



IIT ROORKEE



NPTEL ONLINE
CERTIFICATION COURSE

QUANTITATIVE INVESTMENT MANAGEMENT

LECTURE 16

Yield Spreads Contd.

J P Singh

Department of Management Studies



IMPACT OF INTEREST RATE VOLATILITY ON OAS

- Suppose that a 7%, 10-year callable bond of XYZ Ltd is trading for 958.
- Assume that an Analyst P assumes a 15% value for future volatility in generating his benchmark interest rate tree.
- He calculates the value of the bond as 1,050.
- He then computes the OAS (the increase in discount rate required to lower the calculated bond value of 1050 to the price of 958) for this bond to be 80 bps.

- Analyst Q assumes a 20% value for future volatility, and because of higher assumed volatility, the computed value of the bond turns out to be 992.
- **(Note that this is lower than the \$1,050 calculated by P—the higher the volatility, the lower a callable bond's value).**
- He then computes the OAS (the increase in discount rate required to lower the calculated bond value of 992 to the market price of 958) for this bond to be 54 bps.
- Thus, the OAS calculated by B is accordingly lower at 54 bps.

- Hence, we find that for the same bond, the OAS calculated varied with the volatility assumption used.
- The higher volatility led to lower computed price and hence lower OAS.
- Hence when the estimated (or assumed) volatility (of benchmark rates) used in a binomial tree is higher, the computed value of a callable bond will be lower—and therefore closer to its true market price.

- **The constant spread that needs to be added to the benchmark rates to correctly price the bond.**
- **The OAS is therefore lower.**

CONCLUSION

- When we use a higher estimate of volatility to value a callable bond,
- the calculated value of the call option increases,
- the calculated value of the straight bond is unaffected, and
- the computed value (not the market price) of the callable bond decreases (since the bondholder is short the option).
- The constant spread that needs to be added to the benchmark rates to correctly price the bond (the OAS) is therefore lower.

Assumed Level of Volatility	Value				OAS_{CALL}	OAS_{CALL}
	Calls	Puts	Callable	Puttable		
High	High	High	Low	High	Low	High
Low	Low	Low	High	Low	High	Low

SUMMARY

- To summarize, as the assumed level of volatility used in an interest rate tree increases, the computed OAS (for a given market price) for a callable bond decreases.
- Similarly, the computed OAS of a puttable bond increases as the assumed level of volatility in the binomial tree increases.

SWAP RATES & SWAP SPREADS



SWAP RATE

- In a plain vanilla interest rate swap, one party makes payments based on a fixed rate while the counterparty makes payments based on a floating rate. The fixed rate in an interest rate swap is called the swap fixed rate or swap rate.



SWAP RATE CURVE

- If we consider how swap rates vary for various maturities, we get the swap rate curve, which has become an important interest-rate benchmark for credit markets.



SWAP RATE CURVE: FEATURES

- Swap rate curve is preferred as a benchmark interest rate curve rather than a government bond yield curve for the following reasons:
- Swap rates reflect the credit risk of commercial banks rather than the credit risk of governments.
- The swap market is not regulated by any government, which makes swap rates in different countries more comparable.

- **Government bond yield curves additionally reflect sovereign risk unique to each country.**
- **The swap curve typically has yield quotes at many maturities, while the government bond yield curve has on-the-run issues trading at only a small number of maturities.**

SWAP RATES: COMPUTATION

- A swap rate is the average of:
- (a) the fixed rate that a swap market maker is prepared to pay in exchange for receiving LIBOR (its bid rate) and
- (b) the fixed rate that it is prepared to receive in return for paying LIBOR (its offer rate).
- Swap rate means that a bond with a principal of \$100 and a semiannual coupon equal to swap rate per annum sells for par.



- For example, the 5-year swap (FIXED) rate is an interest rate with a **credit risk** corresponding to the situation where 10 consecutive 6-month LIBOR loans to AA companies are made.
- 5-year swap rates are less than 5-year AA borrowing rates.
- It is much more attractive to lend money for successive 6-month periods to borrowers who are always AA at the beginning of each such period than to lend it to one borrower for the whole 5 years when all we can be sure of is that the borrower is AA at the beginning of the 5 years.

ZERO RATES & SWAP RATES

- Zero rate is the ytm of a zero coupon bond.
- Swap rate is the fixed rate that receiver demands in exchange for the uncertainty of having to pay the short-term LIBOR (floating) rate over time.



EXAMPLE

- The market, on a particular day is quoting a swap rate of 5% for a swap whose payments are made s/a.
- Suppose that the 6-month, 12-month, and 18-month zero rates have been determined as 4%, 4.5%, and 4.8% with continuous compounding. What is the 2-year zero rate.



- This 5% swap rate means that a bond with a principal of \$100 and a semiannual coupon of 5% per annum sells for par. It follows that, if R is the 2-year zero rate, then
- $2.5e^{-0.04 \times 0.5} + 2.5e^{-0.045 \times 1.0} + 2.5e^{-0.048 \times 1.5}$
- $+ 102.5e^{-2R} = 100$
- Solving this, we obtain $R : 4.953\%$.

SWAP SPREAD

- Swap spread refers to the amount by which the swap rate exceeds the yield of a government bond with the same maturity.
- $\text{Swap Spread}_t = \text{Swap Rate}_t - \text{Treasury Yield}_t$
- Swap spreads are almost always positive, reflecting the lower credit risk of governments compared to the credit risk of banks that determines the swap rate.



I-SPREAD

- The I-spread for a credit-risky bond is the amount by which the yield on the risky bond exceeds the swap rate for the same maturity.
- $\text{I-Spread of risky bond} = \text{Yield on the risky bond} - \text{Swap rate for the same maturity}$

- While a bond's yield reflects time value as well as compensation for credit and liquidity risk, l-spread only reflects compensation for credit and liquidity risks.
- The higher the l-spread, the higher the compensation for liquidity and credit risk.

