multicollinearity between reciprocal deposits and these other variables as noted above. The estimated coefficient implies that a 10 percentage point increase in a bank's ratio of reciprocal deposits to assets relative to the sample mean is associated with a 0.0070 higher probability of failure. Compared to the unconditional sample mean, this corresponds to a 25 percent increase in the probability of failure, also economically significant. This finding indicates that the higher risk associated with the use of reciprocal deposits is not entirely captured by the other factors, and suggests some additional channel(s) by which reciprocal deposits are associated with higher risk. The risk substitution hypothesis is rejected and the moral hazard hypothesis is supported.

[8] Recall that banks in the sample exhibited reciprocal deposit ratios as high as 44 percent.

[9] The unconditional mean probability of failure within the sample window is 166 / 5827 = 0.02849.

3. Z-score

A contemporaneous measure of overall bank risk, the Z-score, is defined as Z = (average ROA + equity) / standard deviation of ROA. It corresponds to the number of standard deviations of profitability needed to drive a bank into insolvency. It is more comprehensive than the vector of variables used in Shaffer (2010) because it reflects any impact on profitability and solvency from any source. Accordingly, even absent data on bank failures, it can provide additional evidence on the association between reciprocal deposits and overall bank risk.

Prior studies often use as many as five time periods to calculate the standard deviation of ROA, which is problematic in the present context. Extending the calculation horizon too far after June 2009 removes some failed banks from the sample; and if those banks had below-average Z-scores, as theory predicts, then such removal could bias the estimates against any negative association between reciprocal deposits and the Z-score. Extending the calculation horizon too early before June 2009 increases the risk of reverse causality. Therefore, I restrict the calculation horizon to three periods, using quarterly ROA for March, June, and September 2009.

Table 3 reports regression estimates relating reciprocal deposits to the Z-score, both with and without controlling for the other variables in the logit failure model.[10] Reciprocal deposits are associated with a lower Z-score (higher probability of failure), significant at better than the 0.001 level with a t-statistic of -5.89. Controlling for the

[10] An alternate specification using annualized September and year-to-date June figures, not reported here, gave qualitatively similar results when banks with excessively large Z-scores were excluded due to the possibility of strategic earnings smoothing by banks. Note that quarterly Z-scores will typically exceed annual Z-scores due to smaller quarterly standard deviations of ROA; the sample average for the first three quarters of 2009 was 322.68 with a standard deviation of 576.73.

other risk factors shown in Tables 1 and 2, reciprocal deposits are still associated with a higher probability of failure (lower Z-score), significant at the 0.006 level (t = -2.75).

These results are consistent with the logit estimates in Table 2, and indicate that reciprocal deposits are associated with higher bank risk even beyond that reflected through the channels of the standard predictors of failure. The magnitude of the estimated effect is such that a 1 percentage point increase in a bank's ratio of reciprocal deposits to assets is associated with a decline in the bank's Z-score of 9.36 overall, or 4.02 holding constant the other risk factors. This means that the bank's ability to absorb losses without insolvency would be reduced by four to nine standard deviations of its profitability, an economically significant effect.

4. Conclusion

This note has utilized additional data and expanded risk measures to explore further the findings of Shaffer (2010) regarding bank risk and the use of reciprocal deposits. The results indicate that reciprocal deposits are associated with economically and statistically significant increases in overall bank risk, even when controlling for other known risk factors that previous research has shown to be strongly correlated with reciprocal deposits. These findings reject the hypothesis that known benefits of reciprocal deposits (stability and low cost) are sufficient to offset other forms of bank risk, and further support the moral hazard hypothesis regarding their use.

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Table 1: Variables and Summary Statistics

Variable Name	Variable Definition	Mean	Standard Deviation
RD	reciprocal deposits /assets	0.00555	0.02356
K/A	equity /assets	0.106109	0.042230
ROA	net income /assets	0.00178	0.01067
NCO	net chargeoffs /loans	0.00403	0.00914
AC	operating expenses /assets	0.01663	0.00563
L/A	loans /assets	0.64942	0.15498
CL	commercial loans /assets	0.09134	0.06419
INS	insider loans /assets	0.01278	0.01468

Data from June 30, 2009. ROA, NCO, and AC are year-to-date. Source: Regulatory Call Reports, accessed from www.chicagofed.org.

Table 2: Logit Regression Results

Dependent Variable: Bank Failure between July 1, 2009 and April 1, 2011

Variable	**Coefficient**	**t-statistic**	**P-value**	**Coefficient**	**t-statistic**	**P-value**
Intercept	-3.56	-43.88	0.000	-5.80	-5.87	0.000
RD	4.18	1.90	0.058	4.81	1.88	0.060
K/A	--	--	--	-59.91	-9.92	0.000
ROA	--	--	--	-33.67	-4.10	0.000
NCO	--	--	--	37.82	4.00	0.000
AC	--	--	--	146.92	7.45	0.000
L/A	--	--	--	5.51	4.81	0.000
CL	--	--	--	-5.55	-2.72	0.007
INS	--	--	--	13.44	1.90	0.057

5,827 observations. Variables are defined in Table 1 and discussed in the text.

Table 3: Reciprocal Deposits and Bank Z-Scores

Dependent Variable: Z-score using Data for March, June, and September 2009

Variable	**Coefficient**	**t-statistic**	**P-value**	**Coefficient**	**t-statistic**	**P-value**
Intercept	327.93	41.25	0.000	188.27	4.25	0.000
RD	-935.85	-5.89	0.000	-401.51	-2.75	0.006
K/A	--	--	--	2180.21	8.41	0.000
ROA	--	--	--	2712.46	6.88	0.000
NCO	--	--	--	-5968.86	-6.72	0.000
AC	--	--	--	-3401.58	-2.57	0.010
L/A	--	--	--	-24.74	-0.51	0.608
CL	--	--	--	-155.90	-1.50	0.134
INS	--	--	--	269.20	0.51	0.610

5,743 observations, slightly fewer than in Table 2 because some banks failed or merged by the end of September. Variables are defined in Table 1 and discussed in the text.