THC Financial Engineering
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Risk Modeling Bulletin Issue 9

Caps and floors

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Mortgage prepayments may raise the funding costs. However, protection against such risks can be implemented by using derivatives such as floors. The feature article of this issue describes how THC Decisions' derivative analytics can be used to determine the floor hedging position. Market prices of caps and floors are presented in the Market Perspective.

Feature Article: Hedging the Funding Cost Using Floors

Banks hold mortgages subject to prepayment risks. When interest rates fall, mortgagors prepay, resulting in an increase in the cost of funding. Floors can be used to hedge prepayment risk. The optimal use of floors for hedging can be determined by THC Decisions.

Consider the following simulation. Suppose we hold a 30yr mortgage, hedged with a floor position as described in tables 1 and 2. Figure 1 shows the performance profiles of the conventional 30yr fixed-rate mortgage loan and the portfolio consisting of the same mortgage with the 3-month LIBOR 5yr floor described in table 2. The NPV of the mortgage increases at a decelerated speed as interest rates fall. The floor provides protection, hedging the prepayment risk.

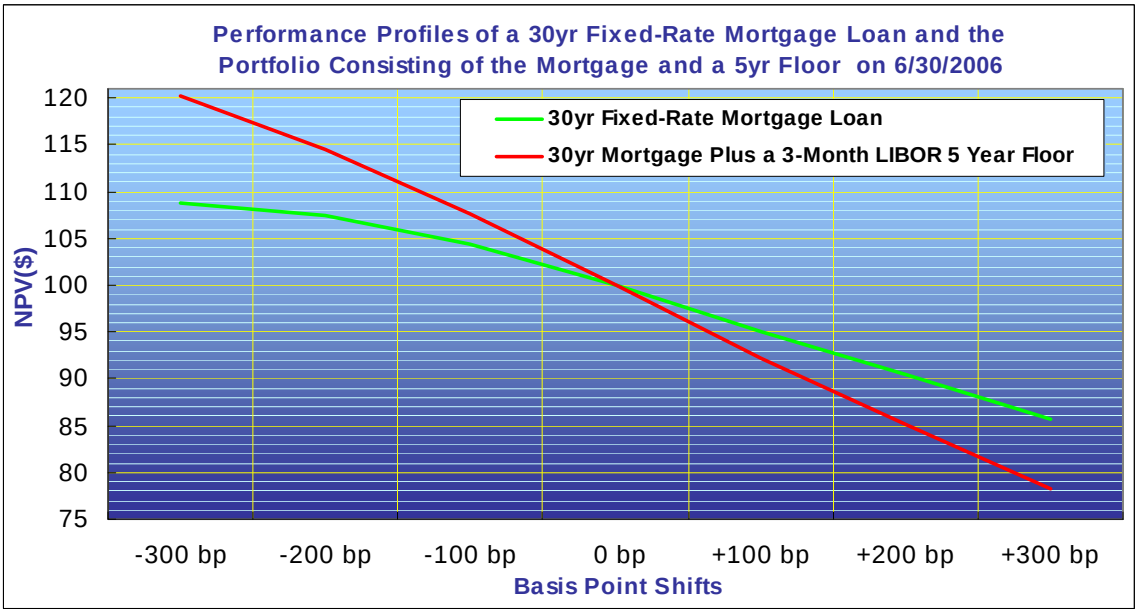
TABLE 1: 30yr Mortgage Loan

	Principal($)	WAC	Start Date	Maturity
30yr Fixed-Rate Mortgage Loan	102.73	6.47	2006-03-31	2035-11-30

TABLE 2: 3-Month LIBOR 5yr Floor

	Notional Amount ($)	Floor Rate(%)	Start Date	Maturity	Pay Freq
3-Month LIBOR 5yr Floor	33,759.00	3.00	2006-03-31	2011-3-31	Quarterly

FIGURE 1



From the performance profile depicted in Figure 1the strike/tenor of the floors and the amount of the hedging position can be determined such that the optimal tradeoff between the cost of hedging and protection against the rate fall is optimized.

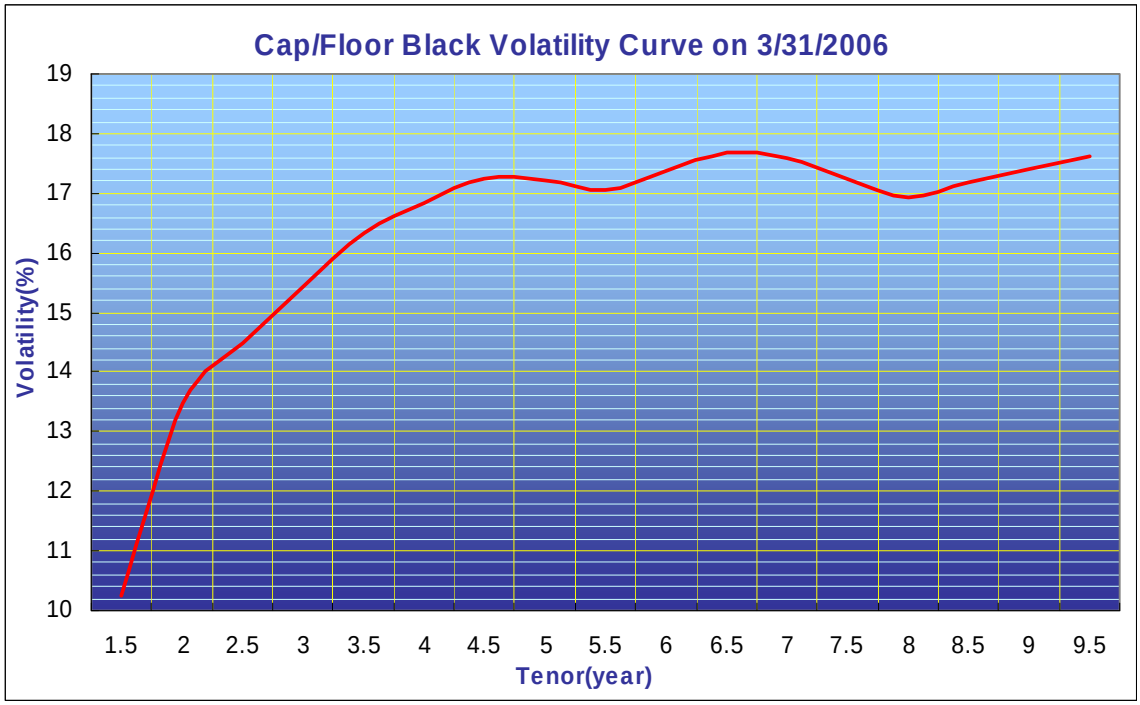
Market Perspective: Cap/Floor Black Volatility Curve

The implied volatilities of the interest rate models are typically calibrated from the swaption prices as discussed in Bulletin 3. Market volatilities can also be observed from the cap and floor prices. These prices are related by the pricing formula derived from the Black-Scholes model, where the three-month LIBOR rate is assumed to have a log-normal distribution around the forward rate. The volatility of the three-month rate that determines all the caplet (floorlet) prices of a cap (floor) such that the total value equals the traded cap (floor) price is called the Black volatility or the 'flat volatility." The values of the at-the-money caps over a range of tenors are reported below.

TABLE 3: Cap/Floor Black Volatilities on 3/31/2006

Tenor(year)	1.5	2	2.5	3	3.5	4	4.5	5	5.5
Volatility(%)	10.25	13.48	14.50	15.41	16.33	16.85	17.23	17.21	17.05
Tenor(year)	6	6.5	7	7.5	8	8.5	9	9.5	
Volatility(%)	17.37	17.69	17.59	17.26	16.92	17.17	17.39	17.62	

FIGURE 2



The results show that the Black volatilities are upward sloping, rising to approximately an 18% annual rate. The higher the implied volatilities, the more costly is the hedging of the mortgage position.

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Contact us if you have any questions, suggestions or comments

support@thomasho.com Voice: 1-212-732-2878 Fax: 1-212-608-1233
Http://www.thomasho.com 55 Liberty Street, 4B, New York, NY 10005-1003 USA