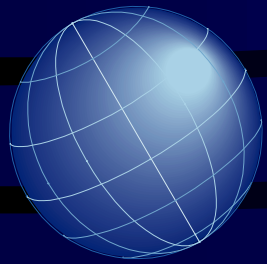


Derivatives and Debt Management

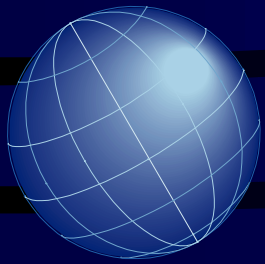


Ravi Balasubramanian
Financial Officer
Treasury ALM Group
The World Bank



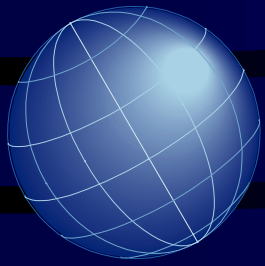
Setting the Stage...

- ❑ **Traditionally, liability management based on “buy and hold” strategy**
- ❑ **Derivatives now enable active liability management to achieve specific goals**
- ❑ **Various derivatives contracts are inter-related; understanding these relationships is key for their appropriate use**
- ❑ **IBRD’s new role in providing hedging products facilitates access to these tools**



Derivatives: The Building Blocks

- Forwards**
- Futures**
- Swaps**
- Option**

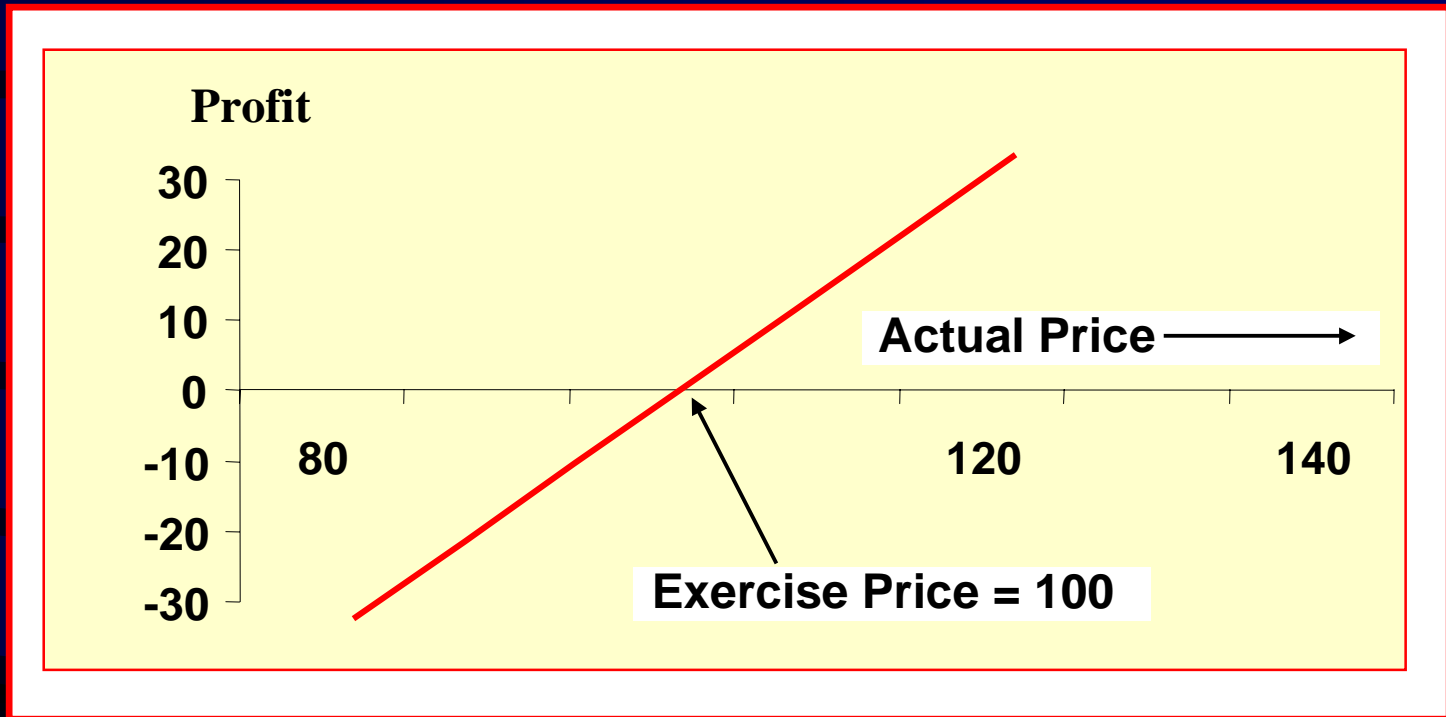


Forwards

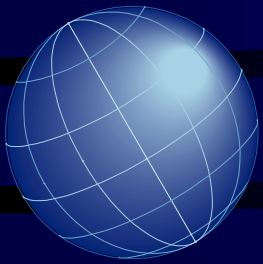
- ❑ A forward contract *obligates* its owner to buy a given asset on a specified date at a pre-specified price (“exercise price”)
- ❑ Typically, this is an arrangement between two private parties
- ❑ No up-front payment
- ❑ Typically, delivery of asset at maturity



Payoff Profile

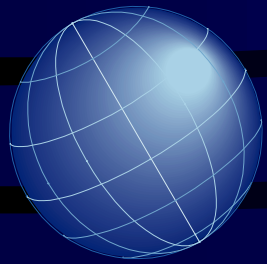


- ❑ If, at maturity, the actual price is higher than forward price, owner makes a profit; else, makes a loss.
- ❑ Default risk is two-sided



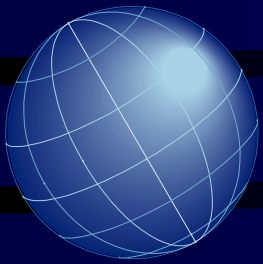
Forward Rate Agreements

- ❑ **Forward Rate Agreements (FRAs) are forward contracts on interest rates**
- ❑ **Underlying asset is the relevant interest rate**
- ❑ **Buyer gets protection against future rise in interest rates and seller gets protection against future fall in interest rates**
- ❑ ***Cash-settled* on settlement date.**
- ❑ **Can be viewed as a one-period interest rate swap**
- ❑ **Can be tailored to suit hedging needs**



Futures

- ❑ **Futures contracts on commodities traded on organized exchanges since mid 19th century**
- ❑ **Financial futures contracts relatively new - since 1972 on currencies**
- ❑ **Financial futures can be written on currencies, stock indices, U.S Treasury Bills and Bonds**
- ❑ **Contract form and payoff profile identical to that of forwards**



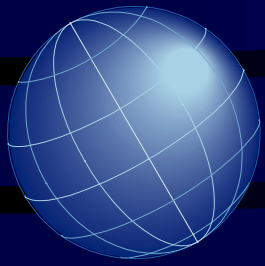
Futures

- ❑ **Key differences:**
 - Daily Marking to market
 - Margin requirement
- ❑ **Result: default risk is practically zero**
- ❑ **A futures contract is somewhat like a “series of forward contracts”**
- ❑ **Futures would be identical to forwards only if there is complete interest rate certainty**



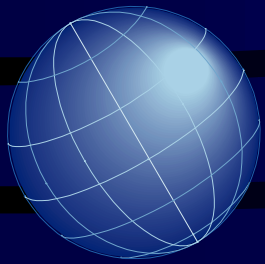
Swaps

- ❑ **Contractual exchange of cashflows between two parties**
- ❑ **Contracts are traded over-the-counter (OTC); not exchange-traded**
- ❑ **Common types of swaps**
 - Interest rate swaps
 - Currency swaps
 - Commodity swaps



Interest Rate Swaps

- ❑ **Involves a payment of a fixed rate in exchange for a floating rate; no principal exchange**
- ❑ **Maturities from three months to 30 years**
- ❑ **Typically, floating index is 3-month or 6-month LIBOR**
- ❑ **Can be tailored to meet specific hedging needs.**
- ❑ **Can be viewed as a portfolio of forwards; so, the payoff profile is identical to that of forwards**



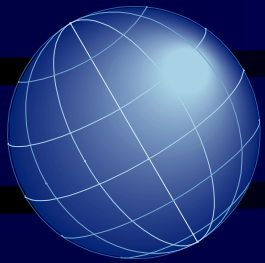
Comparison of Contracts

OTC

FRAs and Swaps
Can be tailored to meet specific hedging needs
No basis risk
Involves counterpart credit risk
Collateral increasingly common
Hedging for end-users

Exchange Traded

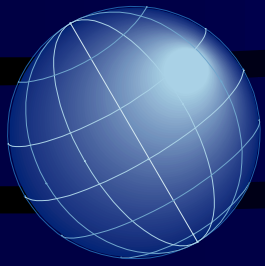
Futures
Standardized contracts
Basis risk present
Minimal credit risk
Requires collateral
Ideal as a trading vehicle



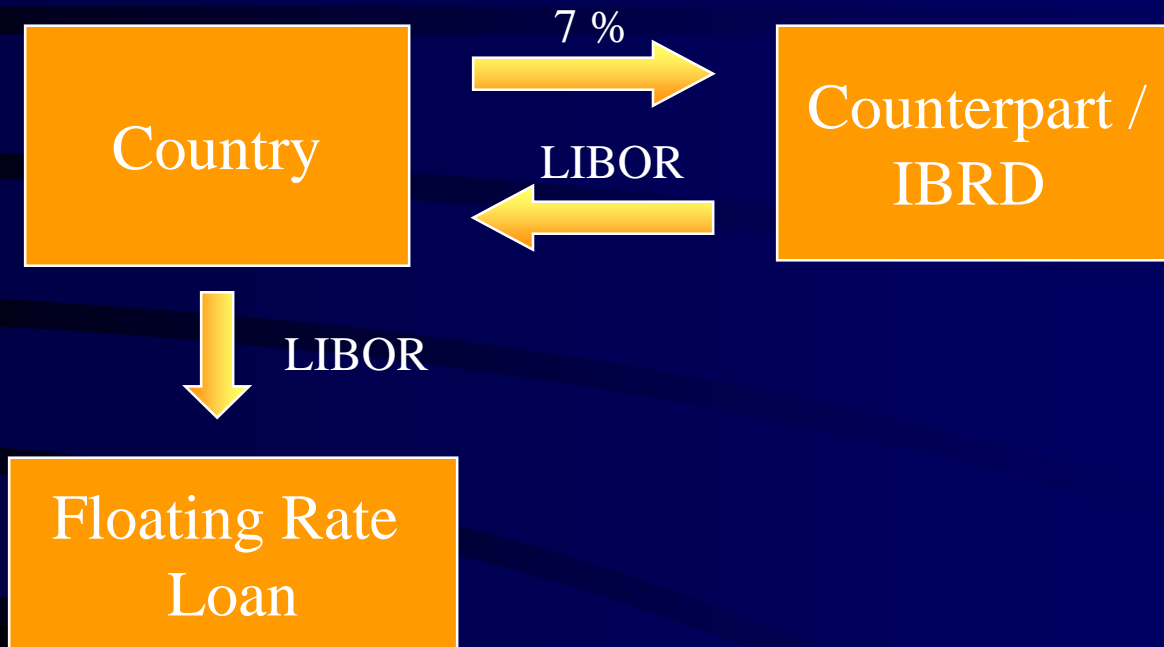
Interest Rate Swap: Illustration



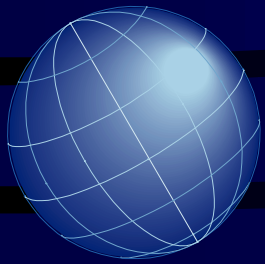
Year	Pays Fixed Amt.	Receives Floating Amt.
1	7 Million	LIBOR X 100 Million
2	7 Million	•
3	7 Million	•
4	7 Million	•
5	7 Million	LIBOR X 100 Million



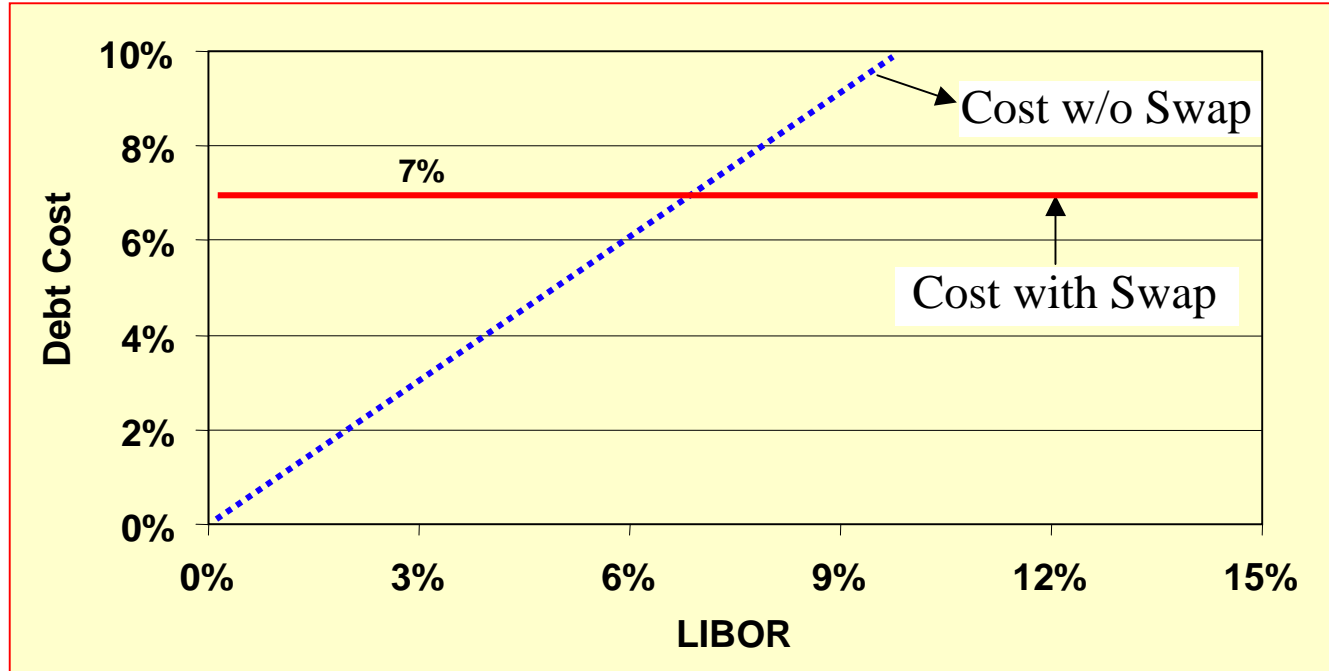
Interest Rate Swap: Application



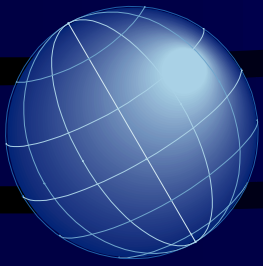
□ Result : Synthetic Fixed Rate Loan



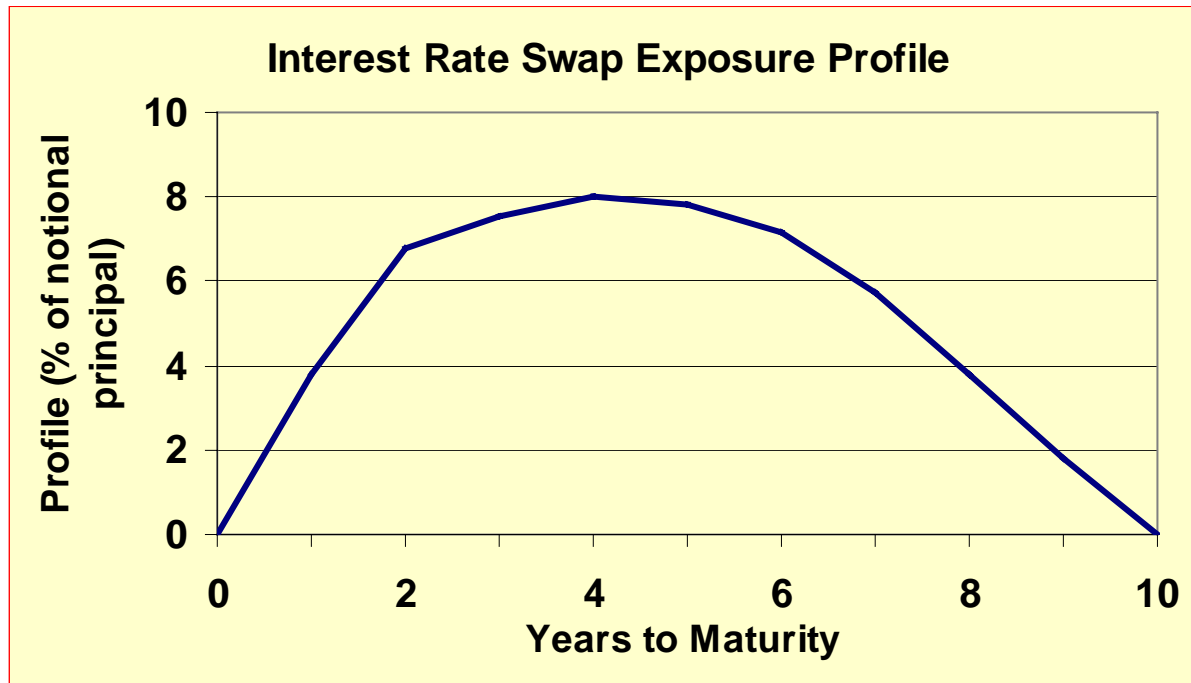
Payoff Profile



- ❑ Default Risk is two-sided



Swap Exposure

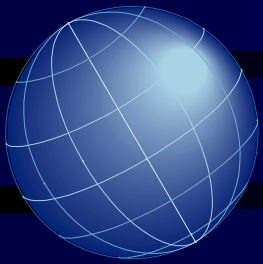


- ❑ Default risk can be mitigated by collateral agreements and netting arrangements
- ❑ Limits access for lesser rated credits



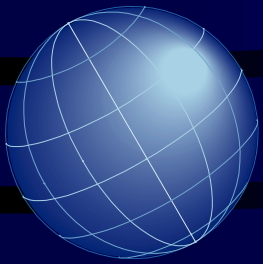
Interest Rate Caps

- Caps provides protection against future increases in interest rates.....
-but benefit from falling interest rates
- Buyer makes an up-front payment and receives protection against a rise in the floating rate index (LIBOR) above a preset level (“strike”)
- If floating rate exceeds the strike rate at the beginning of any period, buyer receives the difference between the market and the strike rates



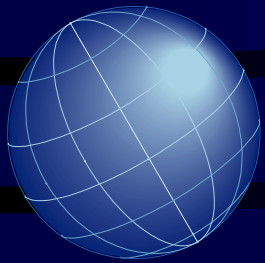
Interest Rate Floors

- ❑ Floors provide protection against future decreases in interest rates.....
- ❑ but benefit from rising interest rates
- ❑ Buyer makes an up-front payment and receives protection against a decrease in the floating rate index (LIBOR) below a preset level (“strike”)
- ❑ If floating rate exceeds strike rate at the beginning of any period, buyer receives the difference between market and strike rates



Caps and Floors

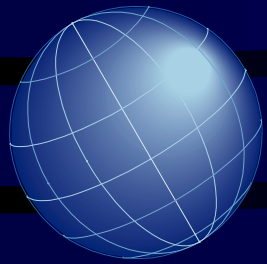
- ❑ **Caps are**
 - purchased by liability managers to reduce floating rate debt exposure (while benefiting from falling rates)
 - sold to generate “premium” income
- ❑ **Floors are**
 - purchased by asset managers to reduce floating rate asset exposure (while benefiting from rising rates)
 - sold to generate “premium” income
- ❑ **Maturities from 3 months to 10 years**
- ❑ **Both Caps and Floors can be tailored to meet specific hedging needs**
- ❑ **Combination of Cap and Floor - the Collar - is actively used for liability management**



Interest Rate Cap: Illustration

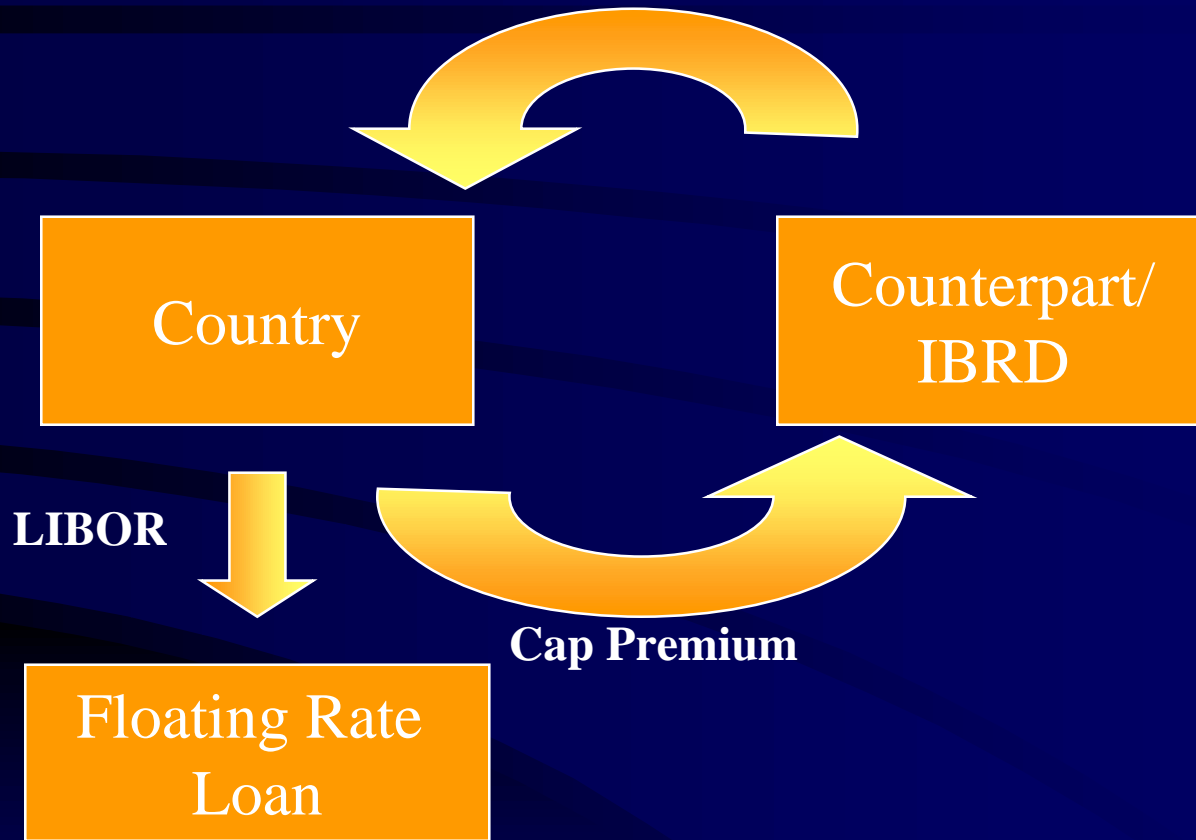


Period	Assumed LIBOR path	Cap cashflow (in millions)
1	6.5%	0
2	7.5%	0.5
3	8.5%	1.5

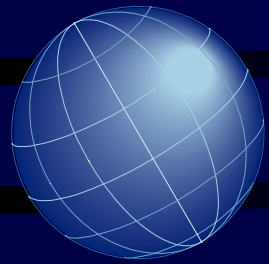


Interest Rate Cap: Application

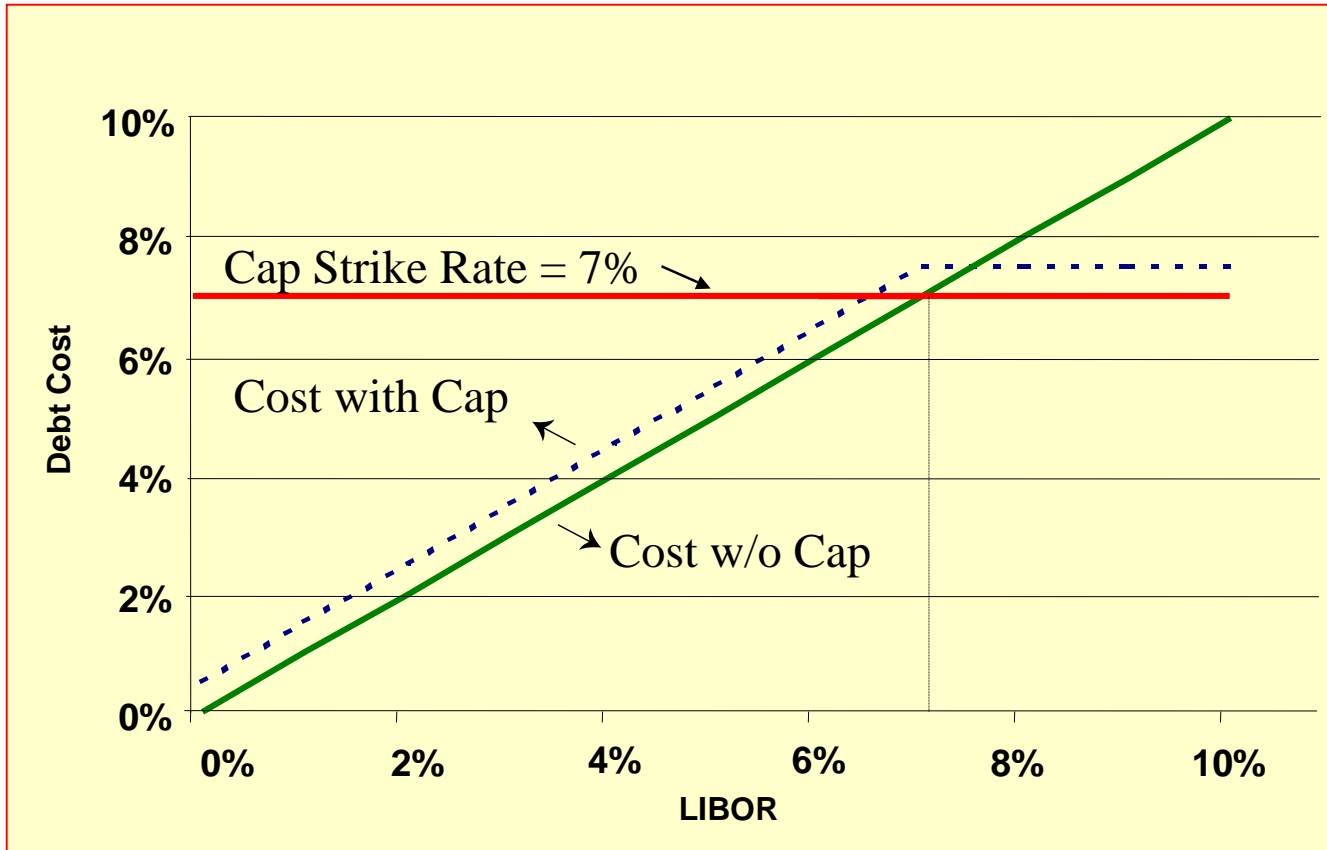
$\text{Max}(\text{LIBOR} - 7\%, 0)$

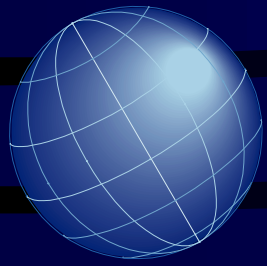


□ Result : Capped Floating Rate Loan



Interest Rate Cap: Payoff Diagram



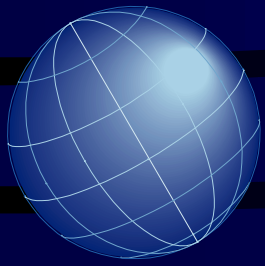


Put - Call Parity

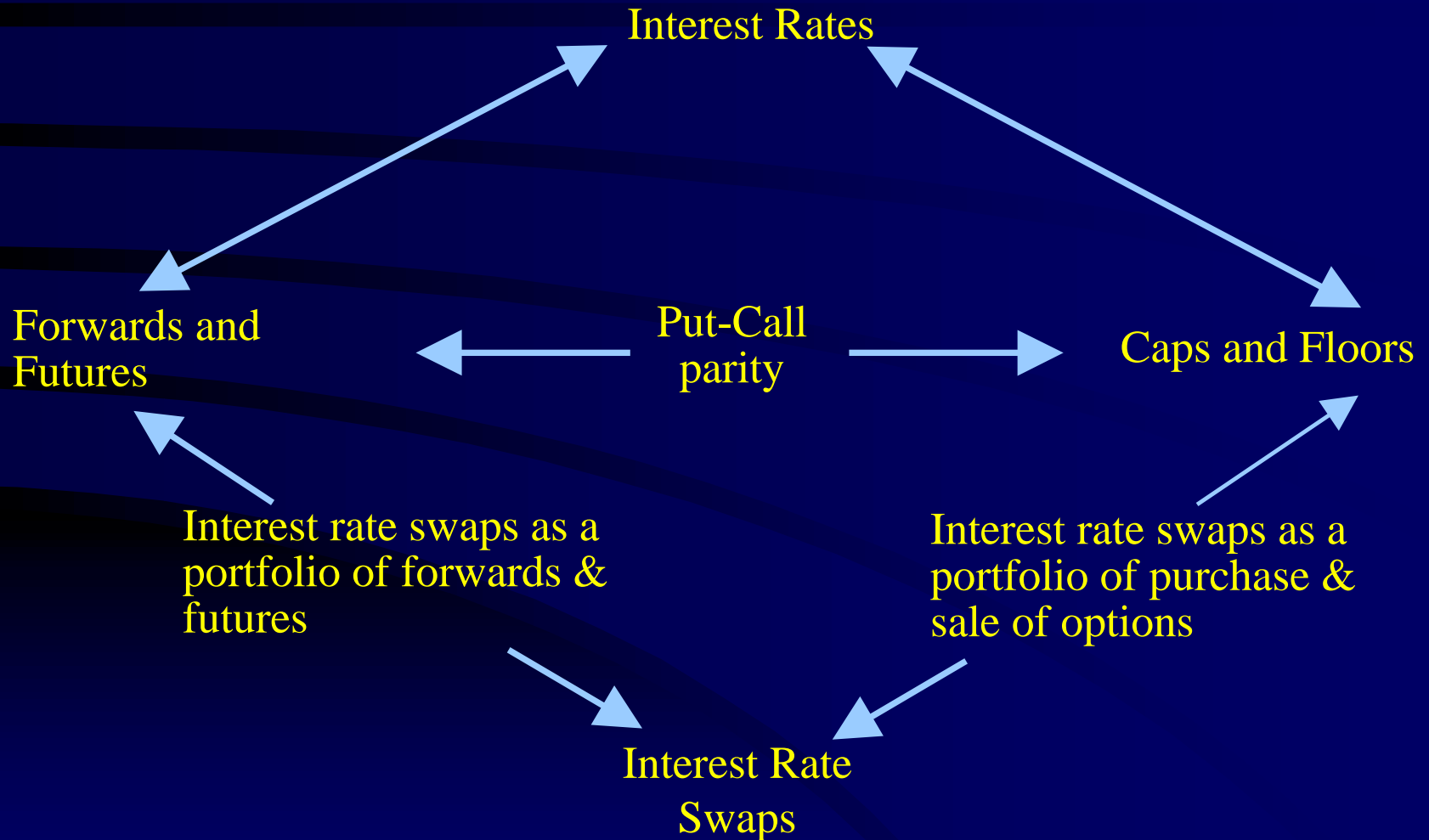
- ❑ **Put-Call parity establishes the relationship between the price of the underlying and option prices:**

$$\begin{aligned} &\text{Value of Call} + \text{PV of Strike Price} \\ &= \\ &\text{Value of Put} + \text{Value of Underlying} \end{aligned}$$

- ❑ **This construct facilitates creation of synthetic option and underlying asset positions**



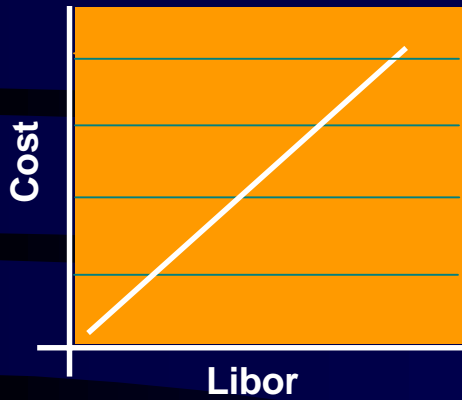
Relationships between Forwards, Swaps and Options



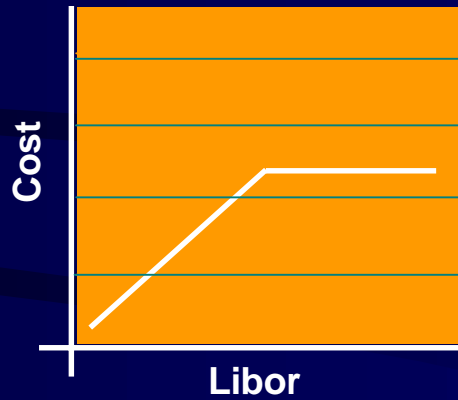


Combining Caps and Floors

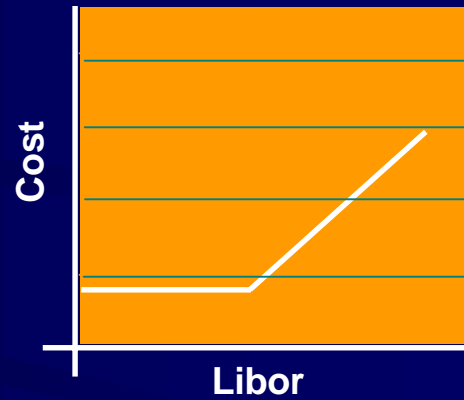
Unhedged



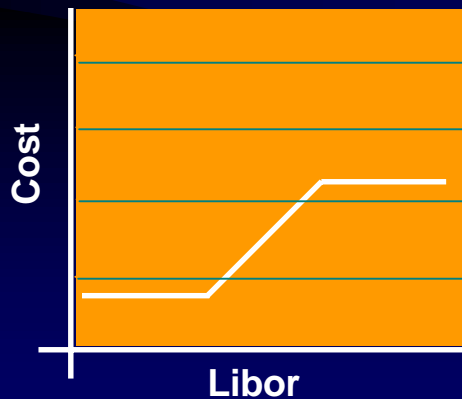
With Cap



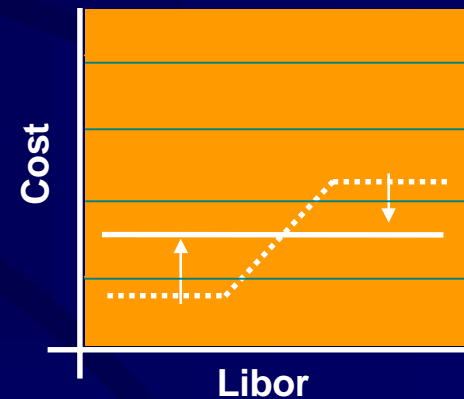
With Floor

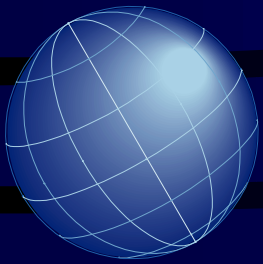


Bought Cap and Sold Floor = Collar



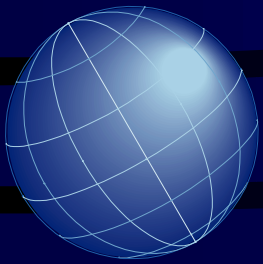
Bought Cap, sold Floor at same Strike = Swap





To Swap or Cap

- ❑ **Decision depends critically on views on future evolution of interest rates; no unambiguous answer**
- ❑ **In an upward sloping yield curve environment**
 - fixing with a swap results in immediate increase in cost
 - cap premium is typically less than this increase
 - cap buyer continues to borrow at the short end of the yield curve
- ❑ **If rates are expected to rise only moderately (or less than implied by the forward curve), cap is better than a swap**
- ❑ **Recognizing that a swap is a special case of a collar helps to focus on acceptable level of volatility**



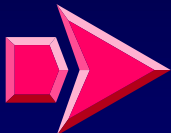
To Swap or Cap: Illustration

□ Data for the example

- 5-year swap rate = 6.85%
- Cap at 7.0% : Premium = 0.55%
- Cap at 7% and Floor at 5.5% ; Collar Premium = 0.35%

Cost Under Alternatives

LIBOR	No Hedge	Interest Rate Swap	Cap	Collar
4.00%	4.00%	6.85%	4.55%	5.85%
5.00%	5.00%	6.85%	5.55%	5.85%
6.00%	6.00%	6.85%	6.55%	6.35%
7.00%	7.00%	6.85%	7.55%	7.35%
8.00%	8.00%	6.85%	7.55%	7.35%
9.00%	9.00%	6.85%	7.55%	7.35%

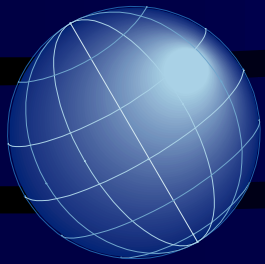


Choice depends on probabilities user assigns to different interest rate environments

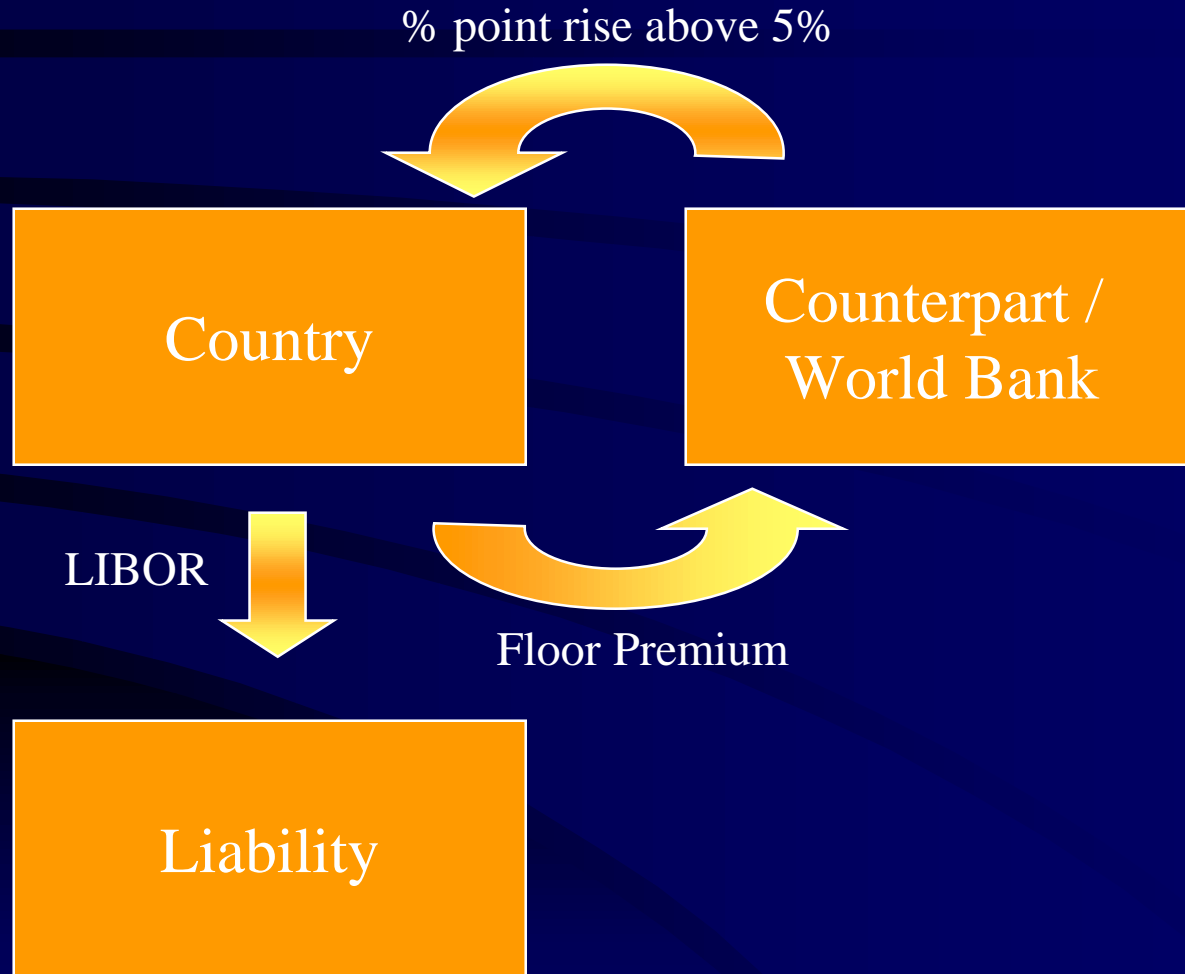


IBRD and Derivatives Intermediation

- ❑ **IBRD hedging products provide strategic tools for managing financial risks**
- ❑ **Use of IBRD credit rating helps borrowers gain access to these tools at attractive costs**
- ❑ **IBRD will also provide technical assistance to clients to implement an effective ALM strategy**



Interest Rate Floor: Illustration





Interest Rate Floor: Payoff Diagram

