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"Organizational Form and Thrift Risk During the US Housing Boom and Bust – Data Appendix"

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This data appendix is a companion document to the paper entitled "Organizational Form and Thrift Risk During the US Housing Boom and Bust." It provides a description of how the variables were constructed. The contents of these tables are described briefly below:

Table A0: A description of how each variable in the housing bust sample was constructed.

Table A1: A description of how each variable in the housing boom sample was constructed.

Explanatory Notes to Data Construction: Descriptions of how the more complicated variables were constructed.

Creating the Mutual Variable Indicator: Provides an overview of the strategy we used to identify whether a thrift was a mutual or stock.

[1] The views expressed in this appendix are those of the authors and not necessarily those of the Federal Reserve Banks of Cleveland or Richmond or the Federal Reserve System.

Table A0 – Variables in the Housing Bust Sample

Variable Name	**Description**	**Call Report Filers**	**TFR Filers**
		Dependent Variables	
Failure	Indicator variable equal to one if a thrift fails	FDIC Historical Statistics on Banking	FDIC Historical Statistics on Banking
		Bank Size and Liabilities Variables	
$Capital_{06}$	Book equity divided by total assets	rcfd3210 / rcfd2170	svcc3491 / svgl2170
Uninsured Deposits	Estimate of uninsured deposits (as reported by the thrift or authors' construction) divided by total assets	rcon5597 / rcfd2170 for thrifts that reported their own estimate and (rconf051 + rconf047 – 100*rconf052 – 250*rconf048) / rcfd2170 otherwise	svgl4964 / svgl2170 for thrifts that reported their own estimate and (svgla308 + svglf047 – 100*svgl0923 – 250*svglf048) / svgl2170 otherwise
$Size_{06}$	The natural logarithm of a thrift's total assets	ln(rcfd2170)	ln(svgl2170)
3-Year Asset Growth	Cumulative asset growth rate from 2003:Q4 to 2006:Q4 (decimal points)	$(rcfd2170_{06q4} – rcfd2170_{03q4}) / rcfd2170_{03q4}$	$(svgl2170_{06q4} – svgl2170_{03q4}) / svgl2170_{03q4}$
		Bank Lending and Other Assets Variables	
CLD Lending	(Domestic) construction and land development loans divided by total assets	rcon1415 / rcfd2170	(svgl0131 + svgl0109 + svgl0133 + svgl1534) / svgl2170
1-4 Family Real Estate Loans	(Domestic) real estate loans backed by 1-4 family residential properties divided by total assets	rcon1430 / rcfd2170	(svgl2689 + svgl5367 + svgl5368) / svgl2170
Other Real Estate Loans	Call Report: *1-4 Family Real Estate Loans* ratio and *CLD Loans* ratio subtracted from *Total Real Estate Loans* ratio	(rcon1410 – rcon1415 – rcon1430) / rcfd2170	(svgl0113 + svgl0136) / svgl2170

	TFR: Multifamily and Nonresidential property (non-CLD) loans divided by total assets		
	Performance Variables		
$Earnings_{06}$[2,3]	Net income divided by total assets	riad4340 / rcfd2170	$(\sum_{q=1}^{4} svgl4340_q)$ / $svgl4340_4$
Nonperforming Assets	Loans 90 or more days past due plus loans 30-89 past due, other real estate owned, and nonaccrual loans, divided by total assets	(rcfd1407 + rcfd1406 + rcfd2150 + rcfd1403) / rcfd2170	(svgl3942 + svgl3936 + svgl3948 + svgl0456 + svgl0461 – svgl1578) / svgl2170
Ln(Max Family Nonperforming)[4]	Natural logarithm of the maximum of nonperforming residential real estate loans and other residential real estate owned as a percentage of total residential real estate loans and other residential real estate owned from quarterly reports from 2007:Q1 through 2013:Q4	Ln(100 * $Max_{07q1-13q4}$\{(rcon5399 + rcon5400 + rconc237 + rconc229 + rconc239 + rconc230 + rcon5510) / (rcon1430 + rcon5510)\})	Ln(100 * $Max_{07q1-13q4}$\{(svgl3944 + svglc237 + svglc239 + svgl3950 + svglc229 + svglc230 + svgl0457) / (svgl2689 + svgl5367 + svgl5368 + rcon0457)\})
	Accounting Variables		
Interest Receivable	Accrued interest receivable and retained interests in accrued interest receivable related to securitized credit cards, divided by total assets	(rcfdb556 + rcfdc436) / rcfd2170	(svgl0449 + svgl1481 + svgl0629 + svgl0443) / svgl2170
Loan Loss Reserves	Allowance for loan and lease losses plus allocated transfer risk reserves, divided by total assets	(rcfd3123 + rcfd3128) / rcfd2170	(svgla602 + svgla603) / svgl2170

[2] Income measures such as $Earnings_{06}$, $Earnings_{01}$, and the net income component of the *5-Year Z-Score* were adjusted to account for mergers.
[3] The Call Report reports income on a year-to-date basis, while the Thrift Financial Report reports income on a quarterly basis.
[4] For thrifts that failed or were acquired before the end of 2013, we calculate the maximum over all quarterly reports from 2007:Q1 until their failure or acquisition.

Macroeconomic Shock Variables			
Peak to Trough [5]	The largest percentage drop in the house price index within each state over any subperiod from 2007:Q1 through 2013:Q4	FHFA HPI data via Haver Analytics	FHFA HPI data via Haver Analytics
Unemployment Increase [6]	The largest increase in the unemployment rate in each state for any subperiod from 2007:Q1 through 2013:Q4	US Bureau of Labor Statistics via Haver Analytics	US Bureau of Labor Statistics via Haver Analytics
Robustness Variables			
De novo Indicator	Equal to 1 if less than or equal to 20 quarters since birth of thrift; 0 otherwise	NIC Attributes	NIC Attributes
Governance Variables			
$Mutual_{06}$	Indicator variable equal to one if the thrift was mutually owned in December 2006	See explanation	See explanation
OTS_{06}	Indicator variable equal to one if the thrift was regulated by the OTS in December 2006	NIC Attributes	NIC Attributes

[5] If house prices did not drop over a time period, then this variable is coded as zero.
[6] If the unemployment rate did not drop over a time period, then this variable is coded as zero.

Table A1 – Variables in the Housing Boom Sample

Variable Name	Description	Call Report Calculation	TFR Calculation
		Dependent Variables	
Chg in CLD	Change in CLD as a percentage of total assets from 2001:Q4 to 2006:Q4	100 * ((rcon1415$_{06q4}$ / rcfd2170$_{06q4}$) – (rcfd1415$_{01q4}$ / rcfd2170$_{01q4}$))	100 * [((svgl0131$_{06q4}$ + svgl0109$_{06q4}$ + svgl0133$_{06q4}$ + svgl1534$_{06q4}$) / svgl2170$_{06q4}$) - ((svgl0131$_{01q4}$ + svgl0109$_{01q4}$ + svgl0133$_{01q4}$ + svgl1534$_{01q4}$) / svgl2170$_{01q4}$)]
5-Year Asset Growth	Cumulative asset growth rate from 2001:Q4 to 2006:Q4 (decimal points)	(rcfd2170$_{06q4}$ – rcfd2170$_{01q4}$) / rcfd2170$_{01q4}$	(svgl2170$_{06q4}$ – svgl2170$_{01q4}$) / svgl2170$_{01q4}$
Ln(5-Year Z-Score)	Natural logarithm of the 20-quarter Z-score (2002:Q1 – 2006:Q4), intended to measure likelihood of default	See explanation	See explanation
Brokered Deposits Usage	Average quarterly brokered deposits share 2002:Q1 through 2006:Q4	$\frac{1}{20}\left(\sum_{q=1}^{20}\left(rcon2365_q \,/\, rcfd2170_q\right)\right)$	$\frac{1}{20}\left(\sum_{q=1}^{20}\left(svgl3994_q \,/\, svgl2170_q\right)\right)$
		Control Variables	
Capital$_{01}$	Book equity divided by total assets	rcfd3210 / rcfd2170	svcc3491 / svgl2170
Size$_{01}$	The natural logarithm of a thrift's total assets	ln(rcfd2170)	ln(svgl2170)
HPI Growth$_{01\text{-}06}$	Growth rate of state-level HPI from 2001:Q4 to 2006:Q4 (decimal points)	(HPI$_{06q4}$ – HPI$_{01q4}$) / HPI$_{01q4}$ using FHFA HPI data via Haver Analytics	(HPI$_{06q4}$ – HPI$_{01q4}$) / HPI$_{01q4}$ using FHFA HPI data via Haver Analytics
Mutual$_{01}$	Indicator variable equal to one if the thrift was mutually owned in December 2001	See explanation	See explanation
OTS$_{01}$	Indicator variable equal to one if the thrift was	NIC Attributes	NIC Attributes

	regulated by the OTS in December 2001		
$Earnings_{01}$	Net income in 2001 divided by total assets	riad4340 / rcfd2170	$(\sum_{q=1}^{4} svgl4340_q)$ / $svgl4340_4$
Cash and Due $From_{01}$	Cash and balances due from depository institutions divided by total assets	rcfd0010 / rcfd2170	(svgl0626 + svgl0437 + svgl0438) / svgl2170
$Loan\text{-}to\text{-}Assets_{01}$	Total loans divided by total assets	rcon1400 / rcfd2170	(svgl2687 + svgl2689 + svgl1568 + svgl1569 + svgl0656 + svgl0131 + svgl0109 + svgl0133 + svgl1534 + svgl0113 + svgl0136) / svgl2170

Explanatory Notes to Data Construction

Measurement of Earnings and Adjusting for Mergers

Earnings are reported differently in the Call Report and the TFR. The Call Report reports income year-to-date, while the TFR reports income on a quarterly basis. Since our $Earnings_{01}$ and $Earnings_{06}$ measures are income for the entire year, for Call Report filers we take their fourth quarter reported earnings, while for TFR filers we add up their quarterly earnings for the year to get annual earnings.

A second complication for earnings is that when a thrift acquires another financial institution, the acquiree's pre-merger earnings are not included in the acquiring thrift's Call Report or TFR filing. For example, if a thrift acquired another institution on May 21, its year-to-date earnings reported in its December Call Report or calculated from the TFR will not include pre-May 21 earnings of the acquired institution. We make an adjustment to correct for these missing earnings. This adjustment affects $Earnings_{06}$, $Earnings_{01}$, and *5-Year Z-Score*.

There are two components to the merger adjustment. The first captures income reported by an acquired institution in Call Report or TFR filings in quarters before its acquisition that same year. The second component of the adjustment is income earned by the acquired institution between its last quarterly report and its acquisition. We do not observe this amount; so we impute it by extrapolating from the acquired institution's year-to-date income at the end of the previous quarter.[7] To do this, we calculate the year-to-date average daily income at the end of the last quarter in which a report was filed. Then we multiply this daily average by the number of days between the last quarterly report and the acquisition. This product is the second component of the merger adjustment. We account for the two components of the merger adjustment by adding both to the year-end income measure of the surviving thrift to create the $Earnings_{06}$ and $Earnings_{01}$ variables. For the *5-Year Z-score* calculation, we use a quarterly measure of ROA; so we add only the second component of the adjustment to the income reported by the acquirer in its first quarterly report following the acquisition. These adjustments affect 20 thrifts in the housing bust sample and 19 thrifts in the housing boom sample.

Uninsured Deposit Adjustment for TFR Filers

The Federal Deposit Insurance Reform Act of 2005 increased the deposit insurance limit for retirement accounts from \$100k to \$250k. This act went into effect in February 2006.[8] The December 2006 TFR report was the first TFR report with a series for the number of retirement accounts above \$250k (svglf048) and the amount of deposits in retirement accounts above \$250k. We use these series to calculate our own estimate of uninsured deposits for TFR filers that did not report their own estimate of uninsured deposits. For some TFR filers in December

[7] In a few cases, the acquired institution did not file a Call Report or TFR in the previous quarter. In these cases, we extrapolate from the year-to-date earnings as of the last filed report.
[8] See Federal Deposit Insurance Reform Act of 2005 | FDIC.gov.

2006, the number of reported retirement accounts above $250k is inconsistent with the amount of deposits reported in those accounts. In particular, the amount of deposits in retirement accounts exceeding $250k cannot be below the hypothetical lower bound in which each such account holds exactly $250k. This lower bound (measured in thousands) is calculated as follows: 250*svglf048. For some TFR filers, this lower bound was greater than the amount of deposits held in retirement accounts exceeding $250k, as reported in svglf047.[9]

This suggests a reporting error in svglf047, svglf048, or both. For many of the TFR filers that we suspected of reporting errors, we noticed the number of retirement accounts exceeding $250k dropped substantially in March 2007 compared to December 2006, indicating a potential correction in reporting by the thrift. To correct for the reporting error, we use the number of retirement accounts exceeding $250k as of March 2007 in our calculation of uninsured deposits in December 2006 for thrifts we suspected of reporting errors. Fortunately, most TFR filers reported their own estimate of uninsured deposits; so we only used this alternative calculation for 11 thrifts.

5-Year Z-score Calculation

The 5-Year Z-score is calculated as the mean ROA over 20 quarters from 2002:Q1 through 2006:Q4 plus the current capital ratio (excluding goodwill) as of 2006:Q4, divided by the standard deviation of ROA over the 20 quarters from 2002:Q1 through 2006:Q4.[10,11]

$$\frac{\left(\overline{ROA} + CAP_{06q4}\right)}{\sqrt{\left(\frac{\left(\sum_{q=1}^{20} ROA_q - \overline{ROA}\right)}{19}\right)^2}}$$

where

$$\overline{ROA} = \frac{1}{20}\sum_{q=1}^{20} ROA_q$$

And t=1 corresponds to 2002:Q1.

For Call Report Filers:

$$ROA_q = \frac{riad4340_q}{rcfd2170_q - rcfd3163_q}$$ if q is the first quarter of the year and

[9] We did not observe any such cases for Call Report filers.
[10] To simplify the explanation, the description of the calculations in this section do not reflect the merger adjustment to income, which can affect the series riad4340 and svgl4340. Our calculations did make the merger adjustment. See the discussion of the measurement of earnings and adjusting for mergers for more information.
[11] In this section, we adjust capital and assets for goodwill by subtracting it from both of them.

$$ROA_q = \frac{riad4340_q - riad4340_{q-1}}{rcfd2170_q - rcfd3163_q} \quad \text{if q is not the first quarter of the year}$$

$$CAP_{06q4} = \frac{rcfd3210_{06q4} - rcfd3163_{06q4}}{rcfd2170_{06q4} - rcfd3163_{06q4}}$$

For TFR Filers:

$$ROA_q = \frac{svgl4340_q}{svgl2170_q - svgl0507_q}$$

$$CAP_{06q4} = \frac{svcc3491_{06q4} - svgl0507_{06q4}}{svgl2170_{06q4} - svgl0507_{06q4}}$$

Creating the Mutual Variable Indicator

We started with the National Information Center (NIC) database, which includes information about financial institutions' attributes, such as their name, location, charter type, and ownership type. Ownership type is indicated by the variable "org_type_cd," which classifies thrifts as stock, mutual, or cooperative.[12] This variable also classifies holding companies according to their ownership type. While investigating this variable, we noticed that in some cases during our sample period, it improperly classified thrifts and holding companies. This meant that we could not rely solely on the "org_type_cd" variable to construct the mutual indicator.

However, there is a more fundamental problem with identifying mutuals using the NIC data. Some thrifts use a legal structure in which the thrift charter is stock organized, but all the stock is owned by a mutual holding company (a one-tier mutual holding company) or all of the stock is owned by an intermediate stock holding company, which in turn is either entirely owned or majority owned by a mutual holding company (the "hybrid" thrifts that we discuss in the paper). This latter structure is often called a two-tier mutual holding company. In both cases, the mutual holding company is owned by the thrift's depositors and governed just like a mutual thrift charter with no holding company. The challenge for our classification is that we identified some thrifts that had holding companies in December 2006, but for which no holding company was included in the thrifts' organizational hierarchy, as reported in the NIC data.

To identify these thrifts, we cross-referenced the NIC ownership type information with other data sources to first determine if the thrift was owned by a holding company and then to determine its ownership type. We make use of a few foundational rules governing thrift ownership structure to expedite the process. These rules are:

[12] Historically, most cooperatives were mutual, but we checked their ownership structure using the procedures described below. Most, but not all, are mutuals.

1. A thrift that is mutually owned at the charter level cannot be owned by a stock holding company so has to be mutual.
2. A thrift that is stock at the charter level will never convert to mutual ownership at the charter level.
3. A stock holding company cannot convert to a mutual holding company.

These rules are based on the idea that a stock thrift will never become a mutual, and in our reading of the thrift literature, we have never come across a reference to such a case. This helps us identify a thrift's organizational type because we can conclude that any thrift that is mutually owned (with or without an MHC) at a point in time has been mutually owned since its inception. It also generally allows us to conclude that any thrift that is entirely stock owned at a point in time, either with a top-tier stock holding company or with no holding company, will continue to be stock owned for the remainder of its existence. The one exception to this is that it is possible for a stock thrift to be purchased by a multi-thrift mutual holding company, effectively going from stock owned to mutually owned. However, these cases are rare, and we make a point to identify them.

Using these rules, we were able to simplify our process by focusing on thrifts that were stock owned at the charter level. With these thrifts we needed to determine if they were owned by a holding company and, if so, whether the top-tier holding company was a mutual holding company. We also looked for mutual-to-stock conversions because once a thrift converted to stock, we knew it was always a mutual before the conversion and always stock afterward. For our purposes, we consider a mutual-to-stock conversion to occur when a thrift goes from wholly or partially mutually owned to entirely stock owned. Although we also identify mutual holding company reorganizations, we do not treat these as mutual-to-stock conversions because the thrift remains mutually owned.

By comparing NIC and FDIC structure data, we were able to confirm that the majority of our sample was mutually owned at the charter level in 2006. We then investigated all the stock thrift charters individually. To do this, we first looked at the FDIC structure data, which flags charter-level conversions from mutual to stock. As discussed above, such a conversion can indicate a complete mutual-to-stock conversion or the reorganization to a mutual holding company structure. If a thrift had a holding company that was an SEC filer, we use 10-K and S-1 forms to find mutual-to-stock conversion and mutual holding company reorganization dates. In some cases, we use news articles about conversions or about mergers and failures to determine if a thrift had a holding company or to shed light on its ownership type. For thrifts that were still active at the end of 2020, we also used the FDIC's 2021 Mutual List to check our classifications. Finally, although not definitive, a thrift's establishment date helped to inform our classifications when other evidence was lacking. Most thrifts in our sample were established before the Great Depression and these were almost entirely mutually owned when established. In contrast, thrifts established in the latter half of the 20th century were generally stock owned when established. If we found a thrift that was started after the 1960s, we could be fairly confident that it was stock owned; so this provided another useful check of our classification.

Using these different sources of information, we created series indicating each thrift's mutual status over time. With these series, we create the variables $Mutual_{06}$ and $Mutual_{01}$, representing a thrift's ownership type in December 2006 and December 2001, respectively.