

CURRENT VIEWS

THE U.S. HOUSING MARKET IN 2014

James R. Barth, Tong Li,
and Daniel E. Nolle



CURRENT VIEWS | APRIL 2012

THE U.S. HOUSING MARKET IN 2014

HOW MUCH FINANCING IS NEEDED, AND WHO WILL SUPPLY IT?

James R. Barth, Tong Li,
and Daniel E. Nolle

I. Introduction¹

Each week the ranks swell of those who believe that the U.S. economy is on the road to recovery. However, even amid the growing optimism, it is generally agreed that the greatest obstacle to robust recovery is the still-crippled housing market. The public dialogue about "solutions" has focused on the merits and flaws of specific proposals, such as foreclosure relief and mortgage modification programs.

Meanwhile and on a separate track, the debate over the future role of government-sponsored enterprises (GSEs) and, indeed, whether they should have a role, in the housing market cycles from front- to back-page news. Concerned observers can be forgiven for not clearly understanding that both sets of policy discussions are intertwined.

Discussions about the housing market also lack a clear description of the actual context in which specific policies are likely to succeed or fail. We propose starting by asking "How much of a housing market, when we have 'fully recovered,' are we talking about?" Essentially, we need a clear idea of the nature and size of the housing market "target" that policies should "hit." This paper addresses that question by asking and then answering two related questions:

(1) How big will demand for home mortgage financing be when the economy returns to its long-run trend growth?²

(2) What roles will the major credit providers likely play in fulfilling that demand?

We focus on the economy-wide supply and demand for housing credit in 2014, when many analysts and market observers expect a measure of stability to have returned to financial markets. Demand for housing credit comes from households; for this sector we look specifically at trends in, and prospects for, home mortgage borrowing. Mortgage credit extension includes loans by "banks" (i.e., commercial banks and thrifts) and, increasingly, securitization of home

1. The opinions expressed in this paper are those of the authors alone and should not be interpreted as reflecting those of the Office of the Comptroller of the Currency or the Treasury Department of the United States.

2. Throughout the paper, the term *home mortgages* refers to mortgages on one- to four-family properties.

mortgage loans in the form of residential mortgage-backed securities (MBS).³ The major issuers of MBS include the so-called “quasi-governmental” entities (the GSEs) and Ginnie Mae (the Government National Mortgage Association); and private-sector (“private-label”) issuers.

Our perspective is to look first at historical patterns in the flow of credit for home mortgages and to use those patterns to project the likely level of credit demand.⁴ We also employ two key assumptions: that there are no major changes in credit costs; and that long-run equilibrium in the housing finance market is represented by a tendency on the part of major credit providers to maintain their traditional share of credit extension.

We rely heavily on long-run average behavior in our analysis, excluding the recent crisis years of 2007–2009. For instance, if credit demand for home mortgages remains fairly stable, as we will argue it does, we deem it reasonable to expect it to stay stable over the next few years. Using this framework, we consider the extent to which the major providers of credit are likely to participate in financing consistent with the projected demand for housing credit. We specifically focus on whether the major credit-extension sectors will be able to supply their traditional share of housing credit to households. If that appears doubtful, we examine areas in which specific stress points or “bottlenecks” in credit provision may emerge.

Our baseline scenario describes a return to moderate, long-run, trend-type growth in the provision of bank credit, a development that is absolutely necessary for sustainable economic recovery.⁵ However, even if banks resume their long-run pattern of credit provision, this by itself will not generate sufficient new credit to meet likely demand if the economy returns to the normal trend level of gross domestic product (GDP) in 2014. Under these circumstances, we find that securitization must experience a healthy revival in the mortgage market.

3. Following common practice, we use the acronyms *MBS* and *RMBS* interchangeably for residential mortgage-backed securities unless specifically stated otherwise.

4. See appendix figure A1 for the magnitude of home mortgages and residential mortgages from 1945 to 2011 in dollar amounts and as a percentage of GDP.

5. Appendix figure A2 provides information on the changing role of banks and GSEs in providing home and residential mortgages from 1945 to 2011. Appendix figures A3 and A4 show the change in funding sources of residential mortgages in selected years. Appendix figure A5 shows that the private sector was the main provider of credit for residential mortgages and mortgage-backed securities from 2002 to 2007.

We base this finding on analysis of various scenarios under which there is too anemic a recovery of securitization in home mortgages. In such circumstances we consider whether banks and other providers might be able to “take up the slack.” We conclude that unless there were sharp adjustments in credit costs in the sector where securitization did not revive, the banks and other providers would not likely fill the gap. Consequently, a moribund securitization market is likely to lead to a serious brake on credit supply to the housing sector.

The paper is organized as follows: Section II describes our basic analytic approach, focusing in particular on the role of banks. Section III briefly describes the importance of securitization in housing finance, and summarizes the roles played by the GSEs, as well as by private-label issuance of securitized mortgage assets. Section IV considers possible near-term roles in home mortgage credit provision by banks, the GSEs, and private-label securitizers. That section highlights in particular the consequences of different shares of total credit extension by the GSEs. Section V summarizes our analysis and considers several significant policy implications.

II. Background and Analytic Approach

Credit extension is intimately linked with economic growth, both as cause and effect.⁶ In particular, as recently emphasized in Hickok and Nolle (2009), the flow of new credit, rather than the outstanding balance of debt, is a major driver of economic growth and development.⁷ The Federal Reserve System’s “Flow of Funds” details myriad dimensions of the sources and uses of credit throughout the U.S. economy. The key flow of credit on which we are focused is net new home mortgage borrowing, the underlying engine for the recovery of the housing market.

6. A large literature has established a strong positive correlation between finance and economic growth, but the nature of the causal link is still under debate. See Levine (2005) for an overview.

7. Our analytic procedure parallels that employed in Hickok and Nolle (2009) for possible credit extension scenarios across all major (non-government) sectors of the U.S. economy. In key respects, our analysis updates the end-2011 situation targeted in that study; also, note that our exclusive focus on the home mortgage market is considerably more detailed than the mortgage market analysis in that study.

The first step in our analytic approach is to establish the baseline, or long-run trend, for home mortgage credit extension. We use nominal gross domestic product (GDP) as our measure of output, and compare the net new flow of home mortgage credit to the level of nominal GDP, which in fact is a flow measurement.⁸

We compare the ratio of annual net new home mortgages to GDP across three different but overlapping long-run time periods, representing three takes on the long-run relationship between housing credit extension and economic output. Each of the periods ends in 2000, ahead of the housing market boom-and-bust; each incorporates at least one full business cycle, as well. Table 1 specifies those housing credit extension-to-GDP ratios. Broadly speaking, regardless of the length of the long-run period, the ratio of credit extension to GDP appears to be relatively stable.⁹ Thus, there is justification for using approximate “average” long-run ratios of home mortgage borrowing, as indicated in the bottom row of table 1.

Table 1. Long-run averages of home mortgages-to-GDP ratios

Time period	Net new home mortgage borrowing as percent of nominal GDP	Net new residential mortgage borrowing as percent of nominal GDP
1971–2000	3.4%	3.7%
1983–2000	3.5%	3.8%
1992–2000	3.1%	3.3%
Long-run pattern	3.4%	3.6%

Note: Residential mortgages are the sum of home mortgages and multi-family residential mortgages.

Sources: “Flow of Funds,” Federal Reserve; authors’ calculation.

The quantitative parameters for our second step are outlined in table 2.¹⁰ Dollar values for housing credit extension relative to the level of GDP are derived from the ratios at the

8. Note that this juxtaposition of credit flow to GDP indicates that there should be no change in the level of credit flow when there is no change in GDP. Intuitively, if the same number of houses is built this year as last, resulting in no change in construction’s contribution to GDP, we would expect there to be the same level of new mortgage credit flow this year as last year.

9. The ratio of housing credit to nominal GDP varies during different years in the business cycle. Because we are interested in equilibrium credit demand across the cycle, we use the average ratio of credit, which is remarkably stable across the various business cycles.

10. Box 1 at the end of this paper provides additional perspective to our analysis, giving background information on (1) long-run changes in the credit provision roles of banks, structured finance, and non-banks; and (2) the

bottom of table 1. We rely upon Bloomberg’s projections for real GDP growth and inflation rates for the fourth quarter of 2012 through 2014, as indicated in table 2, which puts nominal GDP at \$17,385 in 2014.

These projections are based upon the average forecasts of a group of analysts.¹¹ That figure, together with the table 1’s long-run average borrowing-to-GDP ratios for home mortgages, allows us to calculate the dollar amount of borrowing necessary to undergird economic output in 2014. Specifically, net new home mortgage borrowing, at 3.4 percent of the \$17.4 trillion GDP, would be \$585 billion.¹²

Table 2. Projection of credit extension in 2012 to 2014 (US\$ billions)

	Nominal GDP	Home mortgages	Residential mortgages	Underlying assumptions	
				Real GDP growth	Inflation rate
2012	\$15,745	\$530	\$565	2.20%	2.05%
2013	\$16,450	\$550	\$590	2.45%	2.00%
2014	\$17,385	\$585	\$625	3.10%	2.50%

Sources: “Flow of Funds,” Federal Reserve; Bloomberg; authors’ calculation.

Note: Calculations rounded to nearest \$5 billion. For forecasts of real GDP growth and inflation rates from 2012 to 2014, we use Bloomberg composites (February 2012 survey).

The role of the banking sector is the third underlying element for our analysis, and the anchor of our sectoral analysis of home mortgage credit provision. We define the term *bank* to include both commercial banks and thrifts, consistent with the new reality in banking. Many of the historic differences in scope of activities and business models that distinguished the two types of depository institutions from each other diminished substantially or disappeared over the past decade. In addition, the Dodd–Frank Act of 2010 further reduced the relative role of the thrift industry, a decline accelerated during the recent financial crisis when two of the largest thrifts, Washington Mutual and Countrywide, were merged into two large commercial

nature of major credit provision “holes” into which the economy stumbled as the financial crisis unfolded. Of particular importance is the MBS market.

11. Basically, we are projecting what housing credit demand and supply will look like once GDP reaches a certain level; the validity of our argument does not hinge on the precise timing of when this occurs.

12. Financial projections are generally rounded to the nearest \$5 billion in this paper; note also that ratios and projected levels are rounded independently, consistent with our goal of identifying broad trends rather than providing point estimates.

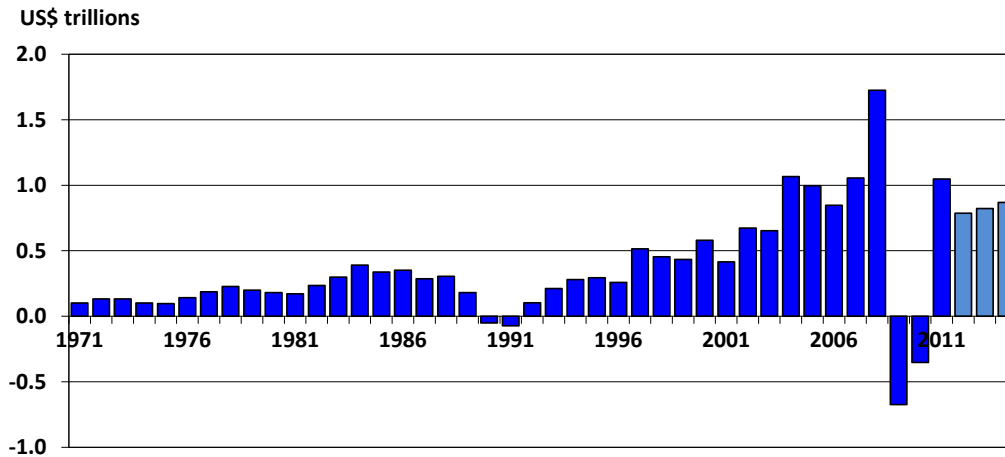
banks as part of rescue efforts led by the Treasury Department and Federal Reserve in mid- to late 2008.

To gauge the near-term role that banks could reasonably be expected to play as providers of credit in the housing market, we looked at past patterns of bank balance sheet growth. Figure 1 shows the pattern of net new acquisition of assets by the banking industry through 2011 (the darker bars represent projected new acquisition of assets for 2012 to 2014). To gauge what the future may look like, we estimate for 2014 what net asset acquisition would amount to for banks if their net new credit extension remained at its 2011 ratio to nominal GDP.¹³ That level of net new asset acquisition by banks for 2014 is shown by the lighter blue bar in figure 1.¹⁴

13. The relationship between bank net new acquisition of financial assets and nominal GDP growth is very erratic. Under such circumstances, we assume that the ratio of bank net new asset acquisition to nominal GDP remains constant at its 2011 level of 7 percent (compared to its average 7 percent for non-recession years in the 1970–2008 period), an assumption we posit in the absence of any compelling reason to expect this ratio to change. Doing so means that the annual bank net new asset acquisition growth pace stays roughly in line with its historically average pace over the past four decades. More important, the assumption is consistent with companion analysis we have done suggesting that the resultant 2014 target of \$850 billion in bank net new asset acquisition is achievable from a funding perspective, but that growth significantly stronger than this would likely be difficult to achieve. Note that to the extent our assumption about the 2014 level of bank net new asset acquisition is considered optimistic, the implications we describe subsequently in the paper for stresses/credit extension challenges faced by non-bank credit providers would become even stronger.

14. We base our analysis on a pre-FAS 140 world. The FAS 140 change requires banks to move some off-balance-sheet activities, notably credit card trusts, onto their balance sheets. The result of this change will be to increase the reported size of banks' balance sheets with the resultant increase in bank credit extension dedicated to financing what were previously off-balance-sheet activities. As such, it would be inappropriate to assume FAS 140–induced balance sheet growth will provide funds available to finance credit extension for purposes other than the previous off-balance-sheet activities. In order to carry out our analysis based on past bank credit extension trends by credit category, we therefore need to consider the size of banks' balance sheets excluding FAS 140–induced balance sheet expansion. See LaMonte (2009, page 4) and FitchRatings (2009) for explanations of FAS 140 accounting changes and their possible impact on bank balance sheets.

Figure 1. Banks' new assets acquisition, 1971–2014
(commercial banks and thrifts, projections after 2011)



Sources: "Flow of Funds," Federal Reserve; authors' calculation.

Table 3 contains the last set of preliminary information necessary for our analysis of overall housing credit extension. The table shows the long-run pattern of housing credit extension by banks to the household sector, expressed as a share of bank balance sheet growth. We define *credit extension* here to include not only new loans held on balance sheets but also banks' net new purchases of GSE and Ginnie Mae MBS.¹⁵

Table 3. Housing credit extension patterns by banks
(Housing credit extension as percent of new asset acquisition by commercial banks and thrifts)

	Home mortgages	Residential mortgages	GSE and Ginnie Mae securities	Private-label MBS
1971–2000	20.6%	23.9%	7.9%	<0.1%
1983–2000	18.7%	22.5%	8.1%	<0.1%
1992–2000	19.8%	20.7%	15.1%	<0.1%
Long-run pattern	20.0%	22.0%	10.0%	—

Sources: "Flow of Funds," Federal Reserve; authors' calculation.

¹⁵ In the "Flow of Funds," GSEs include Fannie Mae, Freddie Mac, the Federal Home Loan Banks (FHLBs), and the Farmers Home Administration (Farmer Mac).

Table 3 shows that total housing credit extension to households amounted to about one-third of the long-run (pre-housing market bubble) net new acquisition of assets by banks. Furthermore, the share of net home mortgage lending was relatively stable, at about 20 percent of bank balance-sheet growth before the housing market bubble emerged.

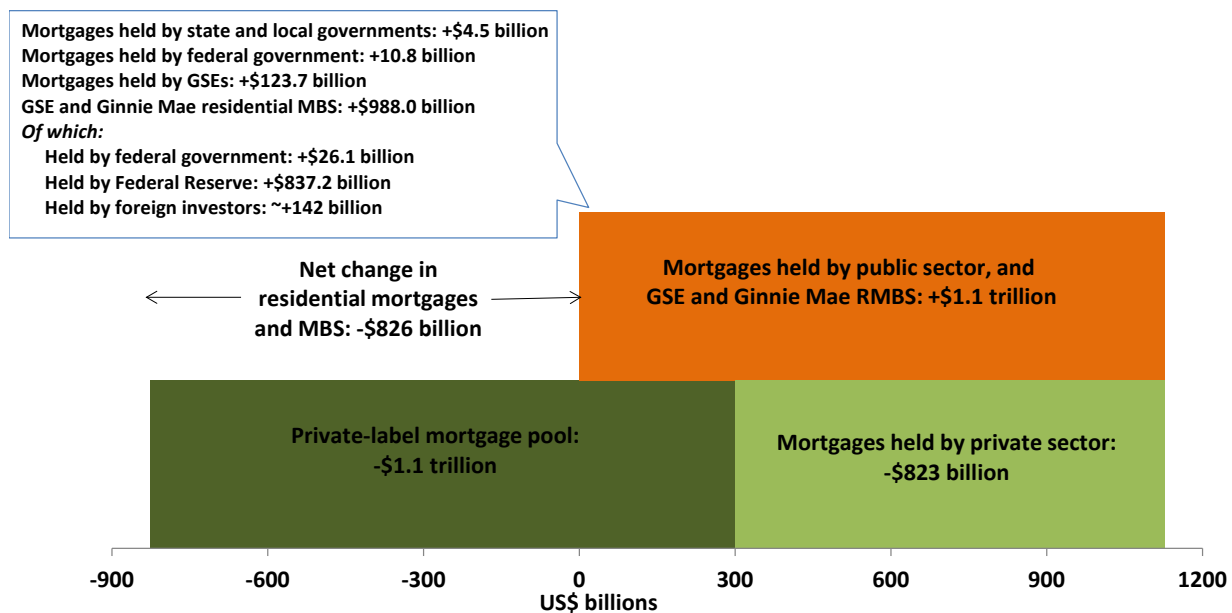
The choice of long-run time period does not matter much for lending for home purchases prior to the housing market bubble. Consequently, we deem it reasonable to expect banks to devote the traditional share of their balance sheets to financing housing purchases going forward, based on the relative stability of the share in the past and the view that the banks chose that share to obtain their desired asset diversification.

With this information in mind, the analysis turns to a consideration of how housing credit could be extended in 2014, and indeed whether there are grounds for concern about sufficient credit extension by major credit suppliers at normal credit cost.

III. Credit Provision for Home Mortgages: The Past Role of Securitization

It is clear that as the United States recovers from the worst financial crisis and economic recession since the Great Depression, it is essential to get the private sector back into its traditional role of funding home mortgages. Figure 2 shows that from December 2007 to December 2011, public-sector holdings of residential mortgages, and GSE and Ginnie Mae MBS, increased by \$1.1 trillion. In contrast, residential mortgages held by the private sector declined by \$823 billion, and private-label MBS decreased by \$1.1 trillion.

Figure 2. Net change in residential mortgage assets, December 2007 to December 2011¹⁶



Sources: "Flow of Funds," Federal Reserve; Federal Housing Finance Agency; Fannie Mae; Freddie Mac; U.S. Treasury; Milken Institute.

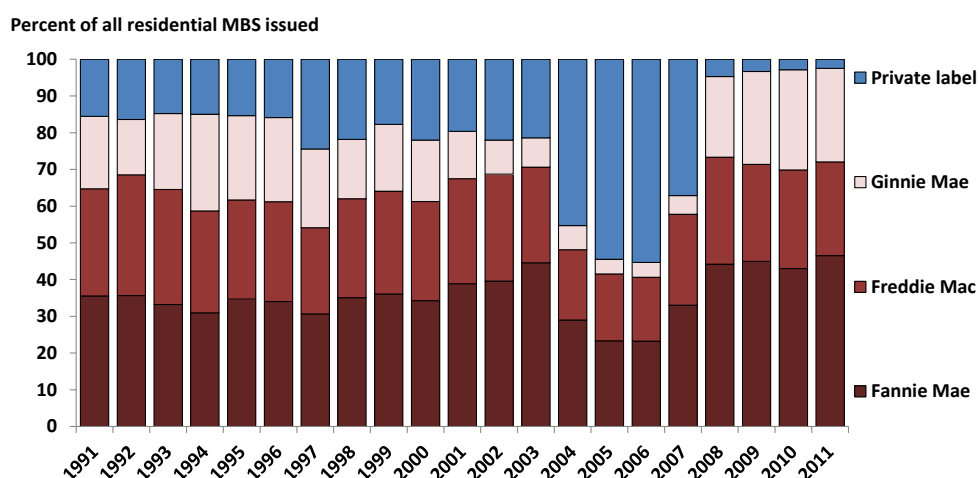
Moreover, more than half of all home mortgages have been securitized in recent years. This particular financial innovation, securitization, has led to more credit being made available to individuals purchasing homes, and at lower interest rates. The homeownership rate is therefore higher than it would be without securitization.

At the moment, however, almost all securitization activity in the housing sector is being undertaken by federal government-run mortgage firms, namely Fannie Mae, Freddie Mac, and Ginnie Mae. As figure 3 shows, this is a reversal from a few years ago, before the financial crisis

16. Notes: (1) "Flow of Funds" does not provide a breakdown of private-label mortgage-backed securities by holder of these securities. (2) Starting in 2010, almost all Fannie Mae and Freddie Mac mortgage pools were consolidated on Fannie Mae and Freddie Mac's balance sheets in response to new accounting rules. These mortgage-backed securities, however, are still outstanding. (3) As of December 2011, the Federal Reserve holds another \$104 billion in GSE and Ginnie Mae-issued (non-MBS) securities. (4) Treasury introduced the Agency MBS Purchase Program in October 2008, after the Housing and Economic Recovery Act of 2008 (HERA) gave Treasury the authority to purchase GSE and Ginnie Mae- guaranteed MBS to provide stability to financial markets. Treasury holding of GSE and Ginnie Mae MBS through this program reached a high of \$191.6 billion in December 2009, before eventually declining to the current level of \$26.1 billion. (5) GSE and Ginnie Mae MBS held by investors are from June 2007 to June 2011.

of 2007–2009, when private firms had been steadily increasing their market share of securitization.¹⁷

Figure 3. Composition of residential MBS issuance



Source: *Inside Mortgage Finance*.

It is quite difficult for the private sector to regain its traditional role in funding home mortgages, given the turmoil that still exists in the housing market and the difficulty of competing against these three government-run firms. Moreover, Fannie Mae and Freddie Mac have been in conservatorship since September 2008. This only adds to the problem because there is substantial uncertainty over the future role these institutions will play.

Most individuals believe that given the contributing role of Fannie Mae and Freddie Mac to the crisis, it is far past time to sharply reduce their involvement in the housing market. If indeed this does happen, the resulting gap in housing credit will have to be filled by a return of the private sector.

Perhaps more important, there is a fairly widespread view that the private sector's overall performance in financing the vast majority of home purchases is far superior to that of the federal government, provided that the sector is subjected to prudential regulation and supervision.

17. For a comparison of the dramatic increase in the public sector's share of securitization before and after 2008, see appendix figure A6. Appendix figure A7 specifically indicates the sharp increase in FHA's and VA's share of home mortgage originations after 2008.

IV. How might home mortgages be financed in 2014?

Net new home mortgage borrowing traditionally has accounted for approximately one-fourth of total annual new borrowing in the U.S. economy. Banks and the GSEs have been the major providers of mortgage credit, and questions about re-establishing long-run stability to the home mortgage market center on these two sectors.

In addition, because private-label securitizers of pools of home mortgages contributed importantly to credit availability even before the post-2000 bubble (see figure 3), we consider the future role of this sector. As outlined in table 2, in order for home mortgage borrowing to be macro-economically consistent with the projected \$17,385 billion GDP in 2014 (representing a moderate recovery level of economic activity), banks, GSEs, and private-label MBS issuers would likely have to provide a combined \$585 billion in net new home mortgage credit.

IV.A. Baseline for financing home mortgage needs in 2014

Banks' home mortgage lending has traditionally accounted for about 20 percent of their net acquisition of financial assets annually, as table 3 illustrates. Under reasonable assumptions, figure 1 posits a baseline projection of \$870 billion in total net acquisition of financial assets for banks. Combining these two patterns yields our baseline of home mortgage lending by banks of \$175 billion in 2014, as shown on the baseline scenario line of table 4. (Other scenarios covered in table 4 are discussed in detail in section IV.B.) That would leave \$410 billion of new home mortgage credit to be provided by some combination of GSE and private-label MBS activity.¹⁸

18. Most FHA/VA-guaranteed mortgages end up packaged in Ginnie Mae-issued MBS.

Table 4. Potential scenarios for financing \$585 billion of home mortgages in 2014 (US\$ billions)

Scenario	Role of GSEs and Ginnie Mae	Of which:			Role of banks	Role of private-label MBS	Role of All other sources of funding	Implied growth in bank assets	Stress points: areas where scenarios likely require unrealistically high activity
		Sold to traditional investors	Retained by GSEs	Remainder sold to banks					
Baseline Scenario	55%				30%	10%	5%		
Traditional financing patterns	\$320	\$115	\$110	\$95	\$175	\$60	\$30	\$875	-
Scenario 2: Decreased role for GSEs									
2a: Private-label MBS with traditional share, banks pick up the slack	25% \$145	\$50	\$50	\$45	60% \$350	10% \$60	5% \$30	\$1,700	Total bank assets
2b: Banks with traditional share, private-label MBS pick up the slack	25% \$145	\$50	\$50	\$45	30% \$175	40% \$235	5% \$30	\$875	Private-label MBS
2c: Banks and private-label MBS both pick up the slack	25% \$145	\$50	\$50	\$45	45% \$265	25% \$145	5% \$30	\$1,325	Private-label MBS and bank assets
Scenario 3: Traditional role for GSEs, changing roles for banks and private-label MBS									
3a: Banks' share declines; private-label MBS picks up the slack	55% \$320	\$115	\$110	\$95	15% \$90	25% \$145	5% \$30	\$450	Private-label MBS
3b: Private-label MBS do not re-emerge; banks pick up the slack	55% \$320	\$115	\$110	\$95	40% \$235	-	5% \$30	\$1,175	Total bank assets

Note: Shaded areas indicate stress points.

Assume that home mortgage accounts for 20% of bank assets.

Sources: "Flow of Funds," Federal Reserve; authors' calculation.

Table 5 presents key aspects of both banks' and GSEs' traditional roles in providing home mortgage market credit. In particular, over the past two long-run time periods of 1983–2000 and 1992–2000, GSEs provided well over 60 percent of net new home mortgage lending. Were GSEs to finance 55 percent of home mortgage market financing in 2014—that is, in the same range as their long-run proportion—they would supply \$320 billion in net new mortgage credit (table 4, baseline scenario).¹⁹ In that case, private-label MBS issuers would have to supply an additional \$60 billion in net new mortgage credit for the combined efforts of banks, GSEs, and private-label MBS issuers to reach the \$585 billion level. Such a contribution by private-label issuers seems credible, as discussed below.

Table 5. Traditional home mortgages financial patterns

Time Period	Role of GSEs		Role of Banks (Commercial banks and thrifts)			Role of private-label issuers of MBS
	GSE financing as % of net new home mortgage lending	Mortgages retained on GSE balance sheet as % of GSE's net financial asset acquisition	Bank financing as % of net new home mortgage lending	Bank home mortgage lending as % of banks' met financial asset acquisition	Bank purchases of GSE Securities as % of banks' net financial asset acquisition	Private-label MBS financing as % of net new home mortgage lending
1971–2000	48.6	15.9	38.0	24.5	7.9	5.3
1983–2000	61.1	6.9	25.6	23.5	8.1	8.9
1992–2000	62.1	6.4	26.6	17.2	15.1	13.2
Long-run pattern	55.0	10.0	30.0	20.0	10.0	10.0

Sources: "Flow of Funds," Federal Reserve; authors' calculation.

For the baseline scenario to hold, the GSEs would have to finance \$320 billion in new mortgage originations by selling approximately this amount of new MBS. Reaching this sales level would not require an unusual pattern of behavior by investors in GSE MBS, and therefore

19. The \$320 billion figure is 55 percent of the total required \$565 billion volume of net new mortgage lending consistent with the \$17.4 trillion projected GDP in 2014, as outlined in table 2.

could reasonably be expected to occur without a sharp change in the interest rate on these securities. We expect “traditional investors,” following past patterns, to purchase around \$115 billion of GSE securities. The four sets of traditional investors in GSE securities include households and other private entities, foreign investors, life insurance companies, and state and local government pension funds.

We have taken a two-step approach to projecting plausible GSE MBS purchase levels for each of these sets. First, we projected investment in all financial assets by each of the four traditional investor sets, as shown in row 1 of table 5. We based these projections on investment flows from 1971 to 2007, as shown in figure 4. Investment levels by life insurance have been fairly stable over the past decade or more, as can be seen in figure 4, and we assume these levels will continue and use \$300 billion as the typical investment level.²⁰

Recent investment patterns for other three groups of investors have been more erratic, as figure 4 illustrates. In the absence of definitive modeling to guide our extrapolation of these groups’ investment plans, we make a conservative assumption that their investment levels will revert to 2000–2005 averages (\$670 billion, \$950 billion, and \$50 billion for households, foreign investors, and state and local pensions, respectively).

**Table 6. GSE securities investors:
Traditional and 2014 potential roles in GSE securities purchases**

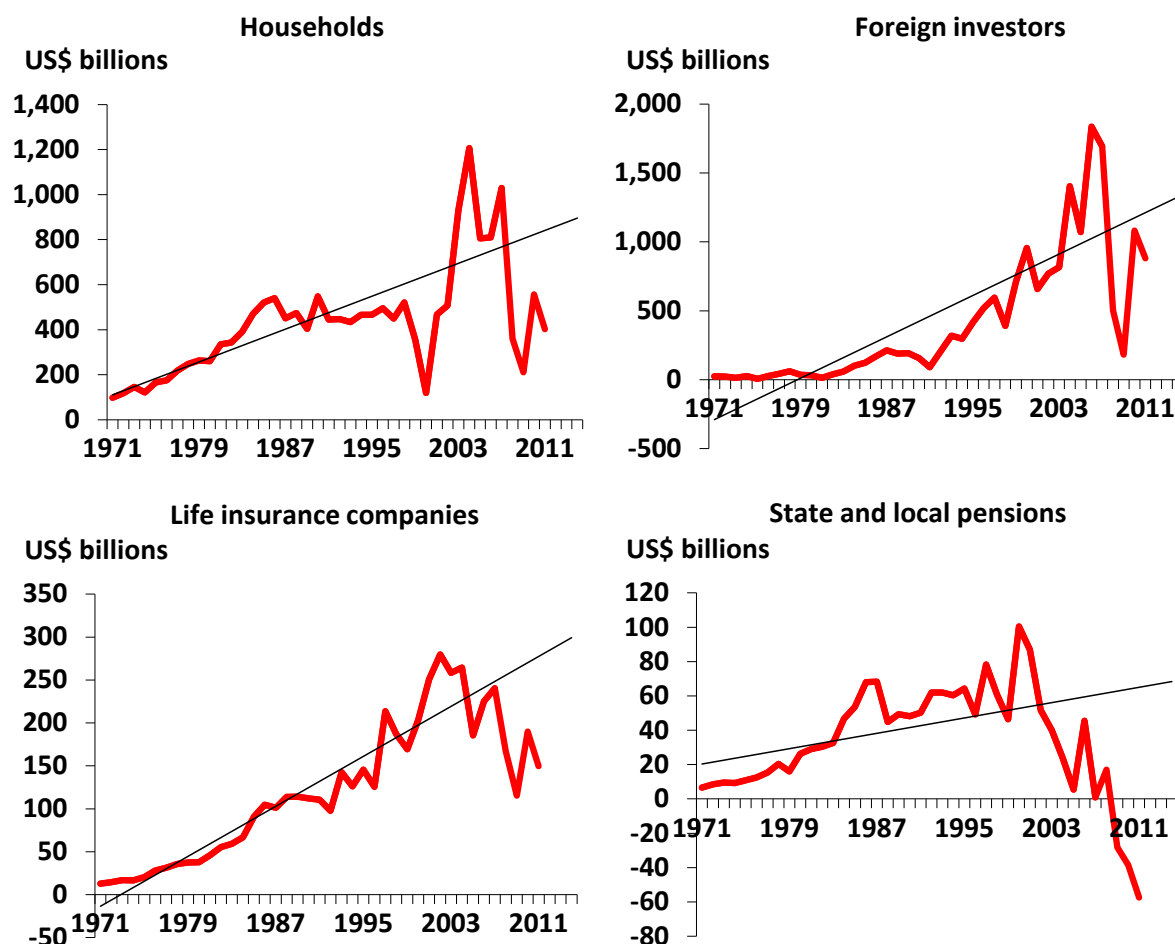
	Households and other entities	Foreign investors (U.S. investment)	Life insurance companies	State and local pensions
1. Projected 2014 total net acquisition of financial assets	\$670 billion	\$950 billion	\$300 billion	\$50 billion
2. 1971–2000 long-run average GSE securities purchases as percent of total net acquisition of financial Assets	5.0	5.0	9.0	13.0
3. Approximate Resultant Projection of Purchases of GSE securities ^a	\$35 billion	\$50 billion	\$25 billion	\$5 billion

Sources: “Flow of Funds,” Federal Reserve; authors’ calculation.

^a Rounded to nearest \$5 billion.

20. Rounded to the nearest \$5 billion.

Figure 4. Historical trends in net acquisition of financial assets by selected investors



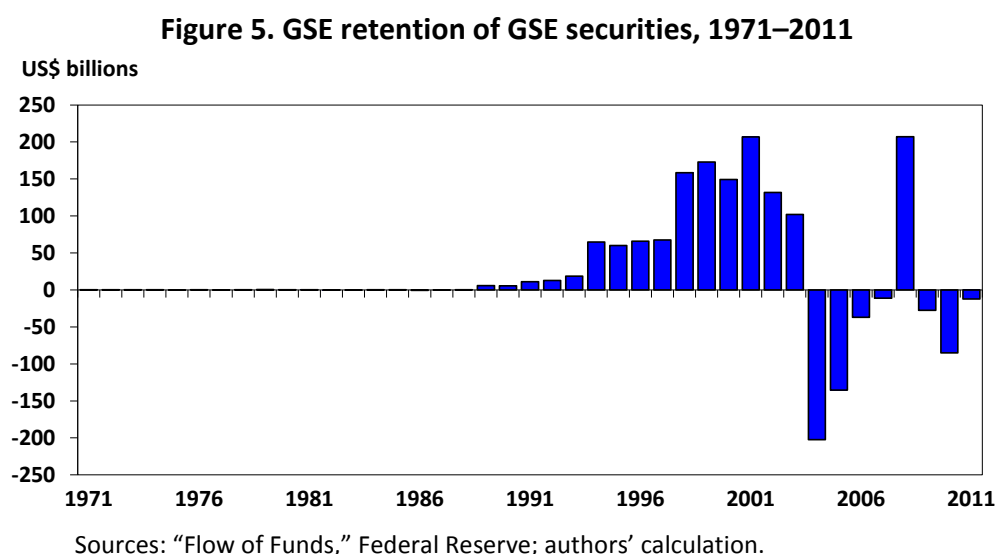
Sources: "Flow of Funds," Federal Reserve; authors' calculation.

This conservative assumption is made to bring these investment levels back to pre-bubble ranges as a potential response to the financial crisis. (Given growth in the U.S. and foreign economies during the current decade, it appears likely that these investment levels could well be higher, giving more scope for the GSEs to find ready demand for their MBS.)

We next considered the typical share of the total investment each group devotes to buying GSE MBS, shown in the second row of table 6. Applying this typical share to the projected level of total investment in row 1 yields the projected levels of demand for GSE MBS by each group in 2014, shown in row 3 of table 6, as follows: households and other entities: \$35 billion; foreign investors: \$50 billion; life insurance companies: \$25 billion; and state and local

(government) pension plans: \$5 billion. Altogether, the four investor groups could be expected, under reasonable assumptions, to purchase \$115 billion of the \$320 billion worth of GSE securities shown in the baseline scenario of table 4 without requiring a sharp rise in interest payments to induce them to do so.

If traditional investors purchase \$115 billion of GSE securities, then banks and the GSEs would have to hold the remaining \$205 billion of the baseline issuance of \$320 billion GSE MBS. Traditionally, the GSEs have retained a significant portion of their net issuance of MBS. Figure 5 shows the historical trend in GSEs' retention of their newly issued MBS between 1971 and 2011.



Under the assumption that by 2014 the GSEs will have scaled back considerably from their peak levels of retention, the baseline scenario in table 4 shows GSE retention of new MBS in 2014 at \$110 billion (1995–2000 level). The remaining purchases by banks of GSE MBS issued in 2014 would, consequently, have to be \$95 billion to yield total GSE MBS sales amounting to \$320 billion.²¹

Such a level of GSE securities purchases by banks would be consistent with the long-run pattern of bank purchases of GSE securities shown in table 6. In particular, were banks to purchase \$95 billion in GSE securities in 2014, out of their baseline \$875 billion in total net new

21. Of course, this depends upon no governmental action being taken to limit the role of the GSEs in holding home mortgages or issuing mortgage-backed securities, which appears unlikely in the near future.

asset acquisition, that would amount to 11 percent of total net new bank assets, a proportion in line with the range listed in the far right-hand column of table 5 as part of banks' long-run pattern of home mortgage financing.

The third major player in home mortgage provision, private-label MBS issuers, could reasonably be expected to finance the \$60 billion in net new home mortgages shown in the first line of table 4. In particular, the GSEs do not securitize jumbo mortgage loans²²; in the absence of any significant re-emergence by 2014 of the subprime mortgage market, it is conceivable that private-label MBS issuers could manage to sell \$60 billion of securitized pools of high-quality jumbo mortgages. This, of course, is based upon the assumption that private-label securitizers will continue to issue mortgage-backed securities.

IV.B. Possible alternative home mortgage financing scenarios

Section IV.A described a baseline scenario reflecting traditional financing patterns, as summarized in the top row of table 4. Table 4 also conveys the consequences for the other two sectors of a deviation from traditional financing patterns by any one of the three major mortgage credit providers. That is, it considers the overall feasibility of situations in which one of the three main home mortgage credit providers supplies less than the baseline scenario. Could the other two sectors be expected to pick up the slack without a substantial spike in mortgage interest rates?

Scenario variations 2a, 2b, and 2c in table 4 consider the possibility that the GSEs substantially decrease their role in the provision of home mortgage credit.²³ Each of the variations of Scenario 2 illustrated in table 4 begins with the assumption that GSEs' home mortgage market role is cut from \$320 billion (i.e., 55 percent) to \$145 billion of net new home

22. Jumbo loans: those with amounts above \$417,000 for most of the United States, apart from Alaska, Hawaii, Guam, and the U.S. Virgin Islands, where the limit is \$625,000.

23. There is an active debate on the future of the GSEs, and one line of reasoning calls for a greatly reduced role for them as a prelude to their restructuring and subsequent sale to the private sector. The Department of the Treasury's white paper "Financial Regulatory Reform: A New Foundation" (June 2009) outlines five major options for the reform of the GSEs. See pp. 41 and 42, in particular.

mortgage credit in 2014. That change would result in total GSE securitizations of \$175 billion.²⁴ How could this reduction in the GSEs' contribution to total new mortgage credit provision be met?

The first issue to be addressed is whether the money presumed in the baseline to be invested in GSE securities would find its way to finance home mortgages through another channel without a substantial adjustment in interest rates. This possibility appears very unlikely. The purchasers of GSE securities would likely channel their investments into other U.S. and foreign government securities since these investors are typically in the market for high credit quality and very liquid securities, making private-label MBS an unlikely substitute.

Moreover, the securities are often used for trading, collateral, and securities-lending purposes, making bank accounts an unlikely substitute. Given these considerations, a pullback of GSE mortgage lending would likely have to be offset by an increase in bank lending or private-label MBS without funding inflow from the erstwhile GSE MBS investors.

Scenario 2a looks at the possibility of banks picking up all of the slack. Were banks to add \$175 billion to their "baseline" net new mortgage lending, they would be financing \$350 billion of new home mortgage loans in total. For that to happen, banks would have two options: (1) They could sharply increase the size of their balance sheets if they wanted to keep home mortgage lending to its normal 20 percent share of their net new asset acquisition, or (2) if they chose to increase mortgages as a share of their asset acquisition while keeping their balance-sheet growth in check, they would have to sharply cut back the share of credit extension to other areas.

In the former case, were home mortgages to remain at the long-run 20 percent of banks' balance-sheet growth, banks would have to expand their overall net asset acquisition to \$1,700 billion; that, in turn, means that banks' assets would have to grow almost three times faster than GDP, a highly unrealistic outcome. In the latter case, where banks shift lending to home mortgages at the expense of lending to other sectors while bank balance sheets grow by only

24. Under the Scenario 2 variations of halving of GSE's MBS issuance, we assume for simplicity that investors (i.e., traditional investors, banks, and the GSEs themselves) halve their investment in GSE MBS issuance, as shown in Table 4, but that particular pattern of the distribution of the lower issuance of GSE MBS among the three investors is not necessary for our analysis to carry forward.

\$875 billion, banks would have to ramp up their home mortgage lending by 100 percent over their baseline level, which was consistent with \$875 billion of net new asset acquisition.

In the wake of the recent mortgage crisis, it is hardly plausible that banks would expand their home mortgage lending to such a degree without an extremely sharp rise in mortgage interest rates. Consequently, under either alternative, banks do not appear positioned to pick up the slack from a significant pullback of the GSEs in a scenario where mortgage financing costs remain moderate.

Suppose then that banks maintain their traditional share of net asset acquisition devoted to home mortgages while experiencing a growth in total net asset acquisition of \$850 billion, and therefore provide only \$175 billion in net new home mortgage loans. Might private-label mortgage securitizations pick up the GSE shortfall?

Scenario 2b suggests that this is unlikely, for it would mean a six-fold increase of private-label MBS issuance over its baseline level, to \$235 billion from \$60 billion. For private-label issuers heretofore focusing on securitizing pools of subprime and nontraditional mortgages, the necessity of radically changing their business model and simultaneously securing sufficient investor confidence is likely to present significant obstacles over a relatively short period. Under these circumstances, there is little reason to suppose that private MBS issuers would be able to pick up much of the slack were GSE issuance to slide substantially.

What about a middle ground then, where a reduced GSE role in the mortgage market is made up in part by greater bank lending and in part by private-label MBS issuance? Scenario 2c considers this possibility, assigning half of the GSE shortfall (\$85 billion additional mortgage lending) to banks and half to private-label securitizers. Under these circumstances, were banks to maintain their long-run 20 percent of net new asset acquisition for home mortgages, overall growth of bank asset acquisitions would need to be \$1,325 billion. That level would be more than what banks could be expected to undertake in the midst of a moderate recovery of economic activity in 2014.

Alternatively, if banks did add \$85 billion in additional home mortgages while their balance sheets grew by only \$1,325 billion, they would end up increasing their mortgage lending by 50 percent above the level consistent with a traditional portfolio share for that type

of mortgage lending of about 20 percent of balance-sheet growth. In light of the so-far slow and uncertain recovery of the mortgage market, this outcome appears unlikely unless mortgage rates were to dramatically rise. Furthermore, the addition of \$85 billion to the mortgage credit provision total for private-label MBS issuers looks unrealistically high for the reasons discussed in the preceding paragraph.

Finally, suppose the GSEs maintain their 55 percent long-run mortgage credit provision share, but that banks and private-label issuers play a reduced role in the mortgage market: could the slack be taken up elsewhere? Scenario variations 3a and 3b in table 4 investigate the two major possibilities.

First, suppose, with GSEs retaining their long-run trend share of mortgage credit provision, banks find their role reduced somewhat. Scenario 3a looks at the case where banks' net new acquisition of mortgage loans declines to \$90 billion from their baseline \$175 billion. It seems certain that banks could reach a level of total net new asset acquisition of \$450 billion implied under this circumstance, with home mortgages remaining 20 percent of bank balance sheet growth. However, private-label MBS issuers would have to pick up the \$85 billion slack caused by banks' actions, resulting in private-label issuers having to provide \$145 billion in mortgage credit. The only way that could happen is if, contrary to our underlying framework, borrowers were willing to pay radically higher mortgage rates in order to increase investor demand for these securities.²⁵

Scenario variation 3b looks at the situation in which private-label MBS are not issued, while GSEs continue to supply 55 percent of mortgage demand. Would banks make up for the MBS shortfall? If banks kept mortgages at their long-run average (20 percent of banks' net new asset acquisition), the answer is, probably not, because that would imply a substantially higher-than-baseline \$1,175 billion in bank balance-sheet growth in 2014. If banks picked up the slack by shifting away from business and other consumer lending, instead of balance-sheet expansion, the result would be that banks increase home mortgage credit by 34 percent above the level, representing 20 percent of bank balance sheet growth. This also does not look like a probable outcome.

25. Calculation of such significant interest rate/securities price adjustments is beyond the scope of this paper.

In summary, under realistic assumptions, it appears that mortgage market financing in line with a moderate recovery level of GDP can emerge in the credit markets. However, that outcome depends crucially on GSE mortgage securitizations at long-run trend levels of about 55 percent of net new home mortgage financing. Banks could be expected to provide mortgage financing consistent with their long-run role, including indirectly as substantial purchasers of GSE mortgage-backed securities. Furthermore, a modest recovery of private-label mortgage securitizations, centering perhaps on high-quality jumbo mortgages (rather than, as in the recent past, on subprime loans) is easily conceivable.

Under these circumstances, GSEs would be able to sell the requisite level of net new securitizations not only to banks but also to traditional investors. If, however, GSEs were to decrease their net new issuance of MBS substantially below their long-run level, either for economic reasons or in response to public policy pressures aimed at intentionally reducing their role in the mortgage market, it appears unlikely that either banks or the private-label market would pick up the slack—unless, of course, the returns that banks and/or private-label investors receive were to rise substantially.

V. Summary and Conclusions

Policymakers and financial market participants are focused intensely on stabilizing banking and financial markets during a period of unprecedented challenges. Nevertheless, it is not too soon to consider what the financial market landscape could look like once the turmoil subsides and the economy begins to recover.

We suggest that 2014 is a reasonable horizon to consider. Our starting point is \$17.4 trillion nominal GDP in 2014; our methodology could be adjusted easily to accommodate a higher, more optimistic level of economic growth, or a lower, more pessimistic forecast. We make use of the “Flow of Funds” data in a straightforward way, focusing on the net ***new level of credit extension*** activity that would have to arise to support private-sector borrowing for homes consistent with a return to trend level of nominal GDP and normal credit costs. We set

aside the 2001–2008 bubble-to-bust time period, and instead use pre–2001 conditions as approximations of long-run behavior patterns in private sector housing credit extension.

A common thread for the housing markets is the role of banks. Banks play multiple direct and indirect roles in credit provision. Our focus is drawn to securitization, specifically the GSE MBS market. The sources of private-sector credit provision raises fundamental questions about what to expect, especially as we consider how one or more of them might address shortfalls in credit provision by other actors. We posit a baseline scenario under which banks (using a broad definition to take account of the recent absorption of large thrifts into the commercial banking industry) return to their long-run trend level of financing for home mortgage sector borrowing.

Our key finding is this: The revival of securitization is critical across all three sectors if credit availability and credit costs are to remain at acceptable levels without significant structural adjustments in credit markets. In the home mortgage market, the GSEs must sell enough MBS to support about half of borrowers' credit needs, or mortgage rates will likely surge.²⁶

In addition, even if the GSEs provide more than half of all home mortgage credit (55 percent in our example), banks will not be able to make up for the complete absence of private-label securitizers unless the banks substantially cut back credit provision for non-mortgage consumer borrowing and/or business borrowing while raising mortgage interest rates. At least a modest role for private-label MBS issuance in, for example, securitizing high-quality jumbo mortgage loans is likely necessary to ensure adequate mortgage credit availability at a normal interest cost.

In our view, these findings generate several important policy implications. First, in light of the need for moderate growth in bank credit extension through 2014, policymakers are well advised to focus on stabilizing bank capital and other elements underlying future credit extension. Second, any program to revamp the GSEs must be mindful of the dominant role that

26. If there were to be a cutback in the supply of GSE MBS, investors likely would switch preferences to liquid government securities. Assuming no change in the supply of government securities to such increased demand by investors, there would likely be a sharp adjustment in relative interest rates, with mortgage and other interest rates rising relative to interest rates on government securities.

these entities are likely to continue to play in the mortgage market. Finally, a modest revival (at least) of private-label securitization appears extremely important in the housing market; hence, any policy measures that detract from that process risk generating a credit crunch in this market.

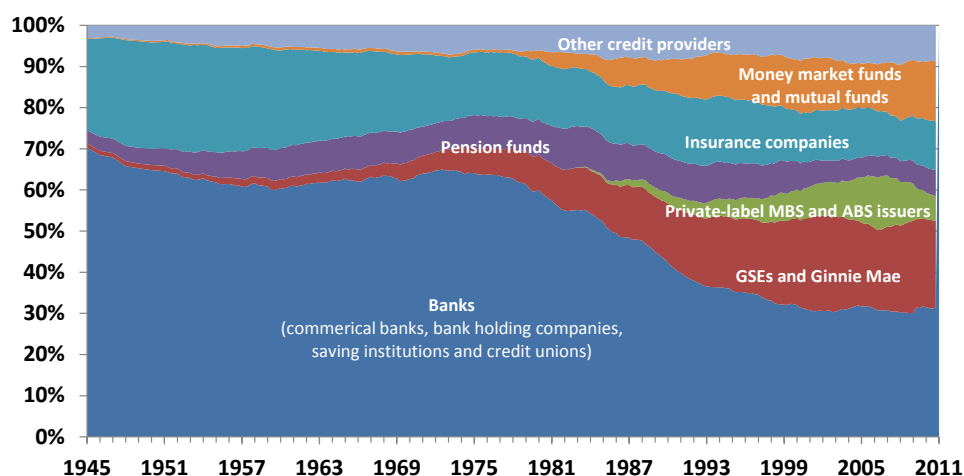
Box 1. The Changing Nature of Credit Extension in the U.S. Economy^a

As economists and policymakers begin identifying and analyzing the causes of the ongoing financial crisis, attention has naturally focused on the banking system.^b Nevertheless, industry experts are aware that non-bank entities play an increasingly important role in finance, and merit consideration from an analytic and a policymaking point of view. Indeed, a consensus has begun to emerge that the current condition of some components of the so-called “shadow banking system” may present particularly challenging obstacles to the re-establishment of financial market stability. Thus, a brief overview of the major players in the credit provision system is in order, with special emphasis on major credit provision “bottlenecks” in structured finance markets.

Figure B1 uses “Flow of Funds” data to divide credit providers into three broad groups: (1) “banks,” composed of broadly similar depository institutions (operating under similar regulatory regimes), including commercial banks, bank holding companies, thrifts, and credit unions; (2) non-banks providing credit via “structured finance” (that is, mortgage-backed securities and other asset-backed securities); and (3) all other non-bank credit providers. There is no single definition of the shadow banking system, but one way to think of it is as the combination of the latter two groups.

Figure B1 shows trends in the shares of outstanding balances of debt held by, or credit extended by, each of these three broad groups, going back almost four decades.

**Figure B1. Shifting shares of major non-bank players in home credit provision
(excludes credit market assets held by the Federal Reserve)**



Source: “Flow of Funds,” Federal Reserve System.

The financial sector traditionally holds about three-fourths of all credit market assets, which corresponds to three-fourths of credit market debt owed across the economy. (The two other sectors holding credit market assets are domestic non-financial providers and foreigners.)

Figure B1 shows that the share of credit extended by banks was halved over the period, declining from an average of nearly 60 percent from 1945 to 1970 to less than 30 percent from 2008 to 2011. Figure B1 also shows that structured finance greatly increased in relative importance, growing from an average of 2 percent of credit provision from 1945 to 1970 to a high of 32 percent at the end of 2007, before declining to 25 percent by the end of 2011.

That shift in market share was largely at the expense of the banking sector’s on-balance-sheet share of credit provision, and by 2008 — as the current financial crisis blossomed — all three major groups of credit providers had approximately the same relative importance across the economy.

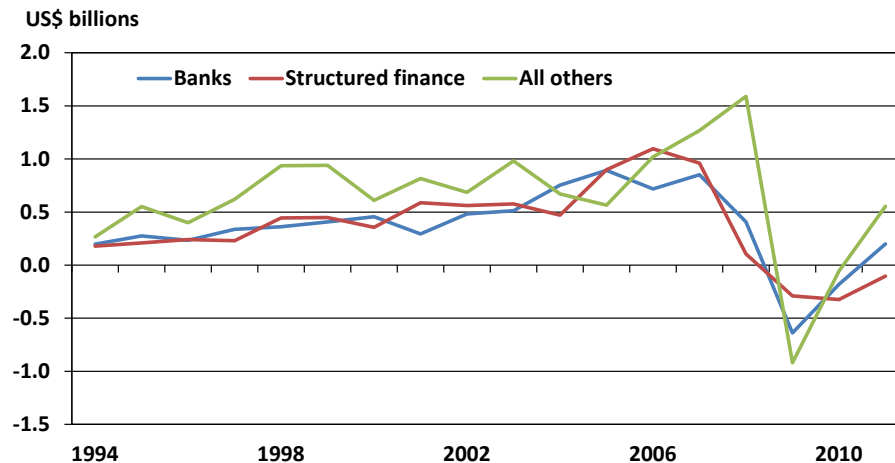
^a The discussion in Box 1 draws heavily on that in Nolle (2009) (<http://financialstability.gov/impact/CPPreport.html>).

^b For an outline of the major events and policy responses to the ongoing financial and economic crisis see *Financial Turmoil Timeline* (http://www.newyorkfed.org/research/global_economy/Crisis_Timeline.pdf), Federal Reserve Bank of New York.

[Box 1, continued]

Turning from credit extension balances outstanding to the flow of (net) new credit, figure B2 illustrates the abrupt plunge in credit flows from all three major groups of credit providers in 2008 and 2009 as the crisis took hold, after strong increases in the provision of credit by both sectors over the 2001–2007 bubble period. (The upward surge in credit provision in 2008 by “all others” was largely a consequence of Federal Reserve System funding of the commercial paper market at the end of the third quarter and during the fourth quarter.)

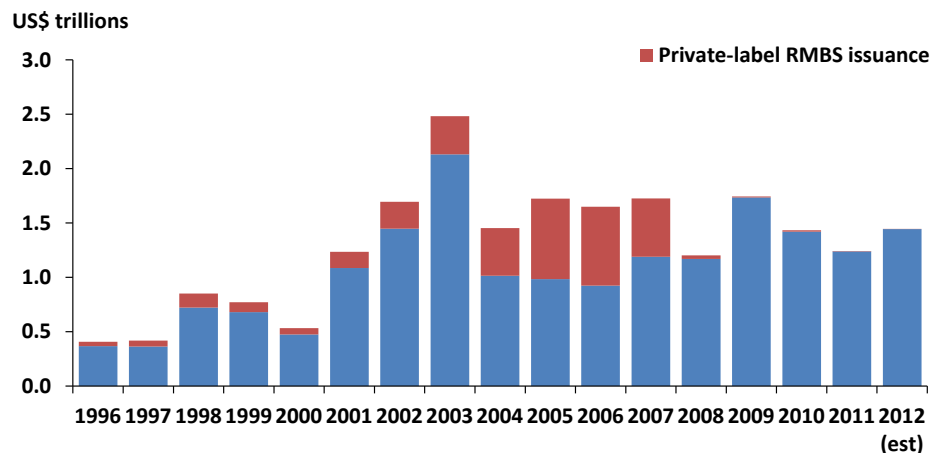
**Figure B2. Net new credit extension: Banks and non-banks
(excludes credit market assets held by Federal Reserve)**



Source: “Flow of Funds,” Federal Reserve System.

The plunge in credit provision by the structured finance market varied across players in those markets. Figure B3 looks at the MBS market, focusing on GSE and private-label MBS issuance from 1996 through February 2012. (The new issuance data in figure B3 are somewhat different from those in figure B2, which shows *net credit flows*, that is, inflows *minus* reductions.) The most salient development in the MBS market is that there is almost no private-label issuance after 2008.

**Figure B3: Flow of home mortgage structured finance: GSEs are the only MBS game in town
(annual issuance of mortgage-backed securities)**



Source: SIFMA.

Box 2. Interrelationship between Banks and Structured Finance

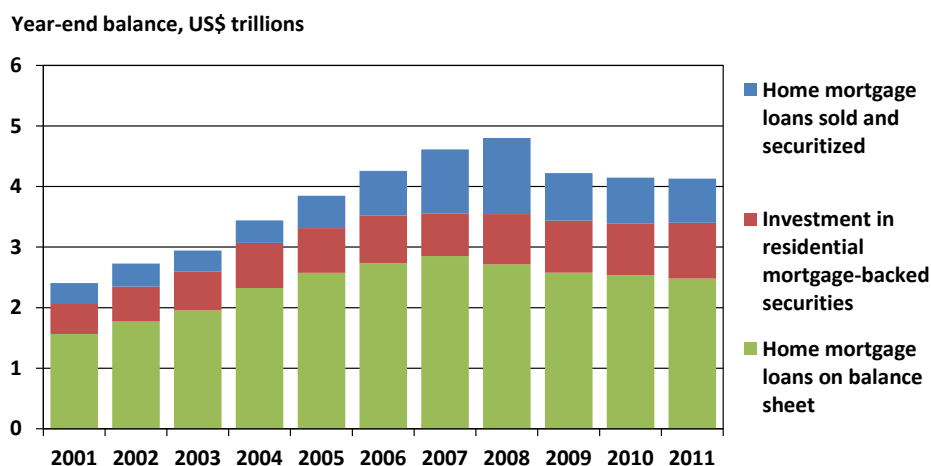
The relationship between the banking sector and the structured finance sector is complicated. This is especially true in the provision of home mortgage credit and credit card loans.

Figure B4 illustrates part of the mortgage-market complexity of the bank-structured finance interrelationship using year-end data from FDIC. The bottom portion of each bar shows home mortgage loans held on banks' balance sheets, while the top portion of each bar shows the value of home mortgage loans that banks sold into the securitization process.^a

Because of this "originate-to-distribute" activity, some argue that analyses may "undercount" banks' role in the mortgage market. But banks also purchase MBS, a fact reflected in the middle portion of each bar in figure B4 showing the value of mortgage-backed securities in which banks have invested. In effect, banks have indirectly provided mortgage financing in this amount, through the structured finance markets. Another way to think about this is to note that because both the bottom (green) and middle (red) portions of the bars in figure B4 are on-balance-sheet mortgage credit extension activities of banks, they are captured in the bottom "Bank" segment of figure B1 (Box 1), while the top (blue) portion of the bars in figure B4 is mortgage credit extension captured in the "Structured finance" (middle) portion of figure B1.

Figure B4 shows that banks' investments in MBS has routinely been greater than the value of the mortgage loans they originate and then sell off; in effect, banks as a group make investments in mortgage credit in excess of what they "originate-and-distribute." Viewed in this light, it is difficult to argue that the "Flow of Funds" necessarily underestimates banks' role in mortgage credit extension.

**Figure B4. Banks, structured finance, and home mortgages
(FDIC-insured commercial banks and thrifts)**

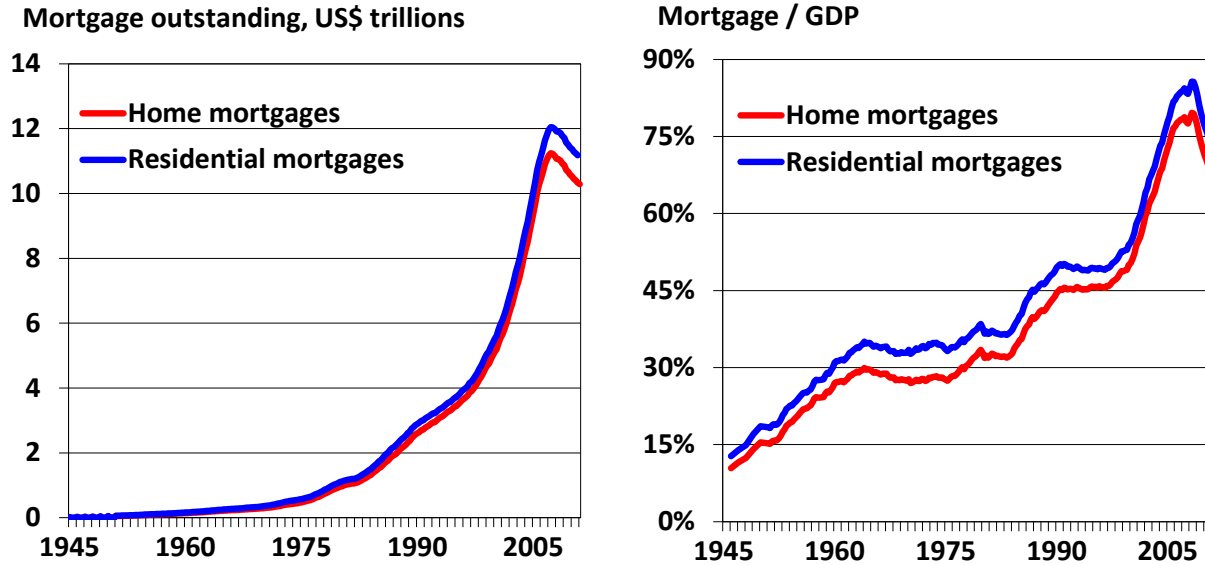


Source: FDIC, Statistics on Banking. "Home mortgage loans on balance sheet" are one- to four-family residential loans; "Investment in residential mortgage-backed securities" are certificates of participation in pools of residential mortgages; "Home mortgage loans sold and securitized" are one- to four-family residential loans sold and securitized with servicing or other recourse retained.

^a As noted at the bottom of figure B4, the mortgage loans sold were securitized with servicing or other recourse retained; i.e., banks still retained some measure of responsibility for the performance of those loans. Loans sold but not securitized are not included in that component. Note that the data in figure B4 is for commercial banks and thrifts.

Appendix

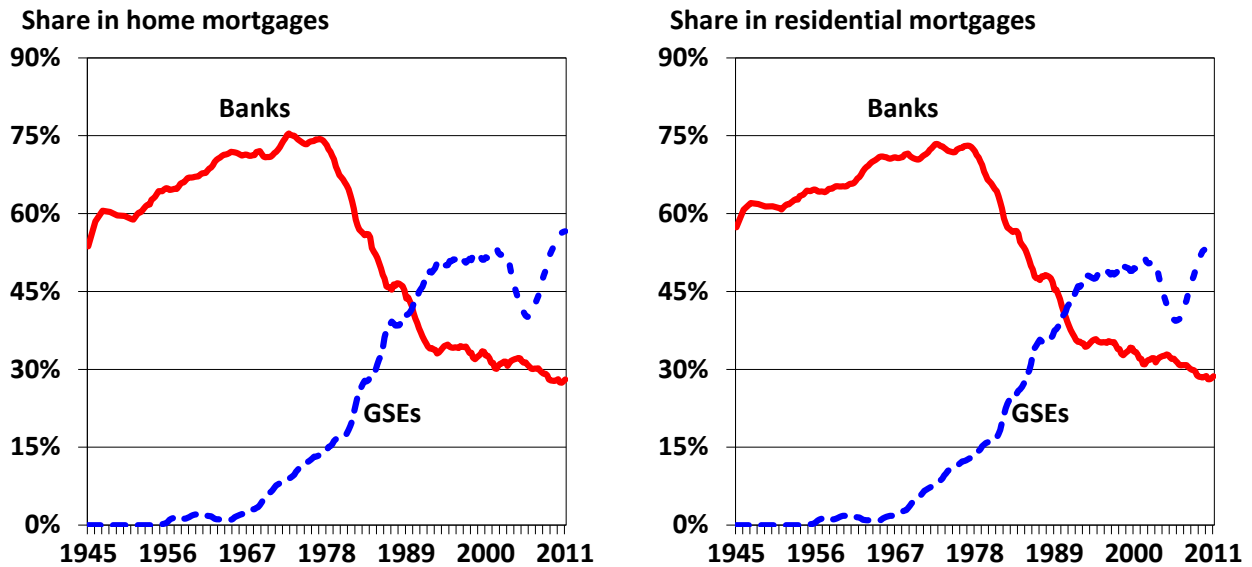
Figure A1. U.S. residential mortgages outstanding, annually, 1945–2011



Note: *Residential mortgage* is the sum of home mortgages and multi-family home mortgages.

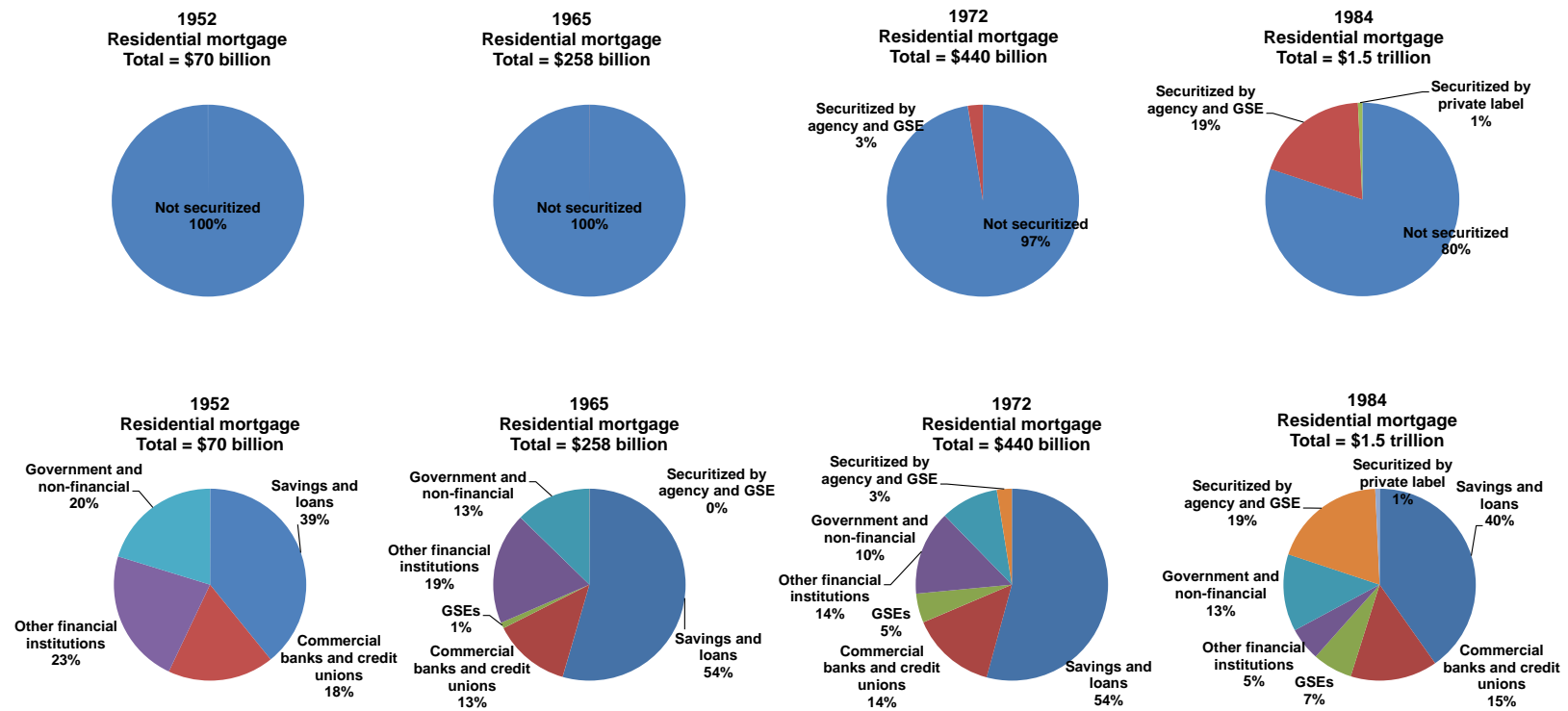
Source: "Flow of Funds," Federal Reserve.

Figure A2. Banks are playing a smaller role in providing funding for housing purchases



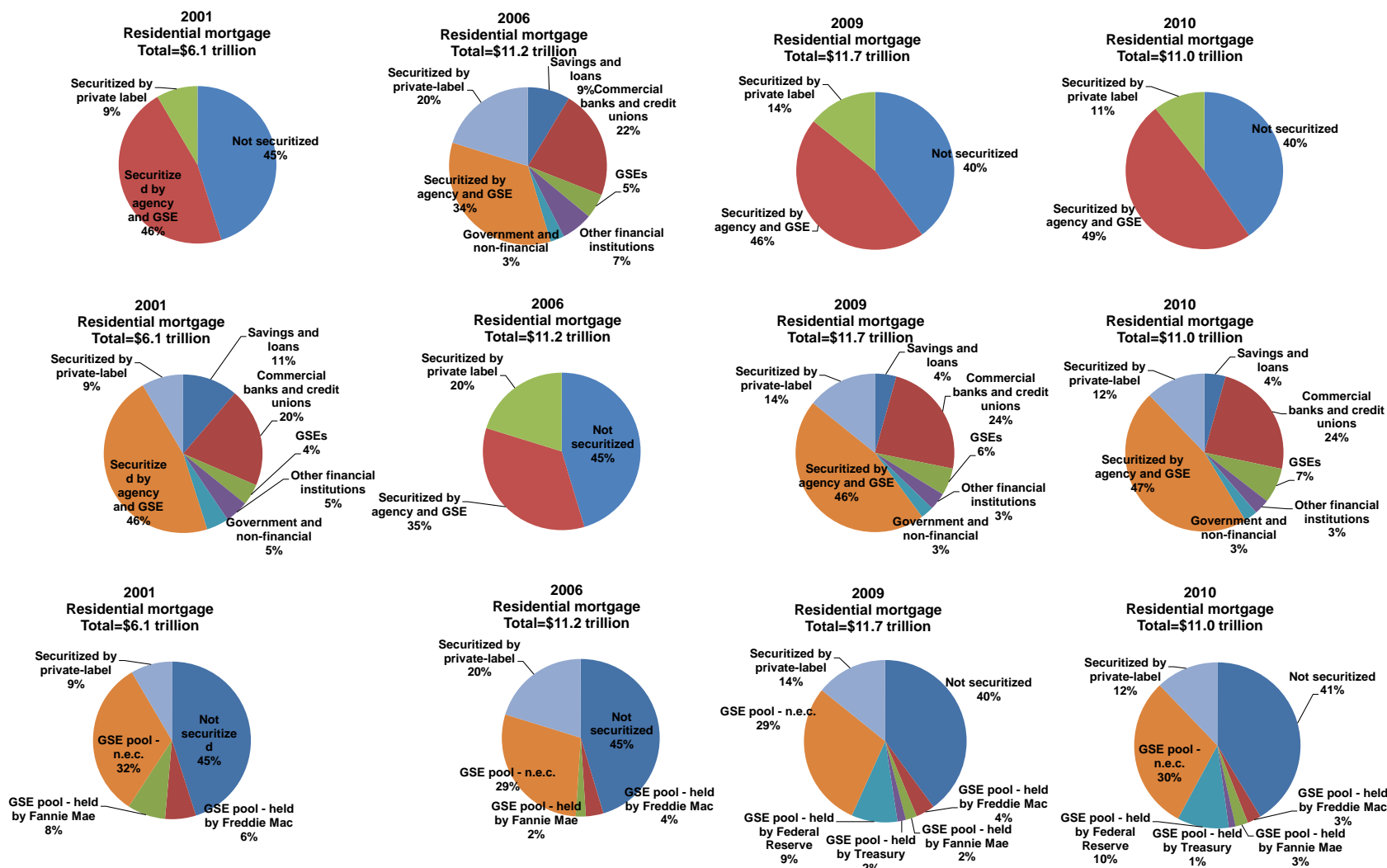
Source: "Flow of Funds," Federal Reserve.

Figure A3. Funding source of residential mortgages, selected years



Source: "Flow of Funds," Federal Reserve.

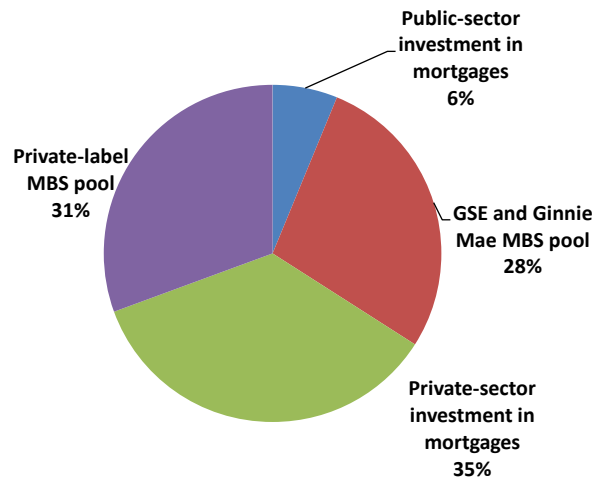
Figure A4. Funding source of residential mortgages, selected years



Note: n.e.c. means not elsewhere classified.

Source: "Flow of Funds," Federal Reserve.

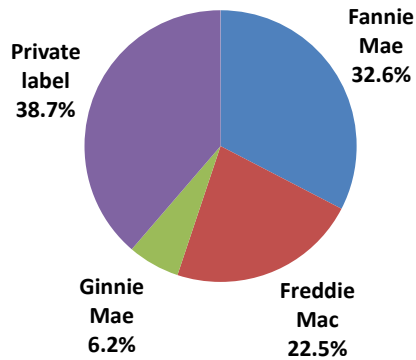
Figure A5. Net change in residential mortgage assets, December 2001–December 2007



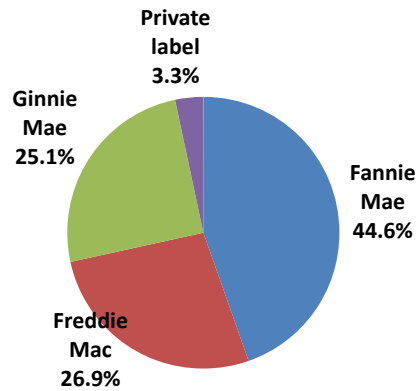
Source: “Flow of Funds,” Federal Reserve.

Figure A6. Composition of residential MBS issuance

**Residential mortgage backed securities issued
December 2001 to December 2007**

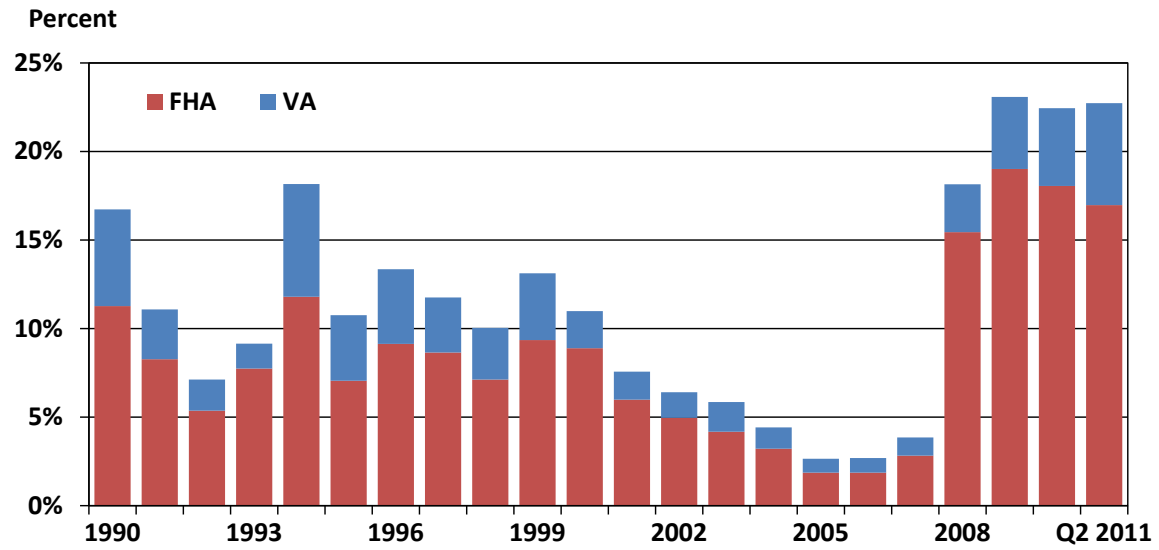


**Residential mortgage backed securities issued
December 2007 to December 2011**



Source: *Inside Mortgage Finance*.

Figure A7. FHA's and VA's shares of home mortgage origination increased significantly after 2008



Sources: FHFA, HUD.

References

- Bank for International Settlements (2009). *79th Annual Report* (June 29).
- Barth, James R., Tong Li, Wenling Lu, Triphon Phumiwasana, and Glenn Yago (2009). *The Rise and Fall of the U.S. Mortgage and Credit Markets*. John Wiley & Sons Inc. Hoboken, N.J.
- Hickok, Susan and Daniel E. Nolle. "The U.S. Financial System in 2011: How Will Sufficient Credit Be Provided?" OCC Economics Working Paper 2009–6.
- Congressional Budget Office (2009). *The Budget and Economic Outlook: Fiscal Years 2009 to 2019* (January). Congress of the United States, Washington, D.C.
- Department of the Treasury (2009). *Financial Regulatory Reform: A New Foundation*, (June). Washington, D.C.
- Fitch Ratings (2009). "Off-Balance Sheet Accounting Changes: SFAS 166 and SFAS 167," *Financial Institutions U.S.A. Special Report* (June 22).
- LaMonte, Mark (2009). "Moody's Credit Card Statement," *Moody's Investor Service, Special Edition* (June 16) p. 4.
- Levine, Ross (2005). "Finance and Growth: Theory and Evidence." In Phillippe Aghion and Stephen Durlauf (eds.), *Handbook of Economic Growth*. The Netherlands: Elsevier Science.
- Nolle, Daniel E. (2009). "What Is Different About This Recession? Nonbank Providers of Credit Loom Large," In *Quarterly CPP Evaluation Report*, Office of Financial Stability, Department of the Treasury (August 17). <http://financialstability.gov/impact/CPPreport.html>.
- U.S. General Accountability Office (2009). *Financial Markets Regulation: Financial Crisis Highlights Need to Improve Oversight of Leverage at Financial Institutions and Across System*, GAO–09–739 (July 22). Washington, D.C.

About the Authors

James R. Barth is the Lowder Eminent Scholar in Finance at Auburn University, the senior finance fellow at the Milken Institute, and a fellow of the Wharton Financial Institutions Center. His research focuses on financial institutions and capital markets, both domestic and global, with special emphasis on regulatory issues. An appointee of Presidents Ronald Reagan and George H.W. Bush, Barth was chief economist of the Office of Thrift Supervision and previously the Federal Home Loan Bank Board. He has also held the positions of professor of economics at George Washington University, associate director of the economics program at the National Science Foundation, and Shaw Foundation Professor of Banking and Finance at Nanyang Technological University. He has been a visiting scholar at the U.S. Congressional Budget Office, the Federal Reserve Bank of Atlanta, the Office of the Comptroller of the Currency, and the World Bank. Barth's expertise has led him to testify before the U.S. House and Senate banking committees on several occasions. He has authored more than 200 articles in professional journals and has written and edited several books, including "Guardians of Finance: Making Regulators Work for Us," "Fixing the Housing Market," "The Rise and Fall of the U.S. Mortgage and Credit Markets: A Comprehensive Analysis of the Meltdown," "China's Emerging Markets: Challenges and Opportunities," "The Great Savings and Loan Debacle," "The Reform of Federal Deposit Insurance," and "Rethinking Bank Regulation: Till Angels Govern."

Tong Li is a senior economist at the Milken Institute. She specializes in the U.S. mortgage market, international capital markets, banking regulations, and the Chinese economy. Li has authored and co-authored more than 30 reports, papers, and articles. Her research work has been published in academic journals and presented at major academic and regulator conferences. She is a co-author of "The Rise and Fall of the U.S. Mortgage and Credit Markets: A Comprehensive Analysis of the Meltdown" and "Financial Institutions in China: A Study on Formal and Informal Credits," both published in 2009. She currently serves on the editorial board of Bank and Banking Systems. Li has been interviewed by such major media outlets as China's CCTV and Phoenix Television. She received her Ph.D. in economics from the University of California, Riverside, with research focused on microfinance and economic development, and special emphasis on China. She received a bachelor's degree in international finance from Peking University.

Daniel E. Nolle is a senior financial economist in the Economics Department at the Office of the Comptroller of the Currency (OCC). Nolle's fields of research and policy analysis include the structure of the U.S. banking industry, foreign banking in the U.S., U.S. and global financial regulatory system reform, cross-country comparisons of banking systems and financial regulation, technological innovation in banking and payments, and consumer financial protection. Before joining the OCC in 1991, Nolle was an economist at the Federal Reserve Bank of New York and an assistant professor at Middlebury College. He received his doctorate in economics from Johns Hopkins University and his bachelor's degree in economics from the University of Missouri-St. Louis.