THC Financial Engineering
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Risk Modeling Bulletin Issue 7

Structured Advances

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Federal Home Loan Bank's (FHLB) structured advances have become an important funding source for many banks. Often, banks with long dated structured advances offer put options to the FHLB. When interest rates rise, FHLB may "put the bond" at par and banks refinance the par amount at a higher rate. This issue analyzes the effect of options on interest rate risk in funding by measuring the key rate durations and the performance profile.

Feature Article: Structured Advances Put Option Value

When a bank fund fixed rate mortgage loans using structured advances, the bank sells prepayment options to the mortgagors and put options to FHLB. Suppose a bank funds 30yr fixed-rate mortgage loan with 7yr structured advance with a one-year lock out and a series of quarterly Bermuda options after the lockout (The two instruments are depicted in Table 1), consider the following simulation from THC Decisions.

TABLE 1: a Structured Advance and a Mortgage Loan

	WAC / Coupon Rate(%)	Start Date	Maturity	First Put Date
Mortgage	6.47	2006-03-30	2035-11-30	---
Advance	4.55	2006-03-13	2013-03-13	2007-03-13

Key rate duration profile shows that the portfolio is exposed to the rise of the 10 and 20 year rates and a fall of the 7 year rate. Furthermore, the bank would sustain losses when the yield curve shifts significantly, rising or falling, as indicated by Figure 2 and 3.

FIGURE 1

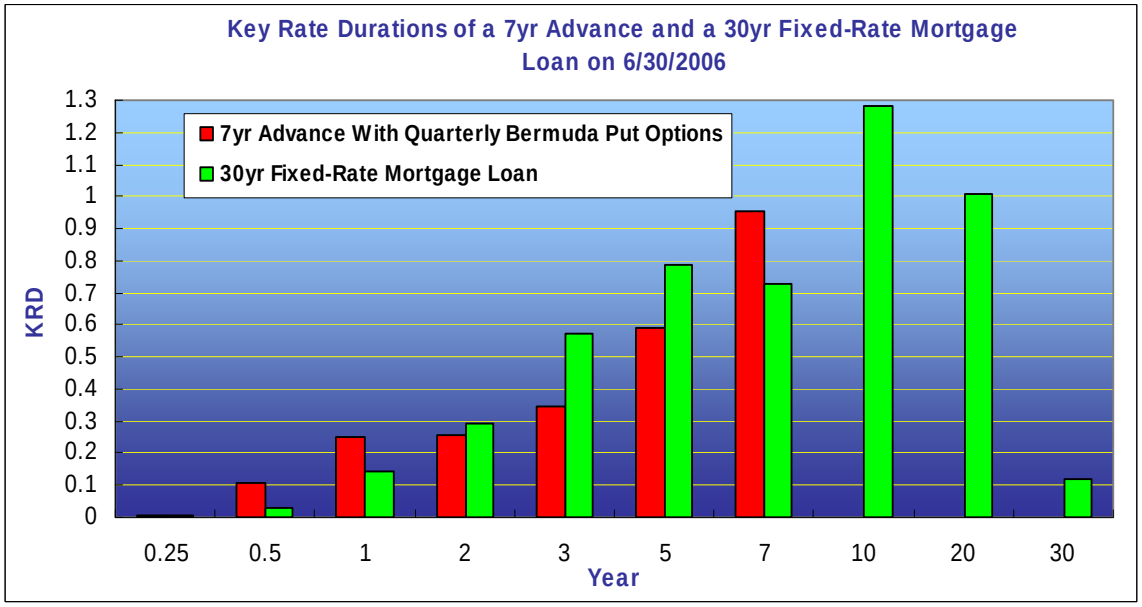


FIGURE 2

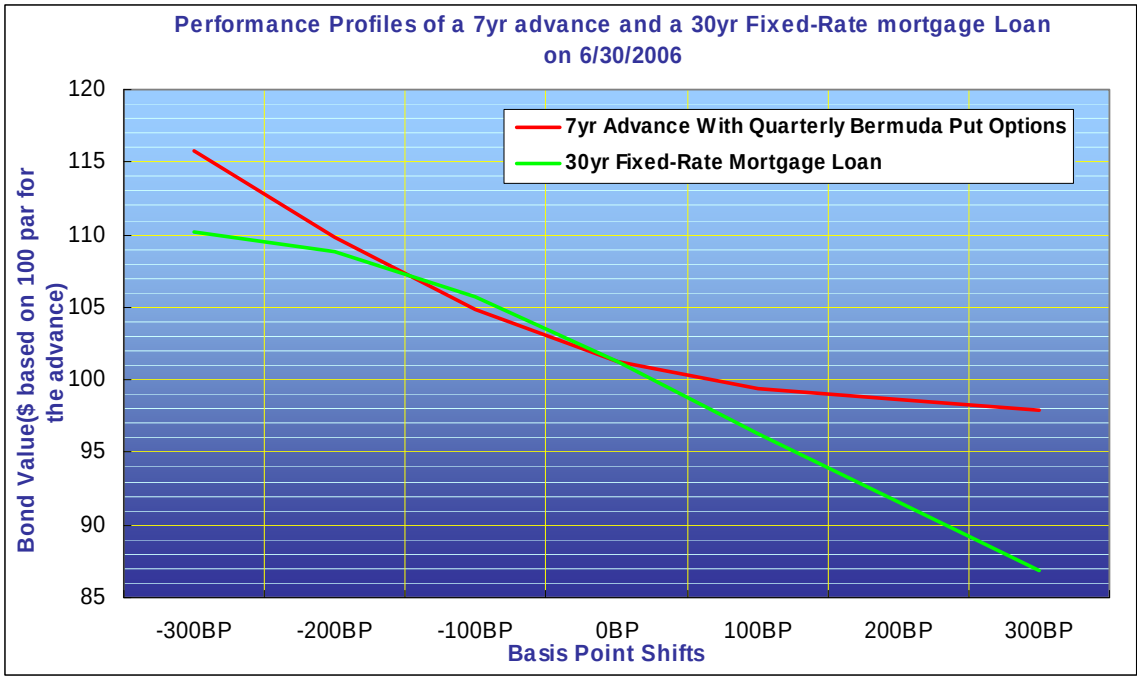
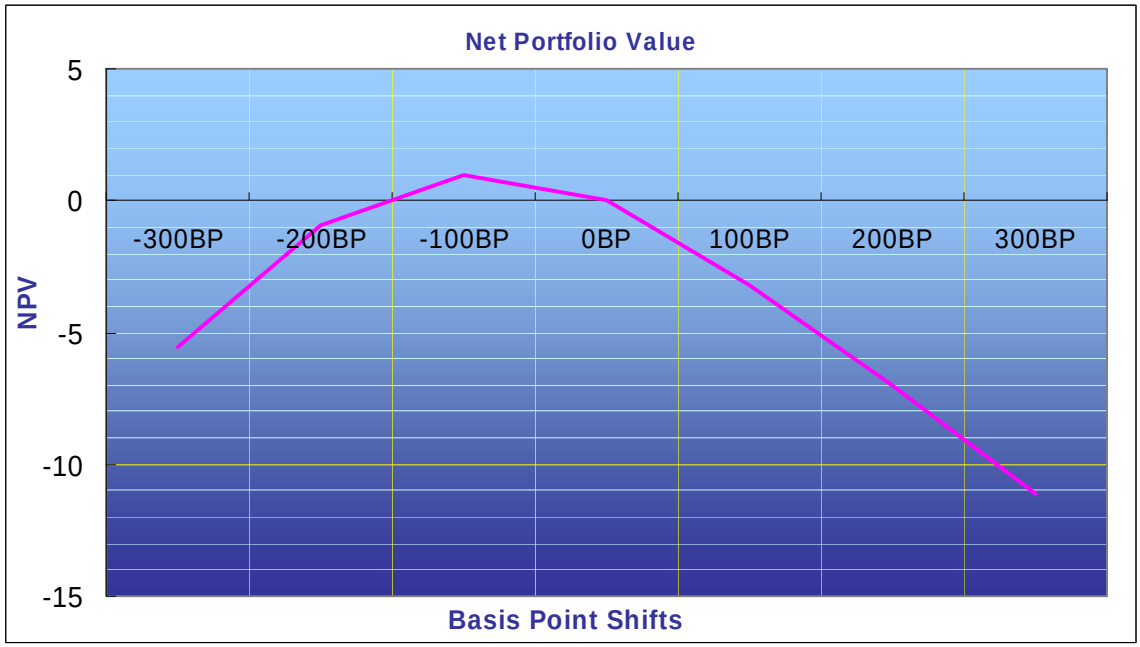


FIGURE 3



Above simulation prove that this funding strategy exposes the bank to losses in a volatile yield curve regime, and the bank management must draw an appropriate tradeoff between such risks to the interest margin gained.

Commonly, long dated structured advances offer put options. The effect is a lowering of the yield and an increase in the re-financing risk. In essence, banks are selling options to FHLB, and as such it is important to determine the option value. Consider THC Decisions' valuation of five putable structured advances, exhibited in Table 2. Table 3 shows the option value determined by the Generalized Ho Lee Arbitrage-Free Interest Rate Model. The valuation is based on 4/28/2006 market data.

TABLE 2: Descriptions of the Advances

ID	Coupon Rate(%)	Start Date	Maturity	First Put Date
1	4.55	2001-03-26	2011-03-28	2004-12-13
2	3.95	2002-07-15	2012-07-16	2006-06-01
3	4.26	2004-06-30	2014-07-01	2007-02-01
4	3.88	2004-07-01	2011-07-01	2005-04-14
5	4.245	2006-03-01	2013-03-01	2006-07-01

(Note: All advances are bullets with quarterly Bermuda put options.)

TABLE 3: Option Valuation

ID	NPV($ based on 100 par)		Option Value($ based on 100 par)
	With Option	Without Option	
1	101.87	99.01	2.86
2	100.88	95.24	5.64
3	102.25	95.68	6.57
4	100.59	95.80	4.79
5	101.70	96.45	5.25

Table 4 reports on the impact of the put option on the bond's duration and convexity. By comparing the risk measures for the bonds with and without the options, the result shows that the option lowers the duration while increases the convexity, and therefore, these options can change the risk profile of the NPV of a bank significantly.

TABLE 4: Duration, Convexity

ID	Duration		Convexity	
	With Option	Without Option	With Option	Without Option
1	2.25	4.29	162	22
2	1.73	5.35	105	34
3	2.89	6.68	99	53
4	1.14	4.56	138	24
5	2.41	5.76	291	39

Market Perspective: Structured Advances OAS – Interest Margin Gained

The price of the put option depends on the term structure of volatility and the yield curve shape, as explained in Bulletin, Issue 3. Table 3 reports the impact of the put option on the current market funding cost, based on market parameters on 4/28/06. The tightening of the yield to maturity is used as a measure. A comparison of the risk measures for bonds with and without options results in the shortening of the duration and increase in the convexity. Note: Other factors that would be used to determine the funding cost, such as liquidity and supply and demand, were not included for the purposes of this simulation.

TABLE 3: The Impact of the Put Option on the Funding Costs on 4/28/06

ID	Coupon Rate(%)	Yield to Maturity (%)		Difference in Yields(bpt)
		With Option	Without Option	
1	4.55	4.49	5.44	95
2	3.95	4.01	5.48	147
3	4.26	4.24	5.54	130
4	3.88	3.97	5.45	147
5	4.245	4.24	5.50	126

The results clearly demonstrate that options have the ability to reduce the funding cost significantly. Further, these options can have a substantial impact on the risk profile of the NPV. The use of

structured advances for funding depends on the bank's expectation of the market. If the yield curve is anticipated to rise, then the risk may outweigh the return in selling the put option. However, if the yield curve is expected to fall, then selling the put option becomes more favorable. Note: The overall NPV risk profile should also be considered since the option may add excess risk to the balance sheet.

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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