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**Liquidity Crises in the Mortgage Market**

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and Nancy Wallace**

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# Liquidity Crises in the Mortgage Market\*

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## Abstract

Nonbanks originated about half of all mortgages in 2016, and 75% of mortgages insured by the FHA or VA. Both shares are much higher than those observed at any point in the 2000s. We describe in this paper how nonbank mortgage companies are vulnerable to liquidity pressures in both their loan origination and servicing activities, and we document that this sector in aggregate appears to have minimal resources to bring to bear in a stress scenario. We show how these exact same liquidity issues unfolded during the financial crisis, leading to the failure of many nonbank companies, requests for government assistance, and harm to consumers. The extremely high share of nonbank lenders in FHA and VA lending suggests that nonbank failures could be quite costly to the government, but this issue has received very little attention in the housing-reform debate.

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# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Background on nonbanks, the GSEs, and Ginnie Mae</b>	<b>3</b>
2.1	Nonbanks in the U.S. residential-mortgage market . . . . .	3
2.2	The GSEs and Ginnie Mae . . . . .	4
<b>3</b>	<b>Factors driving growth in nonbank lending/servicing</b>	<b>7</b>
3.1	Historical evolution of the nonbank mortgage sector . . . . .	7
3.2	Recent factors facilitating the rise of the nonbank sector . . . . .	8
3.3	Understanding the economics of the market structure . . . . .	9
<b>4</b>	<b>Liquidity issues for nonbank mortgage originators</b>	<b>10</b>
4.1	Vulnerabilities of warehouse funding . . . . .	15
4.1.1	Pipeline aging risk and marking to market . . . . .	15
4.1.2	Roll-over risk . . . . .	16
4.1.3	Covenant violations . . . . .	17
4.2	Warehouse funding during the financial crisis . . . . .	18
4.2.1	Post-crisis requests for government assistance of warehouse lending . . . . .	19
4.3	Trends in warehouse lending from the Y-14 supervisory data . . . . .	21
4.4	Nonbank risks for the GSEs and Ginnie Mae . . . . .	26
<b>5</b>	<b>Liquidity issues for nonbank mortgage servicing</b>	<b>26</b>
5.1	Background on servicing advances . . . . .	28
5.2	Funding of servicing advances . . . . .	30
5.3	Servicing-advance liquidity during the financial crisis . . . . .	32
5.4	Servicing-advance liquidity today . . . . .	34
<b>6</b>	<b>Vulnerabilities of nonbanks to macroeconomic shocks</b>	<b>35</b>
6.1	Refinance mortgages and vulnerability to interest rates . . . . .	35
6.2	Credit quality and vulnerability to house price declines . . . . .	38
<b>7</b>	<b>Resources available to weather shocks</b>	<b>41</b>
<b>8</b>	<b>Consequences of a nonbank mortgage company failure</b>	<b>45</b>
<b>9</b>	<b>Regulation and housing-finance reform</b>	<b>47</b>
9.1	Nonbank regulation . . . . .	47
9.2	Housing-finance reform . . . . .	51
<b>10</b>	<b>Conclusions</b>	<b>52</b>
	<b>References</b>	<b>53</b>
<b>A</b>	<b>Data appendix</b>	<b>59</b>
A.1	Survey of Consumer Finances . . . . .	59
A.2	Home Mortgage Disclosure Act . . . . .	60
A.3	Mortgage Bankers Association Performance Report . . . . .	60
A.4	Y-14 data . . . . .	61
<b>B</b>	<b>The economics of vertically disintegrated markets</b>	<b>62</b>
<b>C</b>	<b>Structured Investment Vehicles (SIVs) pre-crisis</b>	<b>64</b>

# 1 Introduction

Most narratives of the housing- and mortgage-market crash in the late 2000s attribute it to house-price declines, weak underwriting, and other factors that caused credit losses in the mortgage system. The Financial Crisis Inquiry Report, for example, notes “it was the collapse of the housing bubble—fueled by low interest rates, easy and available credit, scant regulation, and toxic mortgages—that was the spark that... led to a full-blown crisis” (Financial Crisis Inquiry Commission, 2011, p. xvi). In the aftermath of the crisis, regulators implemented a wide array of reforms intended to improve underwriting practices and outlaw toxic mortgages.

Much less understood, and largely absent from the standard narratives, is the role played by liquidity crises in the nonbank mortgage sector. While important post-crisis research did focus on pre-crisis liquidity problems in short-term debt-financing markets,<sup>1</sup> the literature has been largely silent on the liquidity vulnerabilities of the short-term loans that funded nonbank mortgage origination in the pre-crisis period, as well as the liquidity pressures that are typical in mortgage servicing when defaults are high. These vulnerabilities in the mortgage market were also not the focus of regulatory attention in the aftermath of the crisis.

Of particular importance, these liquidity vulnerabilities are still present in 2018, and arguably the potential for liquidity issues associated with mortgage servicing is even greater than pre-financial crisis. These liquidity issues have become more pressing because the nonbank sector is a larger part of the market than it was pre-crisis, especially for loans securitized in pools with guarantees by Ginnie Mae. As noted in 2015 by the Honorable Ted Tozer, President of Ginnie Mae from 2010 to 2017, there is now considerable stress on Ginnie Mae operations from their nonbank counterparties:<sup>2</sup>

“... Today almost two thirds of Ginnie Mae guaranteed securities are issued by independent mortgage banks. And independent mortgage bankers are using some of the most sophisticated financial engineering that this industry has ever seen. We are also seeing greater dependence on credit lines, securitization involving multiple players, and more frequent trading of servicing rights and all of these things have created a new and challenging environment for Ginnie Mae... In other words, the risk is a lot higher and business models of our issuers are a

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<sup>1</sup>See, for example, Acharya, Schnabl, and Suarez (2013); Covitz, Liang, and Suarez (2013); Gorton and Metrick (2010, 2012); Dang, Gorton, and Holmström (2013); Comotto (2012); Krishnamurthy, Nagel, and Orlov (2014).

<sup>2</sup>See “Remarks by President Ted Tozer from the Ginnie Mae Summit,” 2015, <https://www.ginniemae.gov/newsroom/Pages/SpeechesDispPage.aspx?ParamID=36>.

lot more complex. Add in sharply higher annual volumes, and these risks are amplified many times over. . . . Also, we have depended on sheer luck. Luck that the economy does not fall into recession and increase mortgage delinquencies. Luck that our independent mortgage bankers remain able to access their lines of credit. And luck that nothing critical falls through the cracks. . . .”

This paper explains how the funding and operational structure of the nonbank mortgage sector remains a significant channel for systemic liquidity risk in U.S. capital markets, and why these risks could again lead to important dislocations in mortgage markets, especially for minority and lower-income borrowers. We describe how liquidity pressures played out during and after the 2007–08 financial crisis, and document the appeals that the nonbank mortgage industry made to the U.S. government for assistance. We then describe the ways in which nonbanks are still exposed to significant liquidity risks, both in their funding of mortgage originations and in their servicing portfolios.

A fundamental difficulty in trying to understand the role of nonbanks in the U.S. mortgage market is the very limited data available. Only a few nonbanks are publicly traded, and the commonly used data from *Inside Mortgage Finance* are aggregated and exclude some of the largest Wall Street firms. We assemble data on nonbank mortgage institutions from a variety of sources. Most notably, we identify in confidential supervisory data the lines of credit extended by large commercial bank holding companies to nonbank mortgage institutions. These data provide a rare glimpse into a typically unobserved aspect of nonbank financing. Our data explorations, however, primarily highlight the fact that researchers—as well as many mortgage-market monitors and regulators—do not have the information needed to assess the risks of this sector.

One reason the lack of data is problematic, as we describe in the paper, is that a collapse of the nonbank mortgage sector has the potential to result in substantial costs and harm to consumers and the U.S. government. The Ginnie Mae servicing model, for example, assumes that nonbank servicers will have the resources to absorb a substantial share of credit losses before the government steps in, yet it is not clear that the sector has the capacity to absorb those losses, or that the existing prudential standards are sufficient to ensure the nonbanks’ viability in a stress scenario. In addition to the losses that the government is explicitly on the hook for, the experience of the financial crisis suggests that the government will be pressured to backstop the sector in a time of stress, even if such a backstop is not part of the government’s mandate ex-ante. We end by observing that this aspect of mortgage-market fragility is almost entirely missing from the housing-finance reform debate.

## 2 Background on nonbanks, the GSEs, and Ginnie Mae

### 2.1 Nonbanks in the U.S. residential-mortgage market

The post-crisis U.S. mortgage market has two very different pieces. One part of the market — the “traditional” side — consists of highly regulated banks and other depository institutions that usually handle the three main mortgage functions — origination, funding, and servicing — themselves. They fund their mortgage originations with deposits or Federal Home Loan Bank advances, generally service their own loans, and either hold the loans in portfolio or securitize them in pools guaranteed by Ginnie Mae or the Government-Sponsored Enterprises (GSEs), Fannie Mae and Freddie Mac.

However, there is also a second part of the mortgage market—nonbank mortgage originators and servicers—which is much less discussed in the literature but represented almost half of mortgage originations in 2016, up sharply from around 20% in 2007 (Figure 1). These nonbanks also represented close to half of all mortgage originations sold to the GSEs in 2016, as well as 75% of all originations sold to Ginnie Mae. The striking rise in the Ginnie Mae nonbank share appears to have continued in 2017; data from the Urban Institute pins the nonbank share of Ginnie originations at 80% in December 2017.<sup>3</sup>

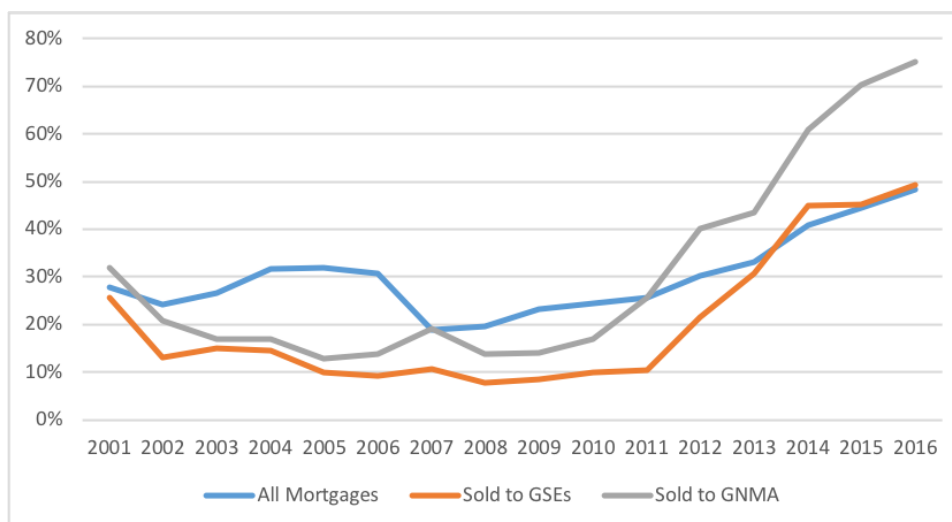


Figure 1: The figure shows the share of all U.S. mortgages originated by nonbanks from 2001 to 2016. Source: Authors’ calculations from Home Mortgage Disclosure Act (HMDA) data.

Nonbanks differ from banks both in the types of mortgages that they originate and the types of borrowers that they serve. In addition to their outsized share of loans sold to Ginnie Mae, nonbanks are more likely to originate mortgages to minority, lower-income, and lower

<sup>3</sup>See Urban Institute, *Housing Finance at a Glance*, January 2018.

credit-score borrowers. For example, in 2016, nonbanks originated 53% of all mortgages, but 64% of the mortgages originated to black and Hispanic borrowers and 58% of the mortgages to borrowers living in low- or moderate-income tracts.<sup>4</sup>

Nonbank mortgages are a smaller share of total mortgages outstanding than of new mortgage originations. However, as shown in Figure 2, in 2016 the dollar volume of mortgages in Ginnie Mae pools issued and serviced by nonbanks exceeded the corresponding volume for banks, and by the end of 2017 the nonbank share was close to 60%. As a result, nonbanks are now the main counterparties for Ginnie Mae. *Inside Mortgage Finance* estimates that the nonbank share of servicing was 38% for Fannie pools and 35% for Freddie pools at the end of 2017 (January 19, 2018).

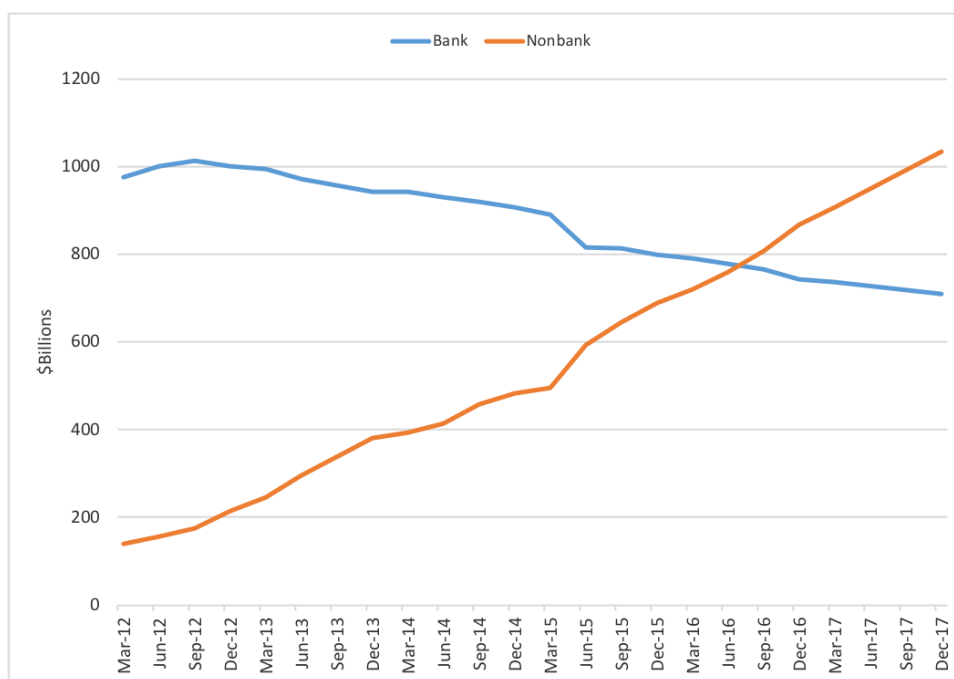


Figure 2: The figure presents the outstanding balance (\$ billion) of MBS guaranteed by Ginnie Mae and serviced by nonbanks. Source: Authors’ calculations from Ginnie Mae data.

## 2.2 The GSEs and Ginnie Mae

Although both the GSEs and Ginnie Mae guarantee mortgage-backed securities, there are a number of essential differences. In particular, Ginnie Mae servicers are exposed to greater liquidity strains, and a greater risk of absorbing credit loss, than GSE servicers. As we

<sup>4</sup>The statistics from HMDA in this paragraph refer to purchase and refinance mortgages for single-family, owner-occupied, site-built homes.

describe at the end of this section, understanding these differences is also key to assessing some housing-finance reform proposals.

**Guarantee and issuance of securities** Both the GSEs and Ginnie Mae provide a guarantee to their mortgage-backed securities (MBS) investors that they will receive their payments of interest and principal on time. One crucial difference between these institutions, though, is who issues the underlying securities. The GSEs purchase loans from mortgage originators and issue the securities themselves. For Ginnie Mae MBS, financial institutions originate or purchase mortgages and then issue securities through the Ginnie Mae platform.

In both cases, the loans in the securities have to meet certain underwriting standards and other requirements. The GSEs set the standards for the loans in their pools. For Ginnie Mae pools, the standards are set by the government agency that provides the insurance or guarantee on the mortgage (Federal Housing Administration, Department of Veterans Affairs, Farm Service Agency, Rural Housing Service, or Office of Public and Indian Housing).

**Insurance against credit risk** Another crucial difference between the GSEs and Ginnie Mae is who bears the credit risk associated with mortgage default. As shown in figure 3, for loans in GSE pools, the mortgage borrower takes the initial credit loss (in the form of her equity in the house), followed by the private mortgage insurance (PMI) company (if the mortgage has PMI), and then the GSE. For loans in Ginnie Mae pools, the mortgage borrower is again in the first-loss position, followed by the government entity that guarantees or insures the loan. However, the Ginnie issuer/servicer — unlike in the GSE case — is expected to bear any credit losses that the government insurer does not cover. (We discuss this issue in more detail in Section 5.) Ginnie Mae covers credit losses only when the corporate resources of the issuer/servicer are exhausted.

The GSEs, Ginnie Mae, and government insurance agencies will not bear the full credit loss, of course, if they can show that the originator or issuer violated the guidelines of their programs. In that case, the agencies can pursue the originator or issuer to recoup some or all of its losses. If the originator or issuer is no longer in business, though, it is difficult to recoup losses. Ginnie Mae, in particular, is unlikely to recoup losses because it only steps in when the issuer/servicer has run out of resources. Its main remedy for practical purposes is to take the servicing without compensating the servicer.

**Implications of these differences for housing-finance reform** The housing-finance reform proposals differ in the extent to which they leverage the existing GSE and Ginnie Mae structure (see Section 9 for more discussion of these proposals). For example, under the



“Ginnie Mae Model” proposed in Bright and DeMarco (2016), Ginnie Mae’s current function would expand, and it would also guarantee securities collateralized by conventional mortgages with private-market credit enhancement. This expansion of Ginnie Mae’s footprint would lead to greater exposure to credit and liquidity risk, in aggregate, for the servicing sector. Bright and DeMarco (2016) recognize this issue and propose giving Ginnie Mae greater resources and budget autonomy to manage this risk.

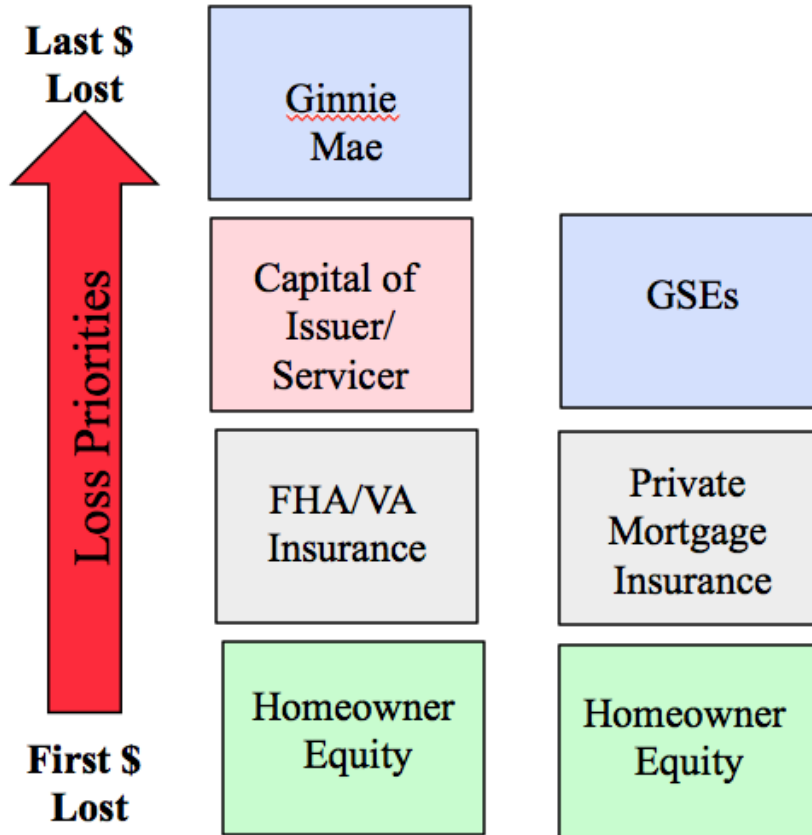


Figure 3: The figure shows the difference between the credit loss position of Ginnie Mae (left set of boxes) and the GSEs (right set of boxes) when a mortgage defaults in a guaranteed pool. Adapted from Success Stories Ginnie Mae Summit, 2016, [https://www.ginniemae.gov/issuers/issuer\\_training/Summit%20Documents/gnma\\_gse\\_differences.pdf](https://www.ginniemae.gov/issuers/issuer_training/Summit%20Documents/gnma_gse_differences.pdf).

## 3 Factors driving growth in nonbank lending/servicing

### 3.1 Historical evolution of the nonbank mortgage sector

The rise in the nonbank lending sector was facilitated by several developments over the past 50 years.

**Development of GSE and Ginnie Mae securitization infrastructure** The first major change occurred in the 1970s, when the federal government introduced standardized securitization systems through the GSEs<sup>5</sup> and the Government National Mortgage Association (Ginnie Mae)<sup>6</sup> and allowed non-depository mortgage banks to issue and service loans under GSE and Ginnie Mae authorization criteria (see Follain and Zorn, 1990; Garrett, 1989, 1990; Jacobides, 2005; Kaul and Goodman, 2016).

**Separation of mortgage origination from mortgage funding** The second major change, the separation of mortgage origination activity from mortgage funding activity, occurred as the result of the recession of 1979–81, when banks and savings and loan institutions (S&Ls) laid off their underwriting staff and then re-established long-term relationships, often with the same staff, as independent loan brokers (see Garrett, 1989, 1990; Jacobides, 2005).

**Separation of mortgage servicing from mortgage funding** The third major change, the separation of loan servicing from loan origination, occurred in 1991, when the Resolution Trust Corporation (RTC), a government-owned asset-management company charged with liquidating the assets of failed S&Ls, devised new legal structures that enabled the separate sale of mortgage servicing rights from loan portfolios (see Resolution Trust Corporation, 1992, 1993, 1994). By the end of 1993, the RTC had successfully sold and priced \$6.9 billion in mortgage servicing rights from the portfolios of 32 failed S&Ls (see Resolution Trust Corporation, 1994), thus launching the stand-alone nonbank mortgage-servicing industry.

**Attempts to recover credit losses** In the aftermath of the financial crisis, the GSEs and the U.S. government pursued loan originators in order to recover some of the credit losses associated with loans collateralizing GSE and Ginnie Mae securities. By 2013, the

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<sup>5</sup>Public Law No. 91–351, 84 Stat. 450, Approved July 24, 1970, Federal Home Loan Mortgage Corporation Act, <http://www.freddiemac.com/governance/pdf/charter.pdf>. Title III of National Housing Act, 12 U.S.C. 1716 *et seq*, Federal National Mortgage Association Charter Act, As amended through July 21, 2010, <http://www.fanniemae.com/resources/file/aboutus/pdf/fm-amended-charter.pdf>.

<sup>6</sup>Title III of National Housing Act, 12 U.S.C. 1716 *et seq*, Government National Mortgage Association Statutory Authority, [https://www.ginniemae.gov/about\\_us/what\\_we\\_do/Documents/statutes.pdf](https://www.ginniemae.gov/about_us/what_we_do/Documents/statutes.pdf).

GSEs had successfully closed on repurchases, indemnifications, and negotiated settlements valued in aggregate at \$46.12 billion of direct liability costs to mortgage lenders, and a trickle of other institutions settled in subsequent years (RBS, for example, settled for \$5.5B in July 2017).<sup>7</sup> Meanwhile, in 2009, the Fraud Enforcement and Recovery Act (FERA) 2009 was passed<sup>8</sup> and the Department of Justice (DOJ) began litigating mortgage fraud cases involving FHA and VA, often pursuing treble damages through the False Claims Act (1863). As of October 2016 the cumulative DOJ settlements had reached \$6.6 billion of mortgage-related False Claim Act Violations against regulated commercial banks (see Goodman, 2017).

These legal and regulatory actions appear to have weighed more heavily on banks than nonbanks. The San Francisco Chronicle noted in 2015, “Banks are also still smarting from the fines, settlements, and repurchase demands that grew out of the mortgage crisis. It has been a painful time for lenders, especially big banks, said Bob Walters, chief economist with Quicken Loans. ‘Independent mortgage companies don’t have the same legacy exposure.’” In addition, the structure of nonbanks may make them less sensitive to such losses. Most nonbanks are privately held and so face less market-disciplinary pressure than banks in response to losses. Most mortgage nonbanks are also monolines with fewer business lines to protect than banks, and so have a more viable option to go out of business in the face of outsized losses.

As a result of these losses, large depositories have faced a greater incentive to participate in the U.S. mortgage market by lending to nonbank originators through lines of credit, or warehouse lines, rather than directly lending to mortgage borrowers. Because warehouse lenders are not the legal lenders of record to mortgage borrowers, they are insulated from losses stemming from the GSEs’ repurchase programs and Department of Justice False Claims Act prosecutions.

## 3.2 Recent factors facilitating the rise of the nonbank sector

**Revised regulatory capital treatment of mortgage servicing rights** In 2013, the federal banking regulators issued a revised capital rule for banking institutions that increased the risk weighting of mortgage servicing rights. The rule was scheduled to take effect January 1, 2018.<sup>9</sup> The proposed revised rules had the potential to have a fairly significant effect on some banks, primarily small-to-midsize banking institutions that specialized in servicing mortgages and for whom these mortgage servicing rights were large relative to their capital.

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<sup>7</sup>See *The Complete Guide to Mortgage Buyback Strategies*, 5<sup>th</sup> Edition, Bethesda, MD, Inside Mortgage Finance Publications, 2013.

<sup>8</sup>Pub.L. 111–21, S. 386, 123 Stat. 1617, enacted May 20, 2009, enhances criminal enforcement of federal fraud laws, especially regarding financial institutions, mortgage fraud, and securities or commodities fraud.

<sup>9</sup>See Board of Governors et al. (2016) for more detail.

In anticipation of these rules, some of these banking institutions reduced their acquisitions of mortgage servicing portfolios. In late 2017, however, the banking regulators announced that they were considering simplifying these rules and delayed full implementation of the new standard.<sup>10</sup>

**IRS tax clarification that facilitates REIT involvement in mortgage servicing** In 2012, the IRS issued a private-letter ruling that established that certain assets associated with mortgage servicing count as qualified assets for REITs.<sup>11</sup> This clarification in tax treatment appears to have contributed to the decision of some REITs to become more involved in holding and financing assets associated with mortgage servicing. New Residential Investment Corporation, for example, increased its holding of such assets from \$43 million in 2011 to \$8.4 billion in the third quarter of 2017.<sup>12</sup> As of the second quarter of 2017, New Residential held the servicing rights on \$353 billion in mortgages, making it the fifth largest holder of servicing rights in the U.S.<sup>13</sup>

**Rapid nonbank technology adoption and focus on refinancing** Some nonbanks have been quicker than banks to adopt “fintech” and profit from refinancing mortgages. In particular, the growing use of algorithmic underwriting on the part of several large nonbanks, such as Quicken, has significantly reduced the consumer-facing costs of origination.

**Growth of the subservicing sector** The subservicing industry has boomed in recent years, thereby allowing nonbanks to hold mortgage-servicing rights without having to build and maintain a servicing infrastructure. Data from *Inside Mortgage Finance* indicate that subservicers serviced \$2 trillion in mortgages in 2017:Q3 (around 20% of all mortgages outstanding), up from around \$1.2 trillion in 2014:Q3.

### 3.3 Understanding the economics of the market structure

Existing theories from the economics literature on transactions costs, contracting, industrial organization and economic networks provide limited insight into competitive outcomes in vertically disintegrated markets such as the current residential mortgage market in the U.S. We are lacking a theoretical framework that represents the fundamental characteristics of

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<sup>10</sup>See <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20170927a.htm>.

<sup>11</sup><https://www.irs.gov/pub/irs-wd/1234006.pdf>.

<sup>12</sup>Source: 10-K and 10-Q filings of New Residential Investment Corporation (starting in 2013) and Newcastle Investment Corporation (prior).

<sup>13</sup>See *Inside MBS and ABS*, “New Residential Goes Whole-Hog into MSR While Largest REIT MBS Investor Takes a Different Tack,” August 4, 2017, p. 9.

the current market structure in which agents can, and do, act strategically when entering into contractual agreements among themselves; are influenced by the actions of others to whom they are only indirectly connected; and make unobservable quality choices related to risk that impact outcomes, locally as well as globally. For a more detailed discussion, see Appendix B.

## 4 Liquidity issues for nonbank mortgage originators

On the origination side of the business, the main vulnerability of nonbanks is their reliance on a type of short-term funding known as warehouse lines of credit. Access to these lines is a crucial aspect of the nonbank business model. For the most part, these lines are provided by commercial banks and investment banks because warehousing requires scale, sophisticated risk management systems, access to capital markets, and personnel.<sup>14</sup>

**Data availability** Lack of data is a significant impediment to understanding warehouse lending to nonbanks fully. One of our paper’s contributions is that we provide the first public tabulations of the warehouse lines of credit that certain large bank holding companies provide to nonbanks; these tabulations are based on supervisory loan-level data collected as part of the Federal Reserve’s Comprehensive Capital Analysis and Review and are known as the Y-14 data after the reporting form number (see Appendix A for more details).

Even establishing the aggregate size of warehouse lending is nearly impossible. Only a few nonbanks are publicly traded (and are thus required to provide information on the structure of their funding facilities and the identities of their counterparties in their 10-Qs). *Inside Mortgage Finance* reports the total outstanding commitments of a sample of warehouse lenders. However, these data exclude many major market participants (*IMF* refers to them as “Wall Street repo lenders”).<sup>15</sup>

For example, as shown in table 1, PennyMac reports in their 10-Q filing that they have warehouse lines from 12 lenders.<sup>16</sup> Of these 12, IMF only captures two (JP Morgan Chase and Wells Fargo), representing just 16% of PennyMac’s total borrowing on warehouse lines.

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<sup>14</sup>Pre-crisis, several large Real Estate Investment Trusts were warehouse lenders. By 2008 they had nearly all failed.

<sup>15</sup>The 2017:Q3 warehouse rankings in the December 1, 2017 issue include data from JP Morgan Chase, Wells Fargo, Texas Capital, Comerica, Everbank, BB&T, Customers Bank, Texas Capital, First Tennessee, Santander Bank, Flagstar Bancorp, People’s United, Southwest Bank, Fidelity Bank and Stonegate/NattyMac.

<sup>16</sup>They also report a line from Fannie Mae’s “as soon as pooled plus” program, which forward-funds pools before sale to investors.

Name of Counterparty	Net amount of liabilities presented in the consolidated balance sheet (\$ 000)
Bank of America	938,104
Credit Suisse First Boston Mortgage Capital LLC	857,882
JPMorgan Chase & Co.	445,746
Citibank	280,127
Morgan Stanley Bank, N.A.	168,184
Daiwa Capital Markets	157,827
Deutsche Bank	114,852
Royal Bank of Canada	94,424
Wells Fargo, N.A.	51,780
Barclays Capital	50,353
BNP Paribas	46,330
Federal National Mortgage Association	1,353
Total	3,206,962

Table 1: Mortgage origination and servicing funding lines reported as derivative liabilities in the Form 10Q, September 30, 2017 for PennyMac Mortgage Investment Trust. The table presents the significant counterparty derivative liabilities sold under agreements to repurchase after considering master netting arrangements. All assets sold under these agreements to repurchase have sufficient collateral or exceed the liability amount recorded. Source: <https://www.sec.gov/Archives/edgar/data/1464423/000156459017022699/0001564590-17-022699-index.htm>

Regulators have access to some data on warehouse lending that are not generally available to researchers. The Y-14 data that we use in this paper, for example, provide a view of warehouse lending from the perspective of the banks, but these data do not include banks that are not required to file the Y-14 data collection, or nonbanks that extend warehouse credit. As we describe in more detail in Section 9, Ginnie Mae and the GSEs collect data on nonbanks' warehouse lines exposure on Mortgage Bankers Financial Reporting Form 1055, and the Conference of State Bank Supervisors collects data on nonbank warehouse lines on the Nationwide Multistate Licensing System Mortgage Call Report.

**Size of the warehouse lending market** Although we can't observe all warehouse lending, the portion we can observe has grown significantly in recent years as nonbank mortgage originations have increased. As of the third quarter of 2017, *Inside Mortgage Finance* reported about \$67 billion in outstanding commitments on warehouse lines, an 11.6% increase from the previous year and a rise of almost 70% from *Inside Mortgage Finance's* estimate of \$40 billion at the end of 2012. Meanwhile, in our sample of warehouse lines recorded in the Y-14 data, the total commitment on warehouse lines of credit from large BHCs to independent mortgage companies has risen from \$17 billion at the end of 2013 to \$34 billion at the end of 2016, with the peak in the series being \$39 billion in the third quarter of 2016 (Figure 4). The figure also shows that of this \$34 billion commitment, mortgage lenders had utilized just over \$23 billion.

The number of dollars on warehouse lines at any given time implies a much higher volume of originations that flow through these lines over a period of time. *Inside Mortgage Finance* estimates that mortgage originations are funded on warehouse lines, on average, for about 15 days (November 30, 2017). Scaling up the \$23 billion in warehouse utilizations in the Y-14 data to the *Inside Mortgage Finance* benchmark suggests around \$40 billion in total warehouse outstandings at the end of 2016, which translates into about \$ 1 trillion in loans funded over the course of a year.<sup>17</sup> To put this number in context, total mortgage originations in 2016 are estimated to be around \$2 trillion, indicating that around half of mortgage originations in a given year cycle through these warehouse lines.

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<sup>17</sup>To reach this estimate, we assume that the ratio that holds between *Inside Mortgage Finance's* committed lines at the end of 2016 (\$62 billion) and what we observe in the Y-14 data (\$34 billion) also holds for line utilization. We also assume that the 15-day estimate of time on warehouse lines recorded in the Mortgage Bankers Performance Report corresponds to calendar days and not business days, and that the IMF total accurately represents the warehouse lines outstanding. Our estimate of total flow of mortgage originations is then  $(\$23 \text{ billion}) \times (\$62 \text{ billion}/\$34 \text{ billion}) \times (365/15) = \$1020 \text{ billion}$ . It is possible that this number underestimates the total flow of originations, because it is based on quarter-end utilization. Industry anecdotes suggest that some nonbanks try to reduce their utilizations at the end of the quarter.

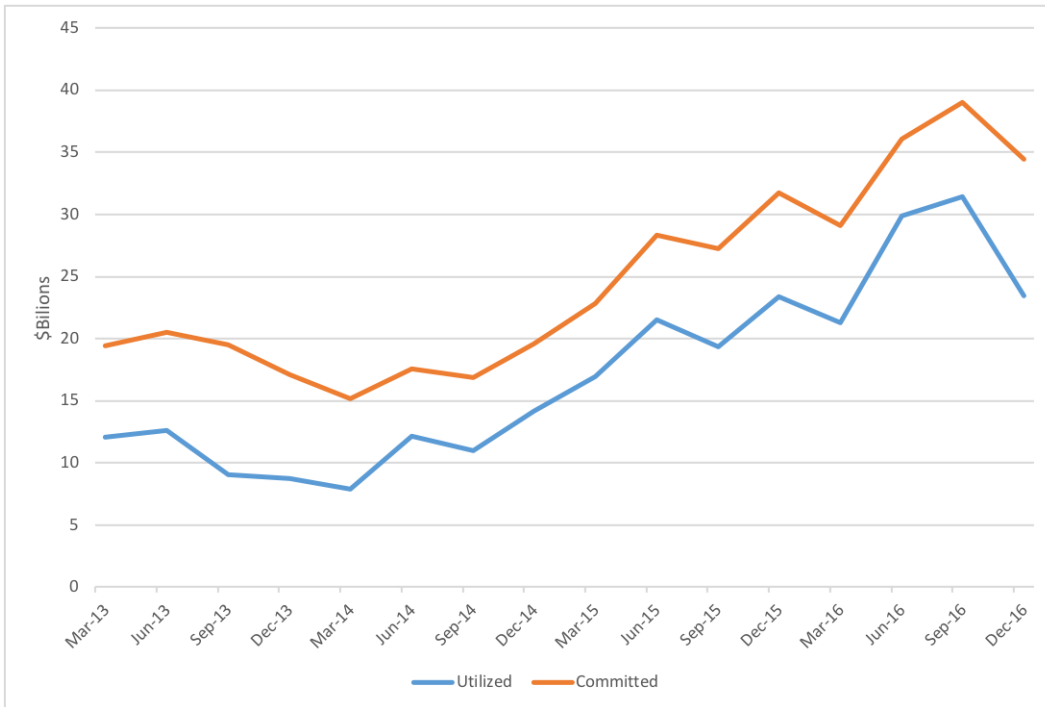


Figure 4: The figure shows the total size and usage of warehouse lines of credit at banks subject to the Federal Reserve’s Comprehensive Capital Analysis and Review (CCAR). Source: Authors’ calculations from Y-14 data.

**The warehouse-lending process** Figure 5 shows the two stages of the warehouse-lending process. In the initial stage shown in Subfigure (a), the mortgage borrower (1) is approved for a mortgage from the nonbank originator (2), who funds the mortgage using a draw from a line of credit provided by a warehouse lender (3). Typically, the warehouse lender will only fund around 95% of the mortgage balance, so that the nonbank originator has some “skin-in-the-game” for each loan. The collateral on the loan is the mortgage on the house, and the nonbank in turn transfers the “mortgage” to the warehouse lender to collateralize the draw on its line of credit.<sup>18</sup> Since the passage of the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) of 2005, mortgage-collateralized warehouse lending is eligible for accounting and legal treatment as repurchase agreements.<sup>19</sup> As shown in Figure 5,

<sup>18</sup>A “mortgage” in the U.S. actually comprises two contracts: 1) a mortgage, which creates a collateral interest in property as security for the performance obligation, or a trust deed, where a third party, a “trustee”, holds the borrower’s real estate title for the lender’s benefit until the loan is repaid; 2) a promissory note, which is the loan document that accompanies the mortgage and specifies the amount of money borrowed and the terms of repayment. Thus, technically the collateral is both the mortgage and the promissory note.

<sup>19</sup>The Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) of 2005 (see Pub.L. 109-8, 119 Stat. 23, enacted April 20, 2005) was a legislative act that made several significant changes to the United States Bankruptcy Code. The specific changes that affected warehouse lending practices included: i) Section 101(47), which redefined the “repurchase agreement” to include mortgage-related securities, mortgage loans, and interests in mortgage related securities or mortgage loans; ii) Section 741(7), which redefined the



the nonbank originator is the repo seller and the warehouse lender is the repo buyer in the origination transaction.

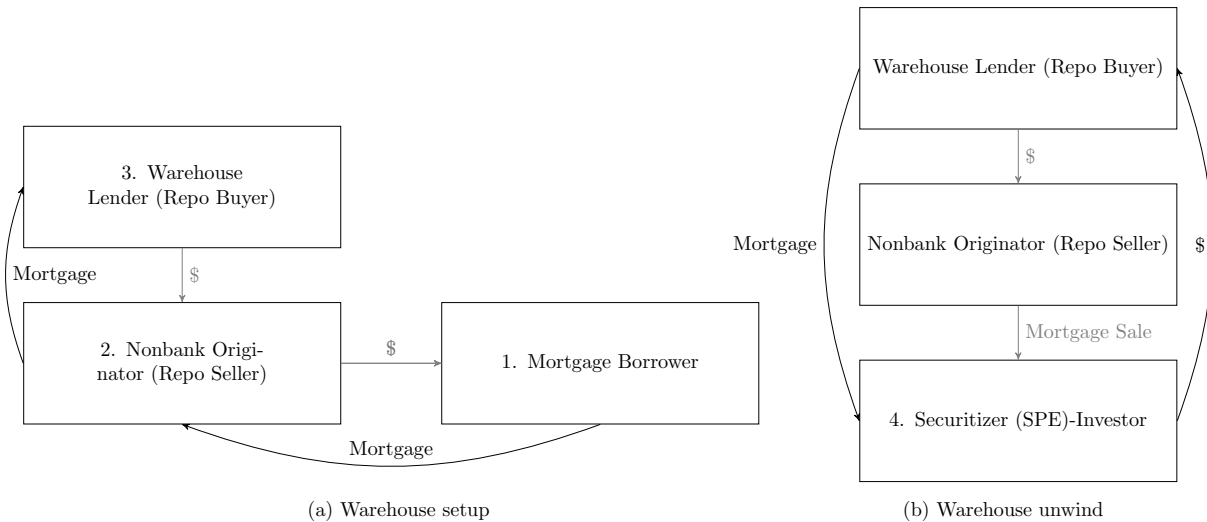


Figure 5: Schematic for the collateralized warehouse lending process for mortgage origination. Subfigure (a) presents the setup phase of warehouse funding for nonbank mortgage origination (warehouse setup), where: (1) a mortgage borrower obtains a mortgage funded by a nonbank originator (technically the repo seller); (2) the mortgage originator funds the loan through a collateralized line of credit; (3) the warehouse lender (technically the repo buyer) holds the mortgage note as collateral against the draw on the line of credit (the draw amount is valued at the loan balance minus a haircut). Subfigure (b) shows the warehouse unwind where: (4) the nonbank mortgage originator must sell the mortgage note to a securitizer-investor — in the case of the GSEs this would be a loan sale (either cash or swap for the bonds of the SPE) to a Fannie or Freddie Special Purpose Entity (SPE), and in the case of Ginnie Mae the loan sale would be part of a sale of Ginnie Mae pool of mortgages to investors. The proceeds from the loan sales flow directly to the warehouse lender, who releases the collateral, the mortgage/trust deed and promissory note, to the securitizer-investor. The warehouse lender then pays down the dollar value of the draw to the nonbank originator’s line of credit.

In the second stage of the warehouse lending process, shown in Subfigure (b) of Figure 5, the nonbank originator is responsible for finding a willing buyer for the mortgage. Currently, these mortgage investors are the GSEs or Ginnie Mae investors. Pre-crisis, investors in private-label mortgage securities also made up a large part of the market. Once the mortgage is sold, the proceeds from the sale are paid to the warehouse lender, who holds the mortgage

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“securities contract” to include mortgage loans and any interests in mortgage loans, including repurchase transactions; and iii) the “safe harbor” amendments in Section 555 and 559, which exempted “repurchase agreements” from automatic stay and, under Section 362(b)(7), enabled a repo buyer to recoup losses due to counterparty bankruptcy by selling the mortgage loans serving as collateral (see Bellicha, Stanton, and Wallace, 2015).

as collateral. The warehouse lender then releases the mortgage/trust deed and promissory note to the mortgage investor (the pool created by the GSEs, the Ginnie Mae issuer, or the private-label securitizer). The warehouse lender then pays down the dollar value of the draw to the nonbank’s line of credit.<sup>20</sup>

## 4.1 Vulnerabilities of warehouse funding

There are three important vulnerabilities associated with the warehouse funding of nonbanks: 1) margin calls due to aging risk (i.e., the time it takes the nonbank to sell the loans to a mortgage investor and repurchase the collateral) and/or mark-to-market devaluations, 2) roll-over risk and 3) covenant violations leading to cancellation of the lines.

### 4.1.1 Pipeline aging risk and marking to market

The time it takes a nonbank to sell a warehoused loan to a securitization vehicle is a fundamental risk, because tardy loan sales are subject to additional interest charges (margin calls) and penalties. This is known as “aging risk.” Tardy loan sales can also lead to higher haircuts on future draws from the line of credit. The contracts on warehouse lines of credit may require the nonbank to take loans off the lines within a certain period of time.<sup>21</sup> The GSE securitization market, under the current conservatorship, and the Ginnie Mae securitization market, are currently working smoothly, and nonbanks are typically able to move loans off the warehouse lines quickly. In fact, *Inside Mortgage Finance* reports that the average time that loans stay in the lines as collateral have fallen to only 14 to 15 days from 18 to 20 days four years ago (see *Inside Mortgage Finance*, November 30, 2017). Since 1990, the GSEs have provided support for purchasing efficiency by providing small “gestation” funding lines,<sup>22</sup> which allow nonbanks to pay off their warehouse line as soon as pool approval rather than at sale.<sup>23</sup> Given the current dominance of the GSEs and Ginnie Mae in nonbank securitization, it could be argued that the government’s implicit liquidity provision in these

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<sup>20</sup>See Warehouse Lending from A to Z, Part One and Two, Mortgage Banking Association Webinars by Sophie B. Schubert, Joe Lathrop, Tom Kelly, Esquire, September 17, 2013 and September 24, 2013.

<sup>21</sup>Credit Suisse’s funding facility with PennyMac, for example, explicitly defines an aging limit of 90 days for agency mortgages. Form 8K, PennyMac Financial Services, Inc, April 28, 2017.

<sup>22</sup>A pool is said to be “in gestation” awaiting delivery to the takeout investor upon security issuance. Gestation warehouse lending from banks and investment banks has long existed to expedite sales for Ginnie Mae issuance.

<sup>23</sup>The programs include the “As soon as pooled plus: Loan-level Funding for Whole Loans or MBS” program of Fannie Mae (see [https://www.fanniemae.com/content/fact\\_sheet/early-funding-options-overview.pdf](https://www.fanniemae.com/content/fact_sheet/early-funding-options-overview.pdf)) and the “Early Execution Program” of Freddie Mac, which allows for funding 45 days before the settlement date of the pool (see [http://www.freddie.com/singlefamily/early\\_funding.html](http://www.freddie.com/singlefamily/early_funding.html)).

securitization markets is one of the linchpins that allows the entire nonbank mortgage sector to stay in business.

Recently, pipeline aging risk led to the sudden closure in March 2016 of a large non-depository lender, W. J. Bradley Mortgage.<sup>24</sup> The precipitating event in this closure was a “pipeline backup” (the pipeline is the funding period between the disbursal of funds to mortgage borrowers and the securitization of the loans), reportedly due to new regulatory oversight of underwriting quality under the Consumer Finance Protection Bureau’s new TRID requirements.<sup>25</sup> TRID violations arising from “small” errors in the underwriting reports for each loan made it impossible for W. J. Bradley to sell the mortgages to a securitization vehicle within the period stipulated in their funding contracts. This covenant violation then precipitated the cancellation of all of its lines of credit. As described in section 4.2, this is very similar to the cancellation of billions of dollars of lines-of-credit to mortgage originators in the fourth quarter of 2006 and first two quarters of 2007 due to slowdowns in the securitization of mortgages in both the GSE and private-label markets. In both cases, these cancellations led to the immediate demise of the mortgage originators.

Typically, the master repurchase agreements for warehouse lines also allow the warehouse lender to mark to market the mortgage loans held as collateral on the line. If mortgage interest rates rise sharply while the mortgage is in the warehouse facility, for example, the mortgage will fall in value. If the market value of the loans times a pre-defined “advance rate” is less than the repurchase obligations owed by the nonbank borrower, the warehouse lender is entitled to make a margin call. The margin call must usually be resolved within 24 hours, either by a cash payment or by delivering additional mortgage loans to bring the facility back into balance.

#### 4.1.2 Roll-over risk

When the term of the warehouse line expires, the nonbank must negotiate a new contract with the warehouse lender (“roll-over risk”). If market conditions have changed, the nonbank can face higher funding costs. Roll-over risk is currently significant, given that most lines have maturities of less than one year, significantly shorter than the usual pre-crisis maturities of 3–5 years.

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<sup>24</sup>See Paul Muolo, “A Wakeup Call for the CFPB — Tombstone Blues?” *Inside Mortgage Finance*, March 18, 2016.

<sup>25</sup>These rules are part of the new Truth in Lending Act (TILA) — Real Estate Settlement Procedures Act (RESPA) Integrated Disclosure Rule, implemented by the CFPB in 2016 (see CFPB, 2016).

### 4.1.3 Covenant violations

Warehouse lenders can adjust the terms or cancel lines if nonbanks violate any of the covenants on the contract. The covenants often include requirements that the nonbank maintain certain levels of net worth and unrestricted cash and ratios of liabilities to net worth, and be profitable for at least one of the previous two consecutive fiscal quarters. Covenants may also require that loans be sold to securitization vehicles within a certain period of time, as discussed earlier.<sup>26</sup>

During normal times, when a nonbank violates a covenant, the warehouse lender will generally waive the covenant or renegotiate the agreement.<sup>27</sup> During times of stress, however, the incentive of the warehouse lender is to pull the line and seize and sell the underlying collateral as quickly as possible, as warehouse lenders are allowed to do under the repo eligibility provisions afforded them under BAPCPA 2005. Amplifying these dynamics is the fact that large nonbanks typically have warehouse lines of credit with multiple warehouse lenders, and the lending contracts tend to have cross-default clauses such that a default on one line triggers an automatic default on the nonbank's other credit obligations. If these lenders sense that the failure of the nonbank is imminent, each has the incentive to minimize its losses by canceling the line and seizing its collateral before its competitors. This race to seize assets can further erode the viability of the nonbank as an ongoing entity, and if the warehouse lender sells the mortgages after it seizes them, those sales can weigh on mortgage valuations.

The rapidity with which covenants can bind is exemplified by the final month of operation of New Century Financial Corporation, which was the largest nonbank mortgage lender in 2006. In a summary of facts, Kevin J. Carey, the U.S. bankruptcy judge, notes that<sup>28</sup>

“On March 2, 2007, NCFC announced that it was unable to file its annual report on Form 10-K for the year ended December 31, 2006 by March 1, 2007, without unreasonable effort and expense... The announcements caused a variety of issues with the repurchase counterparties to the Debtors Master Repurchase Agreements, including margin calls, restricting and ultimately terminating funding for loans originated by the Debtors... This exacerbated the Debtor's liquidity

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<sup>26</sup>PennyMac's 2017 facility with Credit Suisse, for example, requires a minimum net worth of \$500 million, a minimum of \$40 million in unrestricted cash, and a maximum ratio of liabilities to net worth of less than 10:1 (see <https://www.sec.gov/Archives/edgar/data/1464423/000119312517380211/d498496d8k.htm>). As another example, PHH stated in its 2015:Q4 10K that its warehouse line covenants included a net worth minimum of \$1 billion and a ratio of liabilities top net worth less than 4.5 to 1. (see [https://www.sec.gov/Archives/edgar/data/77776/000110465915015004/a14-25744\\_110k.htm](https://www.sec.gov/Archives/edgar/data/77776/000110465915015004/a14-25744_110k.htm)).

<sup>27</sup>See, for example, the waiver granted to Walter in 2017, <https://www.sec.gov/Archives/edgar/data/1040719/000119312517200563/d394793d8k.htm>.

<sup>28</sup>See <https://www.davispolk.com/files/uploads/Insolvency/NewCenturyBankruptcy.pdf>.

situation and, by March 5, 2007, the Debtors were able to fund only a portion of their loan originations. The Debtors’ inability to originate loans and the exercise of remedies by the Repurchase counterparties left the Debtors in a severe liquidity crisis. On April 2, 2007, the Debtors (other than Access Lending) filed chapter 11 bankruptcy cases. . . .”

## 4.2 Warehouse funding during the financial crisis

In 2006, the top 40 mortgage originators accounted for about 97% of the \$2.98 trillion total mortgage originations in the U.S., and 28 of those institutions, representing 59% of total mortgage origination, used at least one warehouse line of credit to fund their originations.<sup>29</sup> Many of these nonbanks and some depository mortgage originators also had off-balance-sheet entities called Structured Investment Vehicles (SIV). SIVs were typically organized as unconsolidated entities within the parent originator’s corporate holding company. They functioned as an additional warehouse lender (repo buyer) to the parent originator and the SIV’s collateralized lending activity to the parent (the repo seller) was funded by selling asset-backed commercial paper (ABCP). In addition to the collateral and fees from the warehouse lending to the parent, the credit quality of the ABCP was further protected through credit enhancements from pre-funded reserves and subordination notes as well as liquidity supports from commercial banks with at least Aaa credit ratings (see Acharya et al., 2013; Pozsar, Adrian, Ashcraft, and Boesky, 2012; Covitz et al., 2013).

The two largest nonbanks in 2006 were New Century Financial Corporation and American Home Mortgage Corporation. New Century issued \$59.8 billion in new originations using \$14.35 billion from nine warehouse facilities<sup>30</sup> and a \$2 billion line from its SIV, Van Karman Funding Trust.<sup>31</sup> American Home Mortgage originated \$58.9 billion of new loans funded via a \$2.49 billion line from its SIV, Broadhollow Funding, LLC,<sup>32</sup> and \$9.25 billion from eight warehouse facilities.<sup>33</sup>

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<sup>29</sup>See *Inside Mortgage Finance* February 2, 2007; Stanton, Walden, and Wallace (2014); Bellicha et al. (2015).

<sup>30</sup>As of December 31, 2005, the warehouse lenders were: Bank of America, N.A. (\$3B); Barclays Bank, PLC (\$1B); Bear Stearns Mortgage Capital (\$800M); Citigroup Global Markets Reality Corporation (\$1.2B); Credit Suisse First Boston Capital, LLC (\$1.5B); Deutsche Bank (\$1B); IXIS Real Estate Capital, Inc. (\$850M); Mortgage Stanley Mortgage Capital, Inc. (\$3B); UBS Real Estate securities Inc.(\$2B) (see <http://www.sec.gov/Archives/edgar/data/1287286/000089256906000258/0000892569-06-000258-index.htm>).

<sup>31</sup>See Moody Investor Services for quarterly reports on Van Karman.

<sup>32</sup>The total credit available from Broadhollow Funding, LLC was \$3.25 billion as reported in quarterly reports on Broadhollow Funding LLC from Moody’s Investor Services.

<sup>33</sup>As of March 30, 2006, American Home Mortgage had warehouse facilities of \$2.5 billion with UBS Real Estate Securities Inc., \$2.0 billion with Bear Stearns, \$1.0 billion with Barclays Bank PLC, \$1.0 billion bank syndicated facility led by Bank of America, N.A., \$750 million with Morgan Stanley Bank, \$150

These sources of warehouse credit began to dry up rapidly in the run-up to the financial crisis as the slowdown in the securitization markets made it difficult for the nonbanks to move loan originations off the warehouse lines and the premiums paid for subprime warehoused loans evaporated. In 2006:Q4 there were 90 warehouse lenders in the U.S. with about \$200 billion of outstanding committed warehouse lines; however, by 2008:Q2 there were only 40 warehouse lenders with outstanding committed lines of \$20–25 billion, a decline exceeding 85%.<sup>34</sup> By March of 2009, there were only 10 warehouse lenders in the U.S. In addition, runs on SIVs led to the collapse of this form of warehouse funding by the end of 2007 (Figure 7), and it has not returned as a funding source post-crisis ((see Acharya et al., 2013; Pozsar et al., 2012; Covitz et al., 2013).

The collapse of the short-term funding structure of nonbanks and some depositories such as Countrywide led to rapid losses in liquidity and lending activity. Origination volumes by the nonbanks, which hovered around \$800–900 billion a year from 2003 to 2006, plummeted to \$280 billion in 2008 (see Figure 6). Many of these firms experienced bankruptcies and closures similar to that of New Century. As shown in the Appendix Table 10, of the nineteen nonbanks and depositories who funded their originations using both warehouse lines and SIVs in the pre-crisis period, only two institutions, Nationstar Mortgage and Suntrust, survived until 2017 and the rest (representing about 45% of 2006 mortgage originations) were closed down, went bankrupt, or were involved in FDIC supervised sales. All together, the total number of mortgage companies (both independent and affiliated with banks) fell in half—a drop of nearly 1,000 companies—between 2006 and 2012.<sup>35</sup>

#### 4.2.1 Post-crisis requests for government assistance of warehouse lending

The sharp contraction in warehouse lending led nonbank mortgage originators to lobby the federal government intensively for help. Letters sent by the Mortgage Bankers’ Association to Treasury Secretary Paulson, Treasury Secretary Geithner, Federal Reserve Chairman Bernanke, and federal bank regulators in late 2008 and early 2009 outlined the gravity of the situation and proposed a variety of policy responses, including a federal guarantee of warehouse lines and a reduction in bank risk-based capital ratings for warehouse lines.<sup>36</sup> In September 2009, the U.S. House of Representatives passed the *21st Century FHA Housing Act of 2009*. This bill included a sense of Congress that “the Secretary of

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million with J.P. Morgan Chase, \$450 million facility with IXIS Real Estate Capital, Inc., and a \$1.4 billion syndicated facility led by Calyon New York Branch (see <https://www.sec.gov/Archives/edgar/data/1256536/000091412106001369/am728775-10q.txt>).

<sup>34</sup>See National Mortgage News, October 20, 2008.

<sup>35</sup>See Bhutta and Canner (2013).

<sup>36</sup>See, for example, [https://web.archive.org/web/20101007080352/http://mbaa.org/files/AU/2009/MBAlettertoGeithner\\_WarehouseLending\\_2-5-2009.pdf](https://web.archive.org/web/20101007080352/http://mbaa.org/files/AU/2009/MBAlettertoGeithner_WarehouseLending_2-5-2009.pdf).

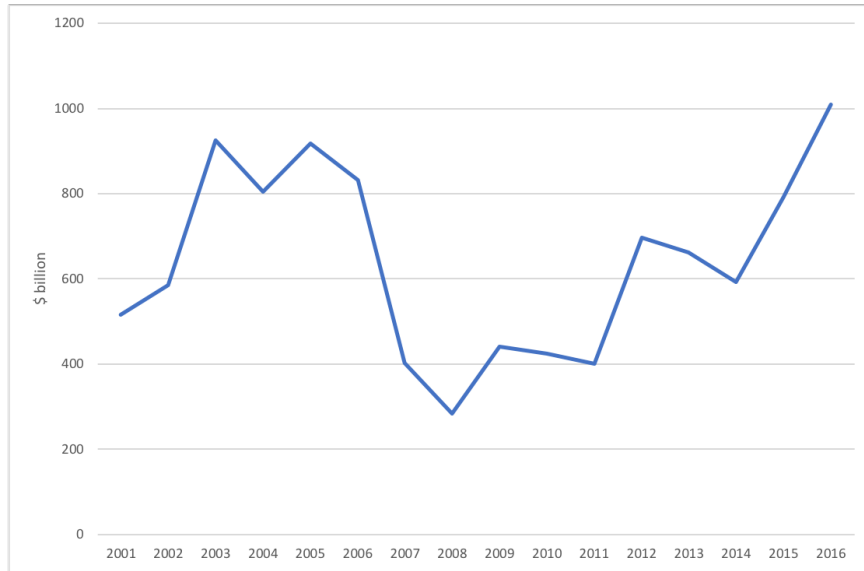


Figure 6: The figure presents nonbank mortgage originations (in \$ billions) from 2001 to 2016. Source: Authors' calculations from HMDA data.

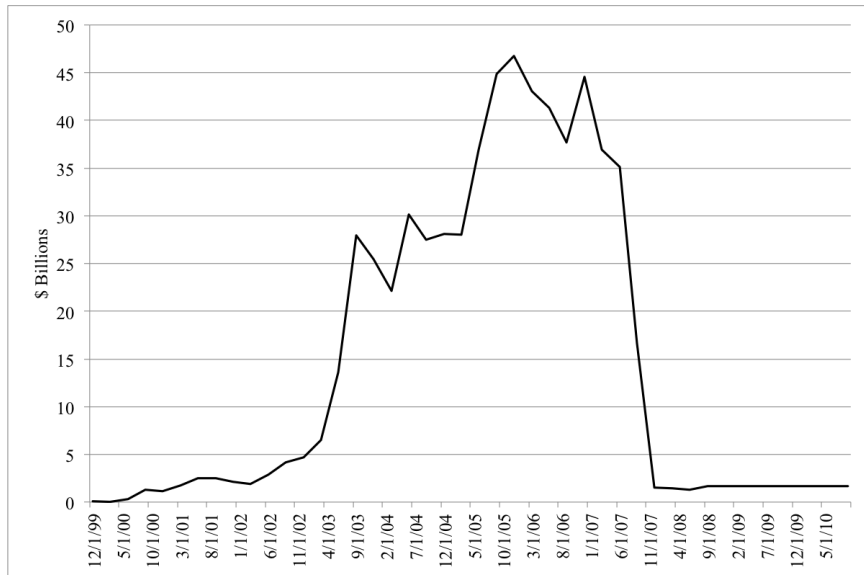


Figure 7: Pre-crisis outstanding committed mortgage warehouse balances in billions of dollars of the off-balance-sheet U.S. Structured Investment Vehicles funded by extendable asset-backed commercial paper and collateralized by mortgage loans held in warehouse prior to securitization. Source: Authors' calculations from quarterly SIV statements reported to Moody's Investor Services.

the Treasury, the Secretary of Housing and Urban Development, and the Director of the Federal Housing Finance Agency should use their existing authority under the Emergency Stabilization Act of 2008, the Housing Economic Recovery Act of 2008 and other statutory and regulatory authorities to provide financial support and assistance to facilitate increased warehouse credit capacity by qualified warehouse lenders...” (see 111th Congress, H.R. 3146, 21st Century FHA Housing Act of 2009, <https://www.congress.gov/bill/111th-congress/house-bill/3146>). The types of support suggested in H.R. 3146 included direct loans, guarantees, credit enhancements, and other incentives. The bill never emerged from the Senate Banking Committee and so was not enacted. In late 2009 and early 2010, however, both Fannie Mae and Freddie Mac introduced programs that facilitated the flow of warehouse credit to independent mortgage banks. Fannie Mae’s program was originally intended to support about \$1 billion in warehouse lines in 2010.<sup>37</sup>

This history suggests that in periods of acute stress, the federal government is likely to be called upon to backstop the nonbank origination funding flow even though the government is not paid ex-ante for providing this insurance function.

### 4.3 Trends in warehouse lending from the Y-14 supervisory data

As previously discussed, even aggregated data on warehouse lending are hard to come by, and loan-level data are even more scarce. In this paper, we explore the current warehouse lending situation using the Y-14 data, which include 5,065 quarterly observations on 663 warehouse lines of credit extended to 287 nonbanks by 14 warehouse lenders from 2013 to 2016.<sup>38</sup>

As shown in Table 2, committed exposures on each line are relatively small, ranging from \$8.7 million at the 10th percentile of the distribution to \$200 million at the 90th percentile. Almost all (93%) of lines are utilized. Of the lines that are utilized, the median utilization rate is 76%; 32% of lines are utilized at 100%, meaning that they have no spare capacity. 15% of the lines are “demand loans,” meaning that the warehouse lender can call them at any time. Of the lines with a scheduled maturity, most of them are 364 days or less; the tenth percentile, median, and 90th percentile of the maturities are 362, 365, and 1,820 days, respectively.<sup>39</sup> Most (77%) of the lines are tied to LIBOR. Interest rates range from 1.45 at

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<sup>37</sup>See <https://www.wsj.com/articles/SB125486796534968995> and <https://www.reuters.com/article/fanniemae-warehouselending/fannie-mae-launches-1-bln-warehouse-lending-plan-idUSN2214885920100222> for early news reports on the programs.

<sup>38</sup>Although the Federal Reserve began to collect Y-14 data in 2011, we do not use data from 2011 or 2012 because of data quality issues in the early years of the data collection.

<sup>39</sup>We infer the maturity of the loan by comparing the origination date and the renewal date. It is possible that some Y-14 reporters do not update the renewal date in their data submissions and so warehouse lines that appear to have multi-year maturities are in fact the 364-day facilities that are standard in this industry.



the tenth percentile, to 2.73 at the median, to 3.65% at the 90th percentile. About 40% of the lines are guaranteed, typically (for nonpublic companies) by personal guarantees from their major shareholders.<sup>40</sup> About 75% of lines are secured by collateral in addition to the mortgage originations; this collateral can take the form of cash or other marketable securities, blanket liens, or other assets.

Large banks extend credit other than warehouse lines to nonbanks; in total, we estimate that large banks extended \$47 billion in credit to nonbanks in 2016:Q4. A bit more than 60% of these credit facilities were identified by the banks as being for warehouse purposes, with another 13% for working capital, 5% for general corporate purposes, and 20% for other reasons.

Banks assign an internally generated credit rating to each of their credit facilities. Looking at all credit facilities extended to nonbanks, only about 5% of the facilities were rated AA or A by the bank lender, with an additional 28% rated triple-B. Of the remaining two-thirds with high-yield ratings, the majority have double-B ratings, but about 15% of all warehouse lines are rated single-B or lower by their warehouse lenders.

As a preview of our results later in this section, we also tabulate the share of nonbanks that have a credit facility (warehouse line or other type) with multiple commercial banks in our sample. In any given quarter, about three-quarters of the nonbanks in our sample have only one credit facility with a large bank in our data, whereas 16% have credit facilities with two banks and 9% have facilities with three or more banks. In a financial crisis, as we noted earlier, the presence of multiple warehouse lenders gives each lender an incentive to seize its collateral before its competitors. Our data suggest this interconnectedness still exists, although we only observe a portion of it because our data include perhaps half of the total warehouse lines outstanding. However, at this point, the interconnectedness is not an issue, as the share of these credit lines that are past due is essentially zero.

**Interconnectedness of warehouse lending** We next explore the characteristics of the nonbanks that pose the greatest interconnectedness risk. In Table 3, we classify nonbanks by the number of banks in our data that extended warehouse lines to them (as opposed to all credit facilities, as Table 2). To obtain more information on the nonbank characteristics, we merged measures of each nonbank’s total mortgage originations and the share of its originations that were guaranteed by the FHA or the VA from the Home Mortgage Disclosure Act data. For those nonbanks that are Ginnie Mae seller-servicers, we merged data from

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<sup>40</sup>“Guaranty requirements vary, but most warehouse lenders require major shareholders of non-public companies to guaranty obligations.” Stoner and Calandra, “Warehouse Lending 2017,” presentation, available at <http://media.straffordpub.com/products/warehouse-lines-of-credit-drafting-mortgage-loan-purchase-agreements-custodial-agreements-reps-and-warranties-2017-05-11/presentation.pdf>.

Panel A: Statistics calculated over warehouse lines	
Committed Exposure (\$Mil.)	
10th percentile	8.70
Median	45.13
90th percentile	200.00
Share of lines that are utilized	0.93
Of lines that are utilized:	
Median utilization rate	0.76
Share of lines that are utilized at 100%	0.32
Share that are demand loans	0.15
Maturity of line (days) (calculated only for non-demand loans)	
10th percentile	362
Median	365
90th percentile	1,820
Share with an interest rate tied to LIBOR	0.77
Interest Rate (%) (calculated only for utilized lines)	
10th percentile	1.45
Median	2.73
90th percentile	3.65
Share with a guarantee	0.41
Share of additional collateral types:	
Cash or marketable securities	0.09
Blanket Lien	0.13
Other types	0.49
No other security	0.29
Panel B: Statistics calculated over all credit lines	
Share of credit line types:	
Mortgage Warehousing	0.62
Working Capital	0.13
General Corporate Purpose	0.05
Others	0.20
Share with a credit rating of	
AA or A	0.04
BBB	0.28
BB	0.52
B	0.14
C or D	0.01
NA	0.01
Share of nonbank-quarter pairs with a credit line with	
1 bank	0.76
2 banks	0.16
3 or more banks	0.09
Share past-due	0.00
N. Obs.	7,594

Table 2: Selected characteristics of bank loans extended to nonbank mortgage companies. Source: Authors' calculations from Y-14 data.

Ginnie Mae on total originations into Ginnie pools, total portfolio serviced for Ginnie Mae, and the delinquency rate on that servicing portfolio. Appendix A provides more information on these merges.

Larger nonbanks, as measured by loan originations, have warehouse lines of credit with more banks. Nonbanks in our data with only one warehouse line originate, on average, about \$621 million in mortgages each quarter. In comparison, institutions with warehouse lines with two lenders originate about \$2.5 billion in mortgages each quarter, and institutions with three or more warehouse lenders originate \$9.4 billion a quarter. The share of these originations that are insured by the FHA or VA does not vary significantly by number of warehouse originations. Meanwhile, nonbanks with more warehouse relationships also have larger portfolios of loans serviced for Ginnie Mae, although the delinquency rates on those portfolios does not vary significantly by the number of warehouse relationships.

Turning to the characteristics of the warehouse lines, nonbanks with more warehouse relationships pay lower interest rates on their lines than nonbanks with fewer relationships. Nonbank credit facilities are also a bit more likely to be rated investment-grade if the nonbank has multiple relationships, are less likely to be required to post a personal guarantee, have a bit higher utilization rates, and are a bit more likely to be demand loans.

We next estimate regressions that explore the extent to which the interest rates charged on warehouse lines reflect the underlying risks. We use interest rates instead of interest rate spreads because we have incomplete information on the interest-rate indexes for the lines. We add fixed-effects for each quarter-end to the regressions to adjust for fluctuations over time in the base rates. The regressions also include fixed-effects for each warehouse lender in order to control for any pricing factors idiosyncratic to each lender.

As shown in table 4, interest rates increase with the lender's internal rating of the riskiness of the credit line. Lines with a double-B rating have rates about 14 basis points higher than lines with double-A or single-A ratings, and lines with a single-B rating have rates about 22 basis points higher. Loans with a guarantee bear higher rates even though the guarantee should provide the warehouse lender with more protection; perhaps the presence of the guarantee indicates that these loans are more risky in other ways that we do not capture in our data.

Nonbanks that have relationships with multiple warehouse lenders have lower rates on their lines than nonbanks with one warehouse line. Larger nonbanks, as measured by their mortgage originations, also have lower interest rates on their lines. As indicated in the earlier table, nonbank size is correlated with the number of lines, so it is noteworthy that the number of lines is negatively associated with interest rates even conditioning on lender

	By number of Y14 bank lenders (calculated for warehouse lines only)		
	(1) One lender	(2) Two lenders	(3) Three or more lenders
HMDA originations (\$Mil)	621 (3,214)	2,574 (7,918)	9,444 (21,612)
Of HMDA originations:			
Share of FHA loans	0.26 (0.18)	0.22 (0.16)	0.22 (0.14)
Share of VA loans	0.10 (0.12)	0.10 (0.15)	0.11 (0.15)
New origination for GNMA pools (\$Mil)	416 (823)	815 (1,620)	1,141 (2,153)
Total portfolio serviced for Ginnie Mae (\$Mil)	3,503 (7,550)	8,230 (17,185)	11,148 (19,992)
Delinquency rate of loan portfolio serviced for Ginnie Mae	0.02 (0.02)	0.02 (0.02)	0.03 (0.03)
Avg. interest rate of lines (%)	2.83 (1.03)	2.41 (0.80)	2.18 (0.64)
Share with a credit rating of:			
AA or A	0.03 (0.18)	0.05 (0.17)	0.06 (0.18)
BBB	0.29 (0.45)	0.34 (0.40)	0.27 (0.31)
BB	0.49 (0.50)	0.48 (0.43)	0.52 (0.38)
B	0.16 (0.36)	0.13 (0.30)	0.15 (0.29)
C or D	0.02 (0.13)	0.00 (0.03)	0.00 (0.00)
NA	0.01 (0.10)	0.00 (0.03)	0.00 (0.00)
Share with a guarantee	0.49 (0.50)	0.39 (0.45)	0.26 (0.37)
Utilization rate	0.67 (0.32)	0.66 (0.28)	0.75 (0.23)
Share that are demand loans	0.14 (0.35)	0.16 (0.32)	0.23 (0.32)
Total Committed (\$Mil)	58 (88)	175 (230)	366 (354)
Originations to Committed Amount	12.91 (29.93)	12.64 (28.09)	23.77 (48.50)
Median maturity (days)	368	675	365
N. Nonbanks	387	119	58
N. Obs.	2,332	694	379

Table 3: Selected characteristics of nonbanks by number of warehouse lenders. Source: Authors' calculations from Y-14, HMDA, and Ginnie Mae data.

size. The result suggests that warehouse lenders do not internalize the possibility of a “run” dynamic or other interconnectedness concerns in their pricing.

We next examine whether the loan pricing varies with the characteristics of the mortgages that collateralize the line. In particular, we examine whether loan pricing varies with the share of originations that are insured by the FHA or VA. These loans tend to be originated to borrowers with a higher probability of default and thus are more likely to lose value in times of economic stress; the servicing rights associated with these loans are also less valuable. If warehouse lenders are concerned about the possibility that they might need to seize and hold the mortgages collateralizing their lines, interest rates should be higher for warehouse lines collateralized with more of these loans. Indeed, both shares are associated with higher rates on the warehouse line, and the VA share is statistically significant at the 1% level. Of course, there are other interpretations of this coefficient, such as if lenders with a lot of VA originations are riskier in other dimensions.

#### **4.4 Nonbank risks for the GSEs and Ginnie Mae**

In the years before the financial crisis, mortgages in GSE and Ginnie Mae pools were primarily originated by banks. These banks largely survived the financial crisis, due in part to funds provided through the Troubled Asset Relief Program. Inasmuch as these banks had exposure to failing nonbanks through warehouse lines of credit, the banks typically seized the mortgages collateralizing the lines, as allowed under BAPCPA. As a result, banks that the GSEs or Ginnie Mae pursued for damages for underwriting violations, under either putback requests or False Claims Act prosecution, largely had the resources to pay these claims.

In contrast, if a financial crisis occurred today, many nonbanks might not have the resources to survive, and subsequently make the GSEs or Ginnie Mae whole for any losses stemming from underwriting violations. The mortgages collateralizing their warehouse lines would move to the banking sector under the warehouse lenders’ BAPCPA rights, and there is no liquidation protocol (except the bankruptcy system) or process to recapitalize the nonbanks. We explore these issues in more detail in Sections 7 and 9.

## **5 Liquidity issues for nonbank mortgage servicing**

The crux of the liquidity issue in mortgage servicing is that servicers of mortgages in securitized pools are required to continue making payments to investors, tax authorities, and insurers when mortgage borrowers skip their payments. Servicers are eventually reimbursed for these “servicing advances,” but they need to finance the advances in the interim.

		Dependent variable: Interest rate of a credit line (%)
Credit rating of:		
BBB		0.000896 (0.02)
BB		0.142*** (2.69)
B		0.218*** (3.25)
C or D		0.173 (0.33)
NA		0 (.)
Demand loan		0.0714 (1.57)
With a guarantee		0.0754* (1.76)
Number of banks with facilities with:		
= 2		-0.0837** (-2.23)
≥ 3		-0.103** (-2.24)
HMDA originations quartile:		
(25%, 50%]		-0.196*** (-3.88)
(50%, 75%]		-0.327*** (-5.46)
(75%, 100%]		-0.367*** (-5.35)
Share of FHA Loans		0.126 (1.16)
Share of VA loans		0.289*** (2.91)
N. Obs.		3,362

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 4: Factors associated with interest rates on warehouse lines of credit. Source: Authors' calculations from Y-14 and HMDA data.

The issue is especially acute for Ginnie Mae servicers. These servicers need to advance more types of payments for much longer than GSE servicers. Ginnie Mae servicers, unlike GSE servicers, may also be required to absorb credit losses (in some cases, potentially large losses) on the underlying mortgages. Finally, obtaining private-market financing of servicing advances is difficult (if not impossible) for Ginnie Mae advances, so servicers need to fund the advances with cash from current operations.

Liquidity issues in servicing tend to unfold more slowly than liquidity issues in mortgage originations: servicers can predict, with some accuracy, the amount of funds that they will need. The worrying aspect of the current situation is that it has never been tested. The Ginnie Mae market was much smaller, and primarily in the hands of banks, in the financial crisis and aftermath. The Ginnie Mae market is now much larger, and primarily in the hands of nonbanks who might not be able, in times of strain, to continue financing these advances from cash, and might not be able to obtain financing from the private market.

During and after the financial crisis, servicers of private-label RMBS faced liquidity issues. A financing market existed for the advances, but credit terms had tightened considerably. The Federal Reserve’s Term Asset-Backed Securities Loan Facility (TALF) helped alleviate these strains. A similar policy response would not be effective today, because a financing market does not even exist for Ginnie Mae advances.

## **5.1 Background on servicing advances**

The amount of exposure that servicers have to servicing advances varies by the type of servicing contract, with servicers for Fannie Mae and Freddie Mac having relatively low exposure, servicers of private-label mortgage securities having a fair amount of exposure, and servicers for Ginnie Mae having substantial exposure. We summarize these provisions below.

Servicers of pools guaranteed by Fannie Mae and Freddie Mac are required to advance principal and interest until the borrower is 120 days delinquent on the loan (Fannie Mae, 2017a, section A1-3-07). Servicers continue paying the property taxes, insurance premiums, and foreclosure expenses associated with delinquent loans after that point, but servicers can submit reimbursement requests for these expenses “as soon as possible” after incurring an expense (Fannie Mae, 2017a, section E-5-01).

Servicers of private-label mortgage-backed securities are required to “advance monthly principal and interest payments as well as property taxes, insurance, and maintenance costs for delinquent borrowers” until the delinquency is resolved (Moody’s Investor Service, 2017). Servicers can stop making advances for principal and interest once they deem that they will

not be able to recover them, although they are obligated to continue advancing other funds. Although new issuance of these pools remains very low, nearly \$800 billion of these securities were still outstanding at the end of 2017, primarily representing legacy securities originated before the financial crisis.<sup>41</sup>

Servicers of pools guaranteed by Ginnie Mae are obligated to continue making payments to investors, property insurers, and tax authorities for the life of the loan “without regard to whether they will be able to recover those payments from liquidation proceeds, insurance proceeds, or late payments” (Ginnie Mae, 2017, Chapter 15). Servicers have the option to stop the advances by purchasing loans out of the pool (for the value of the loan’s remaining principal balance, minus any advanced principal payments) once the mortgages reach 90 days delinquency, but it may not be cost-effective for some nonbanks to hold the mortgages that are bought out of the pool.

The servicer is likely to recover most of these outlays eventually from the FHA, VA, or other government mortgage insurance, or from the foreclosure proceeds, but there can be substantial delays between when the servicer incurs the expense and when it gets reimbursed. In some cases, the insurance does not reimburse the full expense. The amount of VA insurance, for example, is capped at 25% of the outstanding mortgage balance; FHA does not reimburse the first two months of mortgage-borrower interest payments. If the proceeds are not sufficient, “the Issuer must use its own resources to cover shortfalls in amounts due to security holders or to Ginnie Mae resulting from insufficient collections on the mortgage collateral” (Ginnie Mae, 2017, Chapter 4).

We gauge the greater expense associated with servicing FHA or VA loans in foreclosure with data from the Y-14 mortgage servicing rights schedule. Large bank holding companies record their costs for servicing loans, broken out by type of servicing contract (Fannie Mae/Freddie Mac, FHA, VA) and by the delinquency status of the loans. The data are available for seven banks that serviced about \$700 billion in mortgages in total in 2016. For these banks, we calculate their servicing cost in 2016 for an FHA or VA loan in foreclosure relative to their servicing cost for a Fannie or Freddie loan in foreclosure. The median of this measure indicates that the typical bank, for a loan in foreclosure, spends three times as much servicing an FHA loan, and four times as much servicing a VA loan, than a GSE loan.

Although Ginnie Mae servicers take on more risk than Fannie and Freddie servicers, they do not necessarily receive greater servicing compensation. The minimum servicing fee is 25 basis points of the unpaid principal balance for Fannie Mae and Freddie Mac securitizations,

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<sup>41</sup>Securities Industry and Financial Markets Association, “U.S. Mortgage-Related Issuance and Outstanding,” <https://www.sifma.org/resources/research/us-mortgage-related-issuance-and-outstanding/>.



and 19 basis points for Ginnie Mae securitizations.<sup>42</sup> Since the mortgages in Fannie and Freddie pools are typically larger than those in Ginnie Mae pools, the gap in dollars of servicing revenue per mortgage is even larger.

The less-advantageous terms of the Ginnie Mae servicing contract raises the question of why servicers enter this business. The answer appears to be that under prevailing market conditions, originating mortgages can be more profitable for Ginnie Mae pools than Fannie or Freddie pools, especially when coupled with the ease of entry associated with the FHA and VA streamlined refinance programs (see Section 6). Some Ginnie Mae pools trade at better prices than GSE pools, and so originators realize more gain-on-sale income. In the third quarter of 2017, for example, nonbanks who had more than 50% of their originations headed for Ginnie Mae pools earned 254 basis points on average in gain-on-sale income, compared with 196 basis points for those with less than 50% of originations destined for Ginnie Mae pools.<sup>43</sup> The price of originating the more-profitable FHA and VA mortgages is accepting the servicing contract.

## 5.2 Funding of servicing advances

Servicers need to finance their advances until they are repaid from the mortgage insurance, foreclosure proceeds, or other sources. Originally, this financing was provided primarily by commercial banks as a complement to the warehouse funding that they provided to their clients. In 2003, large nonbank servicers started using securitization to fund the servicing advances associated with their private-label RMBS (Ramakrishnan, 2013). The agreements governing the servicing of private-label RMBS establish that the servicer is repaid first (before the bond holders) from the proceeds from the foreclosure or other resolution to the defaulted mortgage. Because of this first claim on the foreclosure proceeds, servicing-advance ABS are typically rated triple-A by the rating agencies, and carry favorable financing terms. In one deal that priced in 2012, for example, the yields on these ABS were 1 to 2%.<sup>44</sup> Securitization

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<sup>42</sup>The Ginnie Mae II program calls for a minimum servicing fee of 19 basis points, with a range up to a maximum of 69 basis points. It is our understanding that Ginnie Mae servicers often retain approximately 30 to 35 basis points on an overall portfolio basis for the Ginnie Mae II business, which covers the majority of the single-family Ginnie Mae MBS production. The much smaller and older Ginnie Mae I program requires 44 basis points in servicing fee be retained, with no range. Issuers that want to capitalize their upfront cash will retain as low a servicing fee as possible in the interest of securitization into the highest MBS pass-through coupon.

<sup>43</sup>Mortgage Bankers Association Performance Report, Table K2

<sup>44</sup>Servicing advance ABS are almost always privately placed, and so it is difficult to get information on pricing. In October 2012, Home Loan Servicing Solutions “priced a Triple A rated 0.99-year average life tranche at 1.35% yield, while it paid a yield of 2% for another 2.99-year Triple A rated tranche” (Ramakrishnan, 2013).

terms typically will fund as much as 95% of the value for the types of advances that get repaid the fastest.

Even with the advent of securitization, though, large banks play a crucial role in the functioning of the servicing-advance market. The reason is that part of a nonbank's servicing-advance funding needs are predictable, and part fluctuate considerably, even within a given month. The securitization trust issues term notes with a fixed principal to finance the predictable part of the advances, and variable funding notes (VFNs) with fluctuating principal to finance the more variable part of the servicing advances. The term notes are generally purchased by capital-markets investors such as asset managers, pension funds, insurance companies, or hedge funds. The VFNs are often funded by bank-sponsored asset-backed commercial paper conduits, or sometimes by banks directly. Banks also may allow nonbanks to finance servicing advances as part of the warehouse lines of credit primarily used for funding loan originations, or banks may arrange other types of financing.

One issue with servicing advances associated with the GSEs and Ginnie Mae is that these institutions retain the right to terminate, sell, or transfer the servicing in the event of servicer underperformance. This right allows these entities to follow through on their guarantee of timely payment of principal and interest to investors. However, this right also implies that these entities, rather than the servicer, have the first claim on the servicing advances. Private creditors are reluctant to finance servicing advances if they are unsure as to whether their loan to the nonbank is truly collateralized.

Fannie Mae and Freddie Mac deal with this issue through an “acknowledgment agreement” with the servicer and the private creditor. That agreement establishes that if Fannie Mae or Freddie Mac terminates, sells, or transfers the servicing, the original servicer will be reimbursed for any servicing advances made before the transfer of servicing.<sup>45</sup> As a result, servicers for Fannie and Freddie are generally able to obtain financing for their advances, although their need for such funding, as discussed earlier, is much lower than for PLS or Ginnie Mae servicers. Some large nonbank servicers fund these advances with securitization, using structures and terms similar to the servicing-advance securitizations used for private-label RMBS.<sup>46</sup>

Ginnie Mae, in contrast, has no acknowledgment agreement that covers servicing advances, and in the event that Ginnie Mae terminates or transfers the servicing, the servicer

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<sup>45</sup><https://www.fanniemae.com/content/guide/servicing/a2/7/02.html>.

<sup>46</sup>(Ramakrishnan, 2013) noted that a triple-A, 2.04-year average-life note issued in 2013 from a Nationstar servicing advance ABS trust backed by Freddie Mac receivables paid a yield of 1%. See <https://www.nationalmortgagenews.com/news/ditech-securitization-funds-300m-of-agency-servicer-advances> for coverage of other ABS collateralized by Fannie Mae and Freddie Mac servicing advances.

will not be reimbursed for the outlays that it has made.<sup>47</sup> “If Ginnie Mae declares a default and extinguishment under the applicable Guaranty Agreement, the Issuer forfeits and waives any and all rights to reimbursement or recovery of any advances and expenditures made by the Issuer, all such rights of the Issuer are extinguished and Ginnie Mae becomes the absolute owner of such rights, subject only to the unsatisfied rights of the security holders.”<sup>48</sup> In the event of servicing transfer, the new servicer receives the proceeds from the servicing advances, even though it did not originally outlay the funds. As a result, Ginnie Mae servicers can only obtain unsecured financing, such as unsecured corporate bonds, to cover their advances. The rates on this financing are high, especially since many of the nonbanks have high-yield credit ratings.

### 5.3 Servicing-advance liquidity during the financial crisis

Servicing advances are more difficult to finance during economic downturns. Mortgage delinquencies, and the associated need for servicing advances, generally rise when house prices fall and unemployment rises. Meanwhile, financing conditions also usually tighten during economic downturns. This combination means that servicer-advance financing is more expensive, and sometimes not available at all, at the same time that the need for it is greatest.

This dynamic can be seen during and after the 2007–08 financial crisis. At that time, the private-label RMBS market was enormous—\$2.7 trillion—and the Ginnie Mae market was both small—\$400 billion— and primarily serviced by banks. The liquidity issues, therefore, manifested in the experiences of companies such as Ocwen Financial Corporation, one of the largest subprime mortgage servicers at that time.<sup>49</sup> In 2004, servicing advances and cash each represented about a third of Ocwen’s assets (Figure 8). In 2006, advances began to increase as a share of assets, rising to 45% in 2006, 59% in 2009, and a whopping 79% in 2011. Cash, meanwhile, contracted, reaching a low of 3% of assets in 2011.

As Ocwen noted in 2009, “An increase in advances outstanding relative to the change in the size of the servicing portfolio can result in substantial strain on our financial resources. This occurs because excess growth of advances increases financing costs with no offsetting increase in revenue, thus reducing profitability. If we are unable to fund additional advances, we could breach the requirements of our servicing contracts. Such developments could result in our losing our servicing rights, which would have a substantial negative impact on our

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<sup>47</sup>Ginnie Mae, like Fannie Mae and Freddie Mac, has an acknowledgment agreement that covers mortgage servicing rights.

<sup>48</sup>Ginnie Mae MBS Guide, Chapter 5, p. 5-4.

<sup>49</sup>In its 2008 10-K, Ocwen describes itself as “one of the largest servicers of subprime mortgage loans.” ([https://www.sec.gov/Archives/edgar/data/873860/000101905609000308/ocn\\_10k08.htm](https://www.sec.gov/Archives/edgar/data/873860/000101905609000308/ocn_10k08.htm)). We focus on the experience of Ocwen because it is publicly traded and so data are available.

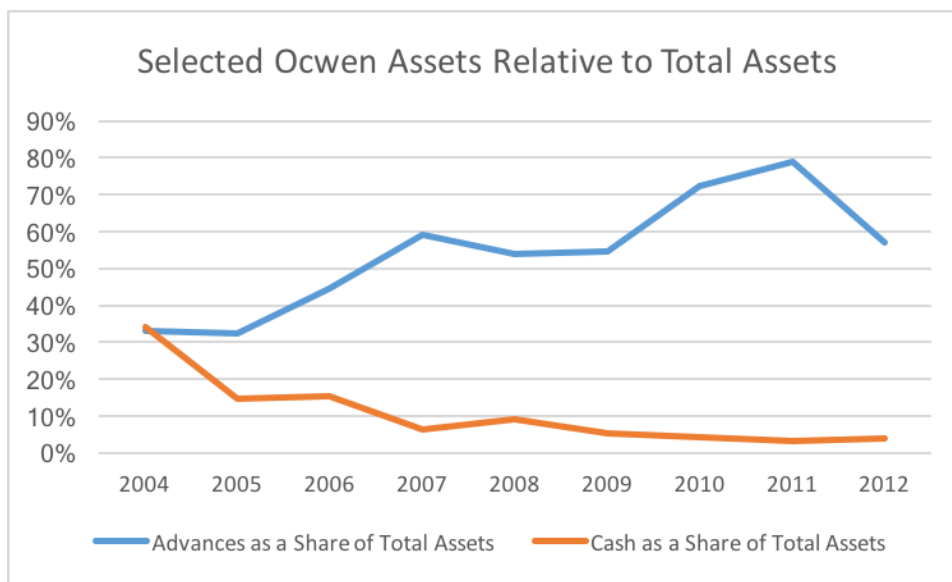


Figure 8: The figure shows selected assets of Ocwen Financial Corporation relative to total assets. Source: Authors’ calculations from Ocwen 10-K filings retrieved via the U.S. Securities and Exchange Commission’s EDGAR system.

financial condition and results of operations and could trigger cross-defaults under our various credit agreements.” At the same time that Ocwen’s advances were increasing, strains in the financial markets were hindering its ability to finance these advances; it noted “The current challenges facing the financial markets have made it difficult to renew or increase advance financing under terms as favorable as those of our current facilities.”<sup>50</sup>

In a hearing before the House Subcommittee on Housing and Community Opportunity, William Erbey, the Chairman and Chief Executive Officer of Ocwen, stated “the large commercial banks who have traditionally provided this financing have all but withdrawn from the market” (Committee on Financial Services, 2009). The large banks withdrew, in part, because they were struggling to digest the servicing advances generated by their own affiliates. He also noted that the situation was difficult enough that a consortium of nonbank mortgage servicers (the Independent Mortgage Servicers Coalition) had made “various proposals to the Federal Reserve, Treasury and FHFA to provide up to \$8 billion in a short-term financing facility and/or a related guarantee to independent loan servicers who, combined, service in excess of \$600 billion in mortgages (over four million homes).”<sup>51</sup>

Concerns were also raised that the servicers’ financing difficulties would give them an incentive to foreclosure quickly on delinquent homeowners or give them modifications that

<sup>50</sup>See Desmond (2009) for an account of similar liquidity troubles at Carrington Mortgage Services.

<sup>51</sup>The five members of the Independent Mortgage Servicers Coalition (IMSC) were American Home Mortgage Servicing, Carrington Mortgage Services, GMAC Mortgage, Nationstar Mortgage, and Ocwen Loan Servicing.

were not in the best interests of the consumer or MBS investor, since these resolutions to mortgage distress would allow servicers to recoup their advances faster.<sup>52</sup> In part as a response to these concerns, the Federal Reserve Board included servicing-advance ABS as an eligible asset class for its Term Asset-Backed Securities Loan Facility (TALF), noting that “accepting ABS backed by mortgage servicing advances should improve the servicers’ ability to work with homeowners to prevent avoidable foreclosures.”<sup>53</sup> The inclusion of servicing-advance ABS as a TALF-eligible asset class contributed to a decrease in interest rates on these securities and helped provide servicers with longer-maturity funding.<sup>54</sup> For example, “the interest-rate spread on the TALF-financed [servicing advance] ABS issued in August [2009] was 75 basis points below the spread on the ABS issued in June [2009].”<sup>55</sup> Ocwen stated in its 2010 10-K that “Our prospects for advance financing have improved due to the inclusion of servicer advances in TALF” (p. 42) and that “Our recent TALF issuances. . . increased the maturity for 42% of our advance financing needs at fixed interest rates” (p. 41). Five servicing-advance ABS with balances totaling \$1.7 billion were ultimately financed with TALF loans.

## 5.4 Servicing-advance liquidity today

Today Ginnie Mae MBS outstanding are quite large and primarily serviced by nonbanks, whereas the private-label market continues to run off (Figure 9). Financing the advances associated with Ginnie Mae MBS is not a strain currently because delinquency rates are low and servicers are generating sufficient cash from their operations. The situation seems likely to be considerably less sanguine in a different macroeconomic environment. In the aftermath of the hurricanes in August and September 2017, for example, concerns were raised that advances associated with the consumer forbearance that the GSEs and Ginnie Mae granted to borrowers with hurricane-damaged homes would be a problem for “thinly capitalized” nonbanks (Inside MBS and ABS, September 8, 2017 “Hurricane Damage: Despite Moratoriums on Default Loan Processing, MBS Issuers Must Keep Making Payments”). Most nonbanks turned out to be sufficiently geographically diversified to withstand this strain. However, a more sustained rise in defaults on FHA and VA could lead to large advances that nonbanks would be unable to finance, as well as outright credit losses that they would be unable to absorb.

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<sup>52</sup>See Aiello (2018) for evidence that this dynamic occurred and was economically significant.

<sup>53</sup><https://www.federalreserve.gov/monetarypolicy/20090319a.htm>.

<sup>54</sup>See Campbell, Covitz, Nelson, and Pence (2011) for a broader discussion of TALF’s effectiveness.

<sup>55</sup><https://images.forbes.com/media/pdfs/2009/08/Bernanke-letter.pdf>.

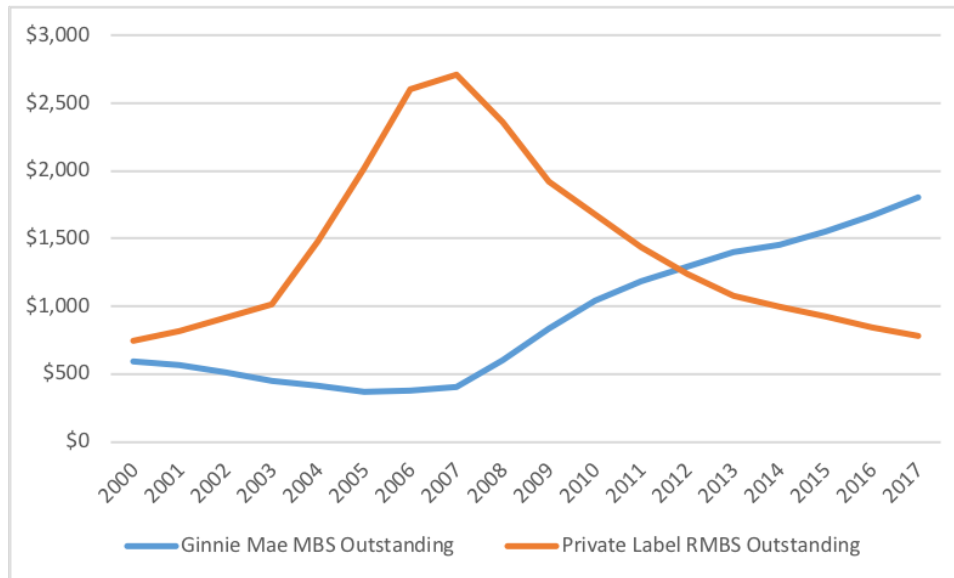


Figure 9: The figure shows outstanding MBS volumes (in \$ billion). Source: Securities Industry and Financial Markets Association, U.S. Mortgage-Related Issuance and Outstanding.

## 6 Vulnerabilities of nonbanks to macroeconomic shocks

The two major macroeconomic shocks that typically affect mortgage markets, interest rates and house prices, would probably have a disproportionate effect on nonbanks because of their business models. These potential hits to their profitability, described in more detail below, can also affect their liquidity through two channels. First, warehouse lenders can pull or reprice lines of credit if nonbanks violate the profitability covenants on the lines. Second, a decline in house prices and a corresponding rise in mortgage defaults will increase the servicing advances that a nonbank needs to finance.

### 6.1 Refinance mortgages and vulnerability to interest rates

Many nonbanks have focused their business on originating refinance mortgage, which could make them more vulnerable to increases in interest rates, as the demand for refinance mortgages is highly interest-rate dependent. Although the 2016 HMDA data indicate that overall, just 48% of nonbank mortgage originations were to refinance existing mortgages (the same fraction as among bank-originated mortgages) this industry average masks the significant dependence of some large lenders on refinances. In particular, for each of the three largest nonbank mortgage lenders, refinances accounted for more than 70% of their 2016 originations. In addition, another four of the 25 largest nonbank mortgage lenders relied on refinances for more than 90% of their total originations in 2016.

The larger focus of nonbank lenders on refinance mortgages is particularly strong in the Ginnie Mae market, where 41% of all nonbank originations in 2016 were for refinances compared with 30% for banks. Traditionally, lower income, credit-constrained borrowers have been less likely to refinance their mortgages and this has led these borrowers to become locked into high coupon mortgages and unable to take advantage of rate decreases and thus lower interest payments on their mortgages.<sup>56</sup>

However, the FHA and VA have streamlined refinance programs that allow nonbanks to originate new mortgages at a relatively low cost, and as a result several large nonbank lenders appear to have heavily focused their activities on refinancing Ginnie Mae borrowers. HMDA data indicate that for four of the 25 nonbanks who originated the most FHA or VA loans in 2016, refinances made up more than 70% of their total origination volume. This aggressive refinancing behavior by lenders has been especially focused on VA borrowers, where evidence of inappropriate refinancing activity on the part of some nonbank lenders was the subject of a recent investigative report (see Consumer Financial Protection Bureau, 2016). Ginnie Mae, as part of its investigation with the Department of Veterans Affairs, notified a small number of lenders in February 2018 that they might lose access to some Ginnie Mae programs if their elevated prepayment speeds did not come more in line with the rest of the market.<sup>57</sup>

One manifestation of the more active refinancing by nonbanks is that nonbank originated mortgages prepay more quickly than bank originated mortgages. Figure 10 presents the relative constant prepayment rates (CPRs) for bank and nonbank Ginnie Mae securities (based upon the performance of single issuer pools). The CPR is the percentage of the principal of the mortgage pool that is paid ahead of schedule, typically because some of the underlying mortgages are refinanced. As shown in the figure, in late 2017, about 14% of the principal of nonbank Ginnie Mae securities was prepaid early, compared with 11% of bank securities, and the nonbank CPRs are almost always higher than the bank CPRs throughout the period shown. Some nonbanks, however, have CPRs two or three times these industry-wide numbers. Figure 11 shows the CPRs for five of Ginnie Mae's nonbank counterparties with the highest CPRs. As shown, the CPRs for these issuers have been in the range of 20 to 25% in the last two years, with some nonbank CPRs spiking above 30% in some months.

In the event of a sustained rise in long-term interest rates, refinancing activity and the associated revenue will drop, and this drop will affect some nonbanks particularly hard. For

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<sup>56</sup>Deng and Gabriel (2006) found in the pre-crisis period that mortgage-backed securities created from borrower pools with higher proportions of more-credit-constrained borrowers tended to prepay more slowly and these slower prepayment speeds more than offset the higher default rates. As a result, these bonds had higher durations and tended to trade at a premium, suggesting that lower-credit-quality borrowers were subsidizing higher returns to MBS bond holders.

<sup>57</sup>See <https://www.ginniemae.gov/newsroom/Pages/PressReleaseDispPage.aspx?ParamID=129>.

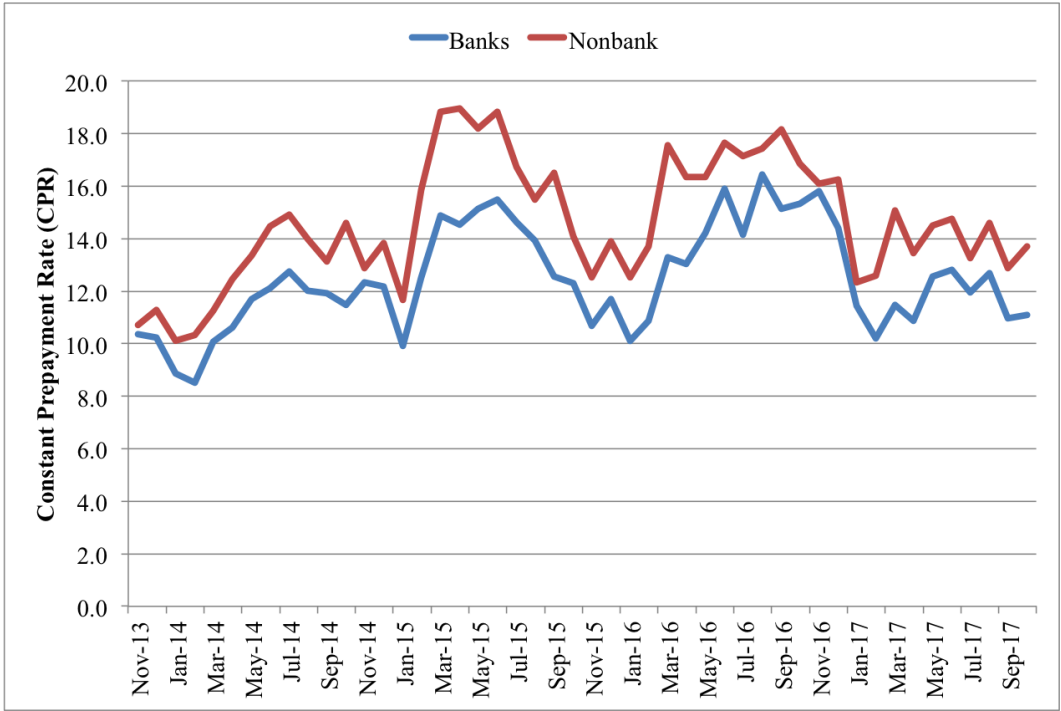


Figure 10: The table compares the constant prepayment rates (CPRs) of bank and nonbank single-issuer Ginnie Mae securities. Source: eMBS.com.

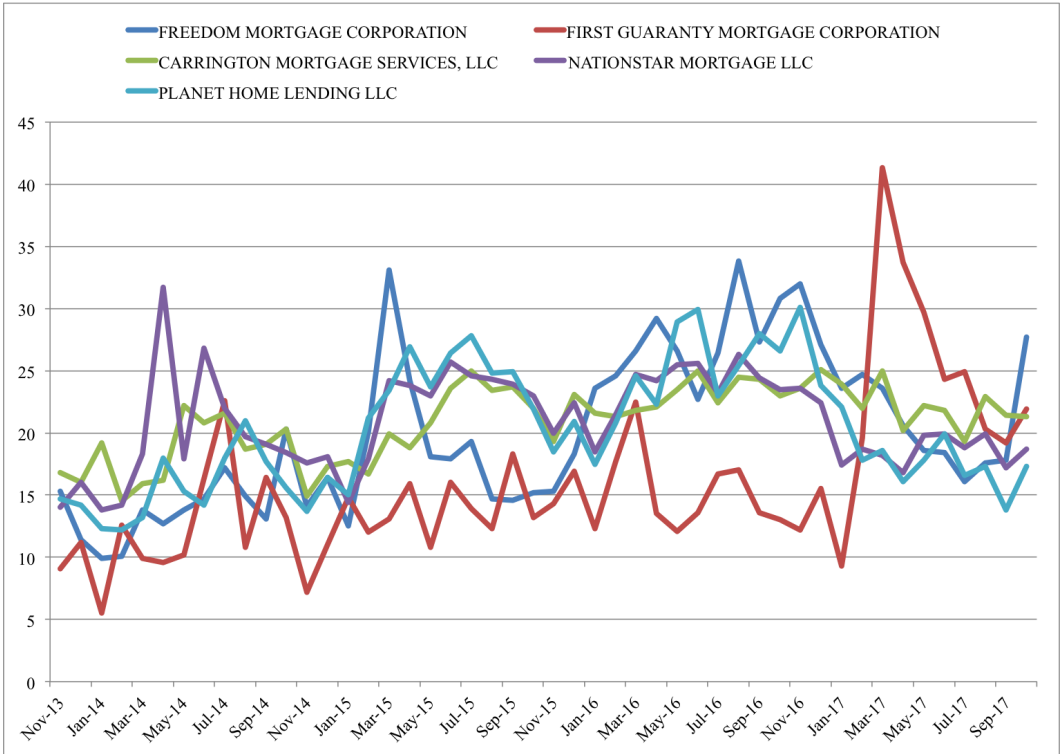


Figure 11: The table presents the constant prepayment rates (CPRs) for the five nonbank counterparties to Ginnie Mae with the highest CPRs. Source: eMBS.com.



some of these nonbanks, their mortgage servicing rights—which typically rise in value when interest rates increase— will offset some of the loss in refinancing revenue. However, this effect will be muted for the nonbanks that have sold some of their servicing revenue to other institutions.

## 6.2 Credit quality and vulnerability to house price declines

Available evidence also suggests that mortgages originated by nonbanks are of lower credit quality than those originated by banks, which means that the nonbank servicers would be more vulnerable to rises in delinquencies triggered by a fall in house prices.

First, as described earlier, a larger fraction of nonbank originations are FHA or VA mortgages, which tend to be riskier than other types of loans. In the third quarter of 2017, the serious delinquency rates on FHA and VA mortgages on single family homes were about 4% and 2% respectively, compared with just under 1% for loans in GSE pools (see Urban Institute, *Housing Finance at a Glance*, December 2017). Delinquency rates on FHA and VA mortgages that are originated and serviced by nonbanks are higher still. Based on issuer-level delinquency rates provided by Ginnie Mae, we estimate that on average, 3.6% of mortgages in Ginnie pools with nonbank issuer/servicers were two months or more delinquent in the fourth quarter of 2017, compared with 1.8% of mortgages in pools with bank issuer/servicers.<sup>58</sup>

These differences in delinquency rates reflect the risk characteristics of the underlying mortgages. Household survey data from the 2016 Survey of Consumer Finances indicate that borrowers with mortgages from nonbanks have higher loan-to-value ratios and higher debt-service-to-income (DTI) ratios than borrowers with mortgages from banks within both the FHA/VA mortgage category and the non-FHA/VA mortgage category (Table 5). Non-bank borrowers are more likely to have lower credit scores, as proxied by the share of these borrowers who report being turned down for credit, or not applying for credit because of a fear of being turned down, in the last year. Nonbank borrowers are also more likely to be from financially vulnerable groups: they have less income and wealth than their bank counterparts, are less likely to have college degrees, and are more likely to be minorities. Finally, the growth and the churn within the nonbank sector are evident from the lower loan ages, and from the higher share of nonbank borrowers who report that their current servicer is not the same institution as their mortgage originator.

Bank and nonbank underwriting differences also appear in GSE and Ginnie Mae securitized loans. As shown in Table 6, the DTI ratios are slightly higher for nonbank originators among both GSE and Ginnie Mae loans. Median FICO scores are also lower for nonbank

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<sup>58</sup>Averages are weighted by the outstanding pool balance.

Selected Characteristics of Mortgage Borrowers  
By FHA/VA Status and Type of Lender  
2016 Survey of Consumer Finances

Characteristic	FHA/VA Mortgages		Not FHA/VA Mortgages	
	NonBank	Bank	NonBank	Bank
Share of All Mortgages	15%	18%	29%	38%
Household income				
Median	\$75,948	\$78,986	\$83,036	\$93,228***
10th percentile	\$24,303	\$30,379*	\$26,706	\$31,311***
Net Worth				
Median	\$93,626	\$137,906***	\$214,850***	\$278,844***
10th percentile	\$6,701	\$21,627**	\$17,500*	\$46,890***
% LTV > 90%	19%	12%***	13%**	6%***
% LTV > 95%	13%	6%***	9%**	3%***
Total debt-service-to-income ratio (median)	0.24	0.23	0.23*	0.23***
Total debt-service-to-income ratio (90th percentile)	0.51	0.47	0.49	0.47***
Turned down for credit in last 12 months	25%	22%	14%***	14%***
Did not apply for credit: afraid of being turned down	12%	11%	9%	4%***
% with Bachelor's degree	32%	39%*	46%***	52%***
% non-white	43%	39%	28%***	20%***
Average loan age (yrs)	5.1	6.2***	5.7*	5.9**
% servicer change since origination	58%	39%***	51%**	37%***
N	351	279	679	1,098

Note. The values for each measure are statistically significant different from those for borrowers who obtain FHA or VA mortgages from nonbanks at the \*\*\* 1%, \*\* 5%, or \* 10% level. Standard errors are adjusted to incorporate imputation uncertainty and are bootstrapped with 999 replications to incorporate the SCF sample design. Estimates are weighted.

Table 5: The table presents the characteristics of borrowers with FHA/VA and non-FHA/VA mortgages, broken down by whether their lender is a bank or nonbank. Source: Authors' calculations from the Survey of Consumer Finances.

mortgages, by 5 points among GSE mortgages and by 25 points among Ginnie Mae mortgages. Furthermore, annual changes in both DTI ratios and median FICO scores suggest that the credit quality of Ginnie Mae mortgages being originated by nonbanks is declining more quickly than for bank originated mortgages. In particular, nonbank DTIs have increased by 3.7% year-over-year, faster than the rate of increase for bank DTIs, and the downward trend in FICO scores is nearly twice as high for Ginnie Mae nonbank versus bank originators. (In contrast, the changes in DTI ratios and FICO scores for GSE loans have been similar among bank and nonbank originated mortgages.)

In recent years, the comparatively low credit quality of nonbank-originated loans has not created significant problems for lenders or servicers, as overall mortgage default rates have been low.<sup>59</sup> However, due to the lower credit quality of loans being originated by nonbanks, a rise in defaults would likely hit nonbank lenders and servicers particularly hard, as happened in the years leading up to the financial crisis.

Among other things, a rise in delinquency rates results in higher servicing costs. To gauge this greater expense, we turn again to the data that seven large banks filed for the Y-14 mortgage servicing schedule in 2016. We calculate for each bank the servicing cost of a delinquent loan relative to a performing loan, and the servicing cost of a loan in foreclosure relative to a performing loan. The typical bank, as measured by the median of this measure, spends 10 to 12 times as much servicing a delinquent loan as a performing loan; this ratio does not vary much by whether the loan is serviced for Fannie Mae, Freddie Mac, or Ginnie Mae. However, for loans in foreclosure, the costs differ significantly by type of servicing contract. For loans serviced under a Fannie or Freddie contract, the typical bank spends 17 times as much servicing a loan in foreclosure as a performing loan. For loans serviced under a Ginnie Mae contract, the typical bank spends about 50 times as much servicing a loan in foreclosure as a performing loan.

The servicing-advance strains associated with a rise in defaults on FHA and VA mortgages would affect some parts of the U.S. more significantly than others. Figure 12 shows the share of all mortgages in 2016 that were originated by nonbanks and insured by the FHA or VA in counties that are part of metropolitan statistical areas (MSA).<sup>60</sup> This share is higher in the southern and southwestern parts of the U.S., and in particular in parts of Georgia, North

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<sup>59</sup>As of 2017:Q3, just under 1% of the GSE single family loan portfolio was seriously delinquent, compared to 3 1/2% in 2012. Similarly, serious delinquency rates on FHA loans were under 4%, compared to 9% in 2012. (see Urban Institute, 2017).

<sup>60</sup>The HMDA data are more representative for counties in MSAs.

Carolina, Texas, Virginia, California, and Arizona.<sup>61</sup> Servicers with heavy concentrations in these areas may be more vulnerable to servicing-advance strains.

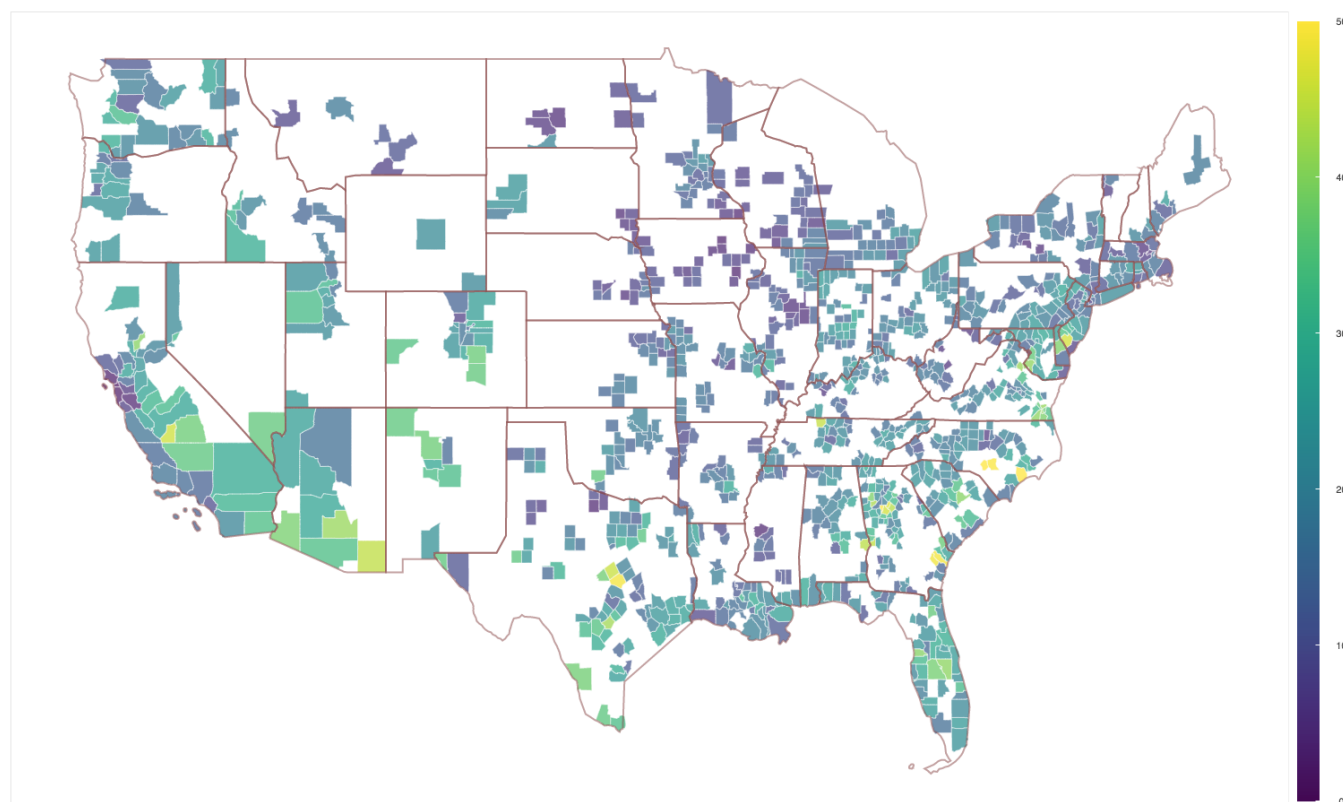


Figure 12: FHA or VA loans originated by nonbanks as a proportion of all loans by county, 2016. Source: Authors' calculations from HMDA data.

## 7 Resources available to weather shocks

In the event of an adverse economic shock, nonbanks have limited resources to draw upon. Table 7 shows selected assets and liabilities of nonbanks, expressed as a share of the totals, as of the third quarter of 2017. The shares are based on simple averages of the reports of 268 independent mortgage companies.

70% of the nonbank assets are mortgages held for sale, which are mortgages on their way to a securitization vehicle. These mortgages serve as collateral for the warehouse lines of credit that fund them, and so are not available to the nonbank to absorb other shocks.

<sup>61</sup>The counties or independent cities, according to our estimates, in which 40 or more percent of 2016 mortgage originations were nonbank FHA or VA loans were Hoke, NC; Clayton, GA; Onslow, NC; Cumberland, NC; Bell, TX; Liberty, GA; Long, GA; Rockdale, GA; Cumberland, NJ; Henry, GA; Kings, CA; Coryell, TX; Montgomery, TN; Cochise, AZ; Russell, AL; Newton, GA; Douglas, GA; Guadalupe, TX; Stafford, VA; Pinal, AZ; Hampton, VA; Portsmouth, VA; Charles, MD; Suffolk, VA; and Osceola, FL.

About 10% of nonbank assets are mortgage servicing rights, which historically were the main unencumbered asset for nonbanks. In recent years, though, nonbanks have devised increasingly complex ways to use these MSRs as collateral for various forms of financing. MSRs are also liable to lose value or become illiquid in an economic downturn. For example, in the fourth quarter of 2008, the reported book values of MSRs held by banks fell by 33%, from \$76 billion to \$51 billion, even though the volume of one-to-four family residential mortgages serviced for others increased during that quarter.<sup>62</sup> Cash represented 6% of assets.

Nonbanks have a limited ability to raise debt to fund additional expenses. Most of their eligible assets are already tied up collateralizing secured lending facilities. Most of the publicly traded nonbanks have high-yield credit ratings, which makes raising funds in unsecured bond markets expensive.<sup>63</sup>

In addition, nonbanks are susceptible to increases in interest rates when their credit facilities mature. In the third quarter of 2017, 83% of their debt was lines of credit, typically with maturities just under a year, and 5% was other short-term debt. The bank lenders can also, in many cases, raise the rates on the lines before the renewal date if the nonbank violates one of the covenants of the credit agreement (which is likely to happen during times of stress). Finally, nonbanks do not have access to the liquidity backstops available to a bank, such as the Federal Reserve System or the Federal Home Loan Bank System.<sup>64</sup>

Servicers with a high concentration of Ginnie Mae servicing appear to have fewer resources to meet liquidity strains than other servicers, even though their servicing-advance requirements make them more vulnerable to such strains. Table 8 reproduces some liquidity measures published by the Mortgage Bankers Association for 2017:Q3. Servicers are sorted by whether servicing for Ginnie Mae represents less (“majority GSE”) or more (“majority Ginnie Mae”) than 50% of their servicing. As shown in the first memo line of the table, servicing for Ginnie Mae represents 6% of servicing for majority-GSE servicers, and 70% for majority-Ginnie Mae servicers. The statistics provide median measures estimated for 144 majority-GSE servicers and 51 majority-Ginnie servicers.

The first measure, median unrestricted cash relative to recurring operating expenses, is 2.6 months for majority-GSE servicers and 2.3 months for majority-Ginnie servicers. The second measure, median liquidity/tangible net worth, is 31% for majority-GSE servicers and 26% for majority-Ginnie servicers. The biggest gap between the two types of servicers

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<sup>62</sup>Board of Governors of the Federal Reserve System et al. (2016), p.21.

<sup>63</sup>In late 2017, Moody’s senior unsecured ratings of major publicly traded nonbanks were Ocwen, Caa2; Walter, Ca; Nationstar, B2; Freedom Mortgage Corporation, B2; PHH, B1; PennyMac Mortgage Investment Trust, B2; Quicken, Ba1.

<sup>64</sup>A couple of mortgage REITs have access to the FHLB through captive insurance subsidiaries through 2019 (Light, January 12, 2016).

	Originator type	Median	Annual % Change	
Debt Service to Income Ratio (percent)	GSE	Nonbank	36	5.9
		Bank	35	6.0
	Ginnie Mae	Nonbank	42	3.7
		Bank	40.25	2.5
Loan to Value Ratio (percent)	GSE	Nonbank	80	0.0
		Bank	80	0.0
	Ginnie Mae	Nonbank	96.5	0.0
		Bank	96.5	0.0
FICO Score	GSE	Nonbank	748	-0.06
		Bank	753	-0.06
	Ginnie Mae	Nonbank	675	-1.3
		Bank	700	-0.06

Table 6: GSE and GNMA Borrower Underwriting Characteristics for Bank and Nonbanks, September 2017. Source: eMBS.com, Urban Institute (2017).

Selected Items, Balance Sheets of Independent Mortgage Companies	
<u>Selected assets</u>	<u>% of total assets</u>
Mortgages held for sale	70%
Mortgages held for investment	1%
Mortgage servicing rights	11%
Mortgage advances	1%
Unrestricted cash and cash equivalents	6%
<u>Selected liabilities</u>	<u>% of total liabilities</u>
Lines of credit	83%
Other short-term debt	5%
Long-term debt	5%
<u>Memo</u>	
Number of independent mortgage company respondents	268

Table 7: The table shows the share that selected assets and liabilities represent of total assets and liabilities for independent mortgage companies as of 2017:Q3. Source: Authors' calculations from Mortgage Bankers Performance Report data, 2017:Q3.

	Majority GSE% Q3 2017	Majority Ginnie Mae% Q3 2017
<b>LIQUIDITY METRICS (Median)</b>		
Unrestricted cash and cash equivalents/ Monthly recurring operating expenses (ratio, representing number of months)	2.6	2.3
Liquidity/Tangible net worth (%)	31	26
FHA liquidity metric/Agency servicing UPB (bps)	66	39
<b>MEMO</b>		
% Government owned servicing (#)	6.4	70
Number of companies reporting	144	51

Table 8: The table shows various liquidity measures for independent mortgage companies as of 2017:Q3. Source: Authors' calculations from Mortgage Bankers Performance Report data, 2017:Q3.

appears in the FHA liquidity metric relative to agency servicing unpaid principal balance. The median of this measure is 66 basis points for majority-GSE servicers and 39 basis points for majority-Ginnie servicers.

It is difficult to assess the liquidity position of nonbank servicers from these statistics because we do not have threshold values for these measures for stressed scenarios and because the statistics obscure considerable heterogeneity across firms. Moody's, however, publishes assessments of the liquidity positions of the nonbank mortgage finance companies that it rates. One of its key measures is secured debt relative to gross tangible assets.<sup>65</sup> Moody's notes, "High reliance on secured debt reduces a finance company's financial flexibility because it encumbers assets, making them unavailable to be used as a liquidity source should an unexpected need arise."<sup>66</sup> A company with an A rating on this measure should have secured debt that is less than 10% of its gross tangible assets; a company with a Ba rating (the lowest investment-grade rating) should have a value of 35% or less on this measure; a company with a deep-junk rating of Ca or worse will have a value of 60% or more. Of the ten nonbank mortgage companies that Moody's assessed in June 2017, eight had values on this liquidity measure consistent with a Ca rating; a couple of these eight companies had secured debt in the range of 80 to 90% of their gross tangible assets.<sup>67</sup>

<sup>65</sup>Gross tangible assets exclude credit loss reserves.

<sup>66</sup>Moody's Investors Service, "Rating Methodology: Finance Companies," October 2015.

<sup>67</sup>Moody's Investors Service, "Mortgage Finance Companies: Profitability Will Stay Modest as Rates Increase and Originations Decline," June 15, 2017.

## 8 Consequences of a nonbank mortgage company failure

In the event of a failure of a nonbank mortgage company, there are three main types of parties who would bear losses: (1) consumers; (2) the U.S. government and, by extension, taxpayers; (3) the nonbanks, their shareholders, and their creditors.

**Harm to consumers** A large-scale failure of nonbanks has the potential to lead to a significant contraction in mortgage origination capacity. As noted earlier, nonbanks disproportionately serve borrowers with lower credit scores, higher loan-to-value ratios, and higher debt-to-income ratios; they also disproportionately serve lower-income and minority borrowers. If nonbank failure resulted in a reduction in mortgage origination capacity, it is not clear that other financial institutions would extend credit on the same terms to these borrowers, or perhaps even extend credit at all. This contraction in mortgage credit availability has the potential to be a significant drag on house prices.<sup>68</sup>

On the servicing side, as discussed earlier, a financially stressed servicer has an incentive to pursue resolutions to delinquent loans that minimize the nonbanks' servicing advances rather than alternatives that might be more beneficial for borrowers or investors. In the event of an outright and disorderly servicer failure, there is potential for harm to a broader group of borrowers. For example, borrowers might not be properly credited for their payments to mortgage lenders, tax authorities, and insurance companies; mortgage modifications might get stalled. After years of scrutiny by federal and state regulators in the aftermath of the financial crisis, most servicing operations are in better shape than pre-crisis, and so these worries are somewhat less acute. Nonetheless, borrowers may find it confusing or stressful when their servicers switch suddenly.

This discussion assumes that the GSEs or Ginnie Mae are able to find a new organization to take over the servicing. The number of entities doing their own servicing has contracted over the past few years, and servicing has become more concentrated in a small handful of subservicers. In 2008, for example, 77% of independent mortgage companies serviced their own loans; by 2017:Q3, the share was 43%.<sup>69</sup>

**Harm to U.S. government** The losses to the U.S. government would stem from two main sources. First, in the aftermath of the financial crisis, Fannie Mae, Freddie Mac, and the U.S. Department of Justice (on behalf of Ginnie Mae) pursued originators through put-backs and False Claims Acts prosecutions for losses associated with poor loan underwriting, and

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<sup>68</sup>See Anenberg, Hizmo, Kung, and Molloy (2017) for one study that establishes the significant effect of credit availability on house prices.

<sup>69</sup>Source: Mortgage Bankers Performance Report.



recouped billions of losses in the process. The government would have much less of an ability to recoup these funds today if the nonbanks that originated the mortgages subsequently went out of business.

Second, the GSEs and Ginnie Mae may incur losses after absorbing the servicing portfolio of a failing servicer. A servicer in financial distress is also a servicer that is more likely to take shortcuts in some of its operations, and remedying those deficiencies can be costly. The contraction in servicing capacity noted above might also make it difficult to find another servicer to take over the portfolio of a failing servicer, especially if that servicing has little value. Ginnie Mae does not have clear authority to pay a servicer to take a portfolio in a situation in which a rapid transfer is in the interest of borrowers. Ginnie Mae would also be responsible for absorbing the portion of the credit loss on delinquent loans that was not covered by the FHA or VA insurance or the corporate resources of the servicer before its failure.

As an outsized example of the costs involved, in 2010, Ginnie Mae increased its reserve for losses by \$720 million, in large part due to the expected losses associated with its acquisition of the servicing portfolio of the nonbank, Taylor, Bean, and Whitaker.<sup>70</sup> Those losses were forecasted to arise from the portion of the credit losses that were not covered by the FHA, VA, USDA, or PIH credit insurance on the loan, and from the costs of servicing and liquidating the portfolios. The extensive fraud involved in the TBW failure, however, may make it a poor example for generalization.

**Harm to nonbanks, their creditors, and their shareholders** The employees of a nonbank, obviously, would be hurt in the event of a nonbank failure. Many of the nonbanks themselves, however, appear to have few unencumbered assets to lose in the event of a failure. Shareholders would be wiped out, but in some cases these shareholders have already taken most of their losses. In mid-January 2018, for example, the stock prices of the two hardest-hit nonbanks hovered around \$3 a share for Ocwen Financial Corporation and \$1 a share for Walter Investment Management Corporation, down from nearly \$60 in October 2013 (for Ocwen) and nearly \$50 a share in February 2013 (for Walter).

Turning to the potential for harm to the banks that lend to nonbanks, the exposure here seems relatively small. The bank warehouse lines of credit are collateralized by loan originations, and as detailed earlier, contain multiple additional protections for creditors including personal guarantees, collateral in addition to the loan originations, and provisions

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<sup>70</sup>Taylor, Bean, and Whitaker (TBW) at that point was the fifth-largest issuer of Ginnie Mae securities. See Note H in Ginnie Mae's fiscal-year 2010 financial statements, available at [https://www.ginniemae.gov/about\\_us/what\\_we\\_do/Financial\\_Statements/annual\\_financials10.pdf](https://www.ginniemae.gov/about_us/what_we_do/Financial_Statements/annual_financials10.pdf), for more details on Ginnie Mae's losses.

that allow for the changing of the pricing on, or the cancellation of, the warehouse line in the event that the nonbank violates any of its covenants. The warehouse lines also tend to be quite small relative to the total capital of the bank. To illustrate this point, Table 9 shows selected percentiles of total warehouse commitments relative to assets and relative to equity for the 12 banks in our bank holding company sample that reported extending at least one warehouse line of credit. Warehouse line commitments represent less than 1% of assets for the three percentiles shown. Commitments are larger relative to equity, but even at the 75th percentile are only 5.6% of equity.

	25th percentile	Median	75th percentile
Committed warehouse lines relative to assets	0.05%	0.42%	0.67%
Committed warehouse lines relative to equity	0.46%	3.29%	5.60%

Table 9: The table shows selected percentiles of the distribution of warehouse line commitments relative to bank holding company assets and equity. Source: Authors' calculations from Y-14 data.

Many of the nonbanks' other creditors (such as the investors in servicing-advance ABS) are also secured by assets such as servicing advances or mortgage servicing rights.

## 9 Regulation and housing-finance reform

### 9.1 Nonbank regulation

The sharp rise in nonbank involvement in residential mortgage lending and servicing has important implications for safety and soundness oversight in U.S. mortgage markets. When regulated financial institutions dominated the GSE and Ginnie Mae issuer base, a significant portion of originator risk-management oversight was carried out by bank regulators such as the Federal Deposit Insurance Corporation, the Federal Reserve, the Office of the Comptroller of the Currency, and the National Credit Union Association.

Nonbanks, in contrast, are regulated for safety-and-soundness purposes by the state financial regulators. In recent years, the Conference of State Bank Supervisors (CSBS), a nationwide organization of these regulators, and the American Association of Residential Mortgage Regulators (AARMR) have developed safety-and-soundness examination procedures based on the experiences of state and federal regulators; most states have adopted some or all of these recommendations.<sup>71</sup> CSBS also issued a proposal for prudential stan-

<sup>71</sup>See <https://www.csbs.org/mortgage-examination-supplements> for the examination manual.

dards for non-bank mortgage servicers that has not yet been finalized by CSBS.<sup>72</sup> These regulators have also invested heavily in collecting and aggregating regulatory financial data on nonbank mortgage servicers through the Nationwide Multistate Licensing System (NMLS); these data are gathered through a periodic report of condition and income known as the Mortgage Call Report.<sup>73</sup> CSBS has entered into data-sharing agreements with other regulators so that these data can be used more broadly. As with all data collection efforts for this sector, this initiative remains a work in progress: uniform data standards between state and federal regulators have not been established, and it remains a challenge for reporting forms to keep pace with the rapidly evolving mortgage servicing structures and relationships.

The GSEs and Ginnie Mae also evaluate their issuers for financial and operational soundness. We review here the requirements for nonbanks since the GSEs and Ginnie Mae generally rely on the standards, reporting requirements, and processes set by bank regulators for depository institutions. Broadly speaking, these bank regulatory standards are stricter than the nonbank standards described below.

Both the GSEs and Ginnie Mae set minimum requirements for their counterparties.<sup>74</sup> The minimum net worth requirements are \$2.5 million plus 25 basis points on the servicing unpaid balance for GSE counterparties, and \$2.5 million plus 35 basis points on the issuer unpaid balance for Ginnie Mae counterparties (see Fannie Mae, 2017b; Freddie Mac, 2017; Ginnie Mae, 2017).<sup>75</sup> The minimum required ratio of 6% for tangible net worth to total assets is the same across the institutions. The minimum liquidity requirements for nonbank GSE seller/servicers are 3.5 basis points of servicing unpaid balance with an additional increment for nonperforming loans of 200 basis points for the amount that the nonperforming loan portfolio in excess of 6% of the total agency servicing portfolio. Ginnie Mae requires \$1 million or 10 basis points of outstanding MBS balance, whichever is greater.

The GSEs and Ginnie Mae require that nonbanks submit an audited end-of-fiscal-year financial statement and unaudited statements for the remaining three quarters (see Fannie Mae, 2017b; Freddie Mac, 2017; Ginnie Mae, 2017). Nonbanks are also required to submit the Mortgage Bankers Financial Reporting Form (MBFRF) on a quarterly basis.<sup>76</sup> The MBFRF was revised in the third quarter of 2008 to require quarterly reporting of all debt

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<sup>72</sup>See <https://www.csbs.org/sites/default/files/2017-11/MSR-ProposedRegulatoryPrudentialStandardsforNon-BankMortgageServicers.pdf>.

<sup>73</sup>See <https://mortgage.nationwidelicingsystem.org/slr/common/mcr/NMLS%20Document%20Library/Standard%20MCR%20Definitions%20FV5.pdf>

<sup>74</sup>The Ginnie Mae requirements described here are for their single-family forward-mortgage issuer/servicers.

<sup>75</sup>For Ginnie Mae counterparties, “servicer unpaid balance” and “issuer unpaid balance” are equivalent.

<sup>76</sup>See [https://www.fanniemae.com/content/guide\\_form/form-1002-mortgage-bankers-financial-reporting-form](https://www.fanniemae.com/content/guide_form/form-1002-mortgage-bankers-financial-reporting-form).

facilities, including the many alternative formats that are now used for warehouse facilities.<sup>77</sup> In addition, the MBFRF requires nonbanks to provide quarterly reports on the contractual details and covenants of their 10 largest debt facilities. Although these data have much of the information needed to evaluate nonbank safety and soundness, the data are only available to the GSEs and Ginnie Mae, as well as to the Mortgage Bankers Association for statistical purposes if the nonbank elects to share the data. These data, like the Mortgage Call Report data collected by the CSBS, might also benefit from stronger data standards and governance processes.

We list some of the limitations of this monitoring framework below; some of these points were made originally in Kaul and Goodman (2016).

1. The net worth, capital, and liquidity requirements do not account for the riskiness of the nonbank’s assets, the maturity and capacity of its debt facilities, the effectiveness of its hedging strategies, or the idiosyncratic aspects of its business model. Instead, they are one-sized-fits-all minimums. In contrast, the bank regulatory framework takes many factors into account and uses risk-based assets in capital calculations.
2. The GSE liquidity surcharge of 200 basis points when delinquencies reach a certain level may be counterproductive because it requires firms to raise more funds at a time when the firms are likely already under financial stress. A better approach might be to require higher levels of liquidity throughout the business cycle.
3. Market conditions can change rapidly, particularly when interest rates swing. Quarterly financial statements provided with a lag, particularly those that are unaudited, may not provide regulators with enough information to spot issues in a timely way.
4. As nonbanks become more significant counterparties to the GSEs and Ginnie Mae, and as they engage in more complicated financial engineering, the GSEs and Ginnie Mae must devote more resources to understanding and analyzing the MBFRF data. Ginnie Mae, in particular, has not had the resources for this task; we describe this in more detail below.
5. The GSE’s regulator, the Federal Housing Finance Agency (FHFA), does not have formal access to the MBFRF data, or the ability to examine the GSEs’ counterparties directly. This concern led the FHFA to recommend in its 2016 Report to Congress:

“FHFA’s regulated entities contract with third parties to provide critical services supporting the secondary mortgage market, including nonbank mortgage servicers for the Enterprises. While oversight of these counterparties

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<sup>77</sup>The form now requires an accounting of repurchased loan lines, reverse repurchase facilities, Mortgage Servicing Rights (MSRs), lines of credit, and asset-backed commercial paper facilities.

is important to safety and soundness of FHFA’s regulated entities, it is currently exercised only through contractual provisions where possible. In contrast, other federal safety and soundness regulators have statutory authority to examine companies that provide services to depository institutions through the Bank Service Company Act. The Government Accountability Office has recommended granting FHFA the authority to examine third parties that do business with the Enterprises.”

Ginnie Mae’s lack of resources to carry out these tasks has been highlighted by its Office of the Inspector General. A recent evaluation of Ginnie Mae’s success in meeting its rapidly escalating regulatory functions (Department of Housing and Urban Development, 2017) identified numerous problems and deficiencies, including:

1. Ginnie Mae did not implement policies and procedures for its account executives in a timely manner;
2. Ginnie Mae did not develop a default strategy;
3. Ginnie Mae was not prepared for growth and its staff lacked skills;
4. Ginnie Mae had made progress on nonbank oversight. However, even this progress did not address the operational challenges that Ginnie Mae would face if default occurred;
5. Ginnie Mae may not identify problems with issuers in time to prevent default and may not be able to absorb loans without disrupting service

More broadly, Ginnie Mae has about 150 core staff to handle its nearly \$2 trillion in outstanding MBS, including the associated risk analytics.<sup>78</sup> These staff are supported by contractors that handle bond-administration functions and other more routine tasks. Looking at its staffing as a whole, a 2016 study cited by its inspector general noted that “contractors account for 68% of the FTEs performing Ginnie Mae core competencies, and 84% of all Ginnie Mae FTEs. . . . Ginnie Mae staffing would be approximately 1434 rather than 852 if it were staffed at a level comparable to similarly situated entities” (Department of Housing and Urban Development Office of Inspector General, 2017, p. 5).

To summarize, the prudential regulatory minimums set by the GSEs and Ginnie Mae may not be completely adequate relative to the risks posed by these firms, and the proposed state prudential minimums have not been finalized. Regulators have the option, of course, on a firm-by-firm basis to require higher levels of capital and liquidity. However, such monitoring requires access to data and staffing resources that may not be available.

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<sup>78</sup>The \$2 trillion number referenced here includes all outstanding MBS, not just the \$1.8 trillion in single-family MBS cited earlier in this paper.

## 9.2 Housing-finance reform

There is an active current discussion about how best to manage housing-finance reform in the wake of the financial crisis. Several proposals have been put forward, including Bright and DeMarco (2016); Mortgage Bankers Association (2017); Parrott, Ranieri, Sperling, Zandi, and Zigas (2016a,b, 2017). While all of these proposals discuss in depth the regulation of the GSEs going forward, there is much less discussion of how to mitigate the significant systemic risks we have identified as being posed by the rapid growth of nonbank lenders and servicers. We believe that this critical issue needs to be a much more important part of this discussion. Mortgage Bankers Association (2017) do not touch on the risks associated with nonbanks at all. Indeed, they portray the rise of nonbanks as an unalloyed positive for consumers (p. 6):

“Fortunately for consumers, the gap in funding was filled by independent mortgage bankers (IMBs), whose market share in both purchases and refinances increased from the low 20s in 2008 to nearly 48% in 2015.”

While we agree with Mortgage Bankers Association (2017) that more competition between lenders is desirable, it is important to take account of, and plan how to manage and regulate, the additional risk these firms bring to the market. Bright and DeMarco (2016, p. 16) do note the significance of this risk:

“Historically, when banks and thrifts dominated Ginnie Mae issuance, Ginnie Mae’s risk was largely based on an issuer losing access to liquidity or running out of capital due to unrelated events (such as losses on its other banking activities). Today, however, with complex and costly loss-mitigation requirements, lengthy foreclosure timelines, and the rise of nonbank servicers that do not have access to banks’ traditional funding sources (such as deposits, FHLB advances, and the Federal Reserve), the risk of an issuer liquidity crisis is something Ginnie has become more focused on.”

However, they also note that, because Ginnie Mae is part of HUD, it lacks control over its own budget, with the result that, despite generating \$1 billion per year in insurance fees,

“Ginnie, for example, has been unable to spend \$4 million on additional oversight resources requested to examine the nonbank issuers using its platform. Ginnie has been seeking, even if not as part of broader reform, the authority to spend a small fraction of the money it brings in on a process for more robust oversight and stress testing of its issuers. But because it does not control its own revenues, it cannot spend these resources, even though they are meager relative to the funds Ginnie generates for the Treasury.”

We agree with Bright and DeMarco (2016) that Ginnie Mae needs sufficient control over its budget to be able to examine the nonbank issuers using its platform. However, we also believe that the Ginnie Mae and GSE standards for their counterparties may not reflect the full financial risk that these institutions pose to the government.

## 10 Conclusions

The nonbank mortgage sector has boomed in recent years. The combination of low interest rates, well-functioning GSE and Ginnie Mae securitization markets, and streamlined FHA and VA programs have created ample opportunities for nonbanks to generate revenue by refinancing mortgages. Commercial banks have been happy to supply warehouse lines of credit to nonbanks at favorable rates. Delinquency rates have been low, and so nonbanks have not needed to finance servicing advances.

In this paper, we ask “What happens next?” What happens if interest rates rise and nonbank revenue drops? What happens if commercial banks or other financial institutions lose their taste for extending credit to nonbanks? What happens if delinquency rates rise and servicers have to advance payments to investors—advances that, in the case of Ginnie Mae pools, the servicer cannot finance, and on which they might take a sizable capital loss?

We cannot provide reassuring answers to any of these questions. The typical nonbank has few resources with which to weather these shocks. Nonbanks with servicing portfolios concentrated in Ginnie Mae pools are exposed to a higher risk of borrower default and higher potential losses in the event of such a default, and yet, as far as we can tell from our limited data, have even less liquidity on hand than other nonbanks. Failure of these nonbanks in particular would have a disproportionate effect on lower-income and minority borrowers.

In the event of the failure of a nonbank, the government (through Ginnie Mae and the GSEs) will probably bear the majority of the increased credit and operational losses that will follow. In the aftermath of the financial crisis, the government shared some mortgage credit losses with the banking system through putbacks and False Claims Act prosecutions. Now, however, the banks have largely retreated from lending to borrowers with lower credit scores and instead lend to nonbanks through warehouse lines of credit, which provide banks with numerous protections in the event of nonbank failure.

Although the monitoring of nonbanks on the part of the GSEs, Ginnie Mae, and the state regulators has increased substantially over the past few years, the prudential regulatory minimums, available data, and staff resources still seem somewhat lacking relative to the risks. Meanwhile, researchers and analysts without access to regulatory data have almost no way to assess the risks. In addition, although various regulators are engaged in micro-

prudential supervision of individual nonbanks, less thought is being given, in the housing-finance reform discussions and elsewhere, to the question of whether it is wise to concentrate so much risk in a sector with such little capacity to bear it, and a history, at least during the financial crisis, of going out of business. We write this paper with the hope of elevating this question in the national mortgage debate.

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# A Data appendix

## A.1 Survey of Consumer Finances

The Survey of Consumer Finances (SCF) is a comprehensive survey of household income, wealth, and financial decision-making conducted every three years by the Federal Reserve Board. The most recent survey was conducted in 2016 and contains data from interviews with 6,254 households. The survey design allows us to identify households with mortgages insured by FHA or VA (and thus likely securitized in Ginnie Mae pools) as well as households with mortgages held by nonbank institutions. Three sets of questions are particularly salient:

1. Households with mortgages are asked for the name of the institution that the loan is “with.” The survey answers indicate that households respond to the question by supplying the name of the current loan servicer. Respondents are also asked to identify the type of this institution, and are prompted with the suggestions “a commercial bank, savings and loan or savings bank, a credit union, a mortgage company, a finance or loan company, or something else?” We categorize a lender as a nonbank if the respondent identifies the lender as an institution other than a bank or credit union.
2. Respondents are asked if their mortgage was originated by a different lender than the institution that currently holds it. If so, they are asked for the name and lender-type of the originating institution.
3. Households with mortgages are asked “Is it an FHA mortgage, a VA mortgage, or is it from some other program?” We use the households’ replies to code FHA and VA mortgages.

The tabulations shown in this paper are estimated on the internal version of the data, which allows for slightly more precise identification of FHA and VA loans. In the public version of the data, VA loans are combined with a handful of mentions of other types of guarantee programs, such as “first-time buyer program” or “other federal loan program.”

One potential issue with the SCF is that some borrowers may misreport their type of mortgage or type of lender. For example, in earlier waves of the survey, before the instructions were clarified in the 2007 SCF, some households appeared to report mortgages that were guaranteed by Fannie Mae or Freddie Mac as FHA mortgages.<sup>79</sup>

More information on the Survey of Consumer Finances is available at <https://www.federalreserve.gov/econres/scfindex.htm>.

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<sup>79</sup>Bucks and Pence (2008) and Lam and Kaul (2003) note that in 2001 and 1995 SCF waves, respectively, the FHA share of mortgages appears higher than in comparable benchmarks.

## A.2 Home Mortgage Disclosure Act

The Home Mortgage Disclosure Act (HMDA) was enacted by Congress in 1975 and is implemented by the Consumer Financial Protection Bureau Regulation C. The regulation covers both depository and nondepository lending institutions that (i) do business within metropolitan statistical areas and (ii) exceed minimum thresholds for assets or mortgage lending volume.<sup>80</sup> Under HMDA, lenders are required to disclose to the public detailed information about their home-lending activity each year including the disposition of each application for mortgage credit; the type, purpose, and characteristics of each home mortgage that lenders originate or purchase during the calendar year; the census-tract designations of the properties related to those loans; loan pricing information; personal demographic and other information about loan applicants, including their race or ethnicity and income; and information about loan sales.

The analysis in this paper uses a restricted version of the HMDA data that includes the origination date for each mortgage. Using this additional information, we restrict our calculation of statistics on loan sales to loans originated during the first three quarters of the year. This is because loan sales are recorded in the HMDA data only if the loans are originated and sold in the same calendar year, so loans originated toward the end of the year are less likely to be reported as sold (Bhutta, Laufer, and Ringo, 2017).

## A.3 Mortgage Bankers Association Performance Report

Independent mortgage companies that are approved to do business with Fannie Mae, Freddie Mac, and Ginnie Mae, either as a seller or a servicer, are required to submit the Mortgage Bankers Financial Reporting Form (MBFRF), available at [https://www.fanniemae.com/content/guide\\_form/form-1002-mortgage-bankers-financial-reporting-form](https://www.fanniemae.com/content/guide_form/form-1002-mortgage-bankers-financial-reporting-form), 30 days after the end of each quarter (60 days for the year-end report). The MBFRF contains comprehensive information on companies' income, balance sheets, and exposures. Companies have the option to release their data to the Mortgage Bankers Association for inclusion in aggregate statistics that are reported in the Mortgage Bankers Association Performance Report.

Larger independent mortgage companies make up a disproportionate share of the companies represented in the MBA statistics. Smaller companies typically find it more efficient to sell their originations to larger companies than to become Fannie, Freddie, or Ginnie counterparties themselves. To illustrate this point, Appendix Table A compares statistics

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<sup>80</sup>See <https://www.fdic.gov/regulations/compliance/manual/5/v-9.1.pdf> for additional details on the criteria that determine which financial institutions are covered by HMDA.

on the distribution of the number of loan originations among companies reporting in the MBA data and among the more representative set of nonbank mortgage lenders reporting under HMDA. As can be computed from the statistics in the table, companies with more than \$200M in loan originations in 2016 make up 89% of companies reporting in the MBA data, compared with just 56% of companies reporting under HMDA.

## A.4 Y-14 data

U.S. bank holding companies (BHCs) and intermediate holding companies with \$50 billion or more in total consolidated assets are required to file quarterly data on various asset classes, capital components, and categories of pre-provision net revenue. The Federal Reserve uses these data to assess the capital adequacy of large bank holding companies and intermediate holding companies, including in supervisory stress test models. More information on these data is available at <https://www.federalreserve.gov/apps/reportforms/reportdetail.aspx?s0oYJ+5BzDZGWnsSjRJKDwRx0b5Kb1hL>. We use data from two schedules in our paper.

The **Y-14Q H.1 corporate loan data schedule** collects loan-level detail on corporate loans and leases, including the warehouse lines of credit and other loans that BHCs extend to nonbank mortgage companies. Respondents are instructed to report corporate loans and leases that are held for sale or held for investment on the last day of the relevant quarter. Respondents are also instructed to include all corporate loans that are at the consolidated bank holding company level, and not just loans held by the banking subsidiaries. Loans with a committed balance less than \$1 million do not need to be reported.

Loans extended to nonbank mortgage lenders (also called “obligors” in the rest of this text) are not explicitly identified in the data, so we identify these nonbank obligors, as described below, by a combination of their tax ID, name, type of credit facility, and line of business. We begin by generating a list of nonbank mortgage originators from the HMDA data from 2013–2016; nonbanks are those with the reporting agency listed as the U.S. Department of Housing and Urban Development. The HMDA data and the Y-14 data list the tax IDs of the relevant entities, so our first screen is whether the tax ID of an obligor in the Y-14 data matches that of a nonbank lender in HMDA. This screen identifies 418 nonbank obligors in the Y-14 data. However, these tax IDs will not match in all cases because of the corporate structure of the nonbank, so we next conducted a “fuzzy match” between the mortgage lender name in HMDA and the obligor name in the Y-14 data. We use the “matchit” command in STATA, which uses a bigram string matching algorithm. We only keep matches with match scores above 0.8 on a scale of 0 to 1. After the fuzzy match, we manually check whether the



resulting matches are reasonable. This step identifies an additional 36 nonbanks in the Y-14 data. Finally, we select credit lines in the Y-14 data with “credit facility purpose” equal to “mortgage warehousing.” Some of these lines are likely for commercial mortgages rather than residential mortgages. We eliminate at least some of these commercial-mortgage warehouse facilities by dropping all lines of credit that were originated by a BHC division with a name that includes “commercial.” This screen identifies a final 577 nonbank mortgage companies.

We augment the Y-14 data with data from HMDA, where available, on the number, dollar amount, and type of mortgages that each nonbank originated each quarter. We also obtain information on each nonbank’s Ginnie Mae servicing portfolio by performing a similar fuzzy match between the Y-14 obligor name and the names of Ginnie Mae’s issuers/servicers. This fuzzy match adds information from 156 Ginnie Mae issuers/servicers to our data. The HMDA and Ginnie Mae data give us some rough proxies for the assets, size, and business models of the nonbank lenders.

We also use data from the **Y-14Q Schedule I (MSR valuation schedule)** in the paper. This schedule collects information on the number and dollar value of mortgages serviced by the bank, the value of the associated mortgage servicing rights, the banks’ estimates of changes in the MSR valuations in a variety of stress scenarios, and the banks’ costs incurred in servicing mortgages. Servicing costs are broken out by type of servicing contract (Fannie Mae or Freddie Mac; FHA; VA; non-agency) and the delinquency status of the loan.

## **B The economics of vertically disintegrated markets**

Existing theories found in the economics literature on transactions costs, contracting, industrial organization, and economic networks provide limited insight into competitive outcomes in vertically disintegrated markets in which agents can act strategically when entering into contractual agreements among themselves; are influenced by the actions of others to whom they are only indirectly connected; and make unobservable quality choices that impact outcomes, locally as well as globally. In his famous essay on the nature of the firm, Coase (1937) describes why and how economic activity divides between firms and markets. He argues that firms exist to reduce the costs of transacting through markets. Building on Coase’s seminal ideas, Williamson won a Nobel prize for his development of the transaction cost theory of integration (see Williamson, 1971, 1975, 1979). A key element of this theory is that market contracts are inherently incomplete and this limitation of explicit contracts may be especially severe when complexity or uncertainty make it difficult to specify contractual safeguards, or when parties cannot walk away without incurring substantial costs. Transaction cost theory therefore argues that vertical integration can be an effective response when these features

are present. A related rationale for integration is that it might mitigate potential holdups by suppliers (see Joskow, 2005; Williamson, 2010).

The property rights theories of vertical integration (see Grossman and Hart, 1986; Hart and Moore, 1990; Hart, 1995) have focused on how integration changes the incentives to make specific investments and find that ownership strengthens a party's bargaining position. However, incentive theories (see Holmström and Milgrom, 1994; Holmström, 1999) have also shown that under certain conditions, asset ownership by the agent (e.g., non-integration) can be complementary to providing high-powered financial incentives.

The related literature in organizational economics has focused more directly on the determination of horizontal market structures due to firm-level costs or strategic interaction among firms (see Stigler, 1951). In addition to the trade-off between efficient horizontal scale and vertical market power, Stigler's theory adds the additional idea that formal market institutions are required to support disintegrated trade. Bresnahan and Levin (2013) also argue that transaction costs for vertically disintegrated markets usually depend on market institutions that facilitate search and matching as well as institutions that facilitate contractual and pricing arrangements. Thus, this literature appears to conclude that vertically disintegrated market structures, particularly in industries with frequent arms-length exchange, require market institutions to set standards for products and contracts, establish mechanisms for matching buyers and sellers, and disseminate supply and demand information to function well.

A more recent literature has focused on the importance of network linkages between intermediaries and financial institutions in explaining systemic risk in financial markets similar to the vertically disintegrated mortgage market (see, for example, Allen and Gale, 2000; Allen, Babus, and Carletti, 2012; Cabrales, Gottardi, and Vega-Redondo, 2017; Glasserman and Young, 2015; Acemoglu, Ozdaglar, and Tahbaz-Salehi, 2015; Elliott, Golub, and Jackson, 2014; Babus, 2016; Di Maggio and Tahbaz-Salehi, 2014). These studies show that financial networks may create resilience against shocks in a market via diversification and insurance, but may also generate contagion and systemic vulnerabilities by allowing shocks to propagate and amplify. Stanton, Walden, and Wallace (2017) develop a theoretical model of a network of intermediaries in the private label mortgage market which gives rise to heterogeneous financial norms and systemic vulnerabilities. They show, in markets of this type, that the optimal behavior of intermediaries regarding their attitude toward risk, the quality of the projects that they undertake, and the intermediaries they choose to interact with, is affected by the behavior of their counterparties. These strategic network effects influence the financial strength and systemic vulnerability of individual intermediaries, as well as aggregate market outcomes. Stanton et al. (2014) establish empirically that network effects existed

in the pre-crisis vertically disintegrated U.S. private-label residential-mortgage market, and Stanton et al. (2017) find that endogenous network effects were important determinants of ex post observable systemic vulnerabilities in that market.

## C Structured Investment Vehicles (SIVs) pre-crisis

SIV/ABCP Conduit Program Name	Holding Company Name	<i>Inside Mortgage Finance</i> Rank 2006	Origination 2006 (\$ Billion)	Status
Mountain Funding Trust	Accredited Home Lenders	36	15.70	CH 11 2008
Broadhollow Funding, LLC	American Home Mortgage	13	58.90	CH 11 2007
Main Street Warehouse Funding Trust	Ameriquest Mortgage	16	27.80	Closed 2008
Bishop's Gate Residential Mortgage Trust	Cendant Mortgage*	18	41.26	Sold 2005
Park Granada, LLC	Countrywide	1	462.50	Sold 2008
Park Sienna, LLC	Countrywide	1		
Harwood Street Funding I, LLC	CTX Mortgage	34	13.47	Closed 2008
Harwood Street Funding II, LLC	CTX Mortgage	34		
KKR Atlantic Funding Trust	Deutsche Bank Trust Company Americas**	25	29.00	CH 11 2009
Funding, LLC (Series A)	EMC Mortgage	11	72.43	Closed 2009
Master Funding, LLC (Series B)	EMC Mortgage	11		
MINT I, LLC	GMAC Mortgage	8	74.60	CH 11 2012
Witmer Funding, LLC	GMAC Mortgage	8		
North Lake Capital Funding	Indy Mac	7	89.95	Sold 2007
Luminant Star Funding Statutory Trust I	LaSalle Bank***	18	38.31	Sold 2007
Wind Master Trust	Lehman Brothers****	38	14.00	CH 11 2008
Wind Master Trust	Lehman Brothers*****	20	34.30	Sold 2009
Strand Capital, LLC	Long Beach Mortgage*****	4	195.70	Sold WAMU
Auburn Funding, LLC	Nationstar Mortgage	NA	3.74	Sold 2006
Von Karman Funding Corp., LLC	New Century Financial	12	59.8	CH 11 2007
St. Andrew Funding Trust	New Century Financial	12		
MINT II, LLC	Residential Capital	9	96.75	CH 11 2012
Three Pillars Funding LLC	Suntrust	15	56.45	Going Concern
Ocala Funding, LLC	Taylor Bean Whitaker Mort.	30	24.80	CH 11 2011
Thornburg Mortgage Capital Resources, LLC	Thornburg Mortgage		.29	CH 11 2009
Total lenders with SIVs (\$ Billion)			1,409.46	
Total U.S. origination (\$ Billion)			2,980.00	
SIV lenders as percentage of total			47.30%	

\*PHH Mortgage; \*\*MortgageIT;\*\*\*ABN AMRO;\*\*\*\*BNC Mortgage;\*\*\*\*\*Aurora Loan Services;\*\*\*\*\*WAMU

Table 10: Columns one and two reports the pre-crisis universe of off-balance Structured Investment Vehicles (SIVs) that were used to fund mortgage originations by their parent holding company and were funded by Extendable Asset Backed Commercial Paper issued by their parent holding company. Columns three and four reports the 2006 values for the overall market ranking of the parent and the parent's total mortgage origination in billions of dollars. Finally, column five provides information on the status of the parent company as of 2017. Sources: Mortgage origination data were obtained from *Inside Mortgage Finance* and HMDA. SIV data were obtained from quarterly SIV statements reported to Moody's Investor Services. The status of the parent was obtained from various regulatory and corporate filings.