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Liquidity Crises in the Mortgage Market

ABSTRACT Nonbanks originated about half of all mortgages in 2016, and 75 percent of the mortgages insured by the FHA and the VA. Both shares are much higher than those observed at any point in the 2000s. In this paper, we describe how nonbank mortgage companies are vulnerable to liquidity pressures in both their loan origination and servicing activities, and we document that this sector in the aggregate appears to have minimal resources to bring to bear in an adverse scenario. We show how the 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 high share of nonbank lenders in FHA and VA lending suggests that the government has significant exposure to the vulnerabilities of nonbank lenders, but this issue has received very little attention in the housing reform debate.

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

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Crisis Inquiry Commission (2011, p. xvi), for example, noted that “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.” 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. Although important postcrisis research did focus on precrisis liquidity problems in short-term debt-financing markets,¹ the literature has been largely silent on the liquidity issues on which we focus in this paper: the dependence of nonbank mortgage companies on credit to finance both their mortgage originations and the costs of mortgages in default. 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 before the financial crisis. These liquidity issues have become more pressing because the nonbank sector is a larger part of the market than it was before the crisis, especially for loans with credit guarantees from the Federal Housing Administration (FHA) or Department of Veterans Affairs (VA) that are securitized in pools guaranteed by Ginnie Mae. As noted in 2015 by Ted Tozer, president of Ginnie Mae from 2010 to 2017, there is now considerable stress on Ginnie Mae’s operations from its nonbank counterparties:

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 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 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. (Tozer 2015)

1. 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); and Krishnamurthy, Nagel, and Orlov (2014).

In this paper, we outline the major liquidity vulnerabilities associated with nonbanks in the mortgage market, along with the solvency issues that could trigger or compound these liquidity issues. We describe these separately, although solvency and liquidity risks are, of course, often closely linked. For example, Bear Stearns failed in 2008, while the firm was arguably still solvent, when “a sudden wholesale run . . . impeded the investment bank [from] obtaining funding on both unsecured and collateralized short-term financing markets” (Allen and Carletti 2008, p. 384).

Nonbank mortgage companies finance their originations with a form of short-term credit. This credit is vulnerable to all the dynamics that derailed other short-term lending during the financial crisis, including margin spirals and counterparty runs. Put simply: In times of strain, it is easy for the lender to tighten loan terms or withdraw credit entirely, and this tightening of credit alone can put the nonbank out of business rapidly.

Nonbank mortgage companies also need to finance the costs associated with servicing defaulted loans for extended periods of time. Obtaining this financing can be difficult in times of strain, particularly for loans in pools guaranteed by Ginnie Mae.

At present, most mortgages are guaranteed by the government, and this guarantee eases some of the strains that existed in the precrisis period. However, a government guarantee does not mean that mortgage-related assets are riskless, because the guarantee is conditional on actions by the mortgage originator or servicer that are difficult for future purchasers or lenders to observe.² In addition, institutional details of the Ginnie Mae servicing contract make it almost impossible to pledge some of these assets as collateral for a loan.

The business model of many nonbanks also exposes them to significant solvency risks. Some nonbank lenders are heavily dependent on revenue from mortgage refinancing. A rise in interest rates would significantly affect this source of revenue. In addition, nonbanks are more likely to service loans with a higher probability of default. Although many of these loans are guaranteed by the FHA and VA, these guarantees, as suggested above, are conditional and somewhat limited. As a result, a rise in defaults could expose servicers to costs large enough to jeopardize their solvency.

A fundamental difficulty in trying to gauge these risks is the very limited data available. Only a few nonbanks are publicly traded, and the commonly

2. See Krishnamurthy (2010a) for a discussion of the mechanisms underlying historical financial crises.

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 that the lack of data is problematic, as we describe in this 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. In addition to those losses for which the government is explicitly on the hook, 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.

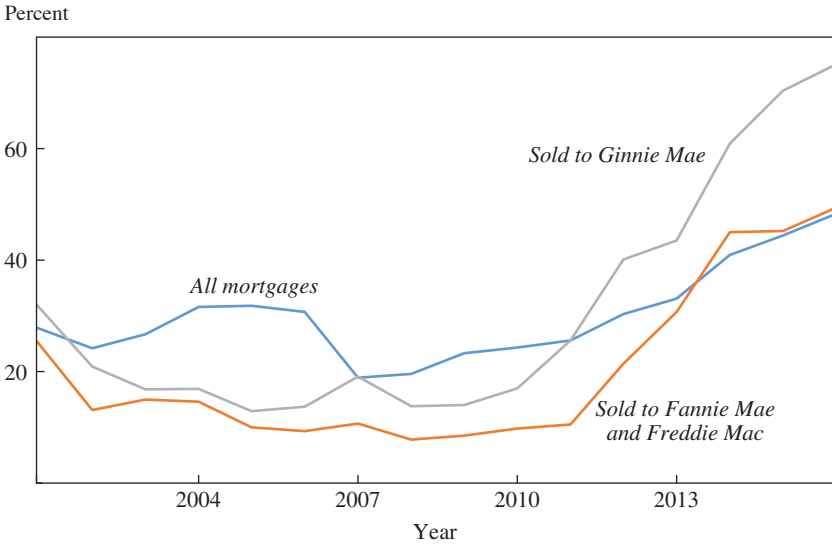
I. Background on Nonbanks, Government-Sponsored Enterprises, and Ginnie Mae

In this section, we briefly describe the role of nonbanks, the government-sponsored enterprises (GSEs)—Fannie Mae and Freddie Mac—and Ginnie Mae in the U.S. mortgage market.

I.A. Nonbanks in the U.S. Residential Mortgage Market

The post-financial crisis U.S. mortgage market has two very different parts. 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, they generally service their own loans, and they either hold the loans in a portfolio or securitize them in pools guaranteed by Ginnie Mae, Fannie Mae, or 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 about 20 percent in 2007 (figure 1). These nonbanks also represented close to half of all mortgage originations sold to Fannie Mae

Figure 1. Percentage of All U.S. Mortgages Originated by Nonbanks, 2001–16

Sources: Home Mortgage Disclosure Act data; authors' calculations.

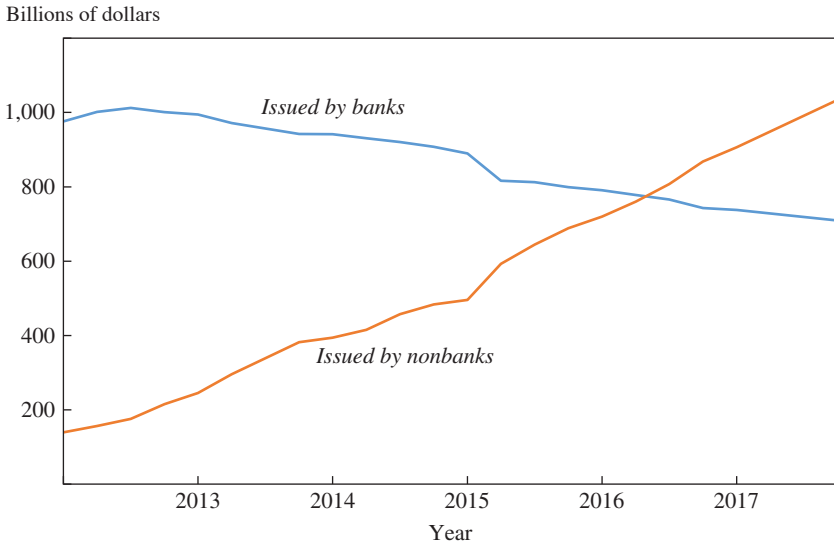
and Freddie Mac in 2016, as well as 75 percent of all originations sold to Ginnie Mae. The striking rise in the Ginnie Mae nonbank share appears to have continued in 2017; data from the Housing Finance Policy Center (2018) pin the nonbank share of Ginnie Mae originations at 80 percent in December 2017.

Nonbanks differ from banks both in the types of mortgages that they originate and in 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 borrowers who are members of minority groups, who have lower incomes, and who have lower credit scores. For example, in 2016, nonbanks originated 53 percent of all mortgages, but 64 percent of the mortgages made to black and Hispanic borrowers, and 58 percent of those made to borrowers living in low- or moderate-income census tracts.³

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 that were issued

3. The statistics from the Home Mortgage Disclosure Act in this paragraph refer to purchase and refinance mortgages for single-family, owner-occupied, site-built homes.

Figure 2. Outstanding Balance of Mortgage-Backed Securities Guaranteed by Ginnie Mae, 2012–17



Sources: Ginnie Mae; authors' calculations.

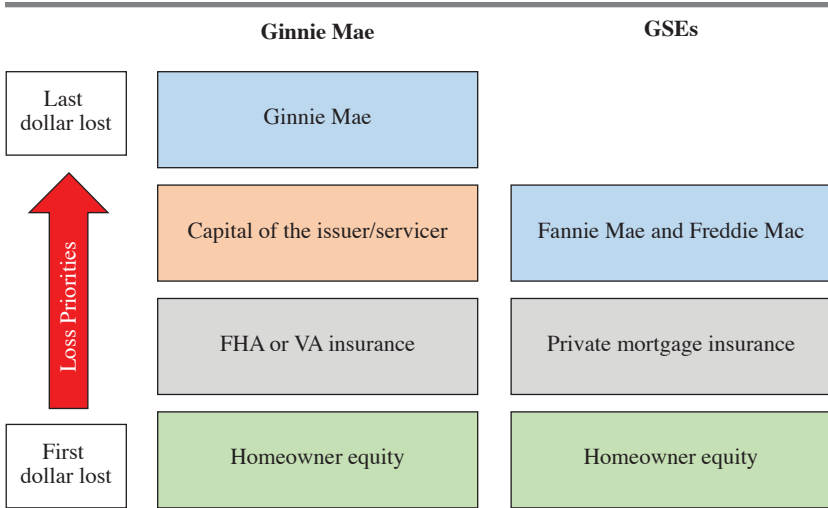
and serviced by nonbanks exceeded the corresponding volume for banks; and by the end of 2017, the nonbank share was close to 60 percent. As a result, nonbanks are now the main counterparties for Ginnie Mae. *Inside Mortgage Finance* (January 19, 2018) estimates that the nonbank share of servicing was 38 percent for Fannie Mae pools and 35 percent for Freddie Mac pools at the end of 2017.

1.B. Fannie Mae, Freddie Mac, and Ginnie Mae

Although Ginnie Mae and both the GSEs—Fannie Mae and Freddie Mac—guarantee mortgage-backed securities (MBSs), there are a number of essential differences. In particular, Ginnie Mae servicers are exposed to greater liquidity strains, and a greater risk of experiencing high unreimbursed servicing costs, than are GSE servicers. As we 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 MBS investors that they will receive their principal and interest payments on time. One crucial difference between these institutions, however, is who issues the underlying securities. The GSEs

Figure 3. Credit Loss Priorities for when a Mortgage Defaults in a Pool Guaranteed by Ginnie Mae or the Government-Sponsored Enterprises



Source: Ginnie Mae (2016).

purchase loans from mortgage originators and issue the securities themselves. For Ginnie Mae MBSs, financial institutions originate or purchase mortgages and then issue securities through the Ginnie Mae platform.

In both cases, the loans underlying the securities must 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 (FHA, VA, 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 his or her equity in the house), followed by the private mortgage insurance company (if the mortgage has such insurance), 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 Mae 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 detail in section IV.) Ginnie Mae covers credit losses

only when the corporate resources of the issuer/servicer are exhausted. The fact that servicers in the Ginnie Mae model are exposed to greater potential credit loss is important in evaluating some housing reform proposals, as we discuss in section VIII.

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 their losses. If the originator or issuer is no longer in business, however, 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. For practical purposes, its main remedy is to take the servicing without compensating the servicer.

II. Factors Driving Growth in Nonbank Lending and Servicing

In this section, we describe some of the developments in the mortgage market that led to the growth in nonbank lending. We first look at historical factors and then at more recent developments that have amplified this growth.

II.A. Historical Evolution of the Nonbank Mortgage Sector

The rise in the nonbank lending sector was facilitated by several developments over the past 50 years. In essence, these developments have led to the vertical disintegration of the nonbank mortgage sector; we review the economics of such markets in online appendix B.⁴

DEVELOPMENT OF THE GSE AND GINNIE MAE SECURITIZATION INFRASTRUCTURE
The first major change occurred in the 1970s, when the federal government introduced standardized securitization systems through the GSEs⁵ and Ginnie Mae,⁶ and allowed nondepository mortgage banks to issue and service loans under GSE and Ginnie Mae authorization criteria (Follain and Zorn 1990; Garrett 1989, 1990; Jacobides 2005; Kaul and Goodman 2016).

4. The online appendixes for this and all other papers in this volume may be found at the *Brookings Papers* web page, www.brookings.edu/bpea, under “Past BPEA Editions.”

5. The Emergency Home Finance Act—Pub. L. 91-351, 84 Stat. 450 (1970)—created the Federal Home Loan Mortgage Corporation (Freddie Mac) and authorized the Federal National Mortgage Association (Fannie Mae) to establish a secondary mortgage market for conventional mortgages.

6. The Housing and Urban Development Act—Pub. L. 90-448, 82 Stat. 476 (1968)—created the Government National Mortgage Association (Ginnie Mae).

SEPARATION OF MORTGAGE ORIGATION 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 staffs and then reestablished long-term relationships, often with the same staffs, as independent loan brokers (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 (RTC 1992, 1993, 1994). By the end of 1993, RTC had successfully sold and priced \$6.9 billion in mortgage-servicing rights from the portfolios of 32 failed S&Ls (RTC 1994), thus launching the stand-alone nonbank mortgage-servicing industry.

II.B. Recent Factors Facilitating the Rise of the Nonbank Sector

In addition, several more recent developments have further facilitated the increase of nonbanks in mortgage lending and servicing.

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 2015:Q3, the GSEs had collected \$76.1 billion in connection with lender repurchases of mortgage originations (McCoy and Wachter 2017). Lenders were required to repurchase these loans because one or more of the “representations and warranties” that they made upon the sale of the loans to the GSEs turned out to be inaccurate or worse.

Meanwhile, the U.S. Department of Justice (DOJ) began litigating cases in which FHA loans had been originated in a manner inconsistent with the rules of the U.S. Department of Housing and Urban Development (HUD). These cases often involved pursuing treble damages against originators through the False Claims Act.⁷ As of October 2016, the cumulative DOJ settlements had reached \$6.6 billion of mortgage-related False Claim Act violations; most of these settlements were with commercial banks

7. False Claims Act, 31 U.S.C. §§ 3729–3733 (1863).

(Goodman 2017). Patricia McCoy and Susan Wachter (2017) provide a comprehensive review of these developments.

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." (Pender 2015)

In addition, the structure of nonbanks may make them less sensitive to such losses. Most nonbanks are privately held, and thus face less market disciplinary pressure than banks in response to losses. Also, most mortgage nonbanks are monolines with fewer alternative business lines to protect than banks, and thus have less skin in the game and 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 non-bank 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 the DOJ's False Claims Act prosecutions.

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 capital requirements for exposures to mortgage-servicing rights (MSRs) (Federal Reserve Board and others 2016). The full implementation of the rule, including an increase in the risk weight for MSRs, was scheduled to take effect January 1, 2018, for all banking organizations. The new requirements had the potential to have a fairly significant effect on some banks, primarily small to midsized banking institutions that specialize in mortgage servicing and for whom these MSRs are large relative to their capital. In anticipation of these rules, some of these banking institutions reduced their acquisitions of mortgage-servicing portfolios.

In late 2017, however, the banking regulators delayed full implementation of the new standard⁸ and also proposed simplifying these rules for banking organizations that are not subject to the capital rule's advanced approaches.⁹ The proposal would simplify the treatment and reduce the

8. 82 Fed. Reg. 55309 (November 21, 2017).

9. 82 Fed. Reg. 49984 (October 27, 2017).

stringency of the capital requirements for holdings of MSRs for all but the largest and most sophisticated banking organizations.¹⁰ These proposed revised rules would probably have only a small effect on the mortgage-servicing activities of small to midsized banking institutions.

TAX CLARIFICATION THAT FACILITATES INVOLVEMENT IN MORTGAGE SERVICING BY REAL ESTATE INVESTMENT TRUSTS In 2012, the Internal Revenue Service issued a private-letter ruling that established that certain assets associated with mortgage servicing count as qualified assets for real estate investment trusts (REITs).¹¹ 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 Corp., for example, increased its holdings of such assets from \$43 million in 2011 to \$8.4 billion in 2017:Q3.¹² As of 2017:Q2, New Residential held the MSRs on \$353 billion in mortgages, making it the fifth-largest holder of MSRs in the United States (*Inside MBS & ABS 2017b*).

RAPID NONBANK TECHNOLOGY ADOPTION AND FOCUS ON REFINANCING Some nonbanks have been quicker than banks to adopt fintech in order to profit from refinancing mortgages. In particular, the growing use of algorithmic underwriting on the part of several large nonbanks, such as Quicken Loans, has significantly reduced the consumer-facing costs of origination. Andreas Fuster and others (2018) and Greg Buchak and others (2017) provide fuller treatments of fintech's role in the increasing presence of nonbanks.

GROWTH OF THE SUBSERVICING SECTOR The subservicing industry has boomed in recent years, thereby allowing nonbanks to hold MSRs 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 (about 20 percent of all mortgages outstanding), up from about \$1.2 trillion in 2014:Q3.

III. Warehouse Lines of Credit

Nonbanks face potential liquidity pressures from both their origination and their servicing lines of business. On the origination side, the main vulnerability of nonbanks is their reliance on a type of short-term funding known

10. See the joint press release at <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20170927a.htm>.

11. See the ruling at <https://www.irs.gov/pub/irs-wd/1234006.pdf>.

12. This is according to 10-K and 10-Q filings of New Residential Investment Corp. (starting in 2013) and Newcastle Investment Corp. (prior) (<https://www.sec.gov/edgar/searchedgar/companysearch.html>).

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.¹³

III.A. Data Availability

A lack of data is a significant impediment to fully understanding warehouse lending to nonbanks. 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 (*Inside Mortgage Finance* refers to these excluded firms as “Wall Street repo lenders”).¹⁴ For example, as shown in table 1, PennyMac reported in its 2017:Q3 10-Q filing that it had warehouse lines from 12 lenders.¹⁵ Of these 12 lenders, *Inside Mortgage Finance* only captures two (JPMorgan Chase and Wells Fargo), representing just 16 percent of PennyMac’s total borrowing on warehouse lines.

Regulators have access to some data on warehouse lending that are not generally available to researchers. 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, known as Y-14 data, after the reporting form number (see online appendix A for more details). These data 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 Form Y-14, or nonbanks that extend warehouse credit. As

13. Before the crisis, several large REITs were warehouse lenders. By 2008, nearly all had failed.

14. The 2017:Q3 warehouse rankings in the December 1, 2017, issue of *Inside Mortgage Finance* include data from JPMorgan Chase, Wells Fargo, Texas Capital Bank, Comerica, EverBank, BB&T, Customers Bank, First Tennessee, Santander Bank, Flagstar Bank, People’s United Bank, SouthWest Bank, Fidelity Bank (Edina, Minn.), and NattyMac/HomePoint.

15. PennyMac also reports a line from Fannie Mae’s “As Soon As Pooled Plus” program, which forward-funds pools before sale to investors.

Table 1. PennyMac's Mortgage Origination and Servicing Funding Lines, 2017:Q3^a

<i>Counterparty</i>	<i>Liabilities (thousands of dollars)</i>
Bank of America	\$938,104
Credit Suisse	\$857,882
JPMorgan Chase	\$445,746
Citibank	\$280,127
Morgan Stanley	\$168,184
Daiwa Capital Markets	\$157,827
Deutsche Bank	\$114,852
Royal Bank of Canada	\$94,424
Wells Fargo	\$51,780
Barclays	\$50,353
BNP Paribas	\$46,330
Fannie Mae	\$1,353
Total	\$3,206,962

Source: PennyMac (2017c).

a. This table reports 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.

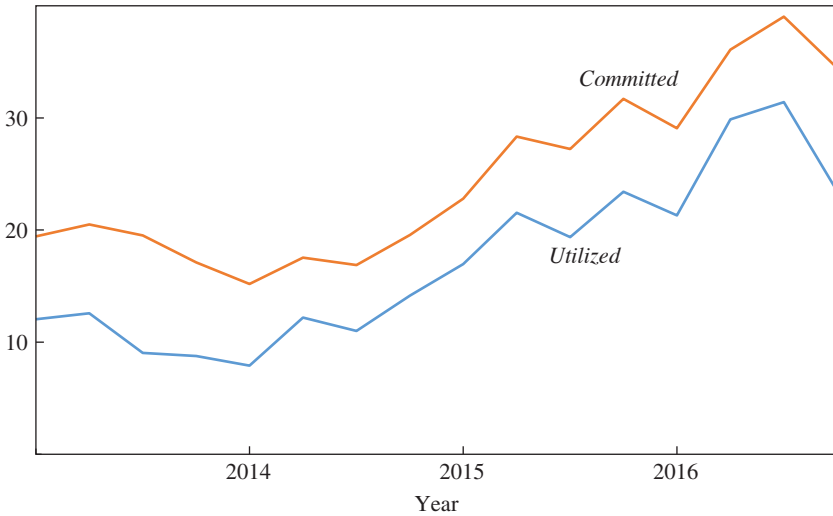
we describe in more detail in section VIII, Ginnie Mae and the GSEs collect data on nonbanks' warehouse lines exposure on the Mortgage Bankers Financial Reporting Form, and the Conference of State Bank Supervisors collects data on nonbank warehouse lines on the Nationwide Multistate Licensing System Mortgage Call Report.

III.B. The Size of the Warehouse Lending Market

Although we cannot examine all warehouse lending, the portion we can study has grown significantly in recent years as nonbank mortgage originations have increased. As of 2017:Q3, *Inside Mortgage Finance* reported about \$67 billion in outstanding commitments on warehouse lines, an 11.6 percent increase from the previous year and a rise of almost 70 percent 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 bank holding companies to independent mortgage companies rose 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 2016:Q3 (figure 4). The figure also shows that of this \$34 billion commitment, mortgage lenders had utilized just over \$23 billion.

Figure 4. The Total Size and Usage of Warehouse Lines of Credit at Banks Subject to the Federal Reserve's Comprehensive Capital Analysis and Review, 2013–16

Billions of dollars



Sources: Federal Reserve Y-14 data; authors' calculations.

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* (November 30, 2017) estimates that mortgage originations are funded on warehouse lines, on average, for about 15 days. Scaling up the \$23 billion in warehouse utilizations in the Y-14 data to the *Inside Mortgage Finance* benchmark suggests that about \$40 billion in total warehouse utilizations were outstanding at the end of 2016, which translates into about \$1 trillion in loans funded over the course of a year.¹⁶ To put this number in context, total mortgage originations in

16. 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 by *Inside Mortgage Finance* corresponds to calendar days and not business days, and that *Inside Mortgage Finance*'s total accurately represents the warehouse lines outstanding. Our estimate of total flow of mortgage originations is then $(\$23 \text{ billion}) \times (\$62 \text{ billion} \div \$34 \text{ billion}) \times (365 \div 15) = \$1,021 \text{ billion}$. 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.

2016 are estimated to be about \$2 trillion, indicating that about half of mortgage originations in a given year cycle through these warehouse lines.

III.C. The Warehouse-Lending Process

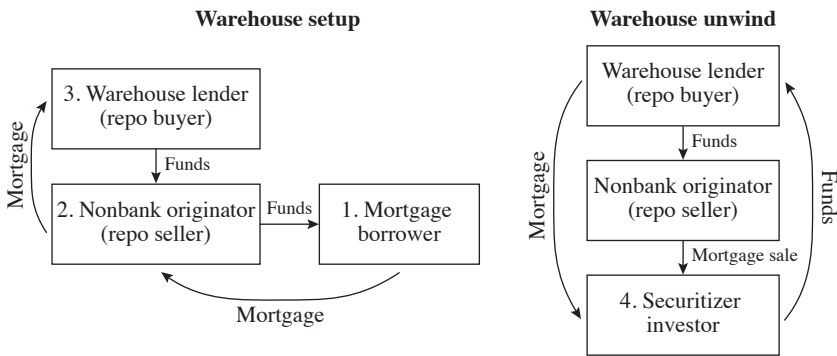
Figure 5 shows the two stages of the warehouse-lending process. In the initial stage, shown on the left side, the mortgage borrower is approved for a mortgage from the nonbank originator, who funds the mortgage using a draw from a line of credit provided by a warehouse lender. Typically, the warehouse lender will only fund about 95 percent 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, and the nonbank in turn transfers the mortgage to the warehouse lender to collateralize the draw on its line of credit.¹⁷ Since the passage of the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005, mortgage-collateralized warehouse lending has been eligible for accounting and legal treatment as repurchase agreements (repos).¹⁸ As shown in figure 5, the nonbank originator is the repo seller and the warehouse lender is the repo buyer in the origination transaction.

In the second stage of the warehouse-lending process, shown on the right side 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. Before the financial 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, which holds the mortgage as collateral. The warehouse lender then

17. What one typically thinks of as a “mortgage” in the United States actually comprises two contracts: (i) 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; and (ii) 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.

18. The Bankruptcy Abuse Prevention and Consumer Protection Act—Pub. L. 109-8, 119 Stat. 23 (2005)—was a statute that made several significant changes to the U.S. 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 “securities contract” to include mortgage loans and any interests in mortgage loans, including repurchase transactions; and (iii) the “safe harbor” amendments in Sections 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 (Bellicha, Stanton, and Wallace 2015).

Figure 5. Schematic for Collateralized Warehouse-Lending Process for Mortgage Originations



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 (Schubert, Lathrop, and Kelly 2013a, 2013b).

III.D. Vulnerabilities of Warehouse Funding

There are five important vulnerabilities associated with the warehouse funding of nonbanks: (i) margin calls due to aging risk (that is, the time it takes the nonbank to sell the loans to a mortgage investor and repurchase the collateral), (ii) mark-to-market devaluations, (iii) rollover risk, (iv) covenant violations leading to cancellation of the lines, and (v) changes in warehouse lender risk appetite.

PIPELINE-AGING RISK 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.¹⁹

As described in subsection III.E, slowdowns in the securitization of mortgages in both the GSE and private-label markets contributed to the

19. Credit Suisse’s funding facility with PennyMac, for example, explicitly defines an aging limit of 90 days for agency mortgages (PennyMac 2017a).

cancellation of billions of dollars of lines of credit to mortgage originators in 2006:Q4–2007:Q2.

MARK-TO-MARKET MARGIN CALLS 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 predefined “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. In other financial markets, such mark-to-market pricing and collateral requirements have, historically, led market conditions and financing conditions to worsen at the same time, precipitating counterparty runs and margin spirals (Bookstaber 2007; Brunnermeier and Pedersen 2009; Allen and Carletti 2008; Krishnamurthy 2010b).

ROLLOVER RISK When the term of the warehouse line expires, the nonbank must negotiate a new contract with the warehouse lender. This is known as “rollover risk.” If market conditions have changed, the nonbank can face higher funding costs. Rollover risk is currently significant, given that most lines have maturities of less than one year, significantly shorter maturities than the usual precrisis ones of three to five years.

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, 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 above.²⁰

During normal times, when a nonbank violates a covenant, the warehouse lender will generally waive the covenant or renegotiate the agreement.²¹ During times of stress, however, the incentive of the warehouse

20. 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 to 1 (PennyMac 2017b). As another example, PHH stated in its year-end 2015 10-K that its warehouse line covenants included a net worth minimum of \$1 billion and a ratio of liabilities to net worth of less than 4.5 to 1 (PHH Corporation 2016).

21. See, for example, the waiver granted to Walter Investment Management Corp. (2017).

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 to them under the Bankruptcy Abuse Prevention and Consumer Protection Act. 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. Liquidity can quickly dry up as nonperformance by one counterparty contractually triggers nonperformance by other counterparties, leading to cascading losses of capital access in times of market stress.

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, noted:

On March 2, 2007, [New Century Financial Corporation] 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 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. (Carey 2008)

CHANGES IN WAREHOUSE LENDER RISK APPETITE Many banks that provide warehouse funding also originate, hold, and service mortgages themselves. This arrangement can increase the attractiveness of warehouse lending: In the event that the bank takes possession of the mortgages that collateralize the lines, it has an existing infrastructure for those mortgages. However, if a bank wants to reduce its overall exposure to mortgage-related risks, it may find it more desirable to cut back on the services that it provides to other mortgage institutions—such as warehouse lending—than to reduce its own operations.

Some of the scenarios that might cause a bank to reassess its mortgage exposure are macroeconomic, such as decreases in house prices or increases in interest rates that reduce the profitability of mortgage lending. Other scenarios involve unexpected changes in government policy that likewise could affect profitability or increase the risks of mortgage lending. For example, in 2009, the U.S. House of Representatives passed legislation that would allow mortgage “cramdown,” which would give bankruptcy judges hearing Chapter 13 petitions the latitude to split the mortgage balance for underwater loans into a secured portion equal to the value of the house and an unsecured portion equal to the excess of the mortgage balance beyond the house value.²² The unsecured portion, like credit cards and other such debts, would probably be discharged for pennies on the dollar. This provision in the legislation did not pass the Senate, in part due to concerns that lenders would react by restricting access to credit in the future (Swagel 2009; Goodman and Levitin 2014).²³ Likewise, as discussed earlier in this paper, in the aftermath of the financial crisis the GSEs and DOJ pursued putback requests and False Claims Act prosecutions, respectively, much more aggressively than they had before the crisis; this shift and the ensuing large costs were not expected by lenders.

III.E. Warehouse Lending during the Financial Crisis

In 2006, the top 40 mortgage originators accounted for about 97 percent of the \$2.98 trillion total mortgage originations in the United States; and 28 of those institutions, representing 59 percent of total mortgage origination, used at least one warehouse line of credit to fund their originations.²⁴ Many of these nonbanks and some depository mortgage originators also had off-balance-sheet entities called structured investment vehicles (SIVs). SIVs were typically organized as unconsolidated entities within the parent originator’s corporate holding company. They functioned as an additional warehouse lender (the 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. In addition to the collateral and fees from the warehouse lending to the parent, the credit quality of the asset-backed paper was further protected through credit enhancements

22. Helping Families Save Their Homes Act of 2009, H.R. 1106, 111th Cong. (2009), as passed by the House of Representatives, March 5, 2009.

23. Helping Families Save Their Homes Act of 2009, Pub. L. 111-22, 12 U.S.C. 5201 (2009).

24. See *Inside Mortgage Finance*, February 2, 2007; Stanton, Walden, and Wallace (2014); and Bellicha, Stanton, and Wallace (2015).

from prefunded reserves and subordination notes, along with liquidity supports from commercial banks with at least Aaa credit ratings (Acharya, Schnabl, and Suarez 2013; Pozsar and others 2012; Covitz, Liang, and Suarez 2013).

The two largest nonbanks in 2006 were New Century Financial Corporation and American Home Mortgage Investment Corporation. New Century issued \$59.8 billion in new originations using \$14.35 billion from nine warehouse facilities,²⁵ and a \$2 billion line from its SIV, Van Karman Funding Trust.²⁶ American Home Mortgage originated \$58.9 billion in new loans funded via a \$2.49 billion line from its SIV, Broadhollow Funding,²⁷ and \$9.25 billion from eight warehouse facilities.²⁸

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 United States, with about \$200 billion in outstanding committed warehouse lines; however, by 2008:Q2, there were only 40 warehouse lenders with outstanding committed lines of between \$20 billion and \$25 billion, a decline of more than 85 percent.²⁹ By March 2009, there were only 10 warehouse lenders in the United States. In addition, runs on SIVs led to the collapse of this form of warehouse funding by the end of 2007 (figure 6), and it has not returned as a funding source since the crisis (Acharya, Schnabl, and Suarez 2013; Pozsar and others 2012; Covitz, Liang, and Suarez 2013).

The collapse of the short-term funding structure of nonbanks and some depositories, such as Countrywide Financial, led to rapid losses in liquidity and lending activity. Origination volumes by the nonbanks, which hovered around \$800 billion to \$900 billion a year from 2003 to 2006, plummeted to \$280 billion in 2008 (figure 7). Many of these firms

25. As of December 31, 2005, the warehouse lenders were: Bank of America (\$3 billion); Barclays (\$1 billion); Bear Stearns (\$800 million); Citigroup (\$1.2 billion); Credit Suisse (\$1.5 billion); Deutsche Bank (\$1 billion); IXIS Real Estate Capital (\$850 million); Morgan Stanley (\$3 billion); and UBS (\$2 billion) (New Century Financial Corporation 2006).

26. See Moody's Investors Service for quarterly reports on Van Karman.

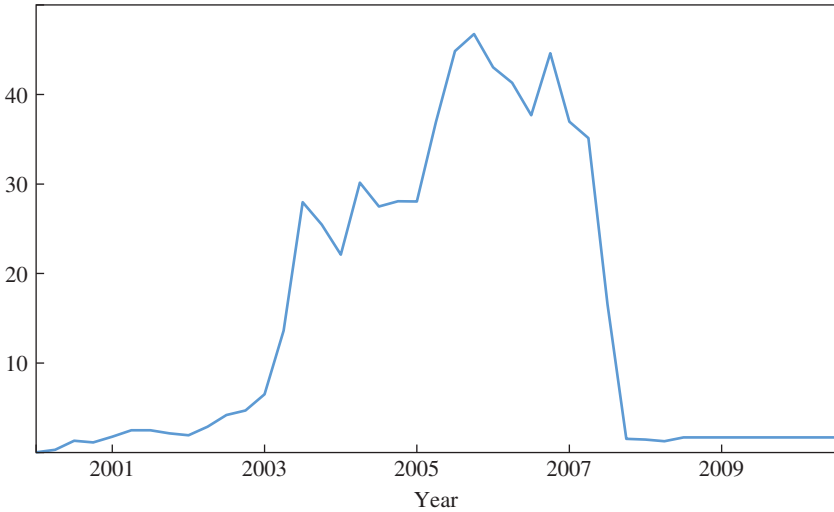
27. The total credit available from Broadhollow Funding was \$3.25 billion, as reported in quarterly reports from Moody's Investors Service.

28. As of March 30, 2006, the warehouse lenders were: UBS (\$2.5 billion); Bear Stearns (\$2 billion); Barclays (\$1 billion); a bank-syndicated facility led by Bank of America (\$1 billion); Morgan Stanley (\$750 million); JPMorgan Chase (\$150 million); IXIS Real Estate Capital (\$450 million); and a bank-syndicated facility led by Calyon's New York branch (\$1.4 billion) (American Home Mortgage Investment Corp. 2006).

29. See *National Mortgage News*, October 20, 2008.

Figure 6. Mortgage Warehouse Lending by Off-Balance-Sheet Structured Investment Vehicles, 2000–10^a

Billions of dollars

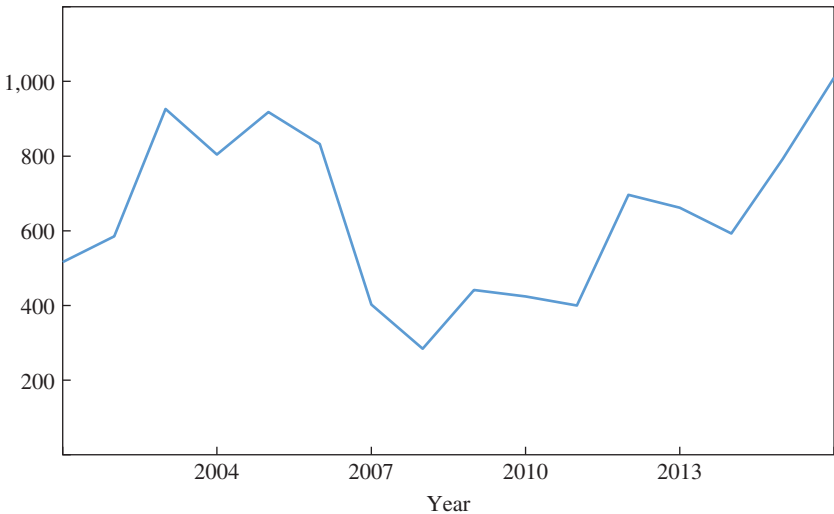


Sources: Moody's Investors Service, quarterly structured investment vehicle statements; authors' calculations.

a. This figure shows the outstanding committed mortgage warehouse balance of off-balance-sheet U.S. structured investment vehicles funded by extendable asset-backed commercial paper and collateralized by mortgage loans held in warehouses before securitization.

Figure 7. Nonbank Mortgage Originations, 2001–16

Billions of dollars



Source: Home Mortgage Disclosure Act data; authors' calculations.

experienced bankruptcies and closures similar to that of New Century. As shown in table 11 in online appendix C, of the 19 nonbanks and depositories that funded their originations using both warehouse lines and SIVs in the precrisis period, only two, Nationstar Mortgage and Suntrust, survived until 2017. The rest (representing about 45 percent of 2006 mortgage originations) were closed down, went bankrupt, or were involved in sales supervised by the Federal Deposit Insurance Corporation. Altogether, the total number of mortgage companies (both independent and affiliated with banks) fell by half—a drop of nearly 1,000 companies—between 2006 and 2012 (Bhutta and Canner 2013).

POSTCRISIS REQUESTS FOR GOVERNMENT ASSISTANCE FOR WAREHOUSE LENDING
The sharp contraction in warehouse lending led nonbank mortgage originators to intensively lobby the federal government for help. Letters sent by the Mortgage Bankers Association to Treasury Secretary Henry Paulson, Treasury Secretary Timothy Geithner, Federal Reserve Chairman Ben 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.³⁰ In September 2009, the U.S. House of Representatives passed a bill that included a sense of the Congress that

the Secretary of 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.³¹

The types of support suggested in the bill 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 2010.³²

30. See, for example, Courson (2009).

31. 21st Century FHA Housing Act of 2009, H.R. 3146, 111th Cong. (2009), as passed by the House of Representatives, September 15, 2009.

32. See Hagerty (2009) and Reuters Staff (2010) for early news reports on the programs.

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.

III.F. Warehouse Lending in the Mid-2010s: Evidence from Y-14 Data

As discussed above, even aggregated data on warehouse lending are hard to come by, and loan-level data are even scarcer. In this paper, we explore the current warehouse lending situation using the Federal Reserve's Y-14 supervisory data, which include 5,065 quarterly observations on 663 warehouse lines of credit extended to 287 nonbanks by 14 warehouse lenders from 2013 to 2016.³³

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 percent) of the lines are utilized. Of the lines that are utilized, the median utilization rate is 76 percent; 32 percent of lines are fully utilized, meaning that they have no spare capacity. Fifteen percent 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 are for 364 days or less; the 10th percentile, median, and 90th percentile of the maturities are 362, 365, and 1,820 days, respectively.³⁴ Most (77 percent) of the lines are tied to the London Interbank Offered Rate (LIBOR). Interest rates range from 1.45 percent at the 10th percentile, to 2.73 percent at the median, to 3.65 percent at the 90th percentile. About 40 percent of the lines are guaranteed, typically (for non-public companies) by personal guarantees from their major shareholders.³⁵ About 70 percent 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

33. 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.

34. 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 multiyear maturities are in fact the 364-day facilities that are standard in this industry.

35. "Guaranty requirements vary, but most warehouse lenders require major shareholders of non-public companies to guaranty obligations" (Stoner and Calandra 2017).

Table 2. Selected Characteristics of Bank Loans Extended to Nonbank Mortgage Companies, 2013–16

<i>Warehouse lines</i>	<i>Statistic</i>	<i>All credit lines</i>	<i>Statistic</i>
Committed exposure (millions of dollars)		Share of credit line types	
10th percentile	8.70	Mortgage warehousing	0.62
Median	45.13	Working capital	0.13
90th percentile	200.00	General corporate purposes	0.05
Share of lines that are utilized	0.93	Other	0.20
Median utilization rate of utilized lines	0.76	Share with credit ratings	
Share of utilized lines that are fully utilized	0.32	AA or A	0.04
Share that are demand loans	0.15	BBB	0.28
Maturity of line for nondemand loans (days)		BB	0.52
10th percentile	362	B	0.14
Median	365	C or D	0.01
90th percentile	1,820	n.a.	0.01
Share with an interest rate tied to LIBOR	0.77	Share of nonbank–quarter pairs with a credit line with	
Interest rate for utilized lines (percent)		One bank	0.76
10th percentile	1.45	Two banks	0.16
Median	2.73	Three or more banks	0.09
90th percentile	3.65	Share past due	0.00
Share with a guarantee	0.41		
Share with additional collateral types			
Cash or marketable securities	0.09		
Blanket liens	0.13		
Other types	0.49		
No other security	0.29		
No. of observations			7,594

Source: Federal Reserve Y-14 data; authors' calculations.

nonbanks in 2016:Q4. A bit more than 60 percent of these credit facilities were identified by the banks as being for warehouse purposes, with another 13 percent for working capital, 5 percent for general corporate purposes, and 20 percent 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 percent of the facilities were rated AA or A by the bank lender, with an

additional 28 percent rated BBB. Of the remaining two-thirds with high-yield ratings, the majority have BB ratings, but about 15 percent of all warehouse lines are rated B or lower by their warehouse lenders.

As a preview of our results discussed 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, whereas 16 percent have credit facilities with two banks and 9 percent have facilities with three or more banks. In a financial crisis, as we noted above, the presence of multiple warehouse lenders gives each lender an incentive to seize its collateral before its competitors. Our data suggest that this interconnectedness still exists, although we only observe a portion of it because our data include perhaps half the total warehouse lines outstanding. Finally, throughout our sample, the credit lines were performing well; the share that are past due is essentially zero.

THE 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 shown in 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 VA from Home Mortgage Disclosure Act (HMDA) data. For those nonbanks that are Ginnie Mae seller/servicers, we merged data from Ginnie Mae on total originations in Ginnie Mae pools, total portfolio serviced for Ginnie Mae, and the delinquency rate on that servicing portfolio. Online 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 the number of warehouse lenders. Meanwhile, nonbanks with more warehouse relationships also have larger portfolios of loans serviced for Ginnie Mae, although the delinquency rates of those portfolios do not vary significantly by the number of warehouse relationships.

Table 3. Selected Characteristics of Nonbanks, by the Number of Warehouse Lenders^a

<i>Statistic</i>	<i>One lender</i>	<i>Two lenders</i>	<i>Three or more lenders</i>
Mean HMDA originations (millions of dollars)	621 (3,214)	2,574 (7,918)	9,444 (21,612)
FHA share of HMDA originations	0.26 (0.18)	0.22 (0.16)	0.22 (0.14)
VA share of HMDA originations	0.10 (0.12)	0.10 (0.15)	0.11 (0.15)
Mean new originations for Ginnie Mae pools (millions of dollars)	416 (823)	815 (1,620)	1,141 (2,153)
Mean total portfolio serviced for Ginnie Mae (millions of dollars)	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)
Mean interest rate of lines (percent)	2.83 (1.03)	2.41 (0.80)	2.18 (0.64)
Share with credit ratings			
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)
n.a.	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)
Mean 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)
Mean total committed (millions of dollars)	58 (88)	175 (230)	366 (354)
Mean originations to committed amount (millions of dollars)	12.91 (29.93)	12.64 (28.09)	23.77 (48.50)
Median maturity (days)	368	675	365
No. of nonbanks	387	119	58
No. of observations	2,332	694	379

Sources: Federal Reserve Y-14 data; Home Mortgage Disclosure Act data; Ginnie Mae; authors' calculations.

a. The values in parentheses are for institutions with only warehouse lines.

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 slightly higher utilization rate, and are a little 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 that may be 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 BB rating have rates about 14 basis points higher than lines with AA or A ratings, and lines with a 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 table 3, 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 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. As we describe in subsection IV.A, if these loans default, servicers are exposed to potentially large unreimbursed servicing costs; the MSR's associated with these loans are also less valuable. If warehouse lenders are concerned about the possibility that they might need to seize

Table 4. Factors Associated with Interest Rates on Warehouse Lines of Credit^a

<i>Independent variable</i>	<i>Credit line interest rate (percent)</i>
Credit ratings ^b	
BBB	0.000896 (0.02)
BB	0.142*** (2.69)
B	0.218*** (3.25)
C or D	0.173 (0.33)
n.a.	n.a. n.a.
Demand loan	0.0714 (1.57)
With a guarantee	0.0754* (1.76)
Nonbank has credit facilities with two banks ^c	-0.0837** (-2.23)
Nonbank has credit facilities with three banks ^c	-0.103** (-2.24)
HMDA originations quartile ^d	
Second quartile	-0.196*** (-3.88)
Third quartile	-0.327*** (-5.46)
Fourth quartile	-0.367*** (-5.35)
FHA loan share	0.126 (1.16)
VA loan share	0.289*** (2.91)
No. of observations	3,362

Sources: Federal Reserve Y-14 data; Home Mortgage Disclosure Act data; authors' calculations.

a. *t* statistics are in parentheses. Statistical significance is indicated at the ***1 percent, **5 percent, and *10 percent levels.

b. The omitted category is AA or A.

c. The omitted category is a nonbank with a credit facility with one bank.

d. The omitted category is the first quartile.

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 percent level. Of course, there are other interpretations of this coefficient, such as if lenders that originate many VA-insured loans are riskier in other dimensions.

III.G. Pipeline-Aging Risk under the GSE Conservatorship

As described in subsection III.E, a key component of the collapse in warehouse lending during the financial crisis was the slowdown of speeds in the private-label securitization market. Today, the mortgage securitization market consists almost entirely of securities with GSE or Ginnie Mae guarantees. This portion of the securitization market, unlike the private-label securities market, worked fairly smoothly during the financial crisis, although in March 2007, before the GSEs entered conservatorship, the average GSE pipeline time to securitization increased from about 30 days to 60 days (Stanton and Wallace 2016).

More recently, various technological and process enhancements to the loan pooling and securitization process have shortened further the amount of time that mortgages are funded on warehouse lines, and the GSEs have continued to refine their “gestation repo” programs,³⁶ which allow nonbanks to pay off their warehouse line as soon as there is pool approval rather than at sale.³⁷ *Inside Mortgage Finance* (November 30, 2017) reports that the average time that loans stay in the lines as collateral has fallen to only 14–15 days, from 18–20 days four years ago. As long as this situation continues, the aging risk that contributed to the collapse of warehouse lending in the private-label securities market during the financial crisis appears less likely.

However, this fact points to a potential vulnerability for housing finance reform: Any changes that undermine the market’s confidence that these fast and reliable speeds will continue has the potential to be destabilizing. The government’s implicit liquidity provision in these securitization markets is one of the linchpins that allows the nonbank mortgage sector to stay in business.

IV. Servicing Advances and Delinquent Loan Costs

As mortgage servicers, nonbanks face both liquidity and solvency concerns. The crux of the liquidity issue in mortgage servicing is that servicers of mortgages in securitized pools are required to continue making payments

36. 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.

37. The programs include Fannie Mae’s “As Soon As Pooled Plus” program, which provides loan-level funding for whole loans or MBSs (see https://www.fanniemae.com/content/fact_sheet/early-funding-options-overview.pdf); and Freddie Mac’s “Early Funding” pool-level execution option, which allows for funding 45 days before the settlement date of the pool (see http://www.freddie.com/singlefamily/early_funding.html).

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. The crux of the solvency issue is that servicers can incur large costs in servicing delinquent loans, especially those that wind up in foreclosure.

The issue is especially acute for Ginnie Mae servicers. These servicers need to advance more types of payments for much longer than GSE servicers. As noted by Ginnie Mae executive vice president Michael Bright, “Liquidity is the ability to make good on principal and interest payments to Ginnie bondholders. . . . Liquidity is key, 100 percent” (*Inside MBS & ABS* 2018). Ginnie Mae servicers, unlike GSE servicers, may also be required to absorb large costs because FHA and VA insurance does not cover all expenses associated with delinquent loans. Finally, private-market financing collateralized by Ginnie Mae advances is essentially impossible to obtain, so servicers need to fund the advances with cash from current operations, unsecured loans, or credit lines collateralized by other assets, such as MSRs.

During and after the financial crisis, servicers of private-label residential MBSs 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 the private market does not consider Ginnie Mae advances as eligible collateral for financing.

IV.A. Background on Servicing Advances and Servicing Expenses

The amount of exposure that servicers have to servicing advances and costs associated with delinquent loans 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 here, describing for each market the concerns about liquidity and the sources of unreimbursed expenses associated with delinquent loans.

FANNIE MAE AND FREDDIE MAC

Liquidity. Servicers of pools guaranteed by the GSEs are required to advance principal and interest until the borrower is 120 days delinquent on the loan (Fannie Mae 2017, sec. 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 2017, sec. E-5-01) or, in some cases, after the completion of the foreclosure. The GSEs take possession of the property after the foreclosure sale, so the servicer is not responsible for any property costs after that point.

Costs of delinquent loans. For delinquent loans, the two major costs are the lost servicing fee and the costs of financing advances. The servicer takes its fee from the borrower’s monthly payment, so if the borrower stops making payments, the servicer does not get paid. The servicer also does not get reimbursed for the costs associated with financing servicing advances, although these costs are relatively small because the servicer is only on the hook for tax and insurance advances for extended periods. Servicers are also liable for costs associated with the foreclosure process and any incurred expenses in excess of GSE guidelines.

PRIVATE-LABEL MORTGAGE-BACKED SECURITIES

Liquidity. Servicers of private-label MBSs 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 Investors Service 2017b). 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 in these securities were still outstanding at the end of 2017, primarily representing legacy securities originated before the financial crisis.³⁸

Costs of delinquent loans. Private-label security servicers—unlike GSE servicers—eventually get reimbursed for their forgone servicing fees from the proceeds from the foreclosure sale or other resolution to the default. Like the GSE servicers, however, they are not reimbursed for the costs that they incur financing the advances (Cordell and others 2009).

GINNIE MAE

Liquidity. 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,

38. This is according to data from the Securities Industry and Financial Markets Association, “US Mortgage-Related Issuance and Outstanding” (<https://www.sifma.org/resources/research/us-mortgage-related-issuance-and-outstanding/>).

or late payments” (Ginnie Mae 2017, chap. 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 much of the advances eventually from the FHA, VA, or other government agency that provides mortgage insurance, or from other resolutions to the mortgage delinquency, but there can be substantial delays between when the servicer incurs the expense and when it gets reimbursed. In the FHA case, for example, roughly 40 months pass on average from the first missed mortgage payment until the point when the servicer is eligible to file a claim with FHA.³⁹ Unlike private-label security servicers, a Ginnie Mae servicer must keep advancing funds even if it anticipates that it will not recover them.⁴⁰

Costs of delinquent loans. Ginnie Mae servicers, like GSE servicers, do not receive the servicing fee for delinquent loans. However, for FHA-insured loans, servicers are allowed to include “debenture interest” in their insurance claim. Currently, this interest is roughly equivalent to the unpaid mortgage balance times the rate on the constant-maturity 10-year Treasury note on the day that the borrower defaulted. However, servicers lose the right to claim much of this interest if they miss certain deadlines in the default-servicing process, even if the deadline is missed by only one day. Karan Kaul and others (2018) document that the servicers in their sample lost part of this interest 43 percent of the time in 2015 and 2016, and that this forgone interest averaged about \$5,000.

Servicers of FHA-insured loans also are out of pocket for the first two months of interest associated with a borrower delinquency, and are exposed to potentially large property repair costs. Many of the property repair costs stem from the fact that the FHA, unlike the GSEs or VA, requires the servicer to bring the property up to salable condition after the foreclosure sale before it is conveyed to the FHA. The FHA does not reimburse some property preservation costs at all; for others, its allowance is below servicers’ actual costs. Repair costs associated with natural disasters can be

39. See HUD (2018, table 4), the sum of months spent in delinquency, foreclosure, and deed transfer.

40. “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, chap. 4).

particularly expensive for servicers.⁴¹ These repair costs can be large; the data used by Kaul and others (2018) indicate that average property preservation losses are about \$4,000 for the 53 percent of foreclosures that follow the more expensive conveyance route. Those same data also indicate that other losses associated with foreclosures, such as legal costs, average about \$3,500 for all types of foreclosures.

As an indicator of the size of these losses, the average annual gross revenue that a servicer earns from a performing loan is about \$575. The average revenue after adjusting for operating costs is about \$350, but this estimate assumes a low overall default rate on the portfolio (2.76 percent).⁴²

Unlike servicers of FHA loans, servicers of VA-insured loans are, in principle, reimbursed for almost all advanced funds and incurred expenses, including taxes, insurance, interest on the unpaid principal balances and other advances, property preservation expenses, and foreclosure costs such as attorney's fees. The VA reimburses the servicer for these expenses plus the credit loss on the mortgage (the difference between the unpaid mortgage balance and the sales price of the foreclosed property). However, the total VA reimbursement is capped, generally speaking, at 25 percent of the original mortgage balance.⁴³ Incurring costs in excess of this guaranteed amount is not difficult, especially if house prices decline by a nontrivial amount. Larry Cordell and others (2009), for example, note that legal fees, sales commissions, and maintenance expenses alone can total more than 10 percent of the loan balance.

To gauge the greater expense associated with servicing delinquent loans, and especially FHA or VA loans, we turn to data from the Y-14 schedule for MSRs. Large bank holding companies record their costs for servicing loans, broken out by type of servicing contract (GSE, 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.

41. The FHA does not reimburse servicers for the costs associated with repairing property damage caused by "fire, flood, earthquake, tornado, boiler explosion (for condominiums) or Mortgagee Neglect," where mortgagee neglect is defined as anything the servicer should have done to keep the property in salable condition between the foreclosure sale and the conveyance of the property to FHA (HUD 2016, sec. IV.A.2.a.ii.(A.)(1.), p. 835).

42. The gross revenue calculation assumes a loan balance of \$177,000 and a servicing fee of 32.5 basis points. The net revenue calculation assumes net operating income of 19.9 basis points. These are the averages for servicers that concentrate on government-guaranteed loans in the 2017:Q3 Mortgage Bankers Performance Report data, tables P2 and P3.

43. For details, see VA (2018, chap. 14).

For each bank, we calculate the cost of servicing a delinquent loan or 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, FHA, or VA. However, for loans in foreclosure, the costs differ significantly by type of servicing contract. For loans serviced under a GSE contract, the typical bank spends 17 times as much servicing a loan in foreclosure as a performing loan. For loans serviced for the FHA or VA, the typical bank spends about 50 times as much servicing a loan in foreclosure as a performing loan. In a separate data set of servicing expenses incurred by both bank and nonbank servicers, Kaul and others (2018) similarly find that the costs of servicing loans that are seriously delinquent or in foreclosure are three times as high for FHA loans as GSE loans.

SERVICING COMPENSATION Although Ginnie Mae servicers take on more risk than GSE 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, and 19 basis points for Ginnie Mae securitizations.⁴⁴ Because the mortgages in Fannie Mae and Freddie Mac 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 raise 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 Mae or Freddie Mac pools, especially when coupled with the ease of entry associated with the FHA and VA streamlined refinance programs (see section V). Some Ginnie Mae pools trade at better prices than GSE pools, and so originators realize more gain-on-sale income. In 2017:Q3, for example, nonbanks that had more than 50 percent of their originations headed for Ginnie Mae pools

44. 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 on a weighted average 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 a servicing fee of 44 basis points be retained, with no range. Issuers that want to capitalize their up-front cash will retain as low a servicing fee as possible in the interest of securitization into the highest MBS pass-through coupon.

earned 254 basis points on average in gain-on-sale income, compared with 196 basis points for those with less than 50 percent of originations destined for Ginnie Mae pools.⁴⁵ The price of originating the more profitable FHA and VA mortgages is accepting the servicing contract. Further, some nonbanks have less skin in the game and may be more willing to take on these risks, realizing profits in good times and knowing they have the option to go out of business if delinquency rates rise.

IV.B. Funding of Servicing Advances

Servicers need to finance the advances associated with delinquent loans 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 residential mortgage-backed securities (RMBSs) (Ramakrishnan 2013). The agreements governing the servicing of private-label RMBSs establish that the servicer is repaid first (before the bondholders) from the proceeds from the foreclosure or other resolution to the defaulted mortgage. Because of this first claim on the foreclosure proceeds, servicing-advance asset-backed securities (ABSs) are typically rated AAA by the rating agencies, and carry favorable financing terms. In one deal that was priced in 2012, for example, the yields on these ABSs were 1 to 2 percent.⁴⁶ Securitization terms typically will fund as much as 95 percent of the value for the types of advances that get repaid the fastest.

Even with the advent of securitization, however, large banks play a crucial role in the functioning of the servicing-advance market. The reason is that some of a nonbank's servicing-advance funding needs are predictable, and some 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 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

45. Mortgage Bankers Association Performance Report, table K2.

46. Servicing-advance ABSs 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 a 1.35% yield, while it paid a yield of 2% for another 2.99-year Triple A rated tranche" (Ramakrishnan 2013).

asset managers, pension funds, insurance companies, and hedge funds. The variable funding notes 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 those 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 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. This 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 (Fannie Mae 2017, sec. A2-7-02). As a result, servicers for Fannie Mae and Freddie Mac are generally able to obtain financing for their advances, although their need for such funding, as discussed in subsection IV.A, is much lower than for private-label securities 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 RMBSs.⁴⁷

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 will not be reimbursed for the outlays that it has made.⁴⁸

If Ginnie Mae declares a default and extinguishment under the applicable Guaranty Agreement, the Issuer forfeits and waives any and all rights to reim-

47. Ramakrishnan (2013) noted that an AAA-rated, 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 percent. See Colomer (2015) for coverage of other ABSs collateralized by Fannie Mae and Freddie Mac servicing advances.

48. Ginnie Mae, like Fannie Mae and Freddie Mac, has an acknowledgment agreement that covers mortgage-servicing rights.

bursement 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. (Ginnie Mae 2017, chap. 5, p. 5-4)

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 because many nonbanks have high-yield credit ratings.

IV.C. 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; servicing costs rise, and profitability falls. Meanwhile, financing conditions usually tighten during economic downturns. This combination means that servicing-advance financing is more expensive, and sometimes not available at all, at the same time that the need for it is greatest.

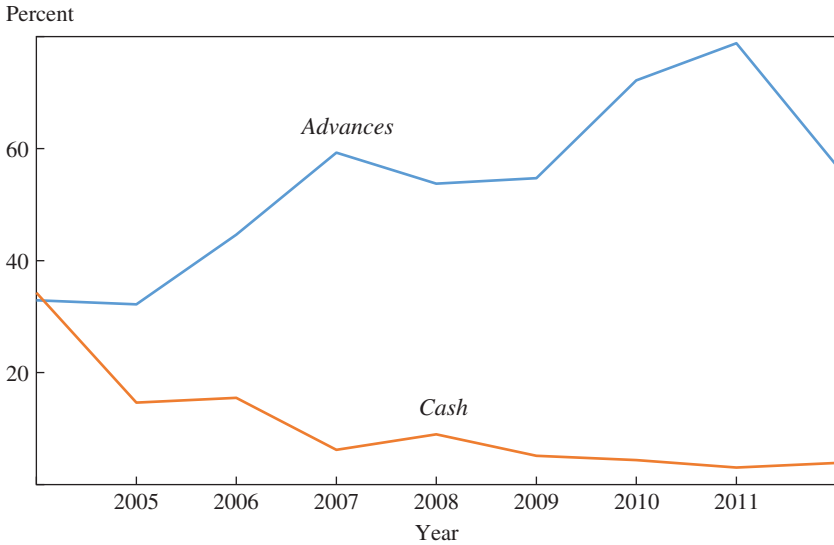
This dynamic can be seen both during and after the 2007–08 financial crisis. At that time, the private-label RMBS market was enormous—\$2.7 trillion—and the Ginnie Mae market was both small—\$400 billion—and primarily serviced by banks. The liquidity issues, therefore, were manifested in the experiences of companies such as Ocwen Financial Corporation, one of the largest subprime mortgage servicers at that time.⁴⁹ 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 percent in 2006, to 59 percent in 2009, and to a whopping 79 percent in 2011. Cash, meanwhile, contracted, reaching a low of 3 percent of assets in 2011.

As Ocwen noted in its 2008 10-K,

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

49. In its 2008 10-K, Ocwen describes itself as “one of the largest servicers of subprime mortgage loans” (Ocwen Financial Corporation 2009, p. 6). We focus on the experience of Ocwen because it is publicly traded, so data are available.

Figure 8. Selected Assets of Ocwen Financial Corporation Relative to Total Assets, 2004–12



Sources: U.S. Securities and Exchange Commission, Ocwen’s 10-K filings; authors’ calculations.

additional advances, we could to [*sic*] 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 financial condition and results of operations and could trigger cross-defaults under our various credit agreements. (Ocwen Financial Corporation 2009, p. 12)

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 that “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” (Ocwen Financial Corporation 2009, p. 24).⁵⁰

In a hearing before the House Subcommittee on Housing and Community Opportunity, William Erbey, the chairman and chief executive officer of Ocwen, stated that “the large commercial banks who have traditionally provided this financing have all but withdrawn from the market” (Committee on Financial Services 2009, p. 74). The large banks withdrew,

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

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 [Federal Housing Finance Agency] 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)” (p. 74).⁵¹

Concerns were also raised that the servicers’ financing difficulties would give them an incentive to foreclose quickly on delinquent homeowners or give them modifications that were not in the best interests of the consumer or MBS investor, because these resolutions to mortgage distress would allow servicers to recoup their advances faster.⁵² In part as a response to these concerns, the Federal Reserve Board (2009) included servicing-advance ABSs as an eligible asset class for TALF, noting that “accepting ABS backed by mortgage servicing advances should improve the servicers’ ability to work with homeowners to prevent avoidable foreclosures.” The inclusion of servicing-advance ABSs as a TALF-eligible asset class contributed to a decrease in interest rates for these securities and helped provide servicers with longer-maturity funding.⁵³ 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]” (Bernanke 2009). Ocwen stated in its 2009 10-K that “our prospects for advance financing have improved due to the inclusion of servicer advances in TALF” and that “our recent TALF issuances . . . increased the maturity for 42% of our advance financing needs at fixed interest rates” (Ocwen Financial Corporation 2010, pp. 41–42). Five servicing-advance ABSs with balances totaling \$1.7 billion were ultimately financed with TALF loans.

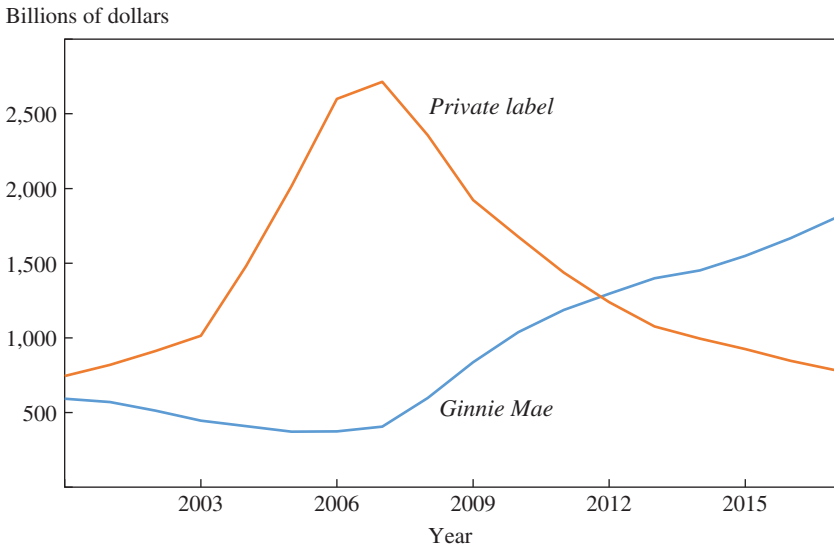
IV.D. Servicing-Advance Liquidity Today

Today, Ginnie Mae’s outstanding MBSs are quite large, and are primarily serviced by nonbanks, whereas the private-label market continues to

51. The five members of the Independent Mortgage Servicers Coalition were American Home Mortgage Servicing, Carrington Mortgage Services, GMAC Mortgage, Nationstar Mortgage, and Ocwen Loan Servicing.

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

53. See Campbell and others (2011) for a broader discussion of TALF’s effectiveness.

Figure 9. Outstanding Volume of Mortgage-Backed Securities, 2000–17

Source: Securities Industry and Financial Markets Association, US Mortgage-Related Issuance and Outstanding.

run off (figure 9). Financing the advances associated with Ginnie Mae’s MBSs is currently not a strain, because delinquency rates are low and servicers are generating sufficient cash from their operations. Likewise, the low delinquency rates mean that the costs associated with servicing delinquent loans are low.

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 & ABS 2017a*). As noted in subsection IV.A, natural disasters are particularly costly for FHA-insured loans, because servicers must repair the associated property damage out of pocket. Most nonbanks turned out to be sufficiently geographically diversified to withstand this strain.

More broadly, the worrying aspect of the situation now is that the current size of the Ginnie Mae market and the concentration of Ginnie Mae servicing in the hands of nonbanks is a combination that has never been

tested. The Ginnie Mae market was much smaller, and primarily in the hands of banks, during the financial crisis and its aftermath. A sustained rise in defaults on FHA and VA loans now could lead to large advances that nonbanks would be unable to finance, along with costs that they would be unable to absorb.

V. Nonbanks' Vulnerabilities to Macroeconomic Shocks

The liquidity vulnerabilities associated with nonbanks could be triggered or amplified by solvency issues. These solvency issues, in turn, might stem from the two major macroeconomic shocks that typically affect mortgage markets: interest rates and house prices. These shocks would probably have a disproportionate effect on nonbanks because of their business models.

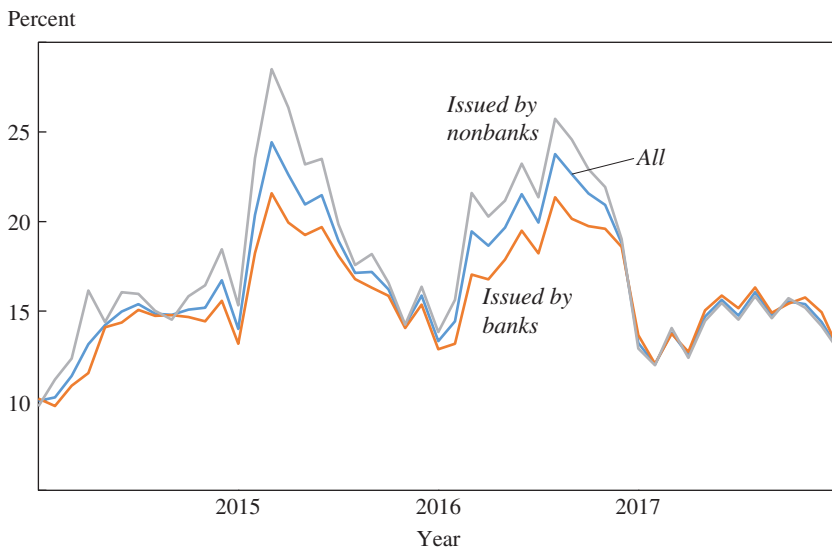
These potential hits to their profitability, described in more detail below, can also affect their liquidity through two channels. First, warehouse lenders can pull or reprice lines of credit if nonbanks violate the profitability covenants on the lines. Second, a decline in house prices and a corresponding rise in mortgage defaults will increase the servicing advances that a nonbank needs to finance along with the unreimbursed costs that it will need to absorb.

V.A. Refinance Mortgages and Vulnerability to Interest Rates

Many nonbanks have focused their businesses on originating refinance mortgages, which could make them more vulnerable to increases in interest rates, given that the demand for refinance mortgages is highly dependent on interest rates. Although the 2016 HMDA data indicate that, overall, just 48 percent 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 refinancings. In particular, for each of the three largest nonbank mortgage lenders, refinancings accounted for more than 70 percent of their 2016 originations. In addition, another four of the 25 largest nonbank mortgage lenders relied on refinancings for more than 90 percent 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 percent of all nonbank originations in 2016 were for refinancings, compared with 30 percent for banks. Traditionally, the lower-income, credit-constrained borrowers that are more prevalent in the FHA market have been less likely to refinance their mortgages, and this has led these borrowers to become locked into

Figure 10. Conditional Prepayment Rates for Ginnie Mae Securities Issued by Banks and Nonbanks, 2014–18



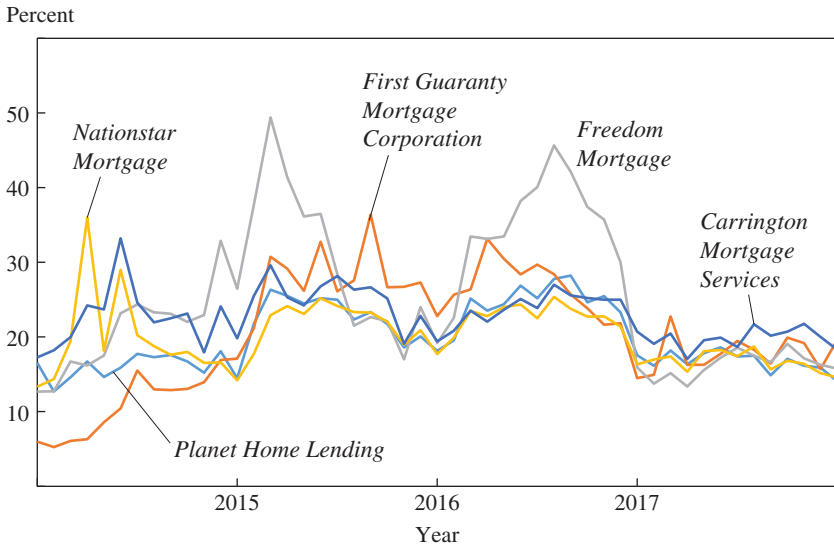
Source: Recursion Co. (data provided by Li Chang).

high-coupon mortgages and to be unable to take advantage of rate decreases, and thus lower interest payments on their mortgages.⁵⁴

However, the FHA and VA have introduced streamlined programs that allow lenders to refinance mortgages at a relatively low cost, and as a result several large nonbank lenders appear to have heavily focused their activities on refinancing borrowers in Ginnie Mae pools. HMDA data indicate that for four of the 25 nonbanks that originated the most FHA or VA loans in 2016, refinancings made up more than 70 percent of their total origination volume. The relative ease of refinancing through the VA program, in particular, appears to have induced some lenders to aggressively solicit borrowers for refinancings that may not have been in the borrowers' best interest (Consumer Financial Protection Bureau 2016; Rexrode 2017).

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 conditional prepayment rates

54. Deng and Gabriel (2006) found in the precrisis period that MBSs created from borrower pools with higher proportions of 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.

Figure 11. Conditional Prepayment Rates for Five Selected Nonbank Counterparties to Ginnie Mae, 2014–18

Source: Recursion Co. (data provided by Li Chang).

(CPRs) for bank and nonbank Ginnie Mae securities (based on all pools, as calculated by Recursion Co.).⁵⁵ 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, during times of elevated refinancing activity, such as in the first half of 2015 and mid-2016, the nonbank CPRs are considerably higher than the bank CPRs. In 2017, bank and nonbank CPRs both hovered around 15 percent. However, as shown in figure 11, some nonbanks have CPRs that are significantly higher than these industry-wide numbers, partly reflecting the elevated refinancing in the VA program. The CPRs of Freedom Mortgage, for example, spiked well above 40 percent in both 2015 and 2016. Ginnie Mae, as part of its investigation with the VA, 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 (Ginnie Mae 2018).

In the event of a sustained rise in long-term interest rates, refinancing activity and the associated revenue will drop, and this drop will hit the

55. We thank Li Chang for generously providing these data.

solvency of some nonbanks particularly hard. For some of these nonbanks, their MSR—*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.

V.B. Credit Quality and Vulnerability to House Price Declines

The 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 above, a larger fraction of nonbank originations are FHA or VA mortgages, which tend to be riskier than other types of loans. In 2017:Q3, the serious delinquency rates on FHA and VA mortgages on single-family homes were about 4 percent and 2 percent, respectively, compared with just under 1 percent for loans in GSE pools (Housing Finance Policy Center 2017b). Delinquency rates on FHA and VA mortgages that are originated and serviced by nonbanks are higher still. On the basis of issuer-level delinquency rates provided by Ginnie Mae, we estimate that on average 3.6 percent of mortgages in Ginnie Mae pools with nonbank issuer/servicers were two months or more delinquent in 2017:Q4, compared with 1.8 percent of mortgages in pools with bank issuer/servicers.⁵⁶

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 or VA mortgage category and the non-FHA and non-VA mortgage category (table 5). Nonbank 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 are 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

56. Averages are weighted by the outstanding pool balance. These delinquency rates are lower than those for FHA- and VA-insured loans overall because servicers have the option to buy delinquent loans out of the pools.

Table 5. Selected Characteristics of Mortgage Borrowers, by FHA or VA Status and Type of Lender^a

<i>Characteristic</i>	<i>FHA or VA mortgages</i>		<i>Not FHA or VA mortgages</i>	
	<i>Nonbanks</i>	<i>Banks</i>	<i>Nonbanks</i>	<i>Banks</i>
Share of all mortgages	0.15	0.18	0.29	0.38
Median household income	\$75,948	\$78,986	\$83,036	\$93,228***
10th percentile of household income	\$24,303	\$30,379*	\$26,706	\$31,311***
Median net worth	\$93,626	\$137,906***	\$214,850***	\$278,844***
10th percentile of net worth	\$6,701	\$21,627**	\$17,500*	\$46,890***
Loan-to-value ratio above 0.90	0.19	0.12***	0.13**	0.06***
Loan-to-value ratio above 0.95	0.13	0.06***	0.09**	0.03***
Median debt-service-to-income ratio	0.24	0.23	0.23*	0.23***
90th percentile of debt-service-to-income ratio	0.51	0.47	0.49	0.47***
Share turned down for credit in the last 12 months	0.25	0.22	0.14***	0.14***
Share that did not apply for credit out of fear of being turned down	0.12	0.11	0.09	0.04***
Share with a bachelor's degree	0.32	0.39*	0.32	0.46***
Share nonwhite	0.43	0.39	0.28***	0.20***
Average loan age (years)	5.1	6.2***	5.7*	5.9**
Share with a servicer change since origination	0.58	0.39***	0.51**	0.37***
No. of observations	351	279	679	1,098

Source: Federal Reserve Board, 2016 Survey of Consumer Finances.

a. Standard errors are adjusted to incorporate imputation uncertainty and are bootstrapped with 999 replications to incorporate the sample design. Statistically significant differences from the first column are indicated at the ***1 percent, **5 percent, and *10 percent levels.

Table 6. Mortgage Characteristics by Security Guarantor and Originator Type

Characteristic	<i>Fannie Mae and Freddie Mac</i>		<i>Ginnie Mae</i>	
	<i>Banks</i>	<i>Nonbanks</i>	<i>Banks</i>	<i>Nonbanks</i>
Debt-service-to-income ratio (percent)				
Median	35	36	40.25	42
Annual percentage change	6.0	5.9	2.5	3.7
Loan-to-value ratio (percent)				
Median	80	80	96.5	96.5
Annual percentage change	0.0	0.0	0.0	0.0
FICO score				
Median	753	748	700	675
Annual percentage change	-0.06	-0.06	-0.06	-1.3

Sources: eMBS.com; Housing Finance Policy Center (2017a).

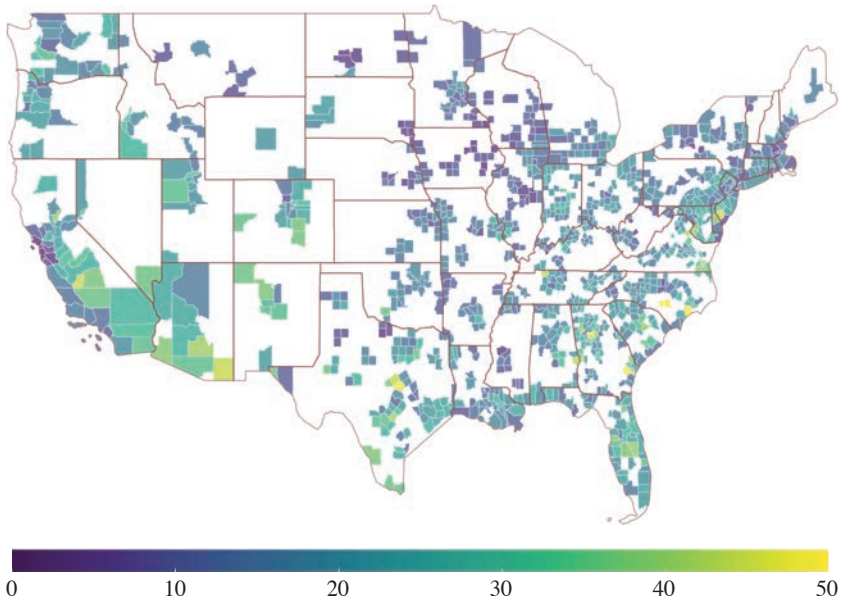
of nonbank borrowers who report that their current servicer is not the same institution as their mortgage originator.

Differences in the characteristics of mortgages originated by banks and nonbanks are also apparent in pools securitized by the GSEs and Ginnie Mae. As shown in table 6, the DTI ratios are slightly higher for nonbank originations in both GSE and Ginnie Mae pools. Median FICO scores are also lower for nonbank mortgages, by 5 points in GSE pools and by 25 points in Ginnie Mae pools. Furthermore, annual changes in both DTI ratios and median FICO scores suggest that the credit quality of nonbank originations in Ginnie Mae pools is declining more quickly than for bank-originated mortgages. In particular, nonbank DTI ratios have increased by 3.7 percent year-over-year, faster than the rate of increase for bank DTI ratios, and the downward trend in FICO scores is nearly twice as high for Ginnie Mae nonbank versus bank originations. (In contrast, the changes in DTI ratios and FICO scores for GSE pools 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, because overall mortgage default rates have been low.⁵⁷ However, due to the lower credit quality of loans being originated by nonbanks,

57. As of 2017:Q3, just under 1 percent of the GSE single-family loan portfolio was seriously delinquent, compared with 3.5 percent in 2012. Similarly, serious delinquency rates on FHA loans were under 4 percent, compared with 9 percent in 2012 (Housing Finance Policy Center 2017a).

Figure 12. FHA and VA Loans Originated by Nonbanks as a Percentage of All Mortgages, 2016



Sources: Home Mortgage Disclosure Act data; authors' calculations.

a rise in defaults would probably hit nonbank lenders and servicers particularly hard, as happened in the years leading up to the financial crisis.

The servicing-advance strains associated with a rise in defaults on FHA and VA mortgages would affect some parts of the United States 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.⁵⁸ This share is higher in the southern and southwestern parts of the United States, and in particular in parts of Georgia, North Carolina, Texas, Virginia, California, and Arizona.⁵⁹

58. The HMDA data are more representative for counties in metropolitan statistical areas.

59. 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, N.C.; Clayton, Ga.; Onslow, N.C.; Cumberland, N.C.; Bell, Tex.; Liberty, Ga.; Long, Ga.; Rockdale, Ga.; Cumberland, N.J.; Henry, Ga.; Kings, Calif.; Coryell, Tex.; Montgomery, Tenn.; Cochise, Ariz.; Russell, Ala.; Newton, Ga.; Douglas, Ga.; Guadalupe, Tex.; Stafford, Va.; Pinal, Ariz.; Hampton, Va.; Portsmouth, Va.; Charles, Md.; Suffolk, Va.; and Osceola, Fla.

Table 7. Assets and Liabilities of Independent Mortgage Companies, 2017:Q3

<i>Assets</i>	<i>Share of total</i>	<i>Liabilities</i>	<i>Share of total</i>
Mortgages held for sale	0.70	Lines of credit	0.83
Mortgages held for investment	0.01	Other short-term debt	0.05
Mortgage-servicing rights	0.11	Long-term debt	0.05
Mortgage advances	0.01		
Unrestricted cash and cash equivalents	0.06		
No. of independent mortgage company respondents			268

Sources: Mortgage Bankers Association, Mortgage Bankers Performance Report; authors' calculations.

Servicers with heavy concentrations in these areas may be more vulnerable to servicing-advance strains. The county-level data underlying figure 12 are available in the online appendix.

VI. Resources Available to Weather Shocks

In the event of an adverse 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 2017:Q3. The shares are based on simple averages of the reports of 268 independent mortgage companies.

Seventy percent of the nonbank assets are mortgages held for sale—that is, mortgages on their way to a securitization vehicle. These mortgages serve as collateral for the warehouse lines of credit that fund them, and thus are not available to the nonbank to absorb other shocks. About 10 percent of nonbank assets are MSR, which historically were the main unencumbered asset for nonbanks. In recent years, however, 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 during an economic downturn. For example, in 2008:Q4, the reported book values of MSRs held by banks fell by 33 percent, from \$76 billion to \$51 billion, even though the volume of one- to four-family residential mortgages serviced for others increased during that quarter (Federal Reserve Board and others 2016, p. 21). Meanwhile, cash represented just 6 percent 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

Table 8. Liquidity Measures for Independent Mortgage Companies, 2017:Q3

<i>Liquidity metric (median)</i>	<i>Majority GSE</i>	<i>Majority Ginnie Mae</i>
Ratio of unrestricted cash and cash equivalents to monthly recurring operating expenses (months)	2.6	2.3
Ratio of liquidity to tangible net worth (percent)	31	26
Ratio of FHA liquidity metric to agency-servicing unpaid principal balance (basis points)	66	39
<i>Memorandum</i>		
Percentage government-owned servicing	6.4	70
No. of companies reporting	144	51

Sources: Mortgage Bankers Association, Mortgage Bankers Performance Report; authors' calculations.

ratings, which makes raising funds in unsecured bond markets expensive.⁶⁰ Finally, nonbanks do not have access to the liquidity backstops available to banks, such as the Federal Reserve and the Federal Home Loan Banks.⁶¹

In addition, as described in subsection III.D, nonbanks are susceptible to increases in interest rates when their credit facilities mature. In 2017:Q3, 83 percent of their debt was in lines of credit, typically with maturities just under a year, and 5 percent was in 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).

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 classified according to whether servicing for Ginnie Mae represents less (“majority GSE”) or more (“majority Ginnie Mae”) than 50 percent of their servicing. As shown in the memorandum line of the table, servicing for Ginnie Mae represents about 6 percent of servicing for majority-GSE servicers, and 70 percent for majority-Ginnie Mae servicers. The statistics

60. In late 2017, Moody's senior unsecured ratings of major publicly traded nonbanks were: Ocwen Financial Corporation, Caa2; Walter Investment Management Corp., Ca; Nationstar Mortgage, B2; Freedom Mortgage Corporation, B2; PHH Corporation, B1; PennyMac, B2; and Quicken Loans, Ba1.

61. A couple of mortgage REITs have access to the Federal Home Loan Banks through captive insurance subsidiaries through 2019 (Light 2016).

provide median measures estimated for 144 majority-GSE servicers and 51 majority-Ginnie Mae 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 Mae servicers. The second measure, median liquidity relative to tangible net worth, is 31 percent for majority-GSE servicers and 26 percent for majority-Ginnie Mae servicers. The biggest gap between the two types of servicers appears in the FHA liquidity metric relative to the 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 Mae 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 adverse 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.⁶² Moody's notes that "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" (Moody's Investors Service 2016, p. 22). A company with a deep-junk rating of Ca or worse on this measure will have a value of 60 percent 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 percent of their gross tangible assets (Moody's Investors Service 2017a).

VII. Consequences of a Nonbank Mortgage Company's Failure

In the event of a failure by a nonbank mortgage company, three main types of parties would have exposure: (i) consumers; (ii) the U.S. government and, by extension, taxpayers; and (iii) banks and other creditors.

VII.A. Effects on Consumers

A large-scale failure of nonbanks has the potential to lead to a significant contraction in mortgage origination capacity. As noted in subsection V.B, nonbanks disproportionately serve borrowers with lower credit scores,

62. Gross tangible assets exclude credit loss reserves.

higher loan-to-value ratios, and higher DTI ratios; they also disproportionately serve lower-income and minority borrowers. If a nonbank failure were to result 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.⁶³

On the servicing side, as discussed in subsection IV.C, 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; and mortgage modifications might be 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 before the crisis, so these worries are somewhat less acute. Nonetheless, a disorderly servicing transfer may still be confusing or stressful for borrowers.

VII.B. Effects on the 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, the DOJ (on behalf of the FHA) pursued originators through putbacks and enforcement actions for losses associated with poor loan underwriting. Because the mortgages in GSE and Ginnie Mae pools at that time were primarily originated by banks that survived the financial crisis, the government was able to recoup billions of dollars in losses. In contrast, if a stressful situation unfolded today, some nonbanks might not have the resources to survive, and their remaining assets—such as the mortgages collateralizing the warehouse lines—would transfer to the lender with the lien on the collateral and would not be available to the government as recourse for poor underwriting.

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 these deficiencies can be costly. The GSEs or Ginnie Mae

63. See Anenberg and others (2017) for one study that establishes the significant effect of credit availability on house prices.

might have difficulty finding a new organization to take over the servicing, 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. The contraction in servicing capacity in recent years has exacerbated this issue. In 2008, for example, 77 percent of independent mortgage companies serviced their own loans; by 2017:Q3, the share was 43 percent.⁶⁴

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. If the servicing still has value, these credit losses may not be large, because Ginnie Mae receives the MSR for free and can sell them for cash. However, Ginnie Mae might struggle operationally if it had to handle several servicer failures at the same time.

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 & Whitaker.⁶⁵ These losses were forecasted to arise from the portion of the credit losses that were not covered by the FHA, VA, U.S. Department of Agriculture, or Public and Indian Housing credit insurance on the loan, and from the costs of servicing and liquidating the portfolios. The extensive fraud involved in the failure of Taylor, Bean & Whitaker, however, may make it a poor example for generalization.

VII.C. Effects on Banks and Other Creditors

The banks that lend to nonbanks seem to have fairly small exposure to nonbank failure. The bank warehouse lines of credit are collateralized by loan originations, and, as detailed in subsection III.F, contain multiple additional protections for creditors—including personal guarantees, collateral in addition to the loan originations, and provisions 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 to nonbank mortgage companies relative to assets

64. This is according to the Mortgage Bankers Performance Report.

65. Taylor, Bean & Whitaker at that point was the fifth-largest issuer of Ginnie Mae securities. See note H in Ginnie Mae's fiscal year 2010 financial statements (Carmichael, Brasher, Tuvel & Company 2011) for more details on Ginnie Mae's losses.

Table 9. Warehouse Line Commitments Relative to Bank Holding Company Assets and Equity

<i>Committed warehouse lines</i>	<i>25th percentile</i>	<i>Median</i>	<i>75th percentile</i>
Relative to assets (percent)	0.05	0.42	0.67
Relative to equity (percent)	0.46	3.29	5.60

Sources: Federal Reserve Y-14 data; authors' calculations.

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 percent of assets for the three percentiles shown. Commitments are larger relative to equity; but even at the 75th percentile, they are only 5.6 percent of equity. Many of the nonbanks' other creditors (such as the investors in servicing-advance ABSs) are also secured by assets such as servicing advances or MSRs.

A more significant effect on banks may stem from the fact that some banks have exited the servicing business and have outsourced their servicing operations to nonbanks. Citigroup, for example, announced in 2017 that it was disbanding its mortgage-servicing department and hiring a non-bank subservicer to service its remaining portfolio of bank-held mortgage loans (Gray 2017). If the subservicer were to fail, Citigroup could have difficulty finding another servicer to pick up the portfolio, and would not have the capacity to service the loans itself.

VIII. Regulation and Housing Finance Reform

In this section, we discuss how the regulatory environment for nonbanks is less stringent than that for traditional banks, and how current housing finance reform proposals have not focused on the risks associated with the increased presence of nonbanks.

VIII.A. 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 Board, 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 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.⁶⁶ CSBS (2017) also issued a proposal for prudential standards for nonbank mortgage servicers that it has not yet finalized. These regulators have also invested heavily in collecting and aggregating regulatory financial data on nonbank mortgage servicers through the Nationwide Multistate Licensing System; these data are gathered through a periodic report of condition and income known as the Mortgage Call Report (NMLS 2016). 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. Here we review the requirements for nonbanks, because 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 here.

Both the GSEs and Ginnie Mae set minimum requirements for their counterparties.⁶⁷ The minimum net worth requirements are \$2.5 million plus 25 basis points on the servicing unpaid principal balance (UPB) for GSE counterparties, and \$2.5 million plus 35 basis points on the issuer UPB for Ginnie Mae counterparties (Fannie Mae 2017; Freddie Mac 2017; Ginnie Mae 2017). The minimum required ratio of 6 percent for tangible net worth to total assets is the same for the GSEs and Ginnie Mae. The minimum liquidity requirements for nonbank GSE seller/servicers are 3.5 basis points of servicing UPBs, with an additional increment for nonperforming loans of 200 basis points for the amount of the nonperforming

66. The examination manual is available at <https://www.csbs.org/mortgage-examination-supplements>.

67. The Ginnie Mae requirements described here are for their single-family forward-mortgage issuer/servicers.

loan portfolio in excess of 6 percent 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 nonbanks to submit an audited end-of-fiscal-year financial statement and unaudited statements for the remaining three quarters (Fannie Mae 2017; Freddie Mac 2017; Ginnie Mae 2017). Nonbanks are also required to submit the Mortgage Bankers Financial Reporting Form (MBFRF) on a quarterly basis.⁶⁸ The MBFRF was revised in 2008:Q3 to require quarterly reporting of all debt facilities, including the many variants of warehouse facilities.⁶⁹ 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.

There are several limitations of this monitoring framework, some of which were originally pointed out by Kaul and Laurie Goodman (2016):

—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-size-fits-all minimums. In contrast, the bank regulatory framework takes many factors into account and uses risk-based assets in capital calculations.

—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 probably already under financial stress. A better approach might be to require higher levels of liquidity throughout the business cycle.

—Market conditions can change rapidly, particularly when interest rates swing. Quarterly financial statements that are provided with a lag, particularly those that are unaudited, may not give regulators enough information to spot issues in a timely way.

68. The MBFRF is available at <http://www.freddie.mac.com/singlefamily/forms/sell/pdf/1055.pdf>.

69. The form now requires an accounting of repurchased loan lines, reverse repurchase facilities, mortgage-servicing rights, lines of credit, and asset-backed commercial paper facilities.

—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.

—The GSEs’ 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 [Fannie Mae and Freddie Mac]. While oversight of these counterparties 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 [Fannie Mae and Freddie Mac]. (FHFA 2017, p. 63)

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 (HUD 2017a) identified numerous problems and deficiencies, including:

—Ginnie Mae did not implement policies and procedures for its account executives in a timely manner.

—Ginnie Mae did not develop a default strategy.

—Ginnie Mae was not prepared for growth and its staff lacked skills.

—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.

—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 members to handle its nearly \$2 trillion in outstanding MBSs, including the associated risk analytics.⁷⁰ This staff is supported by contractors that handle bond

70. The \$2 trillion number referenced here includes all outstanding MBSs, not just the \$1.8 trillion in single-family MBSs cited earlier in this paper.

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 percent of the [full-time employees] performing Ginnie Mae core competencies, and 84 percent of all Ginnie Mae [full-time employees]. . . . Ginnie Mae staffing would be approximately 1,434 rather than 852 if it were staffed at a level comparable to similarly situated entities” (HUD 2017b, 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.

VIII.B. 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; and Parrott and others 2016a, 2016b, 2016c, 2017). Although all these proposals discuss the future regulation of the GSEs in depth, there has been much less discussion of how to mitigate the significant 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 more important part of this discussion.

For example, the Mortgage Bankers Association (2017, p. 6) does not touch on the risks associated with nonbanks at all. Indeed, it portrays the rise of nonbanks as an unalloyed positive for consumers: “Fortunately for consumers, the gap in funding was filled by independent mortgage bankers, . . . whose market share in both purchases and refinances increased from the low 20s in 2008 to nearly 48 percent in 2015.” Although we agree with the Mortgage Bankers Association that independent mortgage bankers played a crucial role in ensuring access to credit in the aftermath of the financial crisis, it is important to take account of, and plan how to manage and regulate, the additional risk that these firms bring to the market.

Moreover, the risks associated with nonbank servicers that we highlight in this paper will be even more significant under some housing finance reform proposals. For example, Michael Bright and Ed DeMarco (2016) propose expanding the Ginnie Mae model. The GSEs, along with other entities licensed by the FHFA, would provide credit enhancement for loans in

MBSs, while Ginnie Mae would wrap the MBSs and guarantee the timely payment of principal and interest to investors.⁷¹

As noted in section IV, the need to fund servicing advances associated with delinquent loans can place large liquidity pressures on Ginnie Mae servicers. Expanding the Ginnie Mae model to a larger set of loans and lenders has the potential to expand these liquidity pressures. Bright and DeMarco (2016) recommend that Ginnie Mae be given more resources to ensure that servicers are able to handle this risk.⁷² A follow-up piece (Kaplan and others 2018) further considers these liquidity issues. Whether servicers in this expanded model are also exposed to the costs of servicing loans in default, as under the current Ginnie Mae arrangement, will depend on the contracts between the new credit enhancement entities and the servicers.

We believe that mortgage reform proposals need to grapple seriously with the extent to which servicers are required to advance payments for delinquent loans, and the exposure that the servicers have to the unreimbursed costs associated with these loans. If either of these risks will be significant for nonbank servicers in a housing reform proposal, it seems important either to have a strong regulatory framework to ensure that servicers will have the resources to weather these risks in a stressful environment, or to find a way to limit the servicers' exposure to these risks.

IX. 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

71. The new GSEs would also be able to purchase loans from small and mid-sized lenders and issue MBSs with Ginnie Mae guarantees.

72. "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. . . . 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" (Bright and DeMarco 2016, p. 16).

to nonbanks at favorable rates. Delinquency rates have been low, and thus nonbanks have not needed to finance servicing advances.

In this paper, we ask, “What happens next?” What happens if an unexpected development in the mortgage market causes lenders to lose their taste for extending credit to nonbanks? What happens if delinquency rates rise and servicers need to advance substantial payments to investors—advances that, in the case of Ginnie Mae pools, the servicer will find very difficult to finance? What happens if these liquidity issues are compounded by solvency issues, such as a sharp contraction in refinancing revenue or a surge in the costs associated with mortgages in default?

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, they have even less liquidity on hand than other nonbanks. Failures of these nonbanks in particular would have a disproportionate effect on lower-income and minority borrowers. As one example of this disproportionate harm, we observe that loans with FHA or VA insurance represented 52 percent of all mortgages originated to black and Hispanic borrowers in 2016, compared with 30 percent of all mortgage originations in the market as a whole.⁷³

In the event of the failure of a nonbank, the government (through Ginnie Mae, the FHA, the VA, 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 they are lending to nonbanks through warehouse lines of credit, which provide banks with numerous protections in the event of nonbank failures.

Although the monitoring of nonbanks on the part of the GSEs, Ginnie Mae, and the state regulators has increased substantially during 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

73. This is based on HMDA data. The sample is limited to first-lien mortgages collateralized by owner-occupied, site-built, single-family homes.

in microprudential 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 that has 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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Comments and Discussion

COMMENT BY

ARVIND KRISHNAMURTHY This paper by You Suk Kim, Steven Laufer, Karen Pence, Richard Stanton, and Nancy Wallace documents the dramatic change in the residential mortgage market since the financial crisis. The share of nonbank mortgage originations rose from 25 percent in 2009 to 50 percent in 2016. The new shadow banks operate like the precrisis shadow banks. They originate mortgage loans, hold them for a short period, then pool them and issue mortgage-backed securities to investors. The originate-to-distribute model is back!

The thesis of the paper is that this shift has again created a source of fragility and systemic risk. The system is prone to liquidity crises, during which mortgage credit will be squeezed, triggering a housing crash and another recession.

My discussion asks: How would a crisis stemming from this latest incarnation of shadow banking play out, and how concerned should we be about systemic risk?

SYSTEMIC RISK AND FINANCIAL CRISES Three variants of financial disruptions occur during financial crises.¹ Most financial crises feature some mix of these disruptions. I outline them as separate mechanisms in order to frame the findings in the paper. Systemic risk can be defined as the probability that these financial disruptions occur.

A run from safe assets. Investors purchase debt claims issued by firms, banks, or households that they think have a low credit risk. There is a selection effect at work here. The pool of investors are ones who have a

1. For further discussion of these mechanisms and historical examples, see Krishnamurthy (2010).

hard time assessing credit risk and thereby demand safe debt claims. In the bust, the “safe” debt claim proves to have risk, and the safe-asset investors sell their claims for even safer assets. Prices of the now-risky debt plummet and financing costs rise, and if the credit supported significant economic activity, there are attendant macroeconomic consequences.

Many of the 19th-century banking crises fit this narrative. Investors hold money in the form of bank deposits. Questions arise about the soundness of bank assets, investors withdraw money, and a banking panic ensues.

This narrative also applies to the 2007–09 crisis, as has been prominently emphasized by Gary Gorton (2008). Banks and nonbanks originate mortgages, hold them for a short period, and pool them to issue mortgage-backed securities to investors. Investors purchase these private-label mortgage-backed securities, viewing them as AAA rated, and thus buy into the notion that the financial engineering behind pooling and tranching creates safety. Shadow banking and the originate-to-distribute model emerge. Then, in 2007 and 2008, defaults in the mortgage market trickle up to reduce the valuation of the advertised-as-safe AAA tranches. The financial engineering has not worked, and the safe-asset investors realize that they did not own a safe asset and run from this market. The collapse of the securitization market had spillover effects on housing, the cost of credit, and the macroeconomy.

Insolvency risk and credit crunch. Financial intermediaries own risky assets financed largely with debt. In a downturn, the value of the risky assets falls, reducing the value of equity capital and triggering the risk of insolvency. Increased distress costs or debt overhang problems lead to increases in financing costs that are passed on to bank-dependent borrowers, or they trigger fire sales that reduce the market values of related assets. If the sectors affected by the credit crunch are sizable, there are macroeconomic spillovers.

This narrative is present in the 2007–09 financial crisis. As banks took losses on mortgage loans, their equity capital levels fell, resulting in a credit crunch that raised the cost of both consumer and business credit. The narrative also applies to mortgage servicers. These servicers suffered losses during the crisis. As Samuel Kruger (forthcoming) shows, they then aggressively pursued borrowers to receive payments. This led to an increase in foreclosures and strained household balance sheets.

Insolvency risk and short-term debt runs. Financial institutions that are funded primarily by short-term debt, as opposed to equity or long-term debt, are vulnerable to self-fulfilling runs, as in the classic model of Douglas Diamond and Philip Dybvig (1983). During the recent financial

crisis, the failures of Lehman Brothers and Bear Stearns best exemplify these types of runs. In both cases, losses eroded solvency over a period of months. The run dynamics were present in the last week before the failures. Prime brokerage customers, fearing imminent failure, moved their funds to other financial institutions. Both institutions were also unable to obtain repo financing, even against high-quality collateral such as Treasury bonds. Darrell Duffie (2010) describes the failure of these dealer banks.

PRECISIS SHADOW BANKING The shadow banking facts in the 2007–09 financial crisis are well known, so I do not repeat them in depth here. I highlight some of the more pertinent facts for my discussion. The data are taken from a paper by Benjamin Keys and others (2013).

—Originations of jumbo, Alt-A, and subprime loans—which cannot be guaranteed by the government-sponsored enterprises (GSEs)—were between \$1 trillion and \$2 trillion in the boom years of 2004–06.

—Securitization rates of Alt-A and subprime loans ranged from 70 to 90 percent during these years. Securitization rates for loans made by the GSEs were similarly high.

—In the 2008–09 bust, the securitization rates of Alt-A and subprime loans fell to near zero.

—The origination volume of Alt-A and subprime loans fell to near zero, while jumbo loans fell to around \$100 billion.

—GSE loan securitization rates and volumes of loan originations were only modestly lower during the bust than during the boom.

The securitization market for non-GSE loans boomed before the crisis and essentially shut down during the crisis. The flow of mortgage credit—particularly to Alt-A and subprime borrowers, which was dependent on the functioning of the securitization market—dried up. The rise and fall of shadow banking before the crisis is a story of the rise and fall of the non-GSE securitization market. Also relevant here is that there was no marked bust apparent in the GSE market.

NEW SHADOW BANKING The authors document a significant shift in the mortgage market after the crisis, and argue that this market is vulnerable to a liquidity crisis.

Nonbanks currently drive just over 50 percent of new mortgage origination. Who are these nonbanks? They are nondepository institutions with a long-standing presence in the mortgage market (New Century Financial Corporation is a good example from before the crisis) and new entrants that have increased market share via online lending platforms (for example, Quicken Loans). There is evidence that the growth of nonbank lending is

due to both regulatory constraints on the traditional banking sector and the growing importance of fintech (Buchak and others 2017).

Nonbanks originate loans, carry these loans on their balance sheets for a few weeks, and then securitize and sell them, either to Fannie Mae and Freddie Mac or via the Ginnie Mae platform. In recent years, the nonbanks have issued over 70 percent of the loans under the Ginnie Mae platform. These loans are largely insured by the Federal Housing Administration or the Department of Veterans Affairs, and they conform to the rules of these insurers. Greg Buchak and others (2017) argue that such growth reflects regulatory constraints on traditional banks in lending to particular segments of the market.

An important point is that unlike the precrisis shadow banks, the new shadow banks issue government-insured loans, either through Fannie Mae, Freddie Mac, the Federal Housing Administration, or the Department of Veterans Affairs. The precrisis shadow banks issued private mortgage-backed securities with no government insurer, and where safety was created through the financial engineering of pooling and tranching.

Nonbanks have no deposit base. They do not issue insured deposits or have access to the Federal Reserve's discount window. They rely on funding from banks to finance the cycle from making loans to selling loans via securitization. This funding, known as warehouse credit, is typically short-term debt financing that is collateralized by new loans. The authors document, using balance sheet data from bank holding companies, that the quantity of such warehouse credit in late 2016 totaled nearly \$40 billion. In 2016, nonbanks cycled through these warehouse credit lines as they originated and securitized about \$1 trillion in mortgage loans.

Nonbanks retain almost no loans themselves. A large fraction of shadow bank loans (upward of 50 percent) are sold in the agency securitization market as described. A significant fraction (about 30 percent) is also sold directly to banks or insurance companies. In contrast, traditional banks sell about 50 percent of their loans in the agency securitization market and retain nearly 50 percent on their own balance sheets, presumably funded via deposits.

The final salient point made by the authors concerns mortgage servicing. The nonbank loan originator is responsible for making payments to the mortgage-backed security holder and in turn collecting payments from the homeowner or borrower. This may involve a time gap, which is likely larger during a period of stress, when households may face liquidity constraints. The servicer makes the payment before it receives the payment, and thus it must finance the advance. The authors note the experience of

Ocwen Financial Corporation during the last crisis, where advances rose from 30 percent of assets in 2004 to 79 percent in 2011. The delay in payments creates a liquidity issue for the servicer. Also, if the household defaults and the payment is not received, the delay can lead to losses for the servicer, potentially eroding solvency.

LIQUIDITY RISK IN WAREHOUSE LENDING The authors argue that there is a significant liquidity risk to the system if the \$40 billion in warehouse credit lines disappears and is not replaced. In this event, the flow of credit from nonbanks to the mortgage market will suffer dramatically. On the order of \$1 trillion in new lending will disappear, which will have significant macroeconomic consequences.

The authors present evidence that warehouse credit to shadow banks did suffer in the last crisis, and indeed shadow banks dramatically reduced mortgage lending. But my discussion of the last and prior crises makes clear how this run occurred: It involved a run of safe-asset investors from assets they perceived to have been safe. The same ingredients are not present in the current arrangement. Banks that provide warehouse credit are not safe-asset investors. Indeed, they own mortgage risk themselves. The loans from nonbank mortgage companies are not private-label mortgages. They are sold with a government insurance wrapper, so market dynamics will more closely match the no-run, GSE segment of the 2007–09 crisis than the run in the private-label segment.

The second and third mechanisms appear more applicable to the current situation. During a recession, if banks suffer losses that reduce their capital levels, a generalized credit crunch will ensue and raise the cost of all credit, including warehouse credit lines. If, additionally, nonbank mortgage companies suffer losses that erode their solvency, warehouse lenders will possibly refuse to roll over their lines of credit, leading to failure and a disruption in the flow of residential mortgage credit. The fact that warehouse lines of credit are akin to short-term debt raises the possibility of a self-fulfilling run.

Both these latter mechanisms would be weakened to the extent that solvency concerns are removed. Thus, the authors underscore the importance of stress-testing and enforcing high equity capital standards for both traditional banks and shadow banks.

LIQUIDITY RISK FROM FINANCING ADVANCES The second risk the authors identify concerns advances. If the housing market suffers a downturn, then nonbanks will need to finance a larger quantity of advances. Lacking sources of financing to do so, mortgage servicers may aggressively pursue borrowers to receive payments, leading to an increase in

foreclosures and straining household balance sheets. Kruger (forthcoming) presents systematic evidence of the link between servicer stress and foreclosures.

My reaction to the authors' analysis of this risk is similar to my reaction to the warehouse liquidity risk concern. An important point is that Kruger's evidence on the servicer-foreclosure link during the 2007-09 crisis is for private mortgage securitization. Currently, because the bulk of the underlying mortgages carry government insurance, the government will cover losses due to default, up to a maximum loss amount. That is, unlike the 2007-09 crisis, the servicer owns some insurance. Banks will likely lend to nonbanks to finance the advances due from households that are guaranteed by the GSEs.

Two potential issues do remain in the current setting involving solvency mechanisms. First, if banks suffer capital losses in a housing downturn, they will raise the cost of credit to all borrowers, including nonbanks. The higher cost of credit will trigger the advances/foreclosures dynamic. Second, to the extent that losses are so large that they exceed government insurance, servicers will be pushed toward insolvency. The authors note that there is some ambiguity in the prioritization of the claims of mortgage servicers and government guarantors during a foreclosure. This ambiguity could further exacerbate solvency problems for the mortgage servicers. In this case, banks will cut back on lending to servicers. Here again, the core issue is one of insufficient capital for nonbanks and banks. Ginnie Mae requires nonbanks to maintain a 6 percent ratio of equity capital to assets. Will that be enough in a downturn?

CONCLUSION I applaud the authors for their careful investigation of the nonbank mortgage sector. The rise in the share of nonbanks in the mortgage sector is remarkable. The extent to which these entities are reliant on short-term debt funding is also a red flag for anyone concerned about systemic risk. My policy conclusion from reading their analysis is that systemic risk may be present in the current shadow banking sector. But it will play out in a much different way from what occurred during the 2007-09 incarnation of shadow banking, largely because much of the current version of shadow banking involves government guarantors. In particular, the authors' analysis underscores the benefits of rigorous stress-testing and enforcing high capital standards for banks. We should also investigate whether capital levels in nonbanks are sufficient to guard against their insolvency in a crisis.

I have focused my discussion on the systemic risk posed by the nonbank mortgage sector. It is worth noting the remarkable rise in the share of

postcrisis mortgage finance that is government guaranteed. Indeed, I have been sanguine about liquidity risk because of the role of the government in absorbing such risk. But such involvement is not without side effects. The current model is originate-to-distribute, with little skin in the game, raising the possibility of moral hazard, deteriorating credit standards, and boom–bust credit dynamics.

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COMMENT BY

SUSAN WACHTER The rise of nonbank lenders is the major structural shift in the mortgage market to come out of the financial crisis. You Suk Kim, Steven Laufer, Karen Pence, Richard Stanton, and Nancy Wallace fully document this shift. The authors also sound the alarm, warning of renewed financial fragility for taxpayers and consumers. The authors point to liquidity issues, which replicate those of the crisis years:

We describe how nonbank mortgage companies are vulnerable to liquidity pressures in both their loan origination and servicing activities, and we document that this sector in the aggregate appears to have minimal resources to bring to bear in an adverse scenario. We show how the same liquidity issues unfolded during the financial crisis, leading to the failure of many nonbank companies, requests for government assistance, and harm to consumers.

Nonbank lending has indeed surged in the aftermath of the crisis. The nonbank sector now originates half of all mortgage loans in the United States, up from 20 percent in 2006 and 30 percent in the years before the crisis. Government-backed securities fund most of this nonbank lending. Nonbank lending includes two-thirds of Ginnie Mae's securitized loans and half of the government-sponsored enterprises' (GSEs') securitized loans. The increase in the nonbank share of loans insured by Ginnie Mae and the GSEs has occurred at the same time as these government-backed loans have come to dominate the overall mortgage market. The contributions of the paper are, first, its careful documentation of the growth of this sector; and second, its modeling of the potential losses of the sector in an adverse scenario, losses that would be borne by the taxpayer. The paper focuses on nonbanks' mortgage seller and servicing functions as the source of potential losses. The taxpayer is exposed to these losses because the nonbank sector is primarily issuing government-backed loans. The magnitude of this exposure is large, despite the fact that it is dispersed among the approximately 400 seller/servicer mortgage companies that are authorized by Ginnie Mae and the GSEs.

These nonbank mortgage companies could fail due to either their seller or servicing functions. As sellers of securitized mortgages, nonbanks are exposed to pipeline risk. Because nonbanks hold 30-year, fixed-rate mortgages before they bundle them into securities, they continuously retain interest rate risk as they originate loans. At origination, borrowers can lock into a contractual interest rate, which could rise sharply, exposing nonbanks to a downward price shift in the mortgages they hold before securitization. Once packaged in Ginnie Mae or GSE securities, the interest rate risk is that of the investor, not the nonbank lender or the taxpayer. Nonetheless, before securitization, there is a system-wide issue because nonbanks as a group are exposed to this pipeline risk. After securitization, the nonbanks are also responsible for servicing the mortgage loans, including if they undergo default. The costs of such servicing are likely to increase dramatically in an adverse environment with a rise in defaults, and nonbanks in general are exposed to these losses if servicing fees collected in normal times are insufficient to cover heightened servicing costs in times of stress. This is potentially a liquidity issue: In the event of missed payments by borrowers, servicers of mortgages in securitized pools are required to advance the principal, interest, tax, and insurance payments. Although they are ultimately compensated for this expense, they are temporarily exposed to a potentially correlated source of unexpected costs.

The nonbank business model has not changed over time. But the key insight of the paper is that nonbanks—and, given their predominance in mortgage lending, the housing finance system itself—are newly vulnerable to a sudden withdrawal of funds by banks from the nonbanks—funds that keep the nonbanks in business. Nonbanks have limited capital, and they depend on lines of credit from banks to do business. If there were a threat to the nonbanks' profitability of sufficient size, either from an interest rate increase or from an increase in servicing costs, banks could and would immediately withdraw their lines of credit, putting nonbanks into failure.

The paper represents a large-scale effort to identify how vulnerable the nonbanks are to potential liquidity issues, due to the withdrawal of bank lines of credit. If nonbanks fail due to liquidity issues, they may go out of business. In order to induce other firms to operate in this space and to take over from the failed nonbanks, the taxpayer would need to cover both sources of losses after the nonbanks' limited capital runs out. Hence, the paper is correct that the taxpayer is exposed and that the mortgage market would be disrupted. The disruption in mortgage markets could be consequential, particularly for first-time homebuyers, who depend on Ginnie Mae's securitization of the Federal Housing Administration's guaranteed loans.

Nonetheless, this would not amount to a replay of the financial crisis. The systemic nature of the financial crisis was due first to the banking sector's financial impairment. Because banks' lines of credit to the nonbanks are limited, can be withdrawn quickly, and are collateralized, it is unlikely that the banking system would be exposed to significant losses. Hence, banks would be able to continue to lend, including to the mortgage market. The other cause of the systemic crisis was the insolvency of borrowers whose homes were underwater. Without the capacity to borrow, homeowners were forced to rebuild their balance sheets and decrease their consumption and home buying, putting downward pressure on housing prices.¹

In an adverse scenario today, these factors need not recur. Although the nonbank mortgage market would be disrupted, there would be buyers for these mortgage securities because they are government backed. New entities would be able to step in to issue these securities. These mortgage

1. The major sources of downward pressure on housing prices were (i) a reversal of house price bubble expectations; (ii) a reversal of too-easy lending without appropriate underwriting; and (iii) the surge in foreclosures themselves, which caused fire sales (Levitin and Wachter 2012).

securities are fundamentally different from those issued by private-label securitizers. Potential buyers of private-label securities in the crisis were deterred from these purchases, because the mortgages were not guaranteed and defaults were rising. A key difference is that reckless lending by poorly regulated mortgage entities drove prices up as they increased credit risk. Liquidity issues are different from solvency issues, and can be addressed.

That said, this paper is a major contribution to the discussion of today's mortgage market liquidity issues as well as to the discussion of the still-to-be-determined future shape of housing finance reform. This paper's warning on potential liquidity issues arising in this sector has encouraged attention to new means of increasing loan loss reserves and of bringing capital to bear to cover liquidity losses. A further contribution of the paper is to highlight the potential disruption to the market. What would happen if nonbank mortgage companies were forced to shut down rather than continue to make new creditworthy loans? Many small and medium-sized nonbanks would go under, at least temporarily, limiting mortgage lending, particularly to first-time homebuyers. This is not the too-big-to-fail risk that housing finance reform has been pointed toward solving, but a very different risk. Housing finance reform proposals that push for many entities that would all be facing the same interest rate and servicing cost risks and that would force these many entities to shut down would not ensure housing finance stability (Wachter, forthcoming).

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GENERAL DISCUSSION Phillip Swagel agreed that the paper raised important issues for the financial crisis and the future. Mortgage servicers were a significant obstacle to mortgage modifications, reducing the impact of foreclosure avoidance policies put in place in early 2009. If the government had been willing to refinance every mortgage at a 1 percent borrowing rate, servicers likely would have been unable to implement such a policy.

On the question of whether nonbank lenders posed significant liquidity risks during the crisis, Swagel was sympathetic to the authors' views in

practice. In principle, banks should be willing to provide bridge financing to servicers, because mortgage assets guaranteed by Fannie Mae and Freddie Mac could serve as collateral. In 2009 and following, however, the possibility of changes to the bankruptcy code to allow cramdown, by which a judge could write down the value of a mortgage, led to questions over the soundness of mortgages as collateral. This would have made banks hesitant to provide liquidity to servicers.

Liquidity challenges in the implementation of the mortgage system remain a policy issue. The Mortgage Bankers Association strongly opposed the House of Representatives' approach to housing finance reform because the House plan would have replaced Fannie Mae and Freddie Mac with a host of smaller credit-enhancer firms that might find it difficult to make good on their obligations in a future crisis, increasing the risk of loss for mortgage originators that are now able to rely on Fannie Mae and Freddie Mac to take on housing risk. Affordable housing advocates further worry that liquidity risks, such as those identified in the paper, could reduce mortgage modifications in a future crisis, hurting low-income borrowers in danger of losing their homes. One solution to this latter concern would be to provide guarantees on liquidity for servicers so mortgage modifications can still take place. This would be an expansion of the government's role in housing finance beyond guarantees on payments to investors who purchase mortgage-backed securities. It is difficult to imagine such an expansion of taxpayer exposure finding broad political support.

Swagel listed two additional possible solutions for the nonbank liquidity risks identified in the paper. First, mortgage lenders could vertically integrate: Big banks could be involved in origination, servicing, and securitization, and then provide the liquidity needed to modify loans. It would be politically difficult, though, to increase the scope of large bank activities. An alternative would be to focus on improved monitoring of the liquidity risks posed by nonbank lenders, with the Treasury Department's Office of Financial Research a natural candidate to collect such data.

Following up on Swagel's comments, Karen Dynan wondered why Ginnie Mae does not just collect the relevant data directly from its mortgage servicers or originators. Are legal, political, or organizational constraints preventing Ginnie Mae from doing so? She was also curious, more broadly, about the specific types of data that the authors would find useful, and whether such data could be collected by the Office of Financial Research without a change in the law, as Swagel had suggested.

Donald Kohn agreed with the authors that nonbank lenders pose significant financial stability and liquidity risks, and he highlighted that such

risks add an element of procyclicality to a market that is already procyclical. The financing structure outlined in the paper could pose fire-sale risks if warehouse mortgage lenders withdrew lines of credit—which seems plausible, given that during the crisis, repo loans against commercial paper backed by Fannie Mae and Freddie Mac were withdrawn. That is, just because a security is backed by the government does not mean that market participants will always accept it as collateral, and few policy tools exist to deal with such risk. Without changing the structure of housing finance, one potential solution could be to stress-test nonbank entities' liquidity and capital buffers against adverse scenarios, much as banks are stress-tested. These entities would then be required to raise appropriate liquidity and capital to survive such an adverse scenario. Although it remains unclear which government agency would run such stress tests, Kohn emphasized their importance, particularly because nonbank lenders' access to the Federal Reserve's discount window is severely constrained.

Robert Hall suggested that the suppression of mortgage brokers exacerbated the rise of the thinly capitalized nonbank lenders discussed in the paper. After Dodd–Frank banned the yield spread premium on mortgage loans, independent brokers left the market. Only vertically integrated entities could capture the value previously secretly rebated from lenders to independent brokers. Hall stressed that any solution to this problem of thin capitalization of these new entities should avoid government promises of a bailout, which would further destabilize the market.

Paul Willen noted that the problem of nonbank mortgage lending is not new. In the 1950s, very thinly capitalized nonbank lenders made about a third of mortgage loans. More recently, these mortgage servicers—including those for subprime mortgages—remained solvent during the financial crisis and successfully made their loan advances, despite many predicting that they would not. Willen asked the authors if they think the nonbank mortgage lending market had actually gotten worse, or if the risks that have existed for a long time were only now starting to be identified.

Amit Seru inquired about the market for loan transfers between servicers. He reasoned that if loan servicers faced liquidity or solvency constraints in the past and were able to transfer loans to other servicers, then nonbanks might pose less of a risk. In addition, Seru asked about state-contingent mortgage contracts and whether they were used in the residential mortgage-backed securities market. If state-contingent contracts that permit some type of special exclusion or service during an economic downturn could be used, they might be a solution. Such contracts are often made in the commercial lending market.

Jay Shambaugh noted that nonbank mortgage risk has become an increasingly prevalent focus in policy circles. He recalled attending meetings in 2015 and 2016 on the rising nonbank share of the Federal Housing Authority's loan market. But despite the growing interest, nonbanks have not been significantly incorporated into housing reform proposals. Echoing Willen's comments, Shambaugh noted that nonbanks actually constituted a smaller share of the mortgage market in 2000 and 2007 than they had historically, which suggests that the mortgage-lending environment may have become even riskier, whether from liquidity, servicing-induced foreclosures, or additional procyclicality. Shambaugh was at least optimistic that riskier loans now seem to be labeled as such, whereas in the past risky securities were often rated AAA.

Christopher Carroll argued that the key mechanism by which financial market disruptions matter to macroeconomic outcomes is by triggering major moves in consumer beliefs. In the recent crisis, retail sales spending fell by 10 percent between the weekend before the collapse of Lehmann Brothers and the weekend after—even though economists at the Treasury Department and the Federal Reserve felt that allowing Lehmann Brothers to collapse probably would not have major consequences, because it was not a particularly large institution. This experience demonstrates that economists have a poor ability to judge whether any particular collapse will trigger a panic. What matters is whether a new financial disruption *actually* panics consumers—not whether it *should* panic them. In their book *Animal Spirits*, George Akerlof and Robert Shiller suggest that the 1990 recession was caused by people's memories of past oil crises, and not by more fundamental or structural economic developments.¹ This interpretation suggests that what matters is not the exact details of the run or the market in which it occurs, but whether it reminds people of the collapse in the Great Recession. If it does, the economy may be exposed to major risks from the collapse of a particular financial market or institution, even if said market is sufficiently different from the market of the Great Recession.

Janice Eberly made two points. First, she noted the trade-off between liquidity risk and taxpayer risk. A policy that reduces liquidity risk would presumably pay for the risk through a government backstop, thereby shifting the risk to taxpayers, which should be a concern, given the lack of fiscal capacity. Second, she appreciated the authors' table 5, which

1. George A. Akerlof and Robert J. Shiller, *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism* (Princeton University Press, 2009).

shows that most nonbank loans are made to minority borrowers. These statistics are important for understanding the nature of the population that is most affected by nonbank mortgage risks at a microeconomic level, she concluded.

Richard Stanton responded to the comments by first observing that the size of nonbank lending was so large because the private mortgage market had not yet recovered from the crisis. Notably, someone with a FICO score below 750 would struggle to get a mortgage today, reflecting the fact that financial markets have not yet recovered. While acknowledging solvency risk, Stanton noted that several nonbank lenders had gone bankrupt recently, solely due to liquidity risks. For example, in 2016 one lender went bankrupt because of a technical rule violation, whereby the sale of several mortgages to a securitization vehicle was delayed; the lack of a timely sale triggered covenant violations and penalty fees, ultimately leading the firm to lose its credit lines and go bankrupt, more or less overnight. These types of bankruptcies happened frequently during the crisis, and they mostly occurred because of the withdrawal of credit lines. Delinquencies and defaults were limited, suggesting that solvency was a secondary concern relative to liquidity.

Stanton agreed with Shambaugh and Willen that the issue of nonbank mortgage lenders is not necessarily a new one. He nevertheless emphasized that these issues need to be taken seriously in light of the experience during the crisis, particularly because data on the risks are not widely available. On Swagel's and Dynan's questions about the practical obstacles preventing Ginnie Mae from acquiring data, Stanton noted that Fannie Mae, Freddie Mac, and Ginnie Mae do collect some data on nonbank mortgage lenders, but that these data are somehow jointly owned by the Mortgage Bankers Association, which does not share the data very widely. "I don't quite understand how or why this would be the situation," he said, "but it seems a bad idea that the Federal Reserve should not have access to these data."

On Seru's question about mortgage transfers, Karen Pence explained that mortgage service brokers do buy and sell the rights to service mortgages, allowing for transfers. These brokers create a very liquid market for the rights to service those Fannie Mae and Freddie Mac loans that are made to high-quality borrowers. However, the market for servicing rights to Ginnie Mae's loans to borrowers with lower-quality credit is very illiquid; firms that wanted to sell the servicing rights to Ginnie Mae's loans got no bids in 2017. Therefore, the transfer of servicing rights to nonbank mortgages is insufficient for dealing with liquidity risks.

Karen Pence disagreed with Willen's categorization that mortgage servicers survived the crisis unscathed. She pointed to congressional testimony, letters to Federal Reserve officials, and letters written by senators requesting that servicers be included as recipients of the Term Asset Loan Facility. She further noted that Ginnie Mae's loan contracts are less favorable to servicers than private securitization contracts. Under the latter, mortgage servicers' losses are capped and their servicing fee is immediately capitalized. Under the former, losses are not capped, and during the crisis the financing market for these servicers came under stress. This means that Ginnie Mae servicers face additional structural disadvantages that make them riskier.