



Fannie Mae Raises the DTI Limit

A Win for Expanding Access to Credit

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In a May 30, 2017, notice, Fannie Mae announced it would consider mortgage applications with debt-to-income (DTI) ratios up to 50 percent in their automated underwriting system (AUS). The old limit had been 45 percent, but even before this change, Fannie Mae's AUS allowed for flexibility up to 50 percent DTI for certain case files with strong compensating factors.¹ In practice, flexibility is extended almost exclusively to mortgages with loan-to-value (LTV) ratios lower than 80 percent. Thus, the increase in the DTI limit from 45 to 50 percent is an important step in increasing access to credit. Our estimate is that 95,000 new loans may now be approved annually. A disproportionate share of these loans will likely be to black and Latino families, as these families are approximately 1.5 times more likely to have DTI ratios above 45 percent.

This expansion of credit comes at a low cost. Given that the loans still need to be evaluated by the AUS, these mortgages will have low risk levels. We estimate that the default probability of mortgages with a DTI ratio between 45 and 50 percent to be only 31 percent riskier than those with a current median DTI ratio of 35 percent, with similar loan characteristics. If current expected default costs are approximately 5 basis points per annum, the extra cost on these loans would be approximately 1.5 basis point per annum.

Analysis of How Many Families Will Benefit from the Change

To do this analysis, we first consider the expansion in Fannie Mae loans only. Then, we broaden the analysis to consider the impact of this change on Freddie Mac and Federal Housing Administration (FHA) loans to estimate the effect on the mortgage market.

Fannie Mae

We looked at 30-year fixed-rate, full documentation, fully amortizing mortgages purchased by Fannie Mae by DTI bucket, as presented in the Fannie Mae loan-level credit database. Table 1 summarizes the share of purchases by DTI bucket.

TABLE 1

Fannie Mae Loans with DTI Ratios Greater than 45 Percent

Origination year	DTI Ratio						All
	≤45	>45–50	>50–55	>55–60	>60–65	>45–65	
1999–2003	7,020,756	672,544	419,787	290,351	153,213	1,535,895	8,556,651
2004–09	5,180,544	755,258	530,719	311,268	192,709	1,789,954	6,970,498
2010–16	7,435,880	345,881	5,876	2,119	1,200	355,076	7,790,956
All	19,637,180	1,773,683	956,382	603,738	347,122	3,680,925	23,318,105
1999–2003 (baseline)	82.1%	8.0%	4.9%	3.4%	1.8%	17.9%	100.0%
2004–09	74.3%	10.8%	7.6%	4.5%	2.8%	25.7%	100.0%
2010–16 (recent)	95.4%	4.4%	0.1%	0.0%	0.0%	4.6%	100.0%
All	84.2%	7.6%	4.1%	2.6%	1.5%	15.8%	100.0%
Baseline–recent		3.4%	4.8%	3.4%	1.8%	13.4%	

Source: Urban Institute calculations from Fannie Mae’s loan-level credit data.

If we consider 1999 to 2003 as a baseline where reasonable decisions were made about mortgage credit, we would expect about 3.4 percent more loans will now be purchased by Fannie Mae by relaxing the DTI override. The loans must still pass Fannie Mae’s AUS. This estimate is close to Fannie Mae’s estimate that about 3 to 4 percent of recent applications were approved by the AUS and had DTI ratios of 45 to 50 percent, but were ineligible because of the additional overlays (Holden and Scott 2017).

Table 2 shows the FICO score and LTV ratio distribution by vintage year for Fannie Mae loans with DTI ratios greater than 45 percent. In the 1999–2003 baseline period, 35.2 percent of the loans had LTV ratios of 80 percent or below and FICO scores above 720. Almost two-thirds of the loans had either (1) LTV ratios of 80 percent or below and FICO scores above 680 or (2) FICO scores above 720. In the recent period (2010–16), of the few loans over 45 percent DTI (almost all are in the 45 to 50 percent range), 80 percent had LTV ratios of 80 percent or below and FICO scores above 720. And 99.7 percent had LTV ratios of 80 percent or below. Before the May 30 policy change, mortgages with DTI ratios between 45 and 50 percent went through the AUS, and then additional overlays were imposed. In

particular, the borrower was required to have both an LTV ratio of 80 percent or less and 12 months of reserves. The 12 months of reserves was a binding constraint.

TABLE 2

Fannie Mae FICO and LTV Distribution by Vintage Year for DTI Ratios Greater Than 45 Percent

Vintage year	LTV ratio	FICO Score				All
		≤640	>640-680	>680-720	>720	
1999-2003 (baseline)	≤80	7.2%	12.2%	16.8%	35.2%	71.4%
	>80-95	2.6%	5.7%	7.2%	10.4%	26.0%
	>95	0.2%	0.5%	0.8%	1.1%	2.6%
	All	10.0%	18.5%	24.8%	46.7%	100.0%
2004-09	≤80	6.5%	11.2%	16.9%	47.8%	82.4%
	>80-95	1.5%	3.3%	4.2%	7.9%	16.8%
	>95	0.1%	0.2%	0.2%	0.4%	0.8%
	All	8.1%	14.7%	21.3%	56.0%	100.0%
2010-16 (recent)	≤80	0.9%	5.3%	13.5%	80.0%	99.7%
	>80-95	0.0%	0.0%	0.1%	0.2%	0.3%
	>95	0.0%	0.0%	0.0%	0.0%	0.0%
	All	0.9%	5.3%	13.5%	80.2%	100.0%
All	≤80	5.7%	10.4%	16.2%	49.3%	81.6%
	>80-95	1.6%	3.6%	4.5%	7.3%	17.0%
	>95	0.1%	0.3%	0.4%	0.6%	1.3%
	All	7.4%	14.3%	21.1%	57.2%	100.0%

Source: Urban Institute calculations from Fannie Mae's loan-level credit data.

The 3.4 percent increase in loan equates to about 85,000 more mortgages made each year, as Fannie Mae currently purchases about 2.5 million mortgages annually. Before we finalize an estimate of this new policy's effect on the mortgage market, we must consider the interaction with both Freddie Mac and the FHA. Some of the loans purchased by Freddie Mac rely on Fannie Mae's AUS, which could raise our estimate. If some of the mortgages that we are counting are already being extended by the FHA, our estimate is too high.

Freddie Mac

Table 3 shows the distribution of DTI in full-documentation Freddie Mac mortgages through time. The data show that from 2010 to 2016, Freddie Mac has 7.5 percent of its mortgages in the 45 to 50 percent DTI bucket, about 3 percent more than Fannie Mae and only 0.9 percent below the 1999-2003 baseline period. Evidently, Freddie Mac's AUS allows more flexibility than Fannie Mae in delivering loans in this bucket. To the extent that Freddie Mac closes this gap from baseline, the resulting 0.9 percent increase would represent about 15,000 new mortgages annually on Freddie's purchases of approximately 1.5 million mortgages.

TABLE 3

Freddie Mac DTI Distribution by Vintage Year (30-Year Fixed-Rate)

Origination year	DTI Ratio						All
	≤45	>45-50	>50-55	>55-60	>60-65	>45-65	
1999-2003	6,004,026	593,954	225,384	139,172	63,706	1,022,216	7,026,242
2004-09	5,441,149	715,982	417,248	225,674	145,787	1,504,691	6,945,840
2010-16	4,906,604	401,621	15,925	108	66	417,720	5,324,324
All	16,351,779	1,711,557	658,557	364,954	209,559	2,944,627	19,296,406
1999-2003 (baseline)	85.5%	8.4%	3.3%	2.0%	0.9%	14.5%	100.0%
2004-09	78.3%	10.3%	6.0%	3.2%	2.1%	21.7%	100.0%
2010-16 (recent)	92.2%	7.5%	0.3%	0.0%	0.0%	7.8%	100.0%
All	84.7%	8.9%	3.4%	1.9%	1.1%	15.2%	100.0%
Baseline-recent		0.9%	2.9%	2.0%	0.9%	6.7%	

Source: Urban Institute calculations from Freddie Mac's loan-level credit data (30-year fixed-rate only).

Some of the closing of the 0.9 percent gap may occur automatically following Fannie Mae's change, as Freddie Mac has historically purchased mortgages based on Fannie Mae's AUS. Additionally, Freddie Mac might modify its policies (specifically, Freddie's Seller Servicer Guide that discourages lending above 45 percent DTI) because of Fannie's actions.² In general, we believe Freddie Mac will likely see an increase in purchases in the 45 to 50 percent DTI bucket of around 15,000 new loans. Combined with the 85,000 new Fannie Mae mortgages, we estimate about 100,000 additional government-sponsored enterprise (GSE) mortgages.

The Federal Housing Administration

Most of these loans are likely to be new loans and not a shift of loans from the FHA to Fannie Mae or Freddie Mac. This reflects the fact that most government mortgages have high LTV ratios. Of the 162,239 loans made by the FHA in 2016 in the 45 to 50 percent DTI bucket, 72.5 percent have an LTV ratio above 95 percent (table 4). Even if we assume that 100 percent of the loans with FICO scores above 680 and LTV ratios of 80 percent or less plus 100 percent of the loans with FICO scores above 720 and LTV ratios between 80 and 95 percent went to the GSEs (high numbers by any measure), this would total approximately 11,000 loans. As a reasonable approximation, assume that about 5,000 loans shift from the FHA to the GSEs.

TABLE 4

Federal Housing Administration 2016 Originations with DTI Ratios from 45 to 50 Percent

LTV ratio	FICO Score				All
	≤640	>640–680	>680–720	>720	
≤80	1,910	3,886	2,756	1,722	10,274
>80–95	5,943	12,560	9,268	6,604	34,375
>95	16,828	44,075	31,521	25,166	117,590
All	24,681	60,521	43,545	33,492	162,239
≤80	1.2%	2.4%	1.7%	1.1%	6.3%
>80–95	3.7%	7.7%	5.7%	4.1%	21.2%
>95	10.4%	27.2%	19.4%	15.5%	72.5%
All	15.2%	37.3%	26.8%	20.6%	100.0%

Source: Urban Institute calculations from eMBS loan-level Ginnie Mae origination data.

So, we have 85,000 additional loans from Fannie, plus 15,000 loans from Freddie Mac less possibly 5,000 from the FHA, for a new add of 95,000 loans. This change could reduce the number of missing loans that we have previously estimated at just over a million loans a year by almost 10 percent.³

Who Are These Borrowers?

We can estimate some characteristic of these 95,000 additional loans. Using the Annual Housing Survey (AHS), we compute the share of housing expenses to income by demographic group. The survey does not allow a direct computation of DTI ratios, as there is no information about other debt expenses (e.g., auto loans, student loans, credit card debt) included in DTI calculations. On the other hand, housing expenses, as measured by the AHS, include utility costs. Both the AHS and GSE DTI calculations include property taxes and insurance. Typically, we would expect the difference between other debt expenses and utilities to run between 5 and 10 percent of income. Therefore, we approximate the 45 to 50 percent DTI bucket by looking at households spending between 35 and 45 percent of their income on housing. Based on this computation, black and Latino homeowners are approximately 1.5 times more likely to be in the 45 to 50 percent DTI bucket (table 5).

TABLE 5

Housing Expense as a Share of Income by Race and Ethnicity

	Debt-to-Income Ratio Bucket		
	30 to 34%	35 to 39%	40 to 49%
Ratio of blacks to whites	1.5	1.4	1.6
Ratio of Latinos to whites	1.4	1.4	1.5

Source: Urban Institute calculations from 2015 American Housing Survey data.

According to Fannie Mae's Annual Housing Activity Report, blacks and Latinos account for about 11 percent of Fannie's loan purchases. Latino families constitute 7.83 percent, and black families make up another 3.07 percent. Applying the 1.5 ratio, we estimate that approximately 16.5 percent, or 16,000 of

the 95,000 new mortgages, will be to black or Latino families. That is, we estimate 95,000 borrowers annually, with 11,500 Latino and 4,500 black families benefiting from Fannie Mae's underwriting change.

The natural question is whether these are prudent loans.

Analysis of the Risk of High-DTI Mortgages

The 85,000 new Fannie Mae loans will represent 3.4 percent of Fannie Mae's annual purchases of around 2.5 million loans and 0.5 percent of Fannie Mae's portfolio of 17 million loans. Further, these loans must still clear all underwriting standards and otherwise receive an approval from Desktop Underwriter. Therefore, the decision to expand credit will not change Fannie Mae's risk position.

Even so, we undertook an analysis to measure any incremental risk in high-DTI loans. Using public data Fannie Mae publishes to support the credit risk transfer program, we ran a logit regression to explain defaults as measured as ever 90 or more days delinquent. The hazard ratio is the ratio of additional defaults relative to the omitted variable—in this case, DTI ratios of 25 percent or less.

The full results are in the appendix table, and the results of main variables of interest are shown in table 6.

TABLE 6

Scorecard Regression Results (Partial)

	Estimate	T	Hazard ratio	Impact
Intercept	-5.2137	-135.19	0.01	-99%
DTI >25-30	0.1193	19.75	1.13	13%
DTI >30-35	0.2491	44.30	1.28	28%
DTI >35-40	0.3891	71.75	1.48	48%
DTI >40-45	0.5206	96.06	1.68	68%
DTI >45-50	0.5930	102.77	1.81	81%
DTI >50-55	0.6590	102.83	1.93	93%
DTI >55-60	0.6616	88.94	1.94	94%
DTI >60-65	0.7323	82.16	2.08	108%
FICO >620-680	-0.5267	-99.30	0.59	-41%
FICO >680-740	-1.2136	-225.76	0.30	-70%
FICO >740-750	-2.0228	-338.50	0.13	-87%
FICO >750	-2.6185	-283.90	0.07	-93%
LTV >60-80	0.6833	141.78	1.98	98%
LTV >80-90	1.0823	183.51	2.95	195%
LTV >90-95	1.2773	189.03	3.59	259%
LTV >95	1.4777	129.87	4.38	338%

Source: Urban Institute calculations from Fannie Mae's loan-level credit data.

Notes: DTI = debt-to-income ratio; LTV = loan-to-value ratio.

This regression allows us to calculate the incremental risk of loans with DTI ratios between 45 and 50 percent. The hazard ratio for this bucket is 1.81. The median DTI ratio in the population is 35 percent. To find the hazard ratio for 35 percent, we average the hazard ratios of the two adjacent buckets of 30 to 35 percent (1.28) and 35 to 40 percent (1.48) to get 1.38. The incremental risk of these loans in the 45 to 50 percent DTI bucket can be calculated as $1.81/1.38$, or 1.31. That is, these loans are 31 percent riskier than an average loan, assuming the loan's other characteristics are similar. To put this in perspective, a 10 percentage point increase in LTV ratio or a 60-point decrease in FICO score typically will lead to a doubling or 100 percent increase in risk. And we are not the first to discover this. Richard Green has shown that LTV ratios and FICO scores are more important predictors of default than DTI ratios.⁴

Another measure of the incremental risk on these loans is to estimate the increased default costs in these loans relative to the overall book. If we apply the losses from the 2000-02 book of business (calculated from Fannie Mae's loan-level credit data) for each LTV ratio and FICO score bucket to the composition of the current book of business, we find cumulative loss rates of 23 basis points, or under 5 basis points a year. But today's loans are tracking under historical experience, but let us be conservative and use 5 basis points a year. To the extent that these loans are 31 percent higher risk, that corresponds to about 1.5 basis point of extra default cost per annum on these loans.

In summary, these loans will pose little incremental risk to Fannie Mae. Over the next two years, they will likely represent only 1 percent of the portfolio, and that 1 percent will be only 1.5 basis points per annum in higher cumulative default costs.

Implications for the Mortgage Market

The move from 45 to 50 percent DTI was an important step to opening the credit box without appreciably increasing the cost to Fannie Mae. We have argued that net, we would expect 95,000 new mortgages, and a disproportionate share of these would be to black and Latino borrowers.

We would expect the Federal Housing Finance Agency (FHFA) and Fannie Mae to monitor the risk of loans in the 45 to 50 percent DTI bucket, and if they perform as predicted, we anticipate the FHFA and the GSEs will look at more opportunities like this, which will result in a substantial number of additional mortgages with little additional risk to the GSEs.

Further relaxing the limit from 50 to 55 percent DTI, using Fannie Mae numbers alone, would bring in about 120,000 (4.7 percent of 2.5 million) mortgages, the overwhelming majority of which are not being made today. Adding Freddie Mac would increase this significantly more, as Freddie has few mortgages over 50 percent DTI. This would be a logical change, given that we have shown that DTI ratios are less powerful predictors of default than LTV ratios or FICO scores.

More generally, putting overlays on top of an automated underwriting system decreases efficiency.⁵ The AUS measures the probability of default using statistical information on millions of observations and allows for compensating factors. Overlays either decrease the number of loans being made, creating an opportunity cost for borrowers who cannot get mortgages and are deprived of the ability to build wealth, or if the same number of mortgages is being made, the probability of default is higher.⁶

Following Richard Green, we did an exercise to illustrate this point (table 7). The 11.66 million loans included in the data had a lifetime default rate of 4.84 percent. If we use 45 percent DTI as a cutoff, 84.2 percent of the loans would be accepted, with a default rate of 3.9 percent, while the 15.8 percent of the loans that were rejected had a default rate of 9.8 percent. If we used the scorecard and accepted the same number of loans as the 45 percent DTI absolute cutoff, the 84.2 percent of the accepted loans has a default rate of 2.8 percent, while the 15.8 percent of the loans that were rejected had a default rate of 15.9 percent. The scorecard does a better job discriminating between loans that are more likely to default and those that are not.

If we use the scorecard and put on an additional overlay at 45 percent DTI, only 73.7 percent of the loans would be accepted, with a default rate of 2.3 percent. We would be rejecting an additional 10.5 percent of the loans, with only a 0.4 percent improvement in the default rate. With an override at 50 percent DTI, we would be rejecting an additional 5.2 percent of the loans versus the scorecard alone, with a default improvement of 0.24 percent. Efficiency argues for using the scorecard alone.

TABLE 7

Scorecard Efficiency versus Overlays

	Share of total count	Default
Total loans	11,661,239	4.84%
Use 45 percent DTI as cutoff		
In	84.21%	3.90%
Out	15.79%	9.81%
Use a scorecard model		
In	84.21%	2.77%
Out	15.79%	15.87%
Additional DTI override at 45 percent		
In	73.68%	2.37%
Additional DTI override at 50 percent		
In	79.04%	2.53%
Difference, compared with 45 percent	5.36%	

Source: Urban Institute calculations from Fannie Mae's loan-level credit data.

This brief, using publicly available data, demonstrates that Fannie Mae's recent change to increase allowable DTI ratios will allow for approximately 95,000 new loans. These new loans disproportionately help black and Latino families. Perhaps 10 percent of the missing loans will reappear because of this action, representing a definite win in expanding access to credit.

Appendix

Logit Regression Results (Full)

	Estimate	T	Hazard ratio	Impact
Intercept	-5.2137	-135.19	0.01	-99%
DTI >25-30	0.1193	19.75	1.13	13%
DTI >30-35	0.2491	44.30	1.28	28%
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DTI >50-55	0.6590	102.83	1.93	93%
DTI >55-60	0.6616	88.94	1.94	94%
DTI >60-65	0.7323	82.16	2.08	108%
FICO >620-680	-0.5267	-99.30	0.59	-41%
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FICO >740-750	-2.0228	-338.50	0.13	-87%
FICO >750	-2.6185	-283.90	0.07	-93%
LTV >60-80	0.6833	141.78	1.98	98%
LTV >80-90	1.0823	183.51	2.95	195%
LTV >90-95	1.2773	189.03	3.59	259%
LTV >95	1.4777	129.87	4.38	338%
Origination year 2000	-0.2634	-11.65	0.77	-23%
Origination year 2001	0.1120	5.08	1.12	12%
Origination year 2002	0.4411	19.86	1.55	55%
Origination year 2003	1.1441	50.34	3.14	214%
Origination year 2004	1.5483	67.70	4.70	370%
Origination year 2005	2.1233	93.46	8.36	736%
Origination year 2006	2.1897	98.59	8.93	793%
Origination year 2007	2.3051	104.00	10.03	903%
Origination year 2008	2.0547	91.50	7.80	680%
Origination year 2009	1.2141	49.67	3.37	237%
Origination year 2010	0.7988	30.23	2.22	122%
Origination year 2011	0.5156	18.47	1.67	67%
Origination year 2012	0.2128	7.28	1.24	24%
Origination year 2013	-0.06355	-2.18	0.94	-6%
Origination year 2014	-0.4054	-13.29	0.67	-33%
Origination year 2015	-1.2723	-33.89	0.28	-72%
Origination UPB	-1E-06	Infty	1.00	-0.1%
Interest rate	0.3364	94.07	1.40	40%
Purchase indicator	-0.4525	-118.62	0.64	-36%
One-unit property indicator	-0.2324	-28.24	0.79	-21%
First-time homebuyer indicator	0.08907	16.22	1.09	9%
Owner-occupied indicator	-0.07398	-14.21	0.93	-7%

Source: Urban Institute calculations from Fannie Mae's loan-level credit data.

Notes: DTI = debt-to-income ratio; LTV = loan-to-value ratio; UPB = unpaid principal balance.

Notes

1. “Debt-to-Income Ratios,” Fannie Mae, August 30, 2016, <https://www.fanniemae.com/content/guide/selling/b3/6/02.html>.
2. The guide states that for manually underwritten mortgages, “When the Borrower’s monthly debt payment to income ratio exceeds 45% the loans is ineligible for sale to Freddie Mac.”
3. Laurie Goodman, Jun Zhu, and Bing Bai, “Overly tight credit killed 1.1 million mortgages in 2015,” *Urban Wire* (blog), Urban Institute, November 21, 2016, <http://www.urban.org/urban-wire/overly-tight-credit-killed-11-million-mortgages-2015>.
4. Richard Green, “The Trouble with DTI as an Underwriting Variable—and as an Overlay,” *Richard’s Real Estate and Urban Economics Blog*, December 7, 2016, <http://real-estate-and-urban.blogspot.com/2016/12/the-trouble-with-dti-as-underwriting.html>.
5. Ibid.
6. The argument for overlays is that there is economic and model uncertainty, and overlays limit the risk of providing loans that would be unsustainable for the borrower. But there is little evidence that overlays better protect the borrower than a sophisticated model that includes compensating factors.

Reference

Holden, Steve, and Walt Scott. 2017. “[Desktop Underwriter Version 10.1—Updates to the Debt-to-Income \(DTI\) Ratio Assessment](#).” Washington, DC: Fannie Mae.

About the Authors

Ed Golding is a nonresident fellow in the Housing Finance Policy Center at the Urban Institute. For 30 years, he has worked in mortgage finance, serving most recently as head of the Federal Housing Administration (FHA) in the US Department of Housing and Urban Development (HUD). During his tenure, the FHA provided more than a million families an opportunity to purchase their first home. Before heading the FHA, Golding was a senior adviser to the secretary of HUD. Golding was a senior fellow at the Urban Institute in 2013. He started his career at the Federal Home Loan Bank Board as a specialist assistant to a board member during the savings and loan crisis and then joined Freddie Mac for 23 years. At Freddie Mac, Golding had various responsibilities, ranging from investor relations to strategy and research. Before working in mortgage finance, Golding taught at the University of Pennsylvania and the University of Florida. From 2008 through 2012, he taught a spring course on financial markets at Princeton University’s Woodrow Wilson School of Public and International Affairs. Golding has an AB in applied mathematics from Harvard University and a PhD in economics from Princeton University.

Laurie Goodman is codirector of the Housing Finance Policy Center. The center is dedicated to providing policymakers with data-driven analyses of housing finance policy issues that they can depend on for relevance, accuracy, and independence. Before joining Urban in 2013, Goodman spent 30 years as an analyst and research department manager at several Wall Street firms. From 2008 to 2013, she was a senior managing director at Amherst Securities Group LP, where her strategy effort became

known for its analysis of housing policy issues. From 1993 to 2008, Goodman was head of global fixed income research and manager of US securitized products research at UBS and predecessor firms, which were ranked number one by *Institutional Investor* for 11 straight years. Before that, she was a senior fixed income analyst, a mortgage portfolio manager, and a senior economist at the Federal Reserve Bank of New York. She was inducted into the Fixed Income Analysts Hall of Fame in 2009. Goodman is on the board of directors of MFA Financial, is an adviser to Amherst Capital Management, and is a member of the Bipartisan Policy Center's Housing Commission, the Federal Reserve Bank of New York's Financial Advisory Roundtable, and Fannie Mae's Affordable Housing Advisory Council. She has published more than 200 journal articles and has coauthored and coedited five books. Goodman has a BA in mathematics from the University of Pennsylvania and an MA and PhD in economics from Stanford University.

Jun Zhu is a senior research associate in the Housing Finance Policy Center. She designs and conducts quantitative studies of housing finance trends, challenges, and policy issues. Before joining Urban, Zhu was a senior economist in the Office of the Chief Economist at Freddie Mac, where she conducted research on the mortgage and housing markets, including default and prepayment modeling. She was also a consultant to the Treasury Department on housing and mortgage modification issues. Zhu received her PhD in real estate from the University of Wisconsin–Madison in 2011.

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