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Mortgage Delivery to the Secondary Market when Interest Rates are Falling

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Abstract

A borrower whose loan is committed to the securitization process has the ability and incentive to switch lenders if market rates drop during the loan origination period, which creates significant exposure for primary lenders. A simple secondary market contract innovation we call a mortgage rate drop guarantee (MRDG) could shift this risk to the securitizers who represent portfolio investors. Our simulation results indicate this shifting would have improved the risk/return distribution faced by originators without damaging the risk/return position of securitizers during our 1977–2010 sample period. Assuming conservative loan lives and origination periods, and competitive lending markets, the risk reduction features of MRDGs could also have generated significant interest savings for borrowers.

Keywords: secondary mortgage markets, securitization, originate to deliver

JEL Classifications: G11, G21, G28

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1. Introduction

Residential mortgage loans, which totaled more than $10.5 trillion outstanding in December 2010, make up almost one-third of the volume in the nonbank credit market. More than half of that amount is held in mortgage-backed securities (MBS), which are assets that allow the separation of the loan origination and investment functions. Efforts to resolve the mortgage crisis have focused on many aspects of the way residential loans are underwritten and securitized but one area that has not been considered thus far is the interest rate risk that originators face during the time between the sale of an approved mortgage to the secondary market and the delivery of the MBS to an investor.[1]

These transactions occur in what is known as the "TBA" (to-be-announced) market, which is a multibillion dollar forward market that remained active even during the height of the mortgage crisis. In a typical TBA transaction, an originator sells an MBS to an investor and promises a package of loans to a securitizer as soon as the underlying borrower and property have been approved. It can then take up to two months for the legal documentation to be completed so originators must wait an uncertain amount of time to deliver loans to securitizers in return for the MBS used to settle their obligations to investors.[2]

Given the structure of the TBA market, originators earn a profit *only* if they are able to deliver closed loans to securitizers, who then return MBS for investors. The movement of market rates during the 30–60-day origination period creates interest rate exposure that must be borne by one or more of the parties to the transaction. Originators typically protect borrowers from loan rate increases by writing explicit rate lock options paid for by nonrefundable, up-front commitment fees. Exercise of these options by borrowers forces originators to create below-market rate loans if interest rates rise during the origination period but the TBA market has transferred this risk to investors when the loans-in-process are sold.

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[1] Hancock and Passmore (2009) propose three innovations, a "buy your own" mortgage option, variable maturity debt and a government bond insurer that insures covered bonds, for promoting financial stability while enhancing the mortgage market. Nejadmalayeri (2011) argues for a mortgage whose payments are indexed to wage inflation to reduce default risk while Ambrose and Buttimer (2012) advocate a mortgage whose balance rises and falls with changes in a house price index to reduce the value of the borrower's option to surrender the home to the lender.

[2] The TBA market has very specific rules that govern the delivery process because originators have sold the MBS to investors *before* the underlying mortgages are closed. See the Securities Industry and Financial Markets Association Web site (www.sifma.org) for standardized rules of good delivery and Mortgage Market Note 08-03, "A Primer on the Secondary Mortgage Market," published by the Office of Federal Housing Enterprise Oversight on July 21, 2008 for an overview of the market structure. In this paper, we use the terms "securitizer" and "investor" interchangeably because the securitizer acts mainly as a bookkeeper, exchanging loans for MBS in return for a very small fee. The paper by Frame and White (2007) contains an excellent overview of the roles of the participants and the administrative structure of the secondary mortgage market.

Borrowers cannot be forced to close loans at previously locked quotes if market rates *drop* during the origination period, however. In this paper, we show that the right to refinance a loan-in-process at a lower interest rate is valuable to borrowers and creates significant risk for originators. We then propose the creation of a mortgage rate drop guarantee (MRDG), which is a contract innovation that would allow originators to mitigate the risk of an interest drop during the origination period by lowering loan rates for approved borrowers if market rates fall. We next show that insurance of this sort would have improved the risk/return distribution faced by originators during the 1977–2010 sample period without harming investors.

Given this result, it should not be surprising that MRDGs could also benefit borrowers. Using conservative simulation assumptions and pre-crisis market data, the MRDGs we propose could have lowered average loan yields by more than $1/8\%$, reducing interest paid by an average of almost $1,000 per loan for 60-day closings. While interest savings of $1,000 per loan may not seem substantial at first, it is worthwhile to remember that more than an estimated 90 million individual mortgage loans were created during the 32+ years of data we study. Thus, the mortgage market innovation we propose could have generated more than $90 billion in reduced interest payments if the benefit of the risk reduction properties of MRDGs were passed through to individual borrowers.

2. The mortgage origination and investment market

2.1. Related research

Interactions between borrowers and lenders often result in complex contractual agreements designed to mitigate adverse incentives and informational asymmetries. For example, Gottesman and Roberts (2004) explore the "all-in" cost of borrowing for syndicated business loans (combining fees and interest rate spreads), and demonstrate that the true, positive, relationship between loan maturity and borrowing cost can only be discovered by comparing loans made to the same borrower by different lenders on the same day. In related work, Gottesman and Roberts (2007) use a similar method to show that loans which include collateral carry higher ex ante yields, ceteris paribus, because collateral mitigates some, but not all, of the credit risk of specific borrowers.

It has long been argued that securitizing individual mortgage loans adds liquidity to the market for residential debt and allows lenders to reduce their loan concentrations. Athavale and Edmister (2004) provide clear evidence that banks obtain and use private information about borrowers during the underwriting process whereas DeMarzo (2005) develops a model where pooling assets and then directing the cash flows from these assets to different tranches of security holders maximizes the benefits of the lenders' private information. DeMarzo (2005) develops a model where pooling assets and then directing the cash flows from these assets to different tranches of security holders maximizes the benefits of the lenders' private information.

Additional points in favor of securitization, summarized in Molyneux and Shamroukh (1996), include: (1) shifting risky assets from risk-averse to risk-neutral lenders, (2) allowing some institutions to specialize in the origination process while others specialize in warehousing loans, and (3) transferring assets from institutions that have poor liability opportunities and good asset opportunities to institutions that have poor asset opportunities and good funding sources.

Recent research has shown that the strategy of originating loans for securitization or syndication, which has been labeled the "originate to distribute" (OTD) model, also has some inherent flaws. Francois and Missonier-Piera (2007) demonstrate the need to monitor the primary lender to mitigate informational asymmetry problems while Downing, Jaffee and Wallace (2009) find evidence that originators target loans they expect to have the least attractive long-term performance (i.e., where underlying borrowers will exercise their loan refinancing options most efficiently) for securitization.

The "OTD" model may have adverse implications for the financial performance of the originators as well. Loutskina and Strahan (2011) compare two distinct classes of mortgage lenders—those who concentrated their activity in a few markets and those who diversified their holdings geographically. Empirical results indicate that concentrated lenders retained more originated loans, earned higher and more stable profits, and suffered smaller declines in the market value of their equity during the 2001–2006 segment of their sample period.

Loutskina and Strahan (2011) explain their results by referencing Grossman and Stiglitz's (1981) model of stable asset pricing equilibria, arguing that "concentrated" lenders function as informed investors who earn abnormal profits because of their ability to produce superior information. Duarte and McManus (2011) build on this point by introducing the notion of a derivative product based on the credit losses experienced by representative mortgage pools that would allow originators to retain whole loans while hedging their credit risk. This innovation is designed to enhance the flow of credit retained by "concentrated" (informed) lenders.

"Uninformed" ultimate lenders, who purchase MBS, also play an important role in the Grossman and Stiglitz world. They create value by serving as liquidity traders who hold well-diversified portfolios, are compensated fairly for the systematic risk they bear and economize on the production of costly information. The MRDG we propose here improves the flow of credit placed with these "liquidity" (uninformed) lenders by mitigating the risk of interest rate declines an originator faces during the time between the sale of an approved loan to the secondary market and the actual closing of that loan.

The wage indexed loan balance innovation proposed by Nejadmalayeri (2011) and the house price indexed loan balance innovation embraced by Ambrose and Buttimer (2012) are based on the assumption that economic efficiency is enhanced when the default risk in mortgage lending is lodged with the ultimate lender, where it can be hedged in volumes large enough to justify the investment in technology and expertise required. We argue that the risk of a significant decline in market rates during the origination process is an additional exposure that should be lodged with the ultimate lender.

2.2. A generalized representation of the origination process

Originators are intermediaries who link primary borrowers and long-term investors. They extract up-front commitment fees (λ) from borrowers to lock-in primary market *yields* R_L at the beginning of loan origination periods (t_k, t_{k+1}) and, at the same time, sell the loans to investors at secondary market *yields* ($R_L - \pi$). Both λ and π are defined as yield equivalents to be consistent with our eventual empirical work. Delivered loans that earn R_L and are priced at ($R_L - \pi$) sell at *dollar premiums* that represent intermediation profits.

A borrower committed to borrowing at R_L will be tempted to forfeit his or her commitment fee and seek a new loan at a lower market rate if the present value of the promised payments based on R_L but discounted at (R_L – λ) for the expected holding period exceeds the loan principal by the dollar value of the commitment fees implied by λ. Thus, (R_L – λ) defines market yields where borrowers are indifferent between keeping loans at (higher) locked rates and forfeiting commitment fees in exchange for new loans at lower current mortgage rates.

Once the originator collects the up-front commitment fee λ and sells the loan forward, the outcome depends on the path of the primary market yield series R_k during the time interval (t_k, t_{k+1}). Consider first the simplest case, where $R_k \in [(R_L - \lambda), \infty)$. Here, the primary market yield remains at or above the borrower's fee-forfeit threshold (R_L – λ). The originator eventually sells the loan that earns R_L at a yield of ($R_L - \pi$), capturing an origination profit of

$$Profit_{\text{Close Original Loan}} = R_L - (R_L - \pi) = \pi. \tag{1}$$

The situation is somewhat more complex if the primary market yield drops substantially during the origination period, that is, if $R_k \in [0, (R_L - \lambda)]$ holds. Now the originator should be confronted by a borrower who threatens to forfeit his or her commitment fee in order to refinance the loan in process at the new, lower, primary market rate. If the originator loses the original borrower, it must cover the loan promised to the investor at ($R_L - \pi$) by purchasing a loan in the secondary market at ($R_k - \pi$), where R_k is the current secondary market yield. Buying a secondary market loan generates a loss for the originator because the yield promised to the investor exceeds the yield earned on the loan actually delivered, ($R_L > R_k$), but the originator retains (λ), which is the yield equivalent of the commitment fee. Net origination profits are

$$Profit_{\text{Lose Original Borrower}} = (R_k - \pi) - (R_L - \pi) + \lambda = R_k - (R_L - \lambda) \leq 0. \tag{2}$$

Evaluating this profit equation at the extreme values of the relevant range for R_k
If $R_k = 0$,

$$Profit_{\text{Lose Original Borrower}} = -R_L + \lambda. \tag{2a}$$

If $R_k = (R_L - \lambda)$,

$$Profit_{\text{Lose Original Borrower}} = 0. \tag{2b}$$

Alternatively, the originator could voluntarily lower the original borrower's loan rate to $(R_k + \lambda)$. Note that the loan rate does not have to drop all the way to R_k because the borrower would have to pay a new commitment fee with yield equivalent (λ) to a new originator. Now the originator's net profit, including the lowered loan rate, is

$$Profit_{\text{Lower Original Loan Rate}} = (R_k + \lambda) - (R_L - \pi) = R_k - (R_L - \lambda) + \pi \le \pi. \tag{3}$$

Evaluating this profit equation at the extreme values of the relevant range for R_k
If $R_k = 0$,

$$Profit_{\text{Lower Original Loan Rate}} = -R_L + \lambda + \pi. \tag{3a}$$

If $R_k = (R_L - \lambda)$,

$$Profit_{\text{Lower Original Loan Rate}} = \pi. \tag{3b}$$

Comparing Equations (2a) to (3a) and (2b) to (3b) illustrates the strategic position an originator faces when primary market yields R_k drop significantly (i.e., $R_k \in [0, (R_L - \lambda)]$). *Originators are always better off by the yield equivalent of π if loan rates are lowered to $(R_k + \lambda)$ to retain their original borrowers*. Comparing Equation (3) to (1) shows the risk originators face in that profits will be less than π whenever $R_k < (R_L - \lambda)$.

Now consider the situation where the originator is able to lower the original borrower's loan rate if the primary market rate declines substantially during the origination period because it has an MRDG. Assume the originator has compensated the investor up front for the option to deliver a lower rate loan via an MRDG fee (p) (where p is also measured in yield equivalent terms). In essence, the MRDG is a put option on the primary market yield R_k. The borrower's commitment fee is safely in hand *before* the loan is sold to the investor so the appropriate option strike rate is $R_X = R_L - \lambda$ and the value of the guarantee to the originator when the loan finally closes is

$$\max[\{(R_L - \lambda) - R_k\}, 0]. \tag{4}$$

If one assumes the originator will always lower loan rate to retain the borrower when the primary market yield, R_k, drops significantly, adding the MRDG generates a net payoff to the originator of

$$Profit^* = R_L - (R_L - \pi) + \max[\{(R_L - \lambda) - R_k\}, 0] - p = \pi - p \quad \text{if } R_k \in [(R_L - \lambda), \infty] \tag{5a}$$

and

$$Profit^{*} = (R_k + \lambda) - (R_L - \pi) + \max[\{(R_L - \lambda) - R_k\}, 0] - p = \pi - p \quad \text{if } R_k \in [0, (R_L - \lambda)]. \tag{5b}$$

Thus, the MRDG allows the originator to lock in the origination profit of $(\pi - p)$ regardless of the path of R_k during the origination period. With the addition of the MRDG to its portfolio, the loan originator is *completely hedged against both increases and decreases in primary market rates* during the period between borrower approval and loan delivery.

3. Market conditions that create the need for MRDGs

3.1. Primary market yield declines

Borrowers who pay originators up-front, nonrefundable commitment fees are protected against rate increases during the 30–60-day period required to assemble the documentation needed to close their loans but do not benefit automatically if market rates decline. If market rates fall significantly borrowers should sacrifice commitment fees in return for lower long-term loan payments, contracting with other lenders if need be.[3] This risk is a short-term version of the borrower's ability to refinance a closed loan in response to a drop in market interest rates. Bennett, Peach and Peristiani (2001) show that the propensity to refinance an existing mortgage has risen in recent years because technological advances and experience with declining interest rates have combined to create a large cohort of informed borrowers. Given this increased sensitivity to falling interest rates, the willingness to refinance a fixed-rate loan commitment if mortgage rates drop during the origination process should have risen as well. Simple Net Present Value "refinancing" analyses available from the authors demonstrate that the borrower's expected tenure in the loan is the most important ingredient in the decision to abandon a commitment they have paid for. Specifically, borrowers with longer expected holding periods will sacrifice fixed commitment fees in return for smaller loan rate drops.

Assuming a typical commitment fee of 1% of the loan amount and interest rates representative of the range of 30-year fixed-rate primary mortgage market loan yields since the early 1980s, borrowers with a five-year expected holding period should refinance their committed loans when the market rate drops by 0.25%. This observation leads us to assume that a market rate decline of 0.25% or more during the origination period generates rate-drop risk for the originator. The choice of 0.25% is conservative in that borrowers with expected holding periods of five years *or more*

[3] These borrowers have already been credit-screened and their property appraisals are already complete. In these cases, applying for a new market rate loan from another lender is not as time-consuming or as uncertain as the first application process.

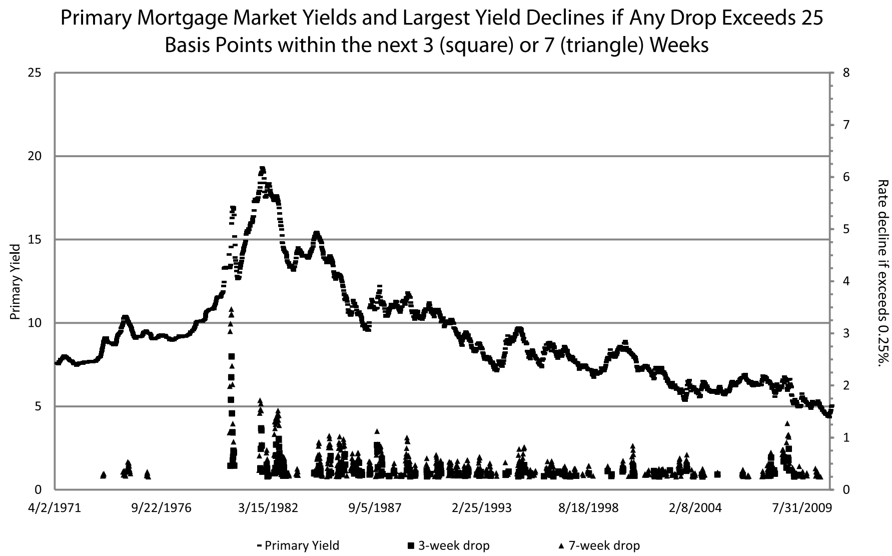

Figure 1

Primary market yields and yield declines in excess of 0.25% over the next three or seven weeks, 1971–2010

This figure plots the primary mortgage market yield to five-year life given the national average 30-year fixed-rate loan rate and points collected by the Mortgage Bankers Association (left-scale). In addition, the series on the bottom (right-scale) indicates the largest drop in the primary market yield *if* the yield drops by 0.25% or more at any time during the next three weeks or the next seven weeks.

are tempted to sacrifice their commitment fees if rates drop by that amount *or less* while their loans are in process.

A weekly nationwide primary market yield series derived from the Mortgage Bankers Association's (MBA's) average rates and points on 30-year fixed-rate loans, assuming that the expected mortgage life is five years, is measured on the left-hand axis (Yield5) in Figure 1. The amount of the biggest decline in the three or seven weeks following the observation, *if* the series drops by more than 0.25%, is measured on the right-hand axis.[4] Rate drops large enough to tempt borrowers to abandon committed loans occur about 10.80% of the 2,075 weeks in the 1971–2010 period if we assume that it takes 30 days to close a loan. The percentage rises to 29.49% for 60-day origination periods. Thus, rate-drop risk is significant for originators who sell loans to investors once borrowers are approved and commitment fees are collected.

[4] Our primary market analysis assumes an exposure period of three weeks for a 30-day loan commitment and seven weeks for a 60-day commitment because it would be difficult for a borrower to postpone closing to renegotiate new financing if the mortgage rate decline occurs in the last week of the origination period.

Table 1

Ordinary least squares regression results: Weekly changes in mortgage rates on changes in 30-, ten-, and five-year Treasury bond yields

This table reports ordinary least squares regression results of weekly changes in mortgages rates against each of the following three data series: weekly yield changes in 30-, ten-, and five-year Treasury bond yields. We report the intercept coefficient, slope coefficient, *t*-statistics, and R^2 of each regression in the full and subsamples. The sample data covers 1971–2010.

	b_0	$T(b_0 = 0)$	b_1	$T(b_1 = 0)$	$T(b_0 = 1)$	R^2
Panel A: Regression model: Δ Mortgage Rate = $b_0 + b_1$(Δ 30-Year T-Bond Yield)						
Full sample: 1971–2010	−0.001	−0.49	0.405	19.28***	−28.29***	0.193
Subsample 1: 1971–1982	0.012	1.17	0.168	3.62***	−17.90***	0.040
Subsample 2: 1983–1990	−0.005	−1.05	0.513	16.26***	−15.44***	0.395
Subsample 3: 1991–2000	0.000	0.01	0.892	24.58***	−2.98***	0.537
Subsample 4: 2001–2010	−0.005	−0.95	0.571	10.95***	−8.23***	0.278
Panel B: Regression model: Δ Mortgage Rate = $b_0 + b_1$(Δ 10-Year T-Bond Yield)						
Full sample: 1971–2010	−0.001	−0.35	0.378	23.84***	−39.21***	0.219
Subsample 1: 1971–1982	0.008	1.48	0.121	4.10***	−29.73***	0.028
Subsample 2: 1983–1990	−0.005	−1.12	0.485	17.33***	−18.42***	0.426
Subsample 3: 1991–2000	0.000	−0.07	0.800	28.01***	−6.98***	0.601
Subsample 4: 2001–2010	−0.002	−0.68	0.660	22.91***	−11.80***	0.502
Panel C: Regression model: Δ Mortgage Rate = $b_0 + b_1$(Δ 5-Year T-Bond Yield)						
Full sample: 1971–2010	−0.001	−0.31	0.333	23.86***	−47.82***	0.219
Subsample 1: 1971–1982	0.008	1.50	0.126	5.19***	−36.10***	0.044
Subsample 2: 1983–1990	−0.005	−1.19	0.478	18.30***	−19.96***	0.453
Subsample 3: 1991–2000	−0.001	−0.32	0.725	26.13***	−9.89***	0.568
Subsample 4: 2001–2010	−0.001	−0.30	0.610	22.94***	−14.69***	0.503

*, **, *** indicate statistical significance at the 0.05, 0.01 and 0.005 level, respectively.

3.2. Alternative hedging vehicles

It may be that secondary mortgage contracts do not include MRDGs because existing derivative contracts function as efficient hedging vehicles. We address that issue in Table 1, where we regress weekly changes in 30-year mortgage yields to five-year life against changes in five-, ten- and 30-year Treasury yields across the 1971–2010 sample. Reading down the R^2 column within each panel shows that the hedging effectiveness of a Treasury/30-year mortgage hedge is weak at best. The beta coefficients, which represent recommended hedge ratios, are always significantly less than one, implying that yield changes are smaller in the mortgage market than the Treasury market. In addition, the hedge ratios are not stable and the R^2 seldom exceed 60% at their highest levels (during the 1991–2000 subsample).This is significantly below the 80% value commonly taken as the hurdle necessary to be considered an effective hedge. Furthermore, the power of the hedges is exceptionally weak during the earliest segments of the sample period. The decade of the 1980s was marked by elevated interest rate levels, which enhanced the value of the borrower's pre-payment option and drove an obvious wedge between mortgage and Treasury yields.

Batlin (1987) identifies and quantifies the problem of hedging pre-payable loans with Treasury bond futures. He documents hedging effectiveness measures similar to those in Table 1 in his 1984–1986 sample period and finds that risk reduction properties are especially poor for high-coupon loans. Fink, Fink and Lange (2005) repeat the analysis over the period from 1997 to 2003, augmenting the dynamic hedge ratio computation by including terms that measured both the slope and the level of the Treasury yield. Their out-of-sample hedging effectiveness values ranged from 50% to almost 80%, but the added variables did not increase effectiveness and the problem of poor performance for high-coupon mortgages remained. Both authors argue that changing values of the borrower's option to pre-pay a mortgage when market rates drop is the root cause of the poor hedging performance of Treasury futures for mortgage investments. Mortgage originators face that same pre-payment risk as ultimate lenders during the time between loan sale and actual closing. Our regression results in Table 1 suggest that attempts to hedge origination profits against declines in primary market rates will be as unsuccessful as the results of earlier research on hedging mortgage investments with Treasury futures.

3.3. Mortgage market yield spreads

Primary lenders' origination profits, which we estimate in Table 2, are a source of funds to pay securitizers or investors for options to deliver lower rate loans. To generate an estimate of origination profits, we average daily 30- and 60-day Freddie Mac yields (NY30 and NY60) on commitments to exchange loans for MBS from June 1977 through December 2010 for 60-day yields and March 1983 through December 2010 for 30-day yields.[5] We match those series with the weekly MBA primary mortgage rate and points series, which we convert to yields-to-five-year-life (Yield5).[6]

Table 2 compares the means and spreads in the three mortgage rate series across the full sample and subperiods. Mean differences between Yield5 and NY30 or NY60 are always positive and statistically significant at the 0.001 level. Standard rank-sum tests on medians also generate statistically significant differences at the

[5] Freddie Mac did not publish their weekly commitment yield series until 1983. We are grateful to Frank Nothaft, Chief Economist, and the staff of the Chief Economist's office for preparing and releasing previously unpublished values for the weekly 60-day commitment yield series from June 1977 through March 1983.

[6] Results using Fannie Mae commitment data over the 1983–2010 segment of the sample are nearly identical to those displayed here and are available from the authors. In addition, conclusions drawn from findings in Table 2, which are based on a five-year expected loan life, hold almost identically if we assume the primary market mortgage loan lasts for a full 30 years or for 12 years, an average life convention once popular in mortgage markets.

Table 2

Summary statistics for primary market and securitizer (Fannie Mae) commitment yields, and primary to securitizer yield spreads

We convert Mortgage Bankers Association (MBA) primary mortgage rate and point pairs into yields-to-five-year mortgage life (Y5) to proxy for primary mortgage market yields and compare them to average daily values for Freddie Mac commitment net yields for 30- and 60-day agreements (NY30 and NY60) across weekly intervals. We report summary statistics on Y5, NY30, and NY60 and spreads between Y5 and each secondary market yield. The spreads give an estimate of the origination profit a primary lender can expect when a loan is sold to the secondary market. The full weekly sample covers from April 1971 through December 2010 for Y5, June 1977 through December 2010 for NY60, and March 1983 through December 2010 for NY30. We show results for the full sample and three approximately equal subsamples. All rates are reported as a percentage.

Full sample:	Y5	NY30	NY60	Y5-NY30	Y5-NY60
Mean	9.371	8.001	8.887	0.516***	0.484***
Median	8.568	7.670	8.250	0.496+++	0.441+++
Minimum	4.356	3.640	3.700	−0.297	−0.420
Maximum	19.321	14.860	18.917	1.550	2.080
St. dev.	3.251	2.417	3.103	0.250	0.290
Subsample 1: 6/3/1977–3/14/1983	**Y5**	**NY30**	**NY60**	**Y5-NY30**	**Y5-NY60**
Mean	13.478	n/a	12.844	n/a	0.634***
Median	13.344	n/a	12.761	n/a	0.523+++
Minimum	9.130	n/a	8.627	n/a	−0.373
Maximum	19.321	n/a	18.917	n/a	2.080
St. dev.	3.166	n/a	2.969	n/a	0.427
Subsample 2: 3/15/1983–12/31/1990	**Y5**	**NY30**	**NY60**	**Y5-NY30**	**Y5-NY60**
Mean	11.894	11.144	11.212	0.750***	0.682***
Median	11.157	10.420	10.480	0.724+++	0.662+++
Minimum	9.543	8.800	8.870	−0.279	−0.420
Maximum	15.452	14.860	14.930	1.550	1.470
St. dev.	1.602	1.544	1.558	0.246	0.246
Subsample 3: 1/1/1991–12/31/2000	**Y5**	**NY30**	**NY60**	**Y5-NY30**	**Y5-NY60**
Mean	8.295	7.891	7.948	0.404***	0.347***
Median	8.218	7.890	7.930	0.374+++	0.318+++
Minimum	6.733	6.390	6.420	−0.297	−0.317
Maximum	10.324	9.740	9.780	0.816	0.726
St. dev.	0.807	0.754	0.759	0.194	0.181
Subsample 4: 1/1/2001–12/31/2010	**Y5**	**NY30**	**NY60**	**Y5-NY30**	**Y5-NY60**
Mean	6.105	5.661	5.725	0.445***	0.380***
Median	6.174	5.730	5.810	0.431+++	0.364+++
Minimum	4.356	3.640	3.700	−0.090	−0.150
Maximum	7.462	7.170	7.220	1.307	1.097
St. dev.	0.705	0.786	0.778	0.170	0.153

*** indicates that the investment market's sample mean is significantly less than the mean of Y5 at the 0.001 level based on a two-sample Z-test (i.e., that the originator sells the loan at a lower yield [*higher price*] than the yield at which it was originated).
+++ indicates that the investment market's sample median is significantly less than the median of Y5 at the 0.001 level based on a two-sample nonparametric rank-sum test.

0.001 level. Primary mortgage market yields typically exceed secondary market yields by 30+ to 60+ basis points so mortgage originators could expect to sell loans in the secondary market for prices higher than the net amounts disbursed to primary borrowers. Therefore, significant funds are available to compensate investors for the right to deliver lower rate loans if interest rates fall significantly in the primary market. Furthermore, results for the subsamples indicate that origination spreads were higher in the earlier portion of the sample, when interest rate levels were elevated. This means that origination profits that can be used to pay for mortgage rate drop insurance (the MRDGs) are higher when the pre-payment risk the insurance is designed to protect against is most needed.

Taken as a group, these results support our arguments in favor of MRDGs in that

(1) Interest rate declines in the primary market were frequently steep enough to tempt informed borrowers to refinance their loan commitments during the origination period,
(2) Due to changing values of the borrower's pre-payment option (a problem that is especially severe when interest rates are falling), primary mortgage market yields were not highly correlated with the yields on the Treasury securities that underlie alternative hedging vehicles, and
(3) Securitizers paid significantly more for closed loans than mortgage originators disbursed to primary borrowers.

We can estimate the time-varying premia originators would pay for MRDGs that would allow delivery of lower rate loans to investors. This exercise will then allow us to simulate the impact of MRDGs on the risk/return distributions faced by each party.

4. MRDG valuation framework and simulations

4.1. The MRDG valuation framework

In a general interest rate option pricing framework of the sort proposed by Black (1976), an interest rate floor has a total life T with reset dates of t_1, $t_{2,\ldots,}$ $t_{n,}$ and $t_{n+1} = T$. Let R_k be the interest rate for the period between time t_k and t_{k+1} observed at time t_k $(1 \leq k \leq n)$. The floor produces a payoff at time t_{k+1} $(1 \leq k \leq n)$ of

$$L\delta_k \max(R_X - R_k, 0),$$

where R_k follows a log-normal distribution with volatility of σ_k; L is the notional loan principal; $\delta_k = t_{k+1} - t_k$ is the amount of time between floor reset dates; and R_X is the exercise rate. We assume $R_X = R_L - \lambda$, where λ is the drop in the primary market yield needed to tempt a borrower to give up a previously paid commitment fee in return for a mortgage loan at the new, lower market yield.

Interest rate floors can be viewed as portfolios of *floorlets* where each $floorlet_k$ is an interest rate put option at time t_{k+1} $(1 \leq k \leq n)$ with a payoff $L\delta_k \max(R_X - R_k, 0)$. Adopting the version of the Black (1976) interest rate option model detailed by Hull (2000) to price a floorlet

$$floorlet = L\delta_k P(0, t_{K+1})[R_X N(-d_2) - F_k N(-d_1)],$$

where

$$d_1 = \frac{\ln(F_k/R_x) + \sigma_k^2 t_k/2}{\sigma_k \sqrt{t_k}}, \quad d_2 = d_1 - \sigma_k \sqrt{t_k}.$$

F_k is the forward rate for the period between time t_k and t_{k+1}; and $P(0, t_{k+1})$ is the risk-free discount factor based on spot risk-free rate over time 0 to t_{k+1}.

4.2. Estimated MRDG premia

Equations 5(a) and 5(b) show that a properly structured MRDG removes the originator's exposure to the risk of a decline in the market interest rate during the time between the sale of an approved loan to the secondary market and the actual closing of the loan, a process that could take up to 60 days even under normal market conditions. Purchasing an MRDG when the borrower is approved locks in the originator's underwriting profit and allows it to automatically lower the loan rate for its customer.[7] The MRDG fee, (p), compensates the investor for the additional risk it now faces.

Simulations based on weekly data from 1977 to 2010 allow us to estimate time-varying values for p. We define the forward rate, F_k, as the primary market mortgage rate when the loan closes, (Yield5_{k+1}); R_L as the primary market mortgage rate when the loan rate is locked (Yield5_k); the loan amount, L; T, the time between mortgage rate lock (t_k) and loan closing (t_{k+1}), as either 30 or 60 days; and λ as 25 basis points.[8] Ninety-day Treasury bill rates taken from the FRED database compiled by the Federal Reserve Bank of St. Louis are used to calculate the risk-free discount factor.

Under these assumptions, the primary market yield at commitment less than 25 basis points drop needed to spur the borrower to forfeit his or her commitment fee, ($\text{Yield5}_k - \lambda$), is the floor (exercise) rate. We compute MRDG premia based on weekly observations of Yield5. Results using full or subsample volatilities of Yield5

[7] We assume lenders have screened borrowers' credit and assessed collateral value prior to offering to lock loan rates. Given that origination periods are quite short (typically 60 days at most), we ignore the possibility that borrowers will back out of loans for noninterest-dependent reasons such as a changes in family size or employment.

[8] One-quarter of 1% is a large enough rate drop to tempt a primary borrower with an expected holding period of five years or more to give up a nonrefundable 1% lock fee on a commitment for a 30-year loan.

Table 3

Mortgage rate drop guarantee (MRDG) premiums for loans with expected lives of five years, measured in yield equivalents, assuming an exercise rate 1/4% below the locked mortgage rate

This table reports summary statistics for the MRDG premia an originator is willing to pay an investor in basis points of yield. MRDG premia are computed using the Black (1976) model for interest rate options. We assume that the time lag between loan commitment and loan closing is either 30 or 60 days. Variances of the percent changes in the primary market yield (Y5) are computed individually in each of the subsample periods. MRDG premia are computed with an exercise rate of 1/4% below the previously locked mortgage rate.

	MRDG premium in basis points with 30-day lock				
Panel A	Mean	Median	Minimum	Maximum	St. dev.
Full sample: 6/3/1977–12/31/2010					
MRDG premium (bps)	2.682	1.683	0.916	9.176	1.911
Subsample 1: 6/3/1977–3/14/1983					
MRDG premium (bps)	6.337	6.251	4.228	9.176	1.507
Subsample 2: 3/15/1983–12/31/1990					
MRDG premium (bps)	3.102	2.951	2.365	4.217	0.459
Subsample 3: 1/1/1991–12/31/2000					
MRDG premium (bps)	1.551	1.525	1.139	2.052	0.194
Subsample 4: 1/1/2001–12/31/2010					
MRDG premium (bps)	1.398	1.414	0.916	1.923	0.204
	MRDG premium in basis points with 60-day lock				
Panel B	Mean	Median	Minimum	Maximum	St. dev.
Full sample: 6/3/1977–12/31/2010					
MRDG premium (bps)	3.671	2.389	1.331	12.159	2.476
Subsample 1: 6/3/1977–3/14/1983					
MRDG premium (bps)	8.385	8.325	5.625	12.159	1.953
Subsample 2: 3/15/1983–12/31/1990					
MRDG premium (bps)	4.308	4.083	3.363	5.823	0.626
Subsample 3: 1/1/1991–12/31/2000					
MRDG premium (bps)	2.201	2.162	1.625	2.901	0.265
Subsample 4: 1/1/2001–12/31/2010					
MRDG premium (bps)	1.982	1.997	1.331	2.670	0.277

appear in Table 3.[9] The panels show the mean, median, maximum, and minimum premia originators are willing to pay for MRDGs to protect against losing sold loans to significant interest rate drops over 30-day (top) or 60-day (bottom) horizons. We translate dollar values into basis points (MRDG premium as a percentage of the original loan size) to be consistent with our previous analysis. MRDG fees are quite small, averaging less than three basis points for 30-day originations and less than four basis points for 60-day originations.

[9] Following Black (1976), the variance of percent changes in primary mortgage yields is used to value the interest rate floors.

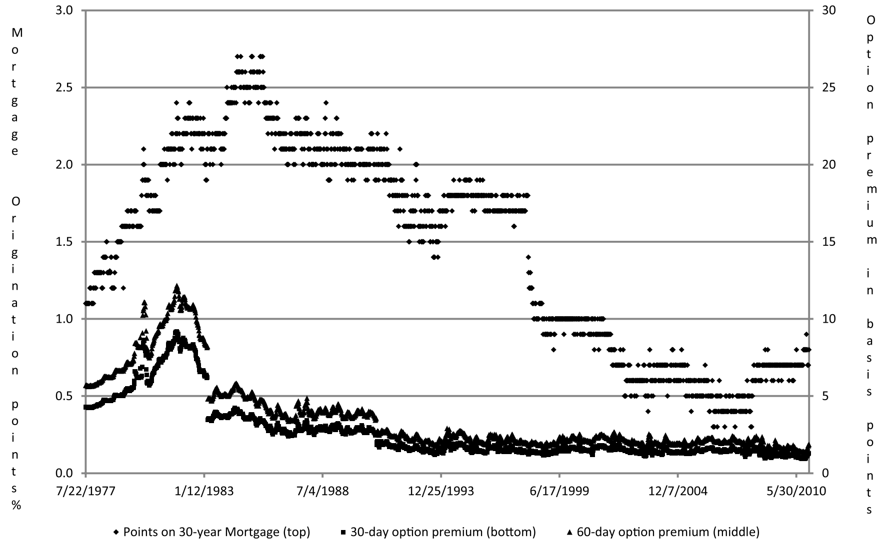

Figure 2

30- and 60-day MRDG premiums in basis points and total loan origination fees (national average)

This figure presents 30- and 60-day MRDG premiums valued from the perspective of a mortgage originator, in basis points, and total loan origination fees (top series, left axis). MRDG premiums are computed using the Black (1976) model for interest rate options and are scaled to the right axis. The data points in the middle portion of the figure represent MRDG premia for 60-day MRDGs whereas the data points in the bottom portion represent MRDG premia for 30-day MRDGs. MRDG strikes are 0.25% below the mortgage rate locked in by the borrower via the payment of a nonrefundable commitment fee. The figure further partitions the full sample period into four subsamples: 1977–1982, 1983–1990, 1991–2000, and 2001–2010 and uses the variance of percent changes in primary mortgage yields within each subsample to compute the MRDG premiums. Loan origination fees are national averages for 30-year fixed-rate loans and are taken from the Mortgage Bankers Association Weekly survey.

Figure 2 compares average origination fees on 30-year loans from the MBA weekly survey, which are quoted in percentage, to estimated 30- and 60-day MRDG fees, which are quoted in basis points. The plots illustrate how small an average premium an originator would have to pay an investor for rate-drop insurance. The figure also shows that MRDG premia and origination fees move together, which means that funds to pay for MRDGs are elevated when required premia are large and vice versa.[10]

[10] Correlations between MRDG premia and origination fees are 52.3% for 30-day exposure horizons and 54.0% for 60-day exposure horizons across the entire 1977–2010 sample. Both are significantly positive at the 0.001 level. Furthermore, correlations between estimated weekly MRDG fees and primary market and secondary market mortgage yield spreads (algebraic transformations of the origination points series and the stated loan rates), are 56.4% for 30-day MRDGs and 47.2% for 60-day MRDGs. These are also

4.3. The impact of MRDGs on risk/return profiles

MRDGs in secondary market loan sale contracts and their accompanying fees would obviously alter the risk/return tradeoffs faced by originators and investors. Specifically, the time-varying guarantee fee would reduce the originator's profit and the investor's cost but the guarantee would only be exercised if the market rate fell by an amount large enough to move the floorlet into the money.

We investigate the impact of MRDGs on the originators who purchase them and the investors who write them in Table 4. Sharpe ratios are the appropriate measures of risk/return tradeoffs because mortgage originators cannot diversify away the business risk of holding portfolios of newly committed similar mortgage loans for limited periods of time.

We begin with the originator's position, in Panel A at the top of Table 4, by computing two estimates of the underwriting profit for each week in the sample period, which runs from 1977 to 2010 for 60-day rate lock periods and 1983 to 2010 for 30-day rate lock periods. Our simulation analysis is constructed in terms of yields, rather than prices, to be consistent with mortgage market practice. All of the calculations in this section assume the underlying mortgage loan has a five-year life.

In the "Without MRDGs" case, profit is defined as the yield spread earned from originating a loan at the primary market yield and selling it at the secondary market yield in place during the origination week *if* the primary market yield does not drop by more than 25 basis points during the next three weeks (for the 30-day rate lock columns) or the next seven weeks (for the 60-day rate lock columns). If the primary market rate falls by more than the stipulated borrower refinancing threshold of 25 basis points, we assume the originator immediately drops the loan rate for the approved borrower and suffers the yield equivalent of the loss incurred by delivering this loan, that earns the now-lower primary market rate, to the investor. For the "With MRDGs" case, profit is defined as earlier with the inclusion of two additional terms: (1) the originator pays the time-varying yield equivalent 30- or 60-day MRDG premium each week, and (2) the originator receives the immediate payoff from the MRDG *if* the primary market yield drops by more than 25 basis points during the next three or seven weeks.

A comparison of the "Without MRDGs" and "With MRDGs" columns for both the 30- and 60-day origination periods shows that the addition of the MRDG lowers the standard deviation of the originator's average return dramatically without leading to a measurable reduction in the size of that return. As a result, Sharpe ratios are significantly larger for the "With MRDGs" series for both 30- and 60-day origination periods.

Panel B considers the investor's position. In the "Without MRDGs" case, the investor earns the 30- or 60-day secondary market yield each week. For the "With

significant at the 0.001 level, which is further evidence that origination profits are high when the cost of insuring them against a significant drop in market rates is elevated, and vice versa.

Table 4

Originator and investor Sharpe ratios for 30-year mortgages with expected lives of five years: Refinancing risk occurs when primary market rates drop by 1/4% during origination period

This table reports statistics on Sharpe ratios based on the returns to a mortgage originator who underwrites mortgage loans and an investor who purchases them. Returns are further partitioned into 30- and 60-day rate lock horizons and computed with and without the use of mortgage rate drop guarantees (MRDGs). The sample period is divided into weeks between 6/3/1977–12/31/2010 for 60-day rate lock quotes and 3/15/1983–12/31/2010 for 30-day rate lock quotes. We report average origination profits (profit) in percentage, standard deviations (std) of origination profits, average Sharpe ratios (Sharpe), and the minimum (min) and maximum (max) Sharpe ratios in the full and subsamples.

Panel A: The originator's position

Origination profit without an MRDG is defined as the spread earned by closing a loan at the primary market yield and selling it at the secondary market yield for that week, less any losses incurred by having to immediately lower the primary loan rate earned when the mortgage rate drops below the fee-forfeit threshold of 0.25% during the next three or seven weeks. With an MRDG, the origination profit series includes two additional terms specified in yield equivalents: paying the time-varying cost of the MRDG each week and receiving the payoff from the MRDG *only if* it finishes in-the-money. We report the average origination profit, the standard deviation of the weekly origination profit series, and the mean, minimum, and maximum Sharpe ratios based on origination profits observed at weekly frequency during our sample period.

	Without MRDG					With MRDG				
	Profit (%)	Std (%)	Sharpe	Min	Max	Profit (%)	Std (%)	Sharpe	Min	Max
30-day rate lock										
Full sample: 1977–2010	2.009	0.967	2.074	−1.233	6.128	2.037	0.019	106.335***	102.593	107.491
Subsample 1: 1977–1982	n/a	n/a	n/a	n/a	n/a	2.001	0.015	104.222***	102.593	105.510
Subsample 2: 1983–1990	2.911	0.924	3.004	−1.161	6.128	2.033	0.005	106.018***	104.327	106.499
Subsample 3: 1991–2000	1.585	0.765	1.635	−1.233	3.374	2.048	0.002	106.959***	106.367	107.224
Subsample 4: 2001–2010	1.735	0.682	1.793	−0.373	4.905	2.050	0.002	107.153***	106.839	107.491
60-day rate lock										
Full sample: 1977–2010	1.659	1.123	1.470	−5.791	5.343	1.899	0.025	76.306***	72.488	77.609
Subsample 1: 1977–1982	1.886	1.787	1.666	−5.791	5.343	1.852	0.020	74.088***	72.488	75.485
Subsample 2: 1983–1990	2.390	0.943	2.119	−1.508	4.539	1.892	0.008	75.895***	74.216	76.443
Subsample 3: 1991–2000	1.240	0.723	1.098	−1.139	2.601	1.914	0.003	76.948***	76.213	77.246
Subsample 4: 2001–2010	1.378	0.706	1.224	−2.114	3.462	1.916	0.003	77.213***	76.862	77.609

(*Continued*)

Table 4 (*continued*)

Originator and investor Sharpe ratios for 30-year mortgages with expected lives of five years: Refinancing risk occurs when primary market rates drop by 1/4% during origination period

Panel B: The investor's position

Here we consider the returns to an investor who buys mortgage loans from the originator. Without an MRDG, the investor's return is defined as the weekly 30- or 60-day secondary market yield (NY30 or NY60, respectively). With an MRDG, the investor's return is the secondary market yield (either 30- or 60-day) plus the yield equivalent of the MRDG premium paid by the mortgage originator each week less the yield equivalent of the payout of the MRDG to the originator *only if* it finishes in-the-money. We report the average investment return, the standard deviation of the weekly investment return series, and the mean, minimum, and maximum Sharpe ratios based on investment returns observed at weekly frequency during our sample period.

	Without MRDG					With MRDG				
	Profit (%)	Std (%)	Sharpe	Min	Max	Profit (%)	Std (%)	Sharpe	Min	Max
30-day rate lock										
Full sample: 1977–2010	8.008	2.414	3.315	1.508	6.151	8.014	2.417	3.314	1.510	6.162
Subsample 1: 1977–1982	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsample 2: 1983–1990	11.155	1.545	4.617	3.643	6.151	11.161	1.554	4.616	3.650	6.162
Subsample 3: 1991–2000	7.905	0.764	3.273	2.645	4.032	7.912	0.762	3.272	2.648	4.036
Subsample 4: 2001–2010	5.676	0.790	2.350	1.508	3.005	5.680	0.791	2.349	1.510	2.976
60-day rate lock										
Full sample: 1977–2010	8.903	3.097	2.872	1.195	6.102	8.870	3.072	2.884	1.209	6.156
Subsample 1: 1977–1982	12.845	2.999	4.142	2.782	6.102	12.865	2.883	4.182	2.824	6.156
Subsample 2: 1983–1990	11.257	1.559	3.631	2.861	4.816	11.213	1.574	3.646	2.896	4.873
Subsample 3: 1991–2000	7.975	0.780	2.573	2.071	3.200	7.958	0.767	2.588	2.093	3.180
Subsample 4: 2001–2010	5.758	0.786	1.858	1.195	2.474	5.743	0.783	1.868	1.209	2.374

*** indicates that the use of MRDG produces statistically higher Sharpe ratios at the 0.001 level.

MRDGs" column, we incorporate two additional terms: (1) adding the weekly yield-equivalent 30- or 60-day MRDG premium, and (2) subtracting the yield equivalent of the immediate payout to the originator *if* the primary market yield drops by more than 25 basis points during the next three or seven weeks. Panel B of Table 4 shows that the periodic receipt of the MRDG fee outweighs the occasional loss when the MRDG is exercised so the investor's Sharpe ratios with and without MRDGs are not significantly different from each other. These results demonstrate that MRDGs could be used to make originators better off without harming investors. We advance a series of economic arguments to explain this finding in the next section of the paper.

5. Explanatory evidence and robustness checks

5.1. Yield change variance ratios

Variance ratio F-tests on absolute changes and absolute percent changes in the originators' yield series (Yield5) and investor's yield series (NY30 or NY60) will allow us to compare sensitivity to incremental interest rate risk between originators and investors. Table 5 reports the variance measures and variance ratio tests for our full and segmented samples. All of the F-statistics are significant at the 0.01 level, which indicates that variances in absolute changes (Panel A) and absolute percent changes (Panel B) in accepted yields were greater for mortgage originators than for long-term investors throughout our sample period. This suggests that the MRDGs we propose act to transfer interest rate risk from a more volatile series to a more stable one, which would explain the results in Table 4. Table 5 also provides implicit support for the argument of Nejadmalayeri (2011) and Ambrose and Buttimer (2012) that the specific risks of mortgage lending are most efficiently housed at the ultimate lender, even if the loan is originated by a securitizer.

There are several reasons why yield volatility might be greater at the originator level than at the investor level. First, purchasers of new MBS already hold large portfolios of seasoned loans of differing rates and ages. Returns on these investments are inherently less correlated with each other than are returns on portfolios of newly originated loans. Therefore, the incremental risk of adding additional current loans should be smaller at the investor level than at the originator level. Second, large long-term investors have the volume and economies of scale needed to justify sophisticated hedging programs to manage the interest rate exposure of their assets.[11] Third, large long-term investors are better able to create natural balance sheet hedges for residential mortgage assets than small short-term originators. Consider the evidence in Table 6, which summarizes the borrowing activity of five active Government Sponsored Enterprises (GSEs) and almost 70 financial firms (Standard Industrial Classification code 6000) listed in the Thomson Financial SDC Platinum (SDC) database from 1994

[11] See Jaffee (2003) for a review of the risk management practices of Fannie Mae and Freddie Mac, two institutions that securitized individual residential loans and provided MBS during our sample period.

Table 5

Variance ratio F-test statistics for the equality of absolute changes and absolute percent changes in primary market and securitizer (Freddie Mac) commitment yields

This table reports variance ratio F-test statistics for absolute changes and absolute percent changes in Freddie Mac commitment net yields for 30- and 60-day agreements (NY30 and NY60) and Mortgage Bankers Association (MBA) primary mortgage yields-to-five-year mortgage life (Y5). Changes in yields are measured by differences and percent changes are measured in log yield differences. We report the variances and variance ratio statistics during the full sample and subsamples. The NY30 series begins in March 1983 and the NY60 series begins in June 1977.[12]

Panel A: Variances in absolute changes in yields

	$\|\Delta$ Yield5$\|$	$\|\Delta$ NY30$\|$	$\|\Delta$ NY60$\|$
Full sample:			
Variance ($\times 10^{-8}$)	102.22	35.43	60.37
Variance ratio	n/a	2.88***	1.69***
Subsample 1: 6/3/1977–3/14/1983			
Variance ($\times 10^{-8}$)	304.21	n/a	154.04
Variance ratio	n/a	n/a	1.97***
Subsample 2: 3/15/1983–12/31/1990			
Variance ($\times 10^{-8}$)	72.14	41.45	55.20
Variance ratio	n/a	1.74***	1.31**
Subsample 3: 1/1/1991–12/31/2000			
Variance ($\times 10^{-8}$)	52.24	25.86	26.25
Variance ratio	n/a	2.02***	1.99***
Subsample 4: 1/1/2001–12/31/2010			
Variance ($\times 10^{-8}$)	56.07	35.31	33.78
Variance ratio	n/a	1.59***	1.66***

(*Continued*)

to 2010. These institutions are important investors in the MBS market and their incremental funding choices shifted dramatically toward variable rate and callable debt during our sample period. These features reduce the potential duration of long-term liabilities to more closely match the expected duration of long-term but pre-payable mortgage assets.

5.2. Alternative mortgage life assumption

Our empirical work assumes a holding period of five years for borrowers of 30-year mortgage loans. This expected loan life generates loan-in-process refinancing risk if the primary market mortgage rate falls 0.25% below the original locked mortgage rate and the borrower has paid the typical 1% commitment fee to lock in his or her mortgage rate against an interest rate increase during the 30–60-day

[12] We thank Frank Nothaft, Chief Economist of Freddie Mac for providing us with previously unpublished weekly NY60 data from June 1977 to March 1983.

Table 5 (*continued*)

Variance ratio *F*-test statistics for the equality of absolute changes and absolute percent changes in primary market and securitizer (Freddie Mac) commitment yields

Panel B: Variances in absolute percent changes in yields

	$\lvert\%\Delta$ Yield5$\rvert$	$\lvert\%\Delta$ NY30$\rvert$	$\lvert\%\Delta$ NY60$\rvert$
Full sample:			
Variance ($\times 10^{-4}$)	1.08	0.74	0.71
Variance ratio	n/a	1.46***	1.51***
Subsample 1: 6/3/1977–3/14/1983			
Variance ($\times 10^{-4}$)	1.34	n/a	0.70
Variance ratio	n/a	n/a	1.93***
Subsample 2: 3/15/1983–12/31/1990			
Variance ($\times 10^{-4}$)	0.58	0.33	0.39
Variance ratio	n/a	1.76***	1.47***
Subsample 3: 1/1/1991–12/31/2000			
Variance ($\times 10^{-4}$)	0.76	0.43	0.44
Variance ratio	n/a	1.74***	1.74***
Subsample 4: 1/1/2001–12/31/2010			
Variance ($\times 10^{-4}$)	1.52	1.15	1.05
Variance ratio	n/a	1.31**	1.45***

*, **, *** indicate statistical significance at the 0.05, 0.01 and 0.005 level, respectively.

origination period. If the expected mortgage life is greater than five years, then smaller declines in primary mortgage rates would generate significant rate-drop risk on loans-in-process for originators.

Consider the case where the expected mortgage holding period is 20 years, which implies that a primary market rate drop of 0.125% below the locked mortgage rate would tempt informed borrowers to walk away from loans in process *unless* originating lenders were willing to reduce their loan rates. We recompute MRDG premiums assuming exercise at (R_L – 0.125%) instead of (R_L – 0.25%) and report the results in the top panel of Table 7. Comparing those results to Table 3, MRDGs (which are interest rate floors) have become slightly more expensive because their threshold exercise rates are higher, but the increase in threshold rates also means the guarantees are more likely to be used. Originator and investor Sharpe ratios for loans with 20-year expected lives are shown in the bottom panel of Table 7. Results are similar to Table 4 in that MRDGs continue to improve the risk/return tradeoff for originators significantly without damaging the position of investors.[13]

[13] Complete version of Tables 3 and 4 computed using the assumption of a 20-year borrower holding period, which implies that a primary market interest rate drop of 1/8% creates refinancing risk for loans in process, is available from the authors.

Table 6

Descriptive statistics for nonconvertible debt issued by five GSEs and 70 frequent issuer financial firms during 1995–2010

This table presents yearly summary statistics for a sample of 75,049 debt issues between January 1, 1995, and April 30, 2010 by financial firms who are frequent issuers in the debt market, as well as Fannie Mae, Freddie Mac, FHLB, Farm Credit System, and Sallie Mae.

Year	*N*	Mean size ($M)	Mean mat. (yrs)	$-Weighted mat. (yrs)	Proportion fixed rate	Proportion callable
1995	1,753	74.90	4.69	4.68	91.10%	65.37%
1996	2,029	67.68	5.26	4.96	93.40%	72.94%
1997	2,281	67.31	5.69	5.31	92.90%	77.69%
1998	5,451	68.71	6.02	6.30	92.63%	80.41%
1999	4,713	56.93	5.97	5.95	92.06%	83.20%
2000	2,751	55.32	4.65	3.96	84.22%	79.50%
2001	8,099	49.14	5.56	4.79	92.01%	93.22%
2002	4,275	51.12	5.14	4.70	81.31%	87.98%
2003	10,188	50.83	5.83	5.44	76.01%	96.68%
2004	8,563	43.88	5.00	5.00	75.16%	95.59%
2005	4,276	50.97	5.39	5.13	79.96%	91.14%
2006	4,322	57.63	5.86	5.51	87.83%	89.77%
2007	4,196	55.77	6.27	6.11	92.11%	92.37%
2008	4,875	55.35	5.86	5.32	88.00%	94.22%
2009	4,676	55.25	6.22	5.58	64.91%	93.35%
2010	2,601	59.24	5.86	5.42	57.13%	94.12%
All Years	75,049	54.77	5.63	5.34	83.03%	89.67%

Source: Thomson SDC Database, 2010 Edition.

6. MRDGs and interest savings for borrowers

Originators who purchase MRDGs from investors are immunized against both increases and decreases in market rates during the origination process. Therefore, they should require lower loan yields than lenders who are protected only against rate increases (the current practice in the secondary mortgage market). We employ a four-step process to estimate the amount of interest rate savings that would have arisen from the use of MRDGs during our sample:

(1) Use the change in the volume of residential mortgage loans outstanding as an estimate of the dollar volume of loans issued during a specific period;

(2) Compute the average yield improvement attributable to the use of MRDGs for each week during the sample period that they are in-the-money. The yield improvement is the amount by which primary lenders would have to have dropped loan rates to hold on to their committed loans *if they were not covered by MRDG*;

(3) Estimate interest savings as the product of the dollar volume of the original purchase loan amount computed in (1), the average loan yield improvement

Table 7

MRDG premiums and Sharpe ratios under alternative assumptions

Panel A reports summary statistics for MRDG premia in basis points computed with an exercise rate of 1/8% below the previously locked mortgage rate. Panel B reports Sharpe ratios (SR) of the originator's position and the investor's position for 30-year mortgages with expected lives of 20 years.

	30-day premium			60-day premium		
Panel A	Mean	Median	St. dev.	Mean	Median	St. dev.
Full sample: 6/3/1977–12/31/2010						
MRDG premium (bps)	2.760	1.760	1.917	3.756	2.467	2.482
Subsample 1: 6/3/1977–3/14/1983						
MRDG premium (bps)	6.429	6.342	1.506	8.485	8.425	1.953
Subsample 2: 3/15/1983–12/31/1990						
MRDG premium (bps)	3.180	3.028	0.460	4.392	4.166	0.627
Subsample 3: 1/1/1991–12/31/2000						
MRDG premium (bps)	1.624	1.597	0.196	2.279	2.238	0.266
Subsample 4: 1/1/2001–12/31/2010						
MRDG premium (bps)	1.474	1.491	0.205	2.064	2.081	0.278

(*Continued*)

Table 7 (*continued*)

MRDG premiums and Sharpe ratios under alternative assumptions

	The originator's position						The investor's position					
	Without MRDG			With MRDG			Without MRDG			With MRDG		
Panel B	\$ (%)	σ (%)	SR	\$ (%)	σ (%)	SR	\$ (%)	σ (%)	SR	\$ (%)	σ (%)	SR
30-day												
Full	1.390	0.858	1.616	1.417	0.019	74.615#	8.008	2.414	3.315	8.014	2.417	3.314
Sub 1	n/a	n/a	n/a	1.381	0.015	72.502#	n/a	n/a	n/a	n/a	n/a	n/a
Sub 2	1.945	0.893	2.260	1.412	0.005	74.292#	11.155	1.545	4.617	11.161	1.554	4.616
Sub 3	0.899	0.709	1.044	1.428	0.002	75.253#	7.905	0.764	3.273	7.912	0.762	3.272
Sub 4	1.452	0.665	1.690	1.429	0.002	75.421#	5.676	0.790	2.350	5.680	0.792	2.349
60-day												
Full	1.024	1.054	0.963	1.259	0.025	50.973#	8.903	3.097	2.872	8.871	3.072	2.885
Sub 1	1.152	1.755	1.077	1.212	0.020	48.754#	12.845	2.999	4.142	12.865	2.883	4.183
Sub 2	1.434	0.922	1.349	1.252	0.008	50.556#	11.257	1.559	3.631	11.215	1.573	3.647
Sub 3	0.559	0.684	0.523	1.274	0.003	51.630#	7.975	0.780	2.573	7.960	0.767	2.589
Sub 4	1.096	0.697	1.037	1.275	0.003	51.870#	5.758	0.786	1.858	5.744	0.783	1.869

#represents that the statistic is significant at the 1% level.

Table 8

Cost savings from mortgage rate drop guarantees (MRDGs)

This table reports the average percentage of simulated MRDGs that finish in-the-money (%IN), average yield improvements in basis points when MRDGs finish in-the-money (δ), the average annual total dollar savings in millions ($), the average annual number of fixed-rate loans originated in the market (#), and the average dollar savings per loan (Savings) during the full sample 6/3/1977–12/31/2010 and each subsample period. Panel A reports results of 30-day MRDGs and Panel B reports results of 60-day MRDGs.

	30-day MRDG cost savings				
Panel A	%IN	δ	$	#	Savings
Full sample: 6/3/1977–12/31/2010					
MRDG premium (bps)	12.68	0.69	$563.98	2,628,710	$263.65
Subsample 1: 6/3/1977–3/14/1983					
MRDG premium (bps)	12.78	1.90	$752.18	1,935,347	$514.77
Subsample 2: 3/15/1983–12/31/1990					
MRDG premium (bps)	18.95	0.54	$808.95	2,283,361	$337.79
Subsample 3: 1/1/1991–12/31/2000					
MRDG premium (bps)	12.46	0.28	$328.50	2,001,836	$168.66
Subsample 4: 1/1/2001–12/31/2010					
MRDG premium (bps)	5.74	0.25	$459.11	4,513,238	$99.38
	60-day MRDG cost savings				
Panel B	%IN	δ	$	#	Savings
Full sample: 6/3/1977–12/31/2010					
MRDG premium (bps)	28.26	0.98	$2,092.29	2,628,710	$915.77
Subsample 1: 6/3/1977–3/14/1983					
MRDG premium (bps)	17.58	3.29	$1,739.53	1,935,347	$1,232.24
Subsample 2: 3/15/1983–12/31/1990					
MRDG premium (bps)	38.15	0.95	$2,815.90	2,283,361	$1,191.32
Subsample 3: 1/1/1991–12/31/2000					
MRDG premium (bps)	30.45	0.51	$1,304.65	2,001,836	$723.18
Subsample 4: 1/1/2001–12/31/2010					
MRDG premium (bps)	22.98	0.38	$2,692.89	4,513,238	$604.74

computed in (2), and the conservatively estimated loan duration factor of four;

(4) Divide the total interest saved by the total number of loans closed to estimate the expected value of an MRDG to the typical borrower.

Table 8 shows the results of this analysis for 30- and 60-day originations on an overall and a segmented sample basis. Not surprisingly, the impact of the MRDG is higher in the early years of the sample when interest rate levels were elevated and borrower pre-payment option values were high. Interest savings per loan averages more than $250 for 30-day origination periods and more than $900 for 60-day origination periods over the entire 30+ year period. These results provide a rough estimate of the benefits MRDGs would bring if originators who took advantage of their risk reduction properties passed the benefits on to borrowers.

7. Conclusions

The mortgage origination and sale process is a profit opportunity for an originator *if and only if* it can deliver a closed loan to an investor via the secondary market and earn a mark-up in price. Changes in primary market rates during the 30–60-day loan-in-process period creates interest rate exposure that must be borne by the borrower, the originator or the investor. Originators protect borrowers from loan rate increases by writing explicit cancellation options via nonrefundable, up-front commitment fees charged as a percentage of the loan amount. Exercise of these call options forces originators to create below-market rate loans if interest rates rise during the origination period but a mandatory-delivery market transfers this risk to securitizers.

Borrowers cannot be forced to close loans at previously locked quotes if rates drop far enough to offset the loss of their commitment fees while the loans are in process. In those cases, originators must choose between lowering loan rates to retain borrowers and losing origination profits. We show that lowering loan rates is the optimal strategy, even though the primary lender suffers a loss based on the difference between the rate that must be offered to retain the borrower and the rate promised to the investor. Subsequent analysis demonstrates how the addition of an MRDG moves this important component of interest rate risk from the originator's portfolio to the investor's portfolio in return for up-front compensation.

Our empirical results show that MRDGs would have been economically viable during our 30+ year sample period for a range of expected mortgage lives. Specifically, originators' Sharpe ratios increase significantly when MRDGs are added to their portfolios, despite the cost of the guarantees, but investors' Sharpe ratios do not decline, despite the increase in risk faced. In addition, the insurance features of MRDGs are efficient in that premia required by investors are high when origination profits to fund them are high, and vice versa.

Our results are attributable to a combination of factors:

(1) the typical frequency and magnitude of interest rate declines is such that originators' exposure to rate-drop pipeline risk is significant,
(2) the typical spread between primary and secondary market loan rates leads to significant origination profits that can be used to pay investors the relatively small premia required for MRDGs, and
(3) the yields accepted by long-term mortgage investors exhibit significantly less volatility than those faced by primary lenders so the incremental impact of rate-drop risk on loans-in-process is smaller at the investor level than at the originator level.

Given that MRDGs improve the risk-return tradeoff faced by mortgage originators without damaging the position of investors, the innovation should lead to lower mortgage rates if lending markets are competitive. We provide preliminary estimates of the interest savings that could accrue to borrowers as a means of quantifying the economic benefit of the innovation we propose and find the amounts to be nontrivial.

This topic is particularly important now because it would improve efficiency in the segment of the mortgage market served by liquidity traders ("uninformed" traders in the Grossman and Stiglitz world). Mortgage securitization volume is currently in decline as other efforts to restart global financial engines continue to take precedence, but it is only a matter of time before the provision of liquidity services will become valuable again.

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