

À la Carte Prepayments

The menu-driven approach.

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Prepayment of the mortgages underlying mortgage-backed securities (MBS) is a major driver of MBS values. The traditional prepayment model, which considers rates, refinancing, death, divorce, and demographics, appears to have seen better days. An expanded analysis to predict exercise of the embedded call option in MBS includes attributes of the borrower and distinctive characteristics of the loan.

There is an ongoing search for positive convexity in MBS portfolios. At the same time, increased use of risk-based pricing of primary market mortgages has provided the raw material to engage in convexity-enhancing exercises.

As society demographics change, and quality of life considerations come to matter as much as professional pursuits, mortgage bankers are increasingly forced to offer products that do not meet the traditional definition of conforming loans. And as these loans are transformed into MBS, with credit guarantees provided by government agencies or private insurance, we have come to recognize their unique prepayment characteristics.

Evidence of this phenomenon is clear on Wall Street MBS trading desks, where lower-balance MBS are offered at a premium to TBA (to-be-announced) pricing, and discount-priced MBS created using loans with prepayment penalties are sold at a concession to TBAs. It stands to reason that, absent some redeeming features about the underlying loans, the investor community would not accept differential pricing of these securities.¹

It turns out that low-balance loans have a higher threshold in terms of propensity to pay because closing

costs have to be amortized over a smaller loan balance, and hence the mortgages command premium pricing. Prepayment penalty MBS prepay more slowly than generic securities because the mortgagor has financial barriers to refinance, and hence are priced lower than TBAs due to the discount pricing.

Our purpose is to explore the expanding market for customized MBS, assess the implications of this trend for the greater market, and explore the relevance of various property and obligor attributes for prepayments.

DIFFERENT FACES OF CUSTOMIZATION

Customization has many faces. At the extreme end of the spectrum is a menu-driven approach to creating MBS, where the buyer specifies obligor and property attributes to create securities with more predictable prepayment patterns. Market participants can also choose from several standard options.

Low-Balance MBS

The underlying mortgages in a low-balance MBS are loans with a maximum original (as opposed to current) balance of \$85,000 for conventional MBS and \$65,000 for government-guaranteed loans. The belief is that such securities are likely to prepay more slowly due to higher refinancing thresholds (on account of the fixed costs of refinancing) and reduced monetary incentives on the part of servicers.

There is also a segment known as the intermediate-loan balance sector, with original balances between \$85,000 and \$110,000. Intermediate-balance loans demand smaller payups from investors due to the modest degree of enhanced convexity.

Low-Weighted Average Coupon MBS

Low-WAC MBS are collateralized by mortgages with lower-than-average-gross WACs. The threshold is usually about 35 to 40 basis points over the pass-through rate of the MBS, although during periods of gross WAC creep, this limit may be raised.²

Such MBS are less sensitive to prepayments due to the lower note rates. As rates rally significantly, the flatter prepayment profile of low-WAC MBS has a tendency to converge with that of similar-coupon generics, thereby negating the convexity advantage at such lower rate levels.

One-Weighted Average Loan Age MBS

One-WALA MBS are pools created with brand-new mortgages. The belief is that MBS with newly originated mortgages are likely to prepay more slowly than seasoned mortgages because of the fixed costs associated with originating mortgages. Hence, the potential interest rate savings at a lower rate may not be sufficient to justify the additional origination cost of new mortgages.³

Prepayment Penalty MBS

Prepayment penalty MBS are composed of mortgages that stipulate an explicit prepayment penalty in the loan agreement. Since the loan cannot be refinanced during the lockout period, prepayment speeds for such MBS are usually slower during that time.

Premium MBS are priced at a payup to TBAs while discounts are priced at a concession.⁴

High Loan-to-Value MBS

High LTV MBS are composed of pools with higher-than-the-usual 80% loan-to-value ratio. These are conforming loans, not to be confused with greater-than-100% LTV loans that are securitized and traded in the asset-backed markets.

The thought is that the underlying higher LTV mortgages have a higher threshold for prepayments on account of the higher mortgage rate. Under a regime of risk-based pricing, higher-than-usual LTVs are associated with a rate premium because of higher perceived incremental risk.

Alt-A MBS

Alt-A MBS are made up of loans underwritten using less rigorous criteria and include borrowers with reduced or limited documentation, investor-owned properties, and second homes. In addition to the normal fees and origination costs, such loans are typically associated with additional up-front points because of higher incremental risks. These loans have a higher prepayment threshold and hence better convexity profiles than generics.

General Pricing Conclusions

Obviously, there is no free lunch—all good things come at a price. With the damped prepayment profile

of the loans underlying the various types of customized MBS, these securities are usually priced at a payup to TBAs. Implicit in these payups is compensation for the embedded value of the desirable prepayment-related effect of the variable driving the customization. This then suggests that certain obligor and property attributes have prepayment-altering characteristics and should be included in the valuation model.

It is equally likely that certain loan parameters might lead to faster prepayment patterns, causing discounts with such characteristics to appreciate in value.⁵

RATIONALE FOR THE EXPANDED MODEL

If obligor and property variables are relevant in valuation, why are such prepayment models not typical? The main reason is likely a lack of publicly available loan-level data.⁶

In an attempt to shed some light on this issue, we rely on proprietary databases that provide origination data and paydown history on conforming loans over 1995–1999, and apply loan-level prepayment models to isolate the effect of various obligor and property attributes. We then assess the long-term impact of these variables on prepayment propensity over 1997–2003.⁷

A variety of obligor and property characteristics should affect the prepayment propensity of mortgages.

Origination Channel. Refers to the source of origination of the loan, such as retail versus wholesale. Typically, a premium is associated with loans originated through the retail channel, as such loans are less susceptible to broker solicitation and hence should prepay slower. As loans originated in the wholesale channel could be originated at a lower effective rate than retail loans, the refinancing threshold for wholesale loans could also be lower.⁸

Occupancy Status. Refers to whether the property is owner-occupied or maintained as a rental property or a second home. As lending rates are higher for non-owner-occupied properties, such loans are expected to exhibit slower prepayment behavior.

Documentation. Refers to the extent and quality of obligor information provided during the underwriting process. Full documentation is the ideal, where all income and asset-related information about the obligor is completely verified. Loans begin to fall into some variation of reduced documentation or expanded criteria loans when this information is obtained through alternative or indirect sources. As loans with reduced documentation are more expensive than fully documented loans, such obligors have

a higher refinancing threshold. Such loans should thus prepay more slowly than loans with full documentation.

Loan-to-Value (LTV) Ratio. Refers to the ratio of the total mortgage indebtedness to the value of the property at origination. As a general rule, the higher the LTV, the greater the perceived risk of the loan, and the higher the rate. Higher-LTV loans are likely to exhibit slower prepayment behavior.

Private Mortgage Insurance (PMI). Required for loans whose LTV exceeds 80%. The insurance payment is calculated as an add-on to the level-pay mortgage payment. For loans originated after July 1999 whose LTV drops below 80%, the lender is obligated by law to remove PMI. The lender may also elect to self-insure the higher-LTV exposure by charging a higher interest rate. Loans with lender PMI (LPMI) are associated with higher LTVs and slower prepayment.

Loan Amount. An important determinant of prepayment behavior, as lower-balance loans are less sensitive to interest rate changes because of the fixed costs associated with refinancing. In other words, the interest rate savings have to be enough to offset the up-front loan costs. According to this logic, lower-balance loans should be less likely to prepay.

FICO Scores. Refer to measurement of the aggregate creditworthiness of the borrower. Assuming that less creditworthy borrowers do not have the same credit opportunities, mortgagors with lower FICO scores are likely to be less sensitive to refinancing opportunities.¹⁰

Property Types. Range from single-family, the most common type of dwelling, to condominiums and multiple-unit properties. Generally, loans other than those associated with single-family dwellings are considered riskier and hence command a premium. These other types of loans should exhibit slower prepayment.

Geography. Affects the prepayment behavior of mortgages through a combination of factors such as regional economic growth, demographic patterns, and real estate appreciation. Certain states are likely to exhibit faster prepayment patterns than others.

EMPIRICAL EVIDENCE

The long-term impact of the loan-level parameters on 30-year conforming prepayments is shown in the Exhibit. Attributes are expressed with reference to a base level, holding the effect of other explanatory variables constant.

Mortgages originated through channels other than retail prepay approximately 8% more quickly. Non-owner-

EXHIBIT

Impact of Loan-Level Parameters on Prepayments

Origination Channel		
Base	Wholesale and Correspondent	8.08%
	Retail Origination	0.00%
Occupancy Status		
Base	Non-Owner	-26.85%
	Owner-Occupied	0.00%
Documentation		
Base	Reduced, Easy Doc	-9.37%
	Full, Alt Doc, or Other	0.00%
Purpose		
Base	Purchase	-6.48%
	Refinance	2.08%
	Cash Out	0.00%
LTV		
Base	(0 - 30)	12.31%
	(30 - 50)	7.68%
	(50 - 60)	4.04%
	(60 - 70)	0.32%
	(70 - 80)	0.00%
	(80 - 90)	-1.31%
	(90 - 125)	-16.46%
PMI		
Base	Yes	16.41%
	No	
Lender PMI		
Base	Yes	-17.58%
	No	0.00%
Loan Amount		
Base	(0 - 50K)	-58.73%
	(50 - 100K)	-31.41%
	(100 - 150K)	0.00%
	(150K - 200K)	29.22%
	(200 - 250K)	56.83%
	250+	97.24%
FICO Score		
Base	(400 - 600)	-30.88%
	(601 - 650)	-19.12%
	(651 - 700)	-7.04%
	(700 - 850)	0.00%
Property Type		
Base	Condominium	21.13%
	Manufactured Homes	-21.53%
	Multiple	-22.01%
	Single-Family Residence	0.00%
Geography		
Base	New England	24.45%
	Middle Atlantic	-17.22%
	South Atlantic	-10.89%
	North East Central	17.18%
	North West Central	27.63%
	South East Central	-7.52%
	South West Central	-17.89%
	Mountain	8.65%
	Pacific	0.00%

occupied property loans prepay more slowly than owner-occupied loans by over 26%. Loans whose obligor has not provided full documentation prepay more slowly than fully documented loans by 9%. Purchase loans prepay more slowly than cash-out refinance loans by 6.5%.

Consistent with expectations, the impact of LTV is not uniform. Lower LTVs prepay faster than higher-LTV

loans because of the higher amount of equity in the property. Loans with LTVs greater than the average (80%) prepay more slowly, as the borrowers need PMI to refinance.

Loans with private mortgage insurance (PMI) prepay faster than loans without this feature by about 16%. As PMI is typically required on loans with LTVs in excess of 80%, such obligors most likely prepay more quickly in order to refinance and eliminate the private mortgage insurance payment, especially in an environment of high real estate appreciation.

Loans with lender-paid mortgage insurance, where the lender effectively self-insures by charging the homeowner a higher rate, prepay more slowly than loans without LPMI by about 18%, as the refinancing threshold is raised due to the higher rates.

Analysis of loan amount provides clear evidence of a low-loan balance effect. As the loan balance increases, the extent of this effect is diminished.

Consistent with expectation, obligors with lower FICO scores display a lower propensity to prepay, primarily because they have fewer credit opportunities available.

Condominium loans prepay faster than single-family homes primarily because of trade-up buying. Other loan types, such as multiple-family properties and manufactured homes, prepay more slowly, mainly because of a combination of reduced credit opportunities and higher contractual rates.

IMPLICATIONS FOR INVESTORS

The pass-through structure that maximizes the positive convexity of the underlying loans is low-FICO, high-LTV, low-balance, non-owner-occupied purchase loans located in slow-pay states. As a practical matter, since MBS are created using various loans, it may not be possible to find loans that meet all these characteristics. It may be best to seek out securities with a higher percentage of such attributes, taking advantage of recently instituted enhanced disclosure programs by the GSE.

There does not appear to be any scientific or consistent means of pricing these payups (or in some cases concessions) to TBAs, as there are no readily available loan-level prepayment models available to isolate the effect of the various convexity-enhancing variables. As the market sells off, these payups appear to collapse, and MBS with defined positive convexity characteristics sometimes trade flat to TBA prices.

When the market rallies from a significant low, the demand for such securities increases exponentially. If the

pricing in customized MBS markets is any indication, this suggests investors are understandably more concerned about convexity during market rallies and are not focused on the issue during selloffs, particularly when such MBS are priced fairly attractively (even though the latter does not make sense). Investors paradoxically appear to be paying up for positive convexity just when it is priced most expensively.

It thus appears that the opportune time to invest in such securities is during a selloff when the payups are not that high. Implicit in this conclusion is that a portfolio strategy that focuses on convexity should be ongoing, and one should take advantage of any opportunity to add positive convexity on a cheaper basis.

ENDNOTES

The views here are those of the authors and do not necessarily reflect the views of Countrywide Financial Corporation or any associated entity.

¹It is perhaps also for this reason that the government-sponsored agencies, such as the Federal National Mortgage Association (FNMA) and the Federal Home Loan Mortgage Corporation (FHLMC), recently started disclosing loan-level information on securities insured by such entities.

²Gross WAC creep refers to mortgages with higher note rates pooled in lower (than usual) coupons. This can occur when compression in inter-coupon MBS price spreads means originators are not compensated for selling premium cash flows in the MBS markets. Under such conditions, originators may choose to pool the loans in lower-coupon MBS and retain the premium cash flows as excess servicing.

³Obviously, if rates are substantially lower, no-point, no-cost, mortgages may be cheaper than recently originated loans. It is also possible that in times of heady real estate appreciation, newly originated mortgages may be subject to cash-out refinance possibilities without any significant decline in interest rates as obligors seek to take advantage of the equity buildup in the properties.

⁴Prepayment penalty mortgages provide obligors with a lower mortgage rate (typically 1/4 of a point) in return for an agreement not to refinance the mortgage over a lockout period, without incurring a penalty. Partial prepayments up to 20% of the original loan amount are allowed, and the penalty cannot be enforced upon sale of the property. The typical penalty is six months' interest on any amount exceeding 20% of the original principal balance that is prepaid during the lockout period.

Our research has shown that prepayment penalty MBS have less turnover than generic MBS during the penalty period, but there is also some evidence that prepayments spike at the end of the lockout period, possibly because of pent-up cash-out refinancing demand, especially if the property has appreciated in value during the lockout period. As a result, seasoned discount prepayment penalty MBS when the lockout time frame coincides with a period

of high real estate appreciation may be mispriced. With their faster prepay, such securities should not command a discount to current coupon pricing.

⁵A condominium in a geographically fast prepayment state is one example. Typically, condominium loans prepay more quickly as the borrowers trade up to single-family detached properties.

⁶Loan-level models have been developed by investment banking firms in the arena of jumbo loans, subprime home equity, and home equity line of credit loans on an issuer-specific basis to provide investors with an understanding of the prepayment and default characteristics of the collateral underlying securitized structures. Data providers such as LoanPerformance provide loan-level data collected from servicers on jumbo, alt-A, and subprime collateral, but data for conforming agency loans are available only at the pool level from vendors such as Muller Data and SIAC.

⁷The basic prepayment model uses survival analysis to estimate the prepayment propensity parameters. Using Y to denote survival period, the survival function is defined as the probability of an individual loan surviving longer than t, so that $S(t) = P(T > t)$. This function can be estimated by the empirical survival function, where:

$$S(t) = \frac{\text{Number of Loans at the Beginning of Month } t}{\text{Total Number of Loans in the Pool}}$$

⁸The lower effective rate in the wholesale channel might occur because the broker rebates a portion of the origination fee to the mortgagor either to get the business or because of lower overhead costs.

⁹The add-on PMI payment is not tax-deductible for the borrower, but the higher interest payment because of a higher rate is. It is possible to eliminate the PMI payment, either by fiat or by petitioning the lender, if the LTV drops below 80%. In the latter case, the most efficient way to eliminate PMI is to refinance the loan. In the case of self-insurance, the higher interest rate is applicable over the life of the loan, irrespective of any improvement in LTV.

¹⁰The FICO score, developed by the Fair Isaac Company, reflects an individual's relative risk of delinquency and default. It is based on factors such as past delinquencies, payment behavior, length of credit history, types of credit, and extent of credit applications. The three major credit-reporting agencies have their own versions of FICO scores. Equifax's version is labeled FICO; Trans Union's Emperica; and Experian's Beacon. While the basic technologies are the same, each agency uses proprietary data and models. Consequently, credit scores can vary across agencies. Lenders usually use the median score (in the case of three scores) or the lower score (in the case of two scores).

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