THC Financial Engineering
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Risk Modeling Bulletin Issue 23

Multi-Family Mortgage Loans

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This issue introduces the multi-family mortgage loans using a fully-amortization adjustable-rate mortgage as illustration.

Feature Article: Multi-Family Mortgage Loans

Multi-Family mortgage loans offer financing for apartments, co-operative housing and condominiums with 5 units or more. While there are many variations in loan structures, we consider a typical structure, a fully amortize loan over 10 years. The first interest reset date is five years. After this date, the reset index is based on the Federal Home Loan Bank index with a margin of 150 basis points. Since the margin is significant, borrowers tend to prepay at the first reset date, resulting in the mortgage behaving like a five year mortgage balloon.

Typically, there are three types of prepayment penalties. The hard penalty refers to a declining schedule over time, such as 5% for the first year declining 1% annually for the next five years. Another penalty is the yield maintenance where the prepayment principal is the present value of the remaining scheduled interest and principal of the loan discounted at the Treasury rates, perhaps with a spread. The third type is the defeasance of the remaining scheduled interest and principal. We will analyze the hard penalty in this example.

Despite the prepayment penalty, some borrowers do tend to prepay. In the example, this structural prepayment is assumed to be a constant rate of 7% annually. When the market interest rate falls and it is advantageous for the borrowers to refinance, we assume that the borrowers prepay efficiently. A summary description of the loan is given in Table 1.

Table 1: A Fully-Amortization Multi-Family Adjustable-Rate Mortgage

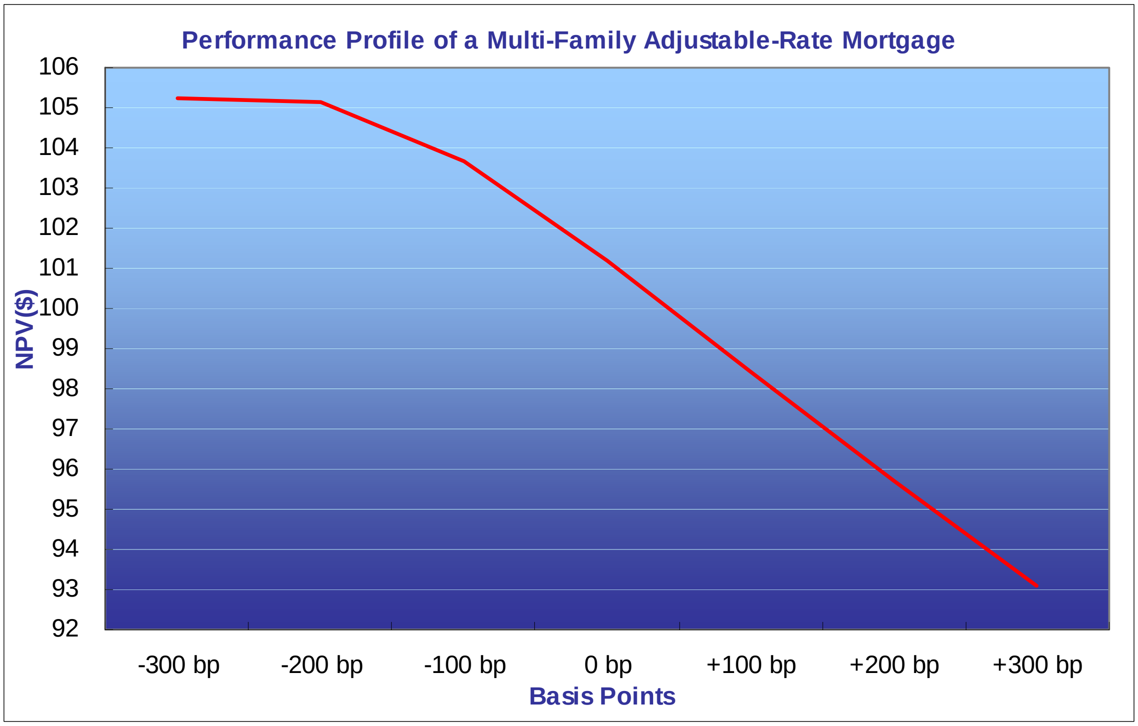
Valuation Date	Origination Date	Maturity Date	Current Coupon Rate
2006-12-29	2006-12-29	2016-12-30	6.35%
Index	**Margin(BP)**	**Interest Reset Period (month)**	**Months to next Reset**
1-Year FHLB Rate	150	60	60
Unpaid Balance($)	**Structural CPR**	**Amortization**	**Payment period**
100	7%	Full Amortization	Month
Prepayment Penalty			
5% at the origination date and decrease by 1% annually			

To value a multi-family mortgage loan, we discount this option embedded mortgage based on a FNMA spread of 50 basis points off the swap curve. The results are presented below.

Figures 1 presents the performance profile. The multi-family mortgage declines with increases in the interest rates. The performance profile bends downward with a fall in the interest rates responding to the predicted preference for prepayment.

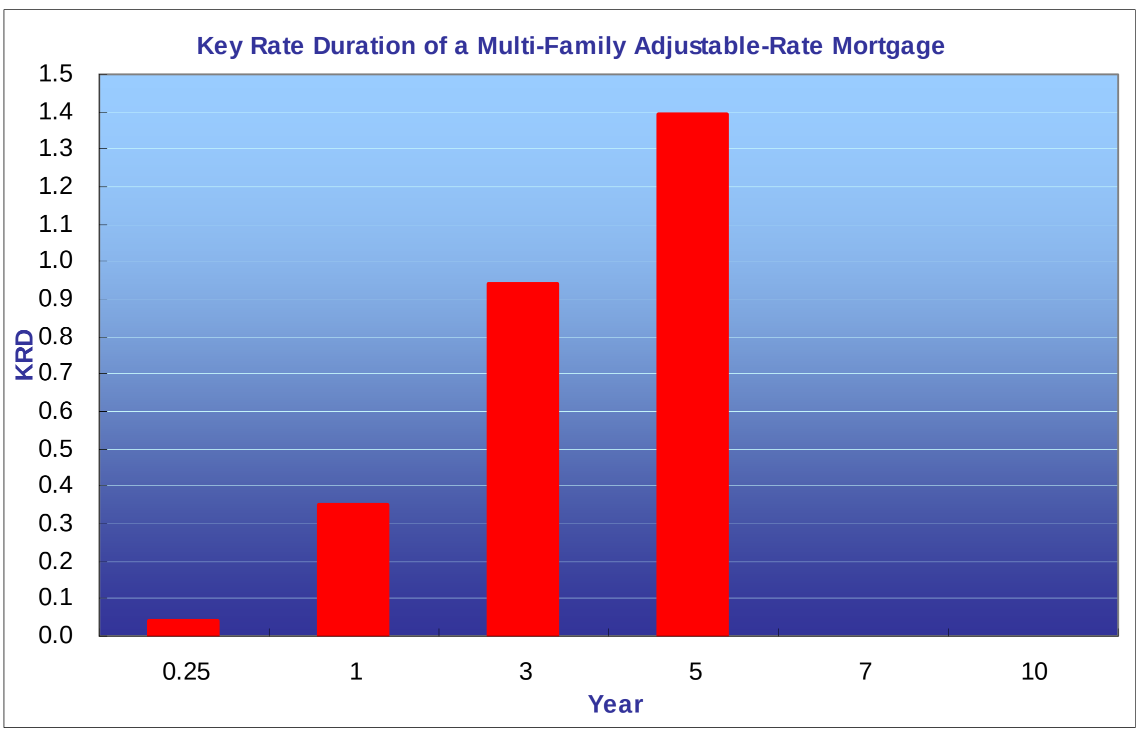
The value of the loan is capped by the principal value with the penalty, resulting from the effect of prepayment.

FIGURE 1



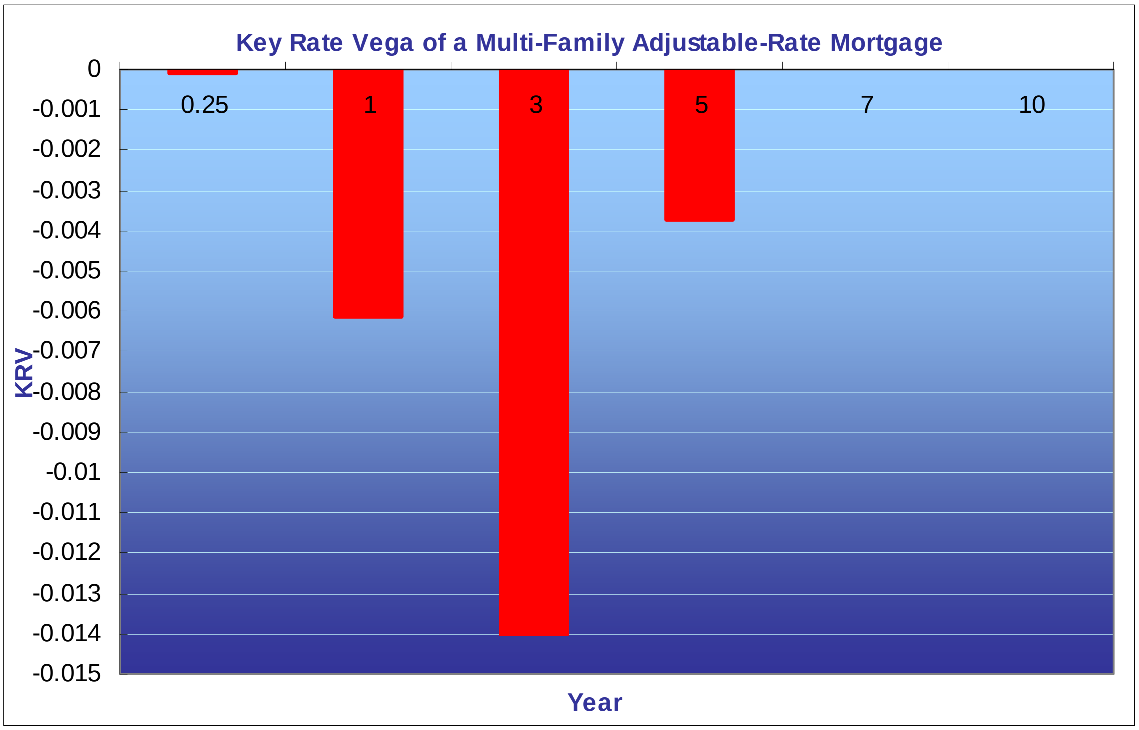
The mortgage is sensitive to changes in the interest rates at the years before the fifth year. Further, it is most sensitive to the 5 year interest rate change that shows refinancing occurs before the first reset date.

FIGURE 2



In Figure 3, the sensitivities of the mortgage to the yield curve risk are depicted by the key rate vegas. The result shows that the mortgage is most sensitive to the three year vega.

FIGURE 3



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