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Who Bears the Risk in Risk Transfers?

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Introduction

When Fannie Mae and Freddie Mac were put into conservatorship, few thought the two agencies would still be wards of the federal government nearly nine years later. But they are, and taxpayers are still on the hook for any losses they may suffer.

To help protect taxpayers from the risks that Fannie and Freddie take when they insure mortgage loans, the Federal Housing Finance Agency, their regulator, requires that the agencies transfer much of their credit risk to private investors through so-called credit risk transfers. These risk transfers began four years ago through transactions with capital market investors and have since been expanded to include risk transfers to reinsurers, private mortgage insurers, and lenders.

A critical question regarding the capital market credit risk transfers is how much risk they are actually transferring to private investors. These are complicated transactions, and determining how much risk they are transferring is not straightforward. Adding to the importance of this question is that most of the recent proposals for reforming the housing finance system and getting the agencies out of conservatorship rely heavily on credit risk transfers.

Our analysis shows that while Fannie's and Freddie's capital market CRT deals are still in their infancy, we believe they offer taxpayers significant protection, particularly in times of economic stress. To be sure, if the credit risk transfer process is to provide a stable source of capital through the economic cycle, it will need to expand to include more institution-based capital. That said, our analysis suggests that the risk transfer process holds significant promise as a way to achieve a well-functioning, reformed housing finance system.

Who Bears the Risk in Risk Transfers?

BY MARK ZANDI, GUS HARRIS, RUBY SHI AND XINYAN HU

When Fannie Mae and Freddie Mac were put into conservatorship, few thought the two agencies would still be wards of the federal government nearly nine years later. But they are, and taxpayers are still on the hook for any losses they may suffer. This is an increasingly meaningful threat; under the terms of their agreement with the U.S. Treasury, the agencies will have no capital to absorb any losses by the end of 2017.

To help protect taxpayers from the risks that Fannie and Freddie take when they insure residential mortgage loans, the Federal Housing Finance Agency, their regulator, requires that the agencies transfer much of their credit risk to private investors through so-called credit risk transfers, or CRTs. These risk transfers began in summer 2013 through transactions with capital market investors and have since been expanded to include risk transfers to reinsurers, private mortgage insurers, and lenders.[1] The capital market transactions, including Fannie's Connecticut Avenue Security transactions and Freddie's Structured Agency Credit Risk transactions, remain the agencies' predominant method of transferring risk.

A critical question regarding the capital market credit risk transfers is how much risk they are actually transferring to private investors. These are complicated transactions, and determining how much risk they are transferring is not straightforward. There is thus skepticism in some quarters about just how well taxpayers are being protected.[2]

Adding to the importance of this question is that most of the recent proposals for reforming the housing finance system and getting the agencies out of conservatorship rely heavily on credit risk transfers. Proposals by the Mortgage Bankers Association, the Milken Institute's Michael Bright and Ed DeMarco, and Jim Parrott, Mark Zandi et al. use the CRTs as a significant source of private capital in their systems. While these reform proposals expect the risk transfer process to evolve and expand, they may be less viable if the capital market CRTs are unable to transfer much risk.[3]

This paper presents our work to determine how much credit risk the capital market CRTs are transferring from the agencies to private investors. We modeled and analyzed all of the 26 CAS and 27 STACR transactions issued through February 2017, and then ran a large number of scenarios through the models to assess the risk transferred. The scenarios are based on changing a range of assumptions, including default rates, loss given default, prepayment rates, the timing of defaults and prepayments, and the timing of loss recognition and recoveries.

In scenarios consistent with a typical well-functioning economy and housing market, the agencies do not transfer much risk. That is because credit losses are low, and the agencies by design shoulder the bulk of the burden of this so-called first loss, generally transferring no more than one-fifth of the risk to investors. That the agencies do not offload much of the first loss risk does ensure they have significant skin in the game, a financial interest in making sure their lending is prudent. This helps align the agencies' interests with those of private investors.[4] Investors are likely also demanding too high a return compared with the agencies' own cost of capital under many market conditions.

As the market strains and losses increase, however, a greater share of their losses would be transferred. Under scenarios in which the economy suffers a recession similar in severity to typical downturns experienced since World War II, the agencies typically transfer more than 60% of the credit risk to private investors, and as high as 80% on some deals. That is because the capital market CRTs transfer a much higher percentage of risk in the so-called mezzanine tranches of the deals. This is the sweet spot for risk transfers, as the probability of a significant recession is low enough to attract investors at a reasonable cost but high enough that it is worth it for the agencies to look for some protection.

Under severe stress scenarios, in which the economy and housing markets suffer a downturn at least as traumatic as the Great Recession, the agencies generally transfer approximately half of the risk to private investors. In addition to varying economic stress, these scenarios include unfavorable assumptions regarding both the timing of prepayments, which are assumed to occur soon after the issuance of the security, and the timing of defaults, which are assumed to occur much later. The share of the losses incurred by the agencies could conceivably increase substantially in these scenarios on some deals as investors get prepaid out of their exposure before a default occurs and they suffer a loss.

The loss protection under the severe stress scenarios can be used to determine how much capital they provide to Fannie and

Table 1: Residential Mortgage Loan Realized Losses

$ bil

	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total 2006-2014	Debt outstanding yr-end 2007	Losses as a % of outstanding
Total	17.1	38.5	130.2	213.3	193.8	166.3	161.4	111.9	76.4	1108.9	11,207	9.9
Government-backed	7.1	7.7	17.9	31.8	51.4	46.3	44.2	34.7	33.7	274.8	5,269	5.2
Fannie Mae & Freddie Mac	0.8	1.8	10.3	21.3	37.3	31.4	26.0	9.4	9.7	147.9	4,820	3.1
Fannie Mae	0.6	1.3	6.5	13.4	23.1	18.3	14.4	4.5	6.0	88.0		
Freddie Mac	0.2	0.5	3.8	7.9	14.2	13.1	11.6	4.9	3.7	59.9		
Federal Housing Administration	6.3	5.9	7.6	10.5	14.1	14.9	18.2	25.3	24.0	126.8	449	28.3
Privately backed	10.0	30.8	112.3	181.5	142.4	120.0	117.3	77.3	42.6	834.2	6,900	12.1
Mortgage insurers	1.5	6.9	4.5	6.8	10.4	10.5	9.8	8.3	5.6	64.4	962	6.7
Depository institutions	2.7	7.3	35.0	54.9	48.2	35.3	31.0	15.0	6.7	236.0	3,729	6.3
Private-label mortgage securities	5.8	16.6	72.8	119.8	83.8	74.2	76.5	54.0	30.4	533.8	2,209	24.2
Subprime	5.6	15.5	55.9	71.6	39.0	34.7	35.6	26.4	17.6	301.8		
Alt-A	0.2	0.9	11.3	28.0	24.0	20.5	20.1	14.0	7.6	126.7		
Option ARMs	0.0	0.2	5.2	17.9	17.4	14.8	16.5	10.9	5.2	88.0		
Jumbo	0.0	0.0	0.4	2.3	3.4	4.1	4.3	2.7	1.4	18.7		
Note: Securitized HELOC	0.2	1.5	5.1	5.1	3.4	2.1	1.6	0.9	0.3	20.2	53	38.4
Note: Home Equity Lines of Credit			11.8	19.4	17.3	12.7	12.1	5.7	3.0	81.8	611	13.4

Note: Debt outstanding for mortgage insurers is insurance-in-force. IIF is not included in total debt outstanding.

Sources: Fannie Mae, Freddie Mac, HUD, FDIC, Federal Reserve, Moody's Analytics

Freddie. For the agencies combined, the capital provided by the capital market CRT deals is an estimated 1.6%.[5] The total estimated capital provided through all the risk transfers, including the capital market CRTs and the institution-based sources of capital, is an estimated 2.1%. This is a substantial amount of protection, accounting for more than two-thirds of the losses the agencies suffered on their mortgage loans and securities during the financial crisis and Great Recession (see Table 1).[6]

To date, the agencies have eased into this entirely new asset class by limiting the amount of risk transferred. They are proceeding cautiously, presumably to find the appropriate balance between investor demand and loss protection. They may also have designed the capital market CRTs to maximize profitability rather than the amount of capital they provide, which is understandable as they experiment with these new financial instruments and given their priorities while in conservatorship.

Criticism that the capital market CRTs provide the agencies and thus taxpayers with little protection from credit risk is overstated. One potential reason for this misperception is that under the scenarios provided by the agencies in their prospectuses for the deals, the loss protection to taxpayers appears relatively low—not quite one-third. However, the prospectus scenarios are not representative of the severe stress scenarios that should be used to determine the capital provided to the agencies by the capital market CRTs. They include stress scenarios, but also other scenarios with low default and prepayment assumptions.

While Fannie's and Freddie's capital market CRT deals are still in their infancy, we believe they could offer taxpayers significant protection, particularly in times of economic stress. To be sure—and as we have discussed elsewhere—if the credit risk transfer process is to provide a stable source of capital through the economic cycle, it will need to expand to include substantially more institution-based capital from reinsurers, private mortgage insurers, lenders, and real estate investment trusts. That said, our analysis suggests that the risk transfer process holds significant promise as a way to achieve a well-functioning, reformed housing finance system.

Some history

Fannie Mae and Freddie Mac have long shared credit risk with private sources of capital. By their congressional charters, the agencies must get credit enhancement on loans they purchase that are originated with less than a 20% down payment. Historically, this credit enhancement has come almost exclusively from private mortgage insurers, which now provide insurance on close to $780 billion in single-family mortgage debt. The risk-in-force

on these mortgages—the maximum loss exposure of the PMIs—totals nearly $200 billion.

To further reduce the credit risk faced by Fannie and Freddie while in conservatorship, the FHFA beginning in 2013 required the agencies to transfer even more credit risk. These risk transfers have taken on greater urgency as the capital the agencies hold to protect against losses has been steadily declining and will be completely depleted by the end of this year.

To date, the agencies through the CRTs have transferred some credit risk on close to $1.6 trillion in mortgages, about one-third of the single-family mortgage debt they insure. The risk-in-force on these mortgages is near $55 billion. Of the CRTs, not quite three-fourths have been with the capital markets through the CAS and STACR transactions. These are unsecured debt securities of Fannie and Freddie, with investors having unsecured recourse to the agencies' balance sheet.[7] The investors in these transactions include asset managers, hedge funds, sovereign wealth funds, real estate investment trusts, and other institutional investors.

Outside of the capital market CRTs, most of the remaining risk transfers have been with reinsurers. The agencies have also done a few small so-called front-end deals—in which the risk is transferred before the agencies purchase the loans—with private mortgage insurers and with lenders through recourse deals. The capital market CRTs and most of the transfers with reinsurers are back-end deals, where the risk is transferred by the agencies after they have purchased the loans.

The capital market CRT transactions have evolved substantially since their inception; the agencies have worked to strike a balance between investor demand and the economics of the deals, and transfer as much risk as possible to investors. Early deals were based on predetermined loss given default, and investors took those losses when the loans became 180 days past due. Since then, the deals have been based on actual loss given default, in which investors take losses with an actual loss event, such as a foreclosure sale, short sale, or real-estate owned disposition. A few of the deals have also included transferring some of the first-loss credit risk, although the agencies appear less likely to transfer this type of risk in the future given the high costs involved.

Deconstructing the deals

The structure of the capital market CRTs has evolved over time, but for the most part losses on mortgages backing the deals have been divided into five tranches. The agencies bear losses along with private investors in the first four tranches, and the agencies bear all of the losses in the fifth tranche.

The initial credit losses are borne by the first loss tranche, which includes the investors' B tranches and the agencies' BH tranches (see Table 2). Losses are then borne in order by the mezzanine tranches, which includes the investors' M3, M2 and M1 tranches and the agencies' M3H, M2H and M1H tranches. The agencies bear all of the losses that occur in the senior AH tranche.

Whether the agencies or investors ultimately bear the credit losses is complicated by the paydowns on the mortgages backing the securities. Paydowns include normally scheduled amortization and unscheduled prepayments, which pay down the tranches owned by private investors and the agencies on a pro rata basis in the order of their seniority. The most senior M1 tranche is paid off first and, under almost all scenarios that we ran, is mostly paid off before it could incur any losses.

The greater the paydown, the less protection the CRT deals provide the agencies. Particularly if there are lots of prepayments early on after the CAS and STACR securities are issued and before there are credit events and losses mount, then the agencies will bear more of the risk. Essentially, investors will get paid off before the losses occur. However, if prepayments are slower and/or losses are incurred early in the life of the deal, then investors remain in the deals for longer and are more likely to bear more of the losses. Thus, who ultimately shoulders the risk depends on which scenario plays out.

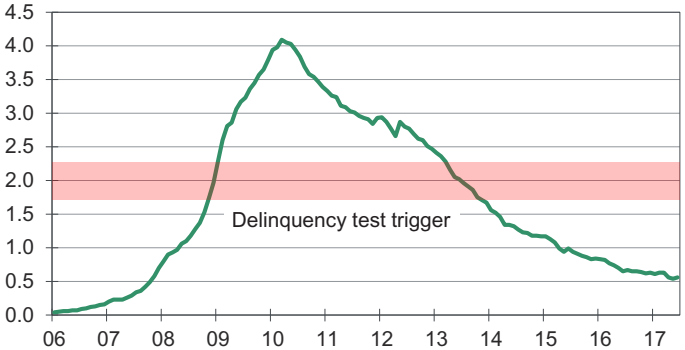
Various features of the deals impact how these scenarios will play out. Performance tests help ensure that investors remain on the hook for some credit losses in the scenario where there are lots of prepayments before the losses hit. Most notable is a minimum credit enhancement test that increases the amount investors have at risk before any prepayments pay down their exposure.[8] There is also a delinquency test: If the average monthly balance of distressed mortgages—defined as 60 or 90 days or more past due depending on the agency, foreclosed, recently modified, etc.—exceeds a threshold generally tied to half the subordination level, then paydowns are curtailed so that investors remain on the hook for some of the losses (see Chart 1).[9]

How the deals define a credit event may also impact who ultimately bears the risk. A credit event triggers the allocation of credit losses across the tranches, and thus when investors begin to absorb them. The more recent change in the definition of a credit event, from when loans go 180 days delinquent to when a foreclosure or short sale or REO occurs, may be more investor-friendly, as it provides more time for the investors to get paid out of the deals before the losses hit. Although it should be noted that a stronger minimum credit enhancement test and the introduction of the delinquency test were instituted in part to mitigate this possibility.[10]

The pricing of the CRT securities also potentially determines who effectively bears the financial burden of the risk. If the agen-

Chart 1: Crisis Would Have Triggered Test

QM-like first mortgage loans 60 days past due, % of $ outstanding



Sources: Equifax, Moody's Analytics

cies pay investors a return that more than compensates for the risk, those investors are effectively taking on less risk.

Concern that investors will get paid out of the deals before the credit losses hit may also be fanned by the performance of the CAS and STACR deals to date. Both have experienced only nominal credit losses, amounting to less than 10 basis points of the unpaid principal balance, but paydowns have been more substantial, with almost one-fourth of the balance in outstanding deals paying down over an average life of about two years. This has been driven by the unprecedented decline in mortgage interest rates over the past decade.

Fannie's CAS and Freddie's STACR transactions differ in some ways that determine who bears the risk in these deals. The size of the tranches is important; Fannie's CAS deals generally have thinner tranches than Freddie's STACRs. For example, the first loss tranche of the typical CAS deal absorbs losses up to 64 basis points, compared with 81 basis points for the typical STACR. Excluding the impact of paydowns, losses must be greater than 365 basis points for the senior AH tranche in CAS deals to suffer, while they must be greater than 496 basis points to hit the senior AH tranche in STACRs (see Table 2).

Also important is the percentage of each tranche held by the agencies and investors. Fannie and Freddie both hold more than 80% of the first loss tranche, but Fannie holds just over 5% of the mezzanine tranches, while Freddie in most of its deals holds more than 30% of these tranches. Fannie has decided to hold the minimum amount of risk that it is permitted under the risk-retention, or so-called skin-in-the-game rules, implemented under the Dodd-Frank regulatory reform. Freddie holds more risk in its capital market CRTs, although it also uses risk transfers with reinsurers on the same mortgages backing its CRT deals to comparably reduce its risk.[11]

Methodological overview

To get an accurate estimate of the amount of risk the agencies are transferring to private investors through their capital market CRTs, it is critical that many scenarios

Table 2: Deconstructing the Capital Market CRT Deals

Across all STACR and CAS transactions

	Freddie STACR transactions	Fannie CAS transactions
Issuance balance		
AH/1AH/2AH (5th loss)	$628,861,574,437	$694,634,490,630
M1/1M1/2M1 (4th loss)	$5,228,000,000	$7,748,530,000
M1H/1M1H/2M1H (4th loss)	$2,432,178,585	$434,051,729
M2/1M2/2M2 (3rd loss)	$6,384,750,000	$9,428,996,000
M2H/1M2H/2M2H (3rd loss)	$3,061,536,137	$529,997,095
M3 (3rd loss)	$6,059,000,000	$3,152,742,000
M3H (3rd loss)	$2,662,574,013	$165,940,052
B1/1B1 (2nd loss)	$1,139,750,000	$207,850,000
B1H/1B1H (2nd loss)	$515,387,398	$10,939,980
B/B2/1B/2B (1st loss)	$988,000,000	$649,086,000
BH/1BH/2BH/B2H/1B2H (1st loss)	$4,356,101,640	$3,949,776,689
Total	$661,688,852,210	$720,912,400,175
Tranche thickness		
1st loss	0.808%	0.638%
2nd loss	0.250%	0.030%
3rd loss	1.318%	0.460%
4th loss	1.428%	1.381%
5th loss	1.158%	1.135%
Cumulative subordination		
1st loss	0.00%	0.00%
2nd loss	0.808%	0.638%
3rd loss	1.058%	0.668%
4th loss	2.376%	1.129%
5th loss	3.803%	2.510%
Total	4.961%	3.645%
Agency retained risk, percent of:		
1st loss	81.5%	85.9%
2nd loss	31.1%	5.0%
3rd loss	30.5%	5.0%
4th loss	32.4%	5.3%
5th loss	31.8%	5.3%
Agency cumulative retained risk, percent of:		
1st loss	81.5%	85.9%
2nd loss	69.6%	82.2%
3rd loss	47.9%	50.7%
4th loss	42.1%	25.7%
5th loss	39.7%	19.4%
Current balance		
AH/1AH/2AH (5th loss)	$474,634,991,627	$520,248,580,239
M1/1M1/2M1 (4th loss)	$1,862,435,562	$3,535,430,484
M1H/1M1H/2M1H (4th loss)	$898,686,357	$191,190,987
M2/1M2/2M2 (3rd loss)	$5,483,875,192	$9,182,020,972
M2H/1M2H/2M2H (3rd loss)	$2,847,769,466	$516,882,692
M3 (3rd loss)	$6,059,000,000	$3,152,742,000
M3H (3rd loss)	$2,662,574,013	$165,940,052
B1/1B1 (2nd loss)	$1,139,750,000	$207,850,000
B1H/1B1H (2nd loss)	$515,387,398	$10,939,980
B/B2/1B/2B (1st loss)	$983,745,280	$649,064,726
BH/1BH/2BH/B2H/1B2H (1st loss)	$4,302,297,456	$3,886,884,816
Total	$501,390,512,352	$541,747,526,947

are considered. We ran two sets of scenarios. The first includes the scenarios presented in the prospectuses that Fannie and Freddie provide with their sales of the CAS and STACR securities to private investors. These scenarios are part of the loss sensitivity analysis the agencies conduct to help investors gauge the risks they face when investing in these transactions.

The prospectus scenarios assume different default and prepayment rates, and a loss given default rate of 15% or 25%.[12] This is a reasonable LGD assumption, as it is approximately equal to the loss rate incurred on defaulting loans historically. However, to better understand the sensitivity of the results to LGD, we also expanded the prospectus scenarios using more LGD assumptions.

The second set of nearly 2,000 scenarios is designed to encompass a very wide distribution of possible economic and housing market outcomes. They include scenarios consistent with a typical well-functioning economy, garden-variety economic recessions, and severely stressed economies with downturns that are even deeper and longer than the Great Recession. Some of the economic scenarios are generated using our model system of the U.S. economy. This model system provides projections for many economic and housing market variables for the nation, states and metropolitan areas, including unemployment, personal income, house prices, inflation and interest rates.

These economic projections are then used to drive our loan-level models of mortgage defaults, prepayments, and loss given default for loans in the CAS and STACR transactions. For each loan in the transactions, default and prepayment probabilities are determined as a function of loan-specific and economic factors. Using a multistep Monte Carlo approach, these probabilities are used to simulate defaults, prepayments, and loss given default and generate projections of principal and interest payments and losses.

Finally, these payment and loss projections are run through our waterfall models for each of the CAS and STACR deals. Waterfall models determine how the principal and interest payments on the mortgage loans backing the securities flow through to the various tranches in the securities. The models account for amortization, prepayments, defaults, loss given default, the timing of prepayments and defaults, and how those features impact the cash flows that are allocated to each of the tranches. Our CAS and STACR waterfall models also account for deal-specific trigger levels and other features of the deals that impact the flow of mortgage payments.[13]

Table 2: Deconstructing the Capital Market CRT Deals

Across all STACR and CAS transactions

	Freddie STACR transactions	Fannie CAS transactions
Paydown amount		
AH/1AH/2AH (5th loss)	$154,226,582,809.54	$174,385,910,391
M1/1M1/2M1 (4th loss)	$3,365,564,437.65	$4,213,099,516
M1H/1M1H/2M1H (4th loss)	$1,533,492,227.73	$242,860,742
M2/1M2/2M2 (3rd loss)	$900,874,808.18	$246,975,028
M2H/1M2H/2M2H (3rd loss)	$213,766,670.67	$13,114,403
M3 (3rd loss)	$-	$-
M3H (3rd loss)	$-	$-
B1/1B1 (2nd loss)	$-	$-
B1H/1B1H (2nd loss)	$-	$-
B/B2/1B/2B (1st loss)	$4,254,719.99	$21,274
BH/1BH/2BH/B2H/1B2H (1st loss)	$53,804,184.35	$62,891,873
Total	$160,298,339,858.11	$179,164,873,228
Paydown, % of issuance	*24.2*	*24.9*
Average for mortgages in the deals		
Loan-to-value ratio	81.0	80.4
Combined loan-to-value ratio	81.7	81.1
Debt-to-income ratio	34.4	33.7
Credit score	759	752

Source: Moody's Analytics

Prospectus scenarios

The prospectus scenarios are useful in determining who bears the credit risk in the CAS and STACR transactions, but only under certain market conditions. On average across the scenarios, the agencies shoulder just over two-thirds of the loss, leaving private investors with nearly one-third of the loss. Fannie appears to have transferred somewhat more risk than Freddie on average across all the deals, although this is likely due to Freddie's use of reinsurance on the same loans referenced in these deals. The amount transferred by both agencies has generally increased somewhat between the early transactions and the more recent ones (see Table 3).[14]

The amount of risk transferred by the agencies is sensitive to the LGD assumptions. When we expand the prospectus scenarios by considering a wider range of LGD assumptions, the agencies are found to transfer closer to 40% of the credit risk in the deals to private investors.

The prospectus scenarios should not be used to infer how much capital the CAS and STACR transactions will provide the agencies. They are intended to give investors an understanding of how the securities perform under a range of scenarios, including non-stress scenarios that are not helpful in understanding the capital provided by the deals. Indeed, taken together the prospectus scenarios will meaningfully understate the amount of capital protection provided by the deals.

Across the business cycle

The effectiveness of the capital market CRTs in transferring credit risk from the agencies to private investors varies considerably across the economic business cycle.

In a typical well-functioning economy consistent with a baseline scenario in the middle of the distribution of possible eco-

Table 3: How Much Risk are the Agencies Transferring in the Prospectus Scenarios?

% of risk transferred to private investors

Fannie CAS & Freddie STACR transactions combined

	All deals	Deals by yr 2017	2016	2015	2014	2013
Prospectus scenarios	34.0	40.8	32.2	29.9	35.2	41.7
Expanded prospectus scenarios	38.6					

Fannie Mae CAS transactions

	All deals	Deals by yr 2017	2016	2015	2014	2013
Prospectus scenarios	36.1	45.2	33.9	30.8	38.1	44.4
Expanded prospectus scenarios	39.2					

Freddie Mac STACR transactions

	All deals	Deals by yr 2017	2016	2015	2014	2013
Prospectus scenarios	31.0	34.5	29.8	29.0	31.0	37.8
Expanded prospectus scenarios	36.2					

Note: This analysis was not done for the expanded prospectus scenarios by deal yr.

Source: Moody's Analytics

nomic outcomes, expected losses on mortgage pools backing a sample of CAS and STACR transactions range from 20 to 80 basis points, depending on the deal. For example, mortgages in the 2017-DNA1 STACR deal have an expected loss rate of 55 basis points, driven by an average default rate of 4.5% and an average loss given default rate of more than 12%. The 2016-CO2 CAS deal has a lower expected loss rate of 29 basis points under the baseline, with a 2.8% average default rate and an almost 11% average LGD.

Baseline tranche paydowns—amortization and prepayments—are expected to run between 20 and 60 basis points per annum.[15] The 2013 CAS and STACR notes have experienced a paydown of near 25 basis points, while the 2015 deals have been closer to 60 basis points per year. Under baseline scenarios, mortgage prepayments and, thus, the tranche paydowns are expected to be at the lower end of this range. That is because the average coupon on outstanding agency mortgages has steadily fallen with the refinancing waves of the past two decades to a very low close to 4%, while future fixed mortgage rates are not expected to fall much below this, at least not for very long.

Based on these loss and paydown expectations, the agencies hold on to the bulk of the credit risk in the CAS and STACR transactions in a typical baseline scenario. They typically transfer no more than one-fifth of the risk to private investors. This reflects the agencies' decision to maintain most of the first loss risk in the deals. Freddie began transferring some first loss risk to private investors only in 2015 and Fannie began in 2016. Investors in the early deals were understandably nervous about taking on first loss risk and to do so would have required returns that were uneconomical to the agencies. As the risk transfer process has matured and investors have become more comfortable with it, the cost to the agencies of transferring first loss risk has declined, but the cost of transferring first loss risk is probably still too high for it to be significant.

The agencies transfer much more risk to investors in scenarios in which the economy suffers a recession similar in severity and length to a typical downturn suffered since World War II. Losses on mortgage pools backing the CAS and STACR transactions range from 80 to 250 basis points in these scenarios. Mortgages in the 2017-DNA1 STACR deal, for example, have an expected loss rate of 230 basis points, driven by an average default rate of 9.1% and an average LGD of approximately 25%. The 2016-CO2 CAS deal has a lower expected loss rate of 130 basis points under a common recession scenario, with an average default rate of 5.5% and an average LGD in excess of 23%. The paydown expectations in the recession scenarios are not much higher than in the baseline scenarios.

Under many recession scenarios, the agencies typically transfer more than 60% of the credit risk in the CAS and STACR transactions to private investors. The agencies appear to be reasonably using investors to shoulder more of the risk burden in difficult economic times—but not so difficult that investors require an outsize return that would make the deal prohibitively expensive.[16]

Severe stress scenarios

The amount of risk transferred by the capital market CRTs under severe stress scenarios is particularly important, because it can be used to determine the capital equivalence of these deals. The amount of capital that financial institutions like the agencies hold must be sufficient to absorb losses they would suffer in severe stress scenarios—scenarios in the tail of the distribution of possible outcomes.

The financial crisis and Great Recession is a benchmark for what the agencies would suffer in such a scenario. As a result of that severe downturn, the agencies experienced an estimated loss rate on their mortgage loans and securities of almost 300 basis points. If another similar downturn were to

occur today, the CAS and STACR transactions would be expected to transfer to private investors 60% to 70% of the credit risk in the mortgages owned by Fannie and Freddie. Thus instead of suffering a 300-basis point loss, the agencies would have lost close to only 100 basis points.[17] It is thus conceivable that Fannie and Freddie could have avoided insolvency and a government takeover.[18]

When constructing stress scenarios for determining the appropriate capitalization for the agencies, even more severe outcomes should probably be considered. We thus simulated a wide range of stress economic scenarios on the agencies' current mortgage loans resulting in losses ranging from 250 to 600 basis points. For example, mortgages backing the 2017-DNA1 STACR deal have an expected loss rate of 550 basis points under such a scenario, driven by an average 15.5% default rate and an average LGD of more than 35%. The 2016-CO2 CAS deal has a lower expected loss rate of 320 basis points, with an average default rate of 9.8% and an average LGD of more than 33%. To further increase the stress in these scenarios, there are meaningfully larger paydowns and the paydowns occur much sooner after the issuance of the securities.

Under these stress scenarios, the agencies transfer approximately half of their credit risk in the CAS and STACR transactions to private investors. And since the notional amount of risk—the total potential amount of risk—that the agencies are transferring to investors in their deals is close to 3%, the capital being provided by these deals is an estimated 1.6%.[19] The agencies are thus raising approximately 40% of their estimated implicit 4% capitalization from their capital market CRTs.[20] Even more impressive, the agencies' entire risk transfer process—the capital market CRTs and the risk transfers to institution-based sources of capital combined—provides the agencies with capital of 2.1%, or more than half of their total 4% capitalization.

Cost of protection

A potential problem with the capital market CRTs is that the agencies may overpay investors to take on credit risk. That is, the agencies may be paying investors substantially more than their own costs of shouldering the risk. If so, then our estimates of the capital equivalence of these transactions would likely be overstated. Though we plan to do more work on this issue, our preliminary findings indicate that this is not the case.

To determine this, we calculated the annual interest cost to the agencies of paying investors in their CAS and STACR transactions at issuance. We then compared the cost of paying investors on the deals to the agencies' own cost of bearing the risk, which we estimate to be equal to the agencies' 40-basis point charge for the return on their implicit capital.

Based on this analysis, Fannie is paying just over 11 basis points of its 40 basis points in capital costs—more than one-fourth of its costs—to private investors on average across all its deals during the first year after issuance of the CAS securities. Freddie is paying investors a bit less, but only because it is transferring some of the risk to reinsurers via its ACIS program. This is consistent with the amount of risk the agencies are transferring to investors on average through the business cycle and all market conditions. There is thus no indication that the agencies are paying investors too much on their capital market credit risk transfers.

How much the agencies have paid investors varies deal by deal, but the most ever was an early-2016 Fannie deal when the agency paid investors just over half its capital costs during the first year (see Chart 2). Not coincidentally, this was the last time financial market conditions were unsettled, credit spreads in fixed income markets widened significantly, and thus the cost of borrowing from capital markets was high for all borrowers. The most Freddie has paid is just under half of its first year premiums.

Fannie is paying out more to investors in its recent deals than in its early ones, but this is consistent with when the agency began to transfer first loss risk. Freddie's payments to investors across its deals have been less variable, and most recently have declined as a percent of its capital costs.

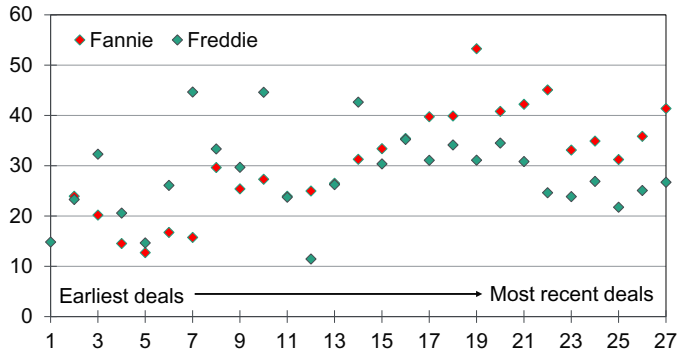
A potential drawback of this analysis is that it captures only the cost of transferring risk to investors in the first year after the issuance of the securities, and thus does not account for the deals' floating rates or that they amortize and prepay. To assess the significance of this, we ran the STACR 2016-DNA4 transaction through a variety of constant prepayment, default and interest rate scenarios. In the most extreme case, lifetime payments to investors got as high as nearly 40%. There is thus no evidence to suggest that the agencies are overpaying investors for taking on credit risk in the capital market CRTs.

Not in all markets

The capital market CRTs to date have been an effective way for the agencies to transfer risk to private investors. But since their introduction four years ago, credit conditions and financial markets have been for the most part very favorable to their success. Mortgage credit quality has arguably never been better, credit spreads in fixed income markets are unusually narrow, and market volatility is extraordinarily low (see Chart 3).[21] What will happen when credit and market conditions turn for the worse? Will the agencies continue to transfer risk as effectively via their capital market CRTs?

Chart 2: A Reasonable Cost for Protection

Y-axis=% of agency premium paid; x-axis=CAS or STACR deal



Source: Moody's Analytics

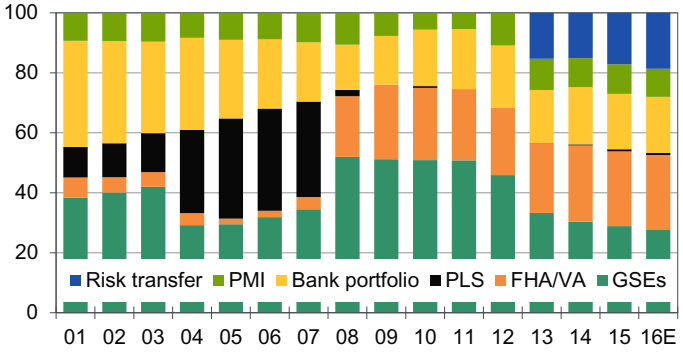
Chart 3: Unusually Calm Fixed Income Markets

Yield spread between high-yield corporate bonds, 10-yr Treasury

Sources: Bloomberg, Treasury, Moody's Analytics

Chart 4: Who Is Taking Mortgage Credit Risk?

Credit risk share of residential mortgage originations, %



Sources: Fannie Mae, Moody's Analytics

Not with their current more-or-less fixed guarantee fees, or g-fees. The agencies have changed their g-fees while in conservatorship, but only sparingly, and for reasons unrelated to changing market conditions and the cost of transferring risk to investors. Conditions will eventually erode such that the agencies' cost of transferring risk to investors will be greater than their fixed g-fees. They likely will be forced at some point to stop their risk transfers or otherwise suffer losses. This could go on for a long time under stressed conditions, requiring the agencies and thus taxpayers to shoulder a significant amount of credit risk.

To help address this, the agencies could link their g-fees, at least partially, to the cost of their risk transfers. As market conditions weaken, the cost of transferring risk to investors rises because they demand a higher return, eventually causing g-fees to rise. The reverse would occur as market conditions strengthen. While this would cause g-fees and mortgage rates to be more procyclical—rising in tough times and falling in good times—it would put more of the cost of taking mortgage credit risk appropriately on borrowers instead of taxpayers.

To further prepare for those tough market conditions when capital market CRTs are not working effectively, the agencies should engage in more risk transfers with more stable institution-based sources of capital. As previously mentioned, these include reinsurers, private mortgage insurers, lenders, and REITs. The cost of this capital would also increase in tough times, but not like the cost of the capital market CRTs, since the institution-based capital is more dedicated to taking on mortgage credit risk and more likely to be available in good times and bad.

Moreover, guarantors in the future housing finance system, which could include some incarnation of the agencies freed from conservatorship, will also need to hold a significant amount of capital. The future guarantors will surely be required to take on credit risk even in the most difficult market conditions, but will not be able to transfer that risk economically to capital markets or institution-based sources of capital, at least not until conditions settle. This will also be necessary to convince investors to take on risk in the good times lest they fear that the guarantors will stumble and be unable to make good on their obligations to investors when times turn bad.

Conclusions

Fannie Mae and Freddie Mac have been stuck in the limbo of conservatorship for nearly nine years, but that does not mean they have been standing still. They have made significant progress reducing their footprint—and thus the governments'—in the mortgage market, and laying the foundation for the future housing finance system.

Especially impressive has been their development, along with the FHFA, of a new market for transferring their credit risk to private sources of capital, reducing the risk that they pose to taxpayers. To put the progress into context, it is useful to consider that private investors in the risk transfers are already taking on what is approaching one-fifth of all the credit risk in single-family residential mortgage loans originated in recent years (see Chart 4).[22] This is comparable to the risk that commercial banks and other depository institutions are shouldering, and it is not too far from the risk that Fannie and Freddie bear or even the risk being borne by the Federal Housing Administration and Veterans Administration.

Most of the agencies' credit risk transfers to date have occurred through capital market CRTs to a wide range of investors, including asset managers, hedge funds, sovereign wealth funds, and REITs. To date, through these transactions some portion of the risk on well over $1 trillion in agency mortgage loans has been transferred to private investors in ways that made economic sense to both the agencies and investors. Liquidity in the market for CRTs is strong and continues to improve, supported by the transparency of the securities and the underlying mortgage loans. Our ability to conduct this analysis is a testimonial to this transparency.

However, the capital market CRTs are complex, raising reasonable concerns over whether they will protect the agencies and taxpayers when the economy stumbles. How effectively the transactions transfer risk from the agencies to investors depends on many factors that are uncertain, including the timing of paydowns and default. So it is important to ask whether these transactions will work out as expected, with private investors shouldering a significant amount of any

losses on the agencies' mortgage loans when unemployment is high and rising and house prices are falling.

Our analysis of the capital market CRTs indicates that the answer is a cautionary yes. When combined with the agencies' risk transfers to institution-based sources of capital, the agencies are able to raise more than one-half the capital they would need to operate as private systemically important financial institutions.

To be sure, Fannie and Freddie have more work to do to fully realize the potential of the credit risk transfer process. To provide a stable source of capital through the entire economic cycle, the process will need to evolve and expand. Financial markets are volatile and there will be times when capital market investors are unwilling to provide capital, at least not at an exorbitant price. Reinsurers, private mortgage insurers, and REITs have a bigger role to play, since they have plenty of capital to take credit risk and are more willing to take risk in less favorable market conditions. These institutions must be as financially strong and have the same obligations to serve the mortgage market as the agencies. More front-end risk transfers would also be desirable for a host of policy reasons.[23]

All of this said, while Fannie and Freddie's credit risk transfer process is still in its infancy, it is already succeeding in pushing off considerable amounts of credit risk to private markets, reducing the threat that the agencies pose to taxpayers in the current housing finance system, and offering a solid foundation on which to build a new one.

Endnotes

1 A good description of the credit risk transfer process and an assessment of how well it is performing are provided annually in the FHFA's Single-Family Credit Risk Transfer Progress Report.
2 A recent critique of the capital market CRTs is found in "Credit Risk Transfer Is Not a Panacea for Fannie and Freddie," Parsons and Shemi, The Journal of Structured Finance, spring 2017. Another outspoken critic of the capital market credit risk transfer process is former Fannie Mae Chief Financial Officer Tim Howard, who has blogged extensively on the subject.
3 An analysis of how to expand and improve the credit risk transfer process is provided in "How to Improve Fannie and Freddie's Risk Sharing Effort," Goodman, Parrott and Zandi, Urban Institute white paper, August 2016.
4 The "skin in the game" argument is more complicated at the current time with the agencies in conservatorship and with dwindling capital.
5 This does not include capital provided by private mortgage insurers.
6 More context is provided by the agencies' 2016 stress test, in which under the severe adverse scenario, which is similar in severity and length to the Great Recession, and the assumption that the agencies would lose their deferred tax assets, the agencies would suffer a 2.6% loss rate.
7 The capital market CRT deals do not own the underlying mortgages on which they are based, as the mortgages have already been sold into the agencies' mortgage-backed securities. The CRT deals synthetically hedge the credit risk assumed by the agencies by referencing the performance of the underlying mortgages. They effectively mirror the credit loss and prepayment performance of the underlying mortgages owned by the agency MBS. The capital market CRT deals are thus the unsecured credit risk of the agencies, and their performance is determined by the credit and payment performance of the underlying mortgages and the general credit worthiness of the agencies.
8 The minimum credit enhancement test has been a feature of the capital market CRTs since their introduction, and has been strengthened in more recent deals.
9 Chart 1 shows the 60 days plus delinquency rate—the percentage of first mortgage debt in dollars outstanding—on first mortgage loans that are similar to loans that satisfy the qualified mortgage rule as currently being accepted by the agencies. The shaded area shows the estimated range of delinquency rate over which the test would generally be triggered.
10 The way loan modifications are treated in the deals is another important feature that could impact who bears the risk, particularly in periods of significant stress.
11 Freddie Mac's insurance-based risk transfer vehicle with reinsurers is known as Agency Credit Insurance Structure, or ACIS. Fannie Mae's is called Credit Insurance Risk Transfer, or CIRT.
12 Loss given default is defined as the total loss (the loss from the decline in home value and other costs associated with a default) suffered by the agencies when a credit event occurs.
13 We did this analysis based on the structure of the securities when they are issued and also as of January 2017. As mortgages backing the securities pay down and defaults occur, the structure changes, which in turn changes the amount of risk transferred by the agencies to investors.
14 The constant default rate in the prospectus scenarios was capped at 3%.
15 This would be approximately consistent with a 10% constant prepayment rate.
16 Fannie appears somewhat more aggressive in employing this strategy than Freddie.
17 This is a rough approximation, as it does not consider the agencies' institution-based risk transfers, but not all of the agencies' risk would be covered by risk transfers.
18 This may be an overstatement, because while the losses Fannie and Freddie would have incurred would take place over several years, they had only 45 basis points of capital going into the financial crisis.
19 This is equal to just over half the 3%.
20 This is derived simply by dividing 1.6 by 4. While the agencies will soon hold no actual capital, their guarantee fee is consistent with an approximately 4% capitalization rate. Consider that of their current 60-basis point guarantee fee, 10 basis points go to fund a temporary reduction in the payroll tax, 6 basis points are for expected losses, 4 basis points are for general administrative expenses, and the remaining 40 basis points are a charge for the return on their implicit capital. Assuming the agencies are earning a 10% after-tax return on equity—consistent with the returns currently received by systemically important financial institutions—then this suggests the agencies have a 4% implicit capitalization (40 basis points divided by 10%).
21 The yield spread between high-yield corporate bonds and 10-year Treasury yields is a good proxy for credit concerns among fixed income investors. This yield spread has averaged 560 basis points since the late 1980s when the high-yield corporate bond market became active.
22 PLS in Chart 4 is an abbreviation for private-label mortgage-backed securities, and GSEs stands for government-sponsored enterprises, which is another way to refer to the agencies. This apportionment of who is bearing credit risk in single-family residential mortgage lending is through the business cycle.
23 At the same time, it is important that the risk transfer process does not go too far in covering mortgage loan products such as adjustable rate mortgages and loans with short terms that are not conducive to such transfers.

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He is on the board of directors of MGIC, the nation's largest private mortgage insurance company, and The Reinvestment Fund, a large CDFI that makes investments in disadvantaged neighborhoods. He is the author of Paying the Price: Ending the Great Recession and Beginning a New American Century, which provides an assessment of the monetary and fiscal policy response to the Great Recession. His other book, Financial Shock: A 360º Look at the Subprime Mortgage Implosion, and How to Avoid the Next Financial Crisis, is described by the New York Times as the "clearest guide" to the financial crisis.

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