SWAPS

1. *Introduction*

- **Basics**
  - Corporations & Financial Organizations must often ASSUME RISKS that are Different from those they'd prefer to take.
  - One way to hedge these risks is through the Futures Market. But Futures are Short-term hedges and thus, a Stack Hedge Strategy may need to be used, bringing with it BASIS Risk. Plus, futures require posting MARGIN and may involve cash flows to meet margin requirements throughout the life of the contract through the mark-to-market mechanism of daily settlement. Plus, Futures exist for only several commodities and cross-hedging brings many risks.
  - Thus, players look to a CUSTOMIZED DERIVATIVE INSTRUMENT, such as the SWAP. Swaps are contractual agreements between 2 parties, in which each party agrees to exchange a stream of cash for a Stipulated party of time (Called the **TENOR** of the Swap) based upon certain agreed-upon parameters and the price fluctuations in some underlying specified commodity or market index.
  - Swap markets were developed in order to meet the needs of corporations, financial institutions, and portfolio managers to modify their exposures to a substantial increase in currency and interest-rate volatility that followed the demise of the Bretton Woods fixed exchange rate system.
- **Advantages of Swaps over Conventional Traded Derivatives**
  - Swaps are HIGHLY FLEXIBLE and can be CUSTOM made to fit the requirements of the parties entering into it
  - The swap market is virtually UNREGULATED, in contrast to the highly regulated futures market. This may change as regulators usually abhor a regulation vacuum and will probably seek to bring the market under their protection
  - The COST of TRANSACTING in the Swap Market is LOW
  - Swaps are PRIVATE Transactions between 2 parties. Often, Swaps are OFF-BALANCE SHEET transactions that can be used to enable a firm to reposition its balance sheet quickly without alerting competitors
- **Disadvantages of Swaps**
  - Being Agreements, a party wishing to enter into a particular swap must find a counter-party that is willing to take the other side of the swap
  - Swaps can be ILLIQUID → once entered into, a swap cannot be easily terminated without the consent of the counter-party
  - As there are No Margin Deposits or Clearinghouse to ensure agreements will be honored, the integrity of the swap depends solely upon the financial & moral integrity of the parties. Thus, Swaps have more CREDIT RISK than Futures

- **Miscellaneous**
  - Swap market participants include SWAP FACILITATORS and their clients & customers. Swap Facilitators are specialists who help clients find ways, via the swap market, to alter or avoid unwanted risk. Thus, they are the financial engineers who design swaps to solve client problems
  - Facilitators also act as BROKERS who bring swap counter-parties together so that a swap can be arranged between them. They can also act as Swap DEALERS who actually enter swap agreements with others as a PRINCIPAL. When acting as a Broker/Designer, swap facilitators earn Commissions for their services; when acting as a dealer, the facilitator becomes a party to swap agreements and accepts the risks and returns associated with them
  - Usually Swap Dealers engage in a series of OFFSETTING Swaps whereby they are long swaps with some parties and short swaps with others, so that their NET Risk Exposure is kept at manageable levels. The dealers PRICE the swaps in which they are principals so as to earn a BID/ASKED spread on their OVERALL Book of Business, even if their net exposure were to be zero.
  - There are Generally **3 Types** of Swaps: EQUITY INDEX, INTEREST RATE, and CURRENCY Swaps

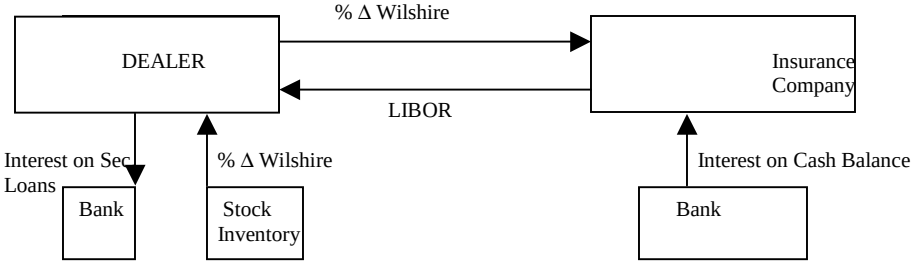
2. ***Equity Index Swaps***

For Example: Consider a SECURITIES DEALER who, in the normal course of business carries a $100,000,000 inventory of equity securities, whose overall performance should generally correspond with the Wilshire 5000 Index. This dealer wants to earn a profit margin based upon a bid/ask spread and does not want exposure to the market. This dealer wants to eliminate this risk on a long-term basis. Then, there is an INSURANCE COMPANY that would like exposure to the stock market. This firm continually experiences cash inflows that it would like to invest quickly. But, due to the logistics of the check processing procedure, it runs idle cash balances averaging about $100,000,000.

The DEALER and the INSURANCE COMPANY are natural counter-parties for an EQUITY INDEX SWAP agreement. When a Swap Broker puts these two parties together, they could reach a long-term agreement in which the DEALER agrees to pay the total return of the Wilshire 5000 index on a NOTIONAL AMOUNT of $100,000,000 to the Insurance Company; and in return the insurance company would agree to pay the dealer a Floating rate of interest that is equal to the US dollar LIBOR on the same Notional amount of principal during the TENOR (length) of the agreement.

Advantages of this Swap Agreement

1. Suppose the Swap Agreement is initiated when the US dollar LIBOR is 5% and, subsequently, the Wilshire 5000 generates a total return of 15%. Under the terms of the swap agreement, the dealer will pay $15,000,000 to the insurance firm (15% of $100,000,000) and the insurance company will pay $5,000,000 to the dealer (5% of $100,000,000). But, only the NET CASH FLOWS are swapped, so the actual payment will be $10,000,000 from the dealer to the insurance company. As the dealer probably realized a $15,000,000 gain on its inventory position, it is simply transferring this gain to the insurance company in return for $5,000,000 in interest income. In effect the Dealer has ELIMINATED the RISK that is INHERENT in BEING EXPOSED to the Stock Market, and has received in return a 5% interest rate on capital that is tied up in its inventory of securities. The Insurance company is able to earn a return that matches what it would have earned if it had been able to keep its idle cash balances invested in a diversified portfolio of equities. The 5% it pays to the dealer is offset by the interest that it might be earning on its cash reserves. See the following diagram



Dealer Cost = Int. rate on Sec. Loans + %ΔWilshire - %ΔWilshire – LIBOR = int. rate on Sec Loans - LIBOR

Insurance Co. Cost = LIBOR – Int. Rate from Bank Cash - %ΔWilshire

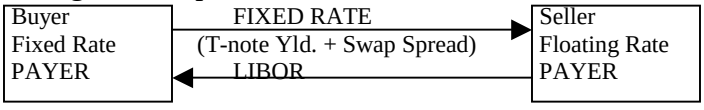
2. Suppose that the Wilshire 5000 Index generates a total return of –15%. The dealer will then receive from the insurance company the 5% interest on $100,000,000 of notional amount plus an ADDITIONAL 15% due to the decline in the stock market index, for a total cash inflow of $20,000,000. Since the dealer probably lost $15,000,000 on its inventories of equities, this means that its exposure to the equity market is hedged and it still earns a net 5% on its $100,000,000 capital invested in securities inventory. The Insurance company must pay out $20,000,000 representing the 5% interest on the notional amount plus the result of the stock market decline. The net loss to the firm is the same $15,000,000 it would have lost if its $100,000,000 idle cash had been invested. But, the firm was willing to assume this risk since it wanted exposure to the market.

- In effect, this swap agreement enables the DEALER to be HEDGED against Stock Market Risk, while earning interest on capital that is tied up in its inventory of stocks, while, at the same time enabling the INSURANCE Company to be fully exposed to the potential returns and risks of the stock market at a cost that is largely offset by what it earns on its cash. This swap shifts the stock market risk that the dealer does not want, but is forced into taking by the nature of its business, to the insurance company that is willing to take the risk.

- The NOTIONAL AMOUNT is just the basis for determining the amount of cash that will be transferred between the parties on the settlement dates of the swap. NO ACTUAL TRANSFER of Principal takes place between the parties at ANY Time. Only the CASH FLOWS that the NOTIONAL Amounts would produce if invested in stocks or LIBOR are transferred between the parties (and then, only on a Net basis). Thus, one earns the returns of a notional amount without actually putting up the principal itself.
- The ability to receive the returns (and assume the risks) of exposure to the market without having to invest any principal into it, offers the advantage of CONVENIENCE (and, sometimes, LEVERAGE) to both parties in the agreement.
- As the agreements are between 2 parties, the Swaps can be quite FLEXIBLE
- However, though CONVENIENT & FLEXIBLE, swaps expose the parties to CREDIT RISK because if one party defaults, it's really tough luck for the other party

3. Interest Rate Swaps

- In a Standard Interest Rate Swap, 2 Counter-parties agree to exchange interest payments, based upon a notional amount of principal, for a stipulated period. Typically, one party (called the Fixed-rate payer or the Pay-Fixed Party) pays a FIXED INTEREST RATE on the Notional Principal, while the Counter-party (the Floating-rate payer or Received-Fixed party) pays a Floating Interest rate on the same notional principal. The Floating interest rate is usually pegged to some short-term interest rate, such as LIBOR, which is called the REFERENCE RATE
- Swaps are agreements. Therefore, they are neither bought nor sold; rather one enters into a swap as either the fixed-rate payer or the fixed-rate receiver. Normally, the Floating-rate side of the agreement is QUOTED FLAT, meaning that the rate paid by the FLOATING-RATE PAYER is the REFERENCE RATE, and any modification to the price of the swap is negotiated as an ADJUSTMENT to the FIXED RATE. Therefore, the INTEREST RATE PAID by the FIXED-RATE PAYER is said to be the PRICE of the SWAP.
- The FIXED-INTEREST RATE is broken Down into TWO Components
  1.) A RISK-FREE YIELD for the MATURITY of the Swap
  2.) A SWAP SPREAD over the Risk-free yield that is the Basis for Pricing the Swap



The Formulas used to Determine the CASH FLOWS that are SWAPPED with a Standard Interest Rate Swap are as follows

Fixed-Rate Payment = $r_{Fixed}\{t_P/365\}\{Notional\ Principal\}$

Floating-Rate Payment = $r_{Float\ (t-1)}\{t_P/360\}\{Notional\ Principal\}$

- NOTE: In a Typical Swap, the Floating Rate that is paid on each Settlement Date is the Floating Rate that Existed at the BEGINNING of the Settlement period, as indicated by (t-1)_above
- The MOST COMMON use of Interest rate swaps is to enable institutions to Obtain Asset/Liability Risk Matches that Eliminate the Risk of BORROWING SHORT to LEND LONG and vice versa.

For Example: Consider a bond dealer how has $100,000,000 inventory of long-term bonds with an average yield of 7.5% financed with short-term borrowings at LIBOR. This arrangement makes the dealer vulnerable to interest rate risk because the return on its inventory is fixed at 7.5% while the cost of financing it is LIBOR. If LIBOR increases or decreases, the spread earned by the dealer (7.5% - LIBOR) will fall and rise. This could produce volatile profit margins. In contrast, an insurance company has long-term liabilities in the form of death benefits that are being financed with long-term bonds. But, the insurance company carries an average cash balance of $100,000,000 earning LIBOR, when the actuarial assumption that determines the financing cost of its life insurance policies is a fixed 6%. From the insurance company's POV, it has an average of $100,000,000 invested in short-term instruments when it has all long-term liabilities. This is an asset/liability mismatch that makes the insurance company vulnerable to interest rate risk.

Both institutions can correct their asset/liability mismatches, thereby reducing their exposure to interest rate risk by entering into an interest rate swap, in which the dealer agrees to pay a fixed rate of interest on a notional amount of principal for a stipulated period of time and the insurance company agrees to pay a floating rate of interest on the same amount of principal.

Assume the following;

TENOR	5 Years
Dealer's Fixed Rate	7.5%
Insurance Floating	LIBOR FLAT (5%)
Notional amount	$100,000,000

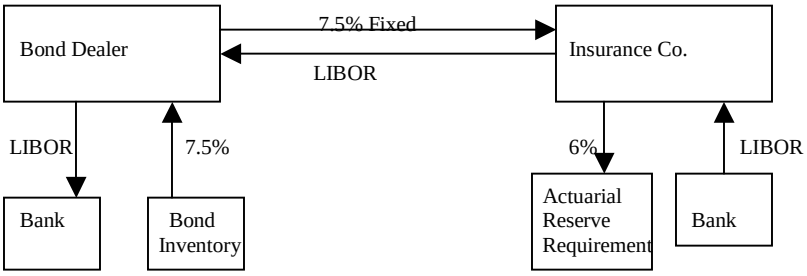
With this agreement, every 6 months, the transfer of funds takes place. 6-months after the initiation date, the following cash flows occur:

Fixed-Rate Payment = (.075/2)(100,000,000) = $3,750,000
Floating-Rate Payment = (.05/2)(100,000,000) = 2,500,000
Net: $1,250,000 from Fixed-Rate to Floating-Rate Payer

Then, if LIBOR increases by 25 basis points, as of the next settlement date

Fixed-Rate Payment = (.075/2)(100,000,000) = $3,750,000
Floating-Rate Payment = (.0525/2)(100,000,000) = $2,625,000
Net: $1,125,000 from Fixed-Rate to Floating-Rate Payer

The SWAP STABILIZES the Spread earned by Both institutions so that they no longer run interest rate risk. The dealer has an inflow of funds equal to LIBOR which offsets the cost of financing its inventory. The 7.5% return that the dealer earns on its inventory is paid to the insurance company. Consequently, the NET SPREAD that the dealer earns on its bond inventory is ZERO at all times. The Dealer's income will be determined by the bid/ask spreads of its bond quotations rather than by changes in the spread. And, the insurance company, receiving an inflow of funds at a constant 7.5% rate can now use that to earn a spread of 1.5% over its 6% annual cost of funding its actuarial assumptions.



Dealer's Spread = 7.5% + LIBOR – 7.5% - LIBOR = 0%
Insurance Co.'s Spread = LIBOR + 7.5% - 6% - LIBOR = 1.5%

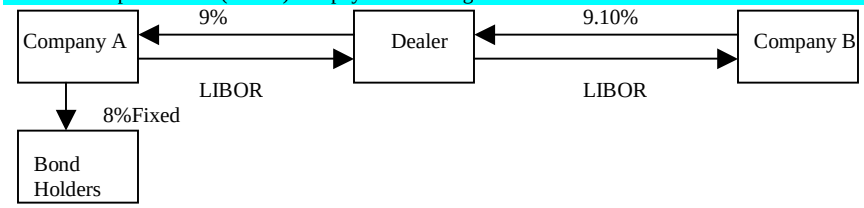
SWAP Facilitator/Dealer as Intermediary in a SWAP

For Example: Suppose Company A wishes to SYNTHETICALLY Convert its Fixed-rate 8% debt to a Floating-rate note by using a swap in which it received a Swap Fixed rate of 9% and paid a Floating Rate equal to LIBOR. Its net cost of funds under this arrangement would be:

Pay Fixed 8% rate on outstanding debt	8.00%
Receive on Swap (Fixed)	(9.00%)
Pay on Swap (Floating)	LIBOR
NET SYNTHETIC FLOATING RATE	LIBOR – 100 bp.

However, suppose Company A cannot find a counter-party on its own, so the dealer participates s a facilitator by doing the swap with company A

To offset this risk, the dealer engages in an offsetting swap with Company B, in which the dealer is the Fixed rate receiver at the asked side of a swap fixed rate (9.10%) and pays the floating rate LIBOR. From the Dealer's POV



Dealer's Spread = 9.10% - 9.00% + LIBOR – LIBOR = 10 bp

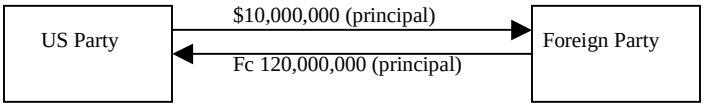
4. Currency Swaps

Currency Swaps are essentially forward contracts between 2 parties that can be tailored to meet their specific needs

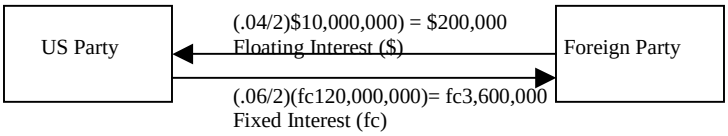
Standard Fixed/Floating Currency Swaps

- A Plain-vanilla currency swap arrangement between a US party and a foreign counter-party functions as follows (in the example)

1. A US Party delivers an agreed $10,000,000 of US dollar-denominated principal to a foreign counter-party in exchange for an equal dollar value of 120,000,000 of foreign-currency denominated principal, based upon the current exchange rate between the 2 currencies. As the exchange of dollars for the foreign currency is based on the current exchange rate, the net exchange in value is zero. Whether or not an actual exchange of the currencies occurs depends upon the terms of the swap. If the motivation for the swap includes a need by the counter-parties to obtain each other's currency, then a currency exchange will be required. In the plain-vanilla swaps here, such a currency exchange is assumed to occur



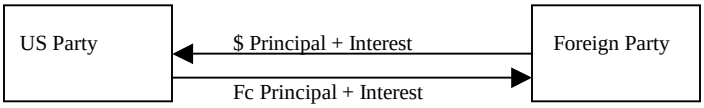
2. On each settlement date through maturity, the US party pays interest to the foreign counter-party. This interest is based upon a fixed interest rate and is denominated in the foreign currency that was delivered on the origination date to the US party. This interest payment is just the periodic fixed rate times the foreign principal amount received on the origination date. Here, assume it is 6%. In return, the foreign counter-party pays a floating-rate denominated in US dollars to the US party at the US LIBOR rate FLAT (meaning LIBOR + 0%) that existed at the START of the Interest period. Assume 4%.



To Determine the NET Value of these exchanges, the exchange rate at the time the exchange takes place must be known. Suppose that at the time of the exchange, the rate between the $ & fc is fc11.00/$. Then, from the US party's perspective:

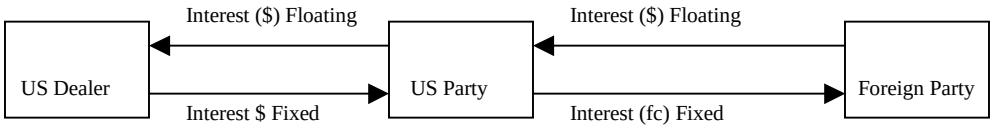
Receipt of Interest	$200,000
Payment of Interest	$327,273 [fc3,600,000 / (fc11.00/$)]
Net	($127,273)

3. When the Swap terminates (matures), the US party repays the foreign currency principal to the counter-party (along with the last interest payment) and the foreign counter-party repays the US dollar principal (along with the last interest payment) to the US party. Typically, the same exchange rate is used when returning the principal as was used when the swap originated so that the US dollar and foreign currency principal amounts that are returned are the same nominal amounts that were originally exchanged. As the actual exchanges rates likely have changed, there will be an economic winner & loser in the return of principal



Creating a Synthetic Fixed/Fixed Currency Swap

- Even though the standard currency swap is an exchange of one currency at a fixed interest rate for another currency at a floating interest rate, it is relatively easy to create a currency swap in which both parties receive a fixed interest rate. This is done by simply combining a standard currency swap with a standard interest rate swap

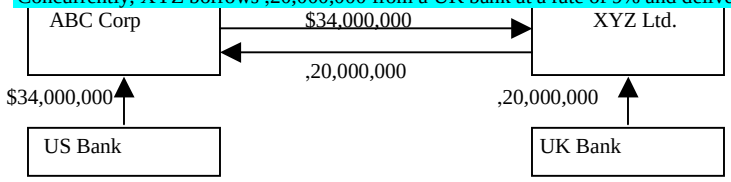


- The Foreign Party is receiving a fixed interest rate denominated in the foreign currency. The US party is receiving a floating rate of interest denominated in US $. If a fixed rate is desired by the US party, all it need do is enter into an INTEREST RATE SWAP with a US Swap dealer, swapping its floating rate for a fixed rate in the same amount of nominal US $ as the currency swap itself
- NOTE: Interest Rate Swaps involve only a notional amount of principal; there is no actual exchange. And, as the interest payments and interest receipts are both denominated in US $, only the net difference has to be paid by one party on each settlement date
- Since swaps are agreements between 2 parties, it is not necessary that the interest in one currency be based on a floating rate, while the interest paid in the other currency is a t a fixed rate. Swaps can be written in any way that the parties choose. Thus, currency swaps can be quoted on either a fixed/floating or fixed/fixed basis. The combination of a fixed/floating currency swap and a fixed/floating interest rate swap need occur only if the counter-party in the currency swap insists on a fixed/floating interest exchange. In fact, there are 4 possible currency swap combinations that can be constructed between 2 parties if the US dollar is one of the currencies.
- Swaps can be arranged by brokers who charge the counter-parties a commission for bringing them together and negotiating the terms of the swap. Often, swaps are entered into by end-user corporations and dealers. Dealers can act as counter-parties to either end of a swap. By hedging the currency risk, dealers earn a spread on their market-making activities.

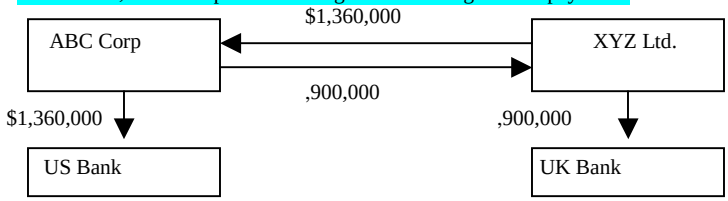
Motivations for Currency Swaps

- Swaps can be used either to ALIGN Assets or Liabilities with Market Expectations OR to EXPLOIT MISPRICINGS between Markets (ARBITRAGE). When Markets are efficient, arbitrage opportunities will be rare
- One Form of ARBITRAGE occurs when there is a COMPARITIVE ADVANTAGE in the rate of interest at which funds can be borrowed by different borrowers that may be related to ho well the borrowers are known by lenders, rather than to their actual creditworthiness

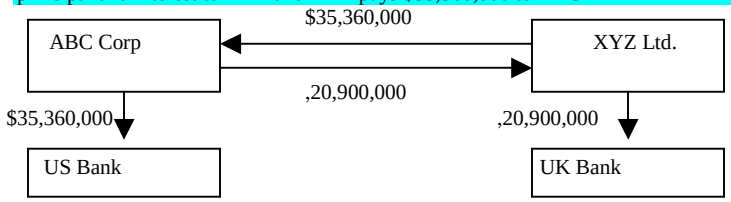
For Example: The ABC Corp, a US firm, wants to borrow ,20,000,000 for 5 years from a UK bank at a fixed interest rate. However, the firm is unknown in the UK so UK banks are only willing to lend it funds at a high rate of 12%. The exchange rate between the UK and US is $1.70/,. XYZ Ltd., a UK firm, wants to borrow $34,000,000 for 5 years at a fixed rate via a private placement in the US. But, it is an unknown credit in the US, so it is having problems.
A Swap broker, familiar with both firms, proposes that both firm borrow in their own nations. In the UK, XYZ can borrow 5-years at a fixed rate of 9% while ABC can borrow in the US at 8%. The broker proposes they enter into a 5-year Fixed/Fixed currency swap agreement with the amount of principal to be exchanged being ,20,000,000 for $34,000,000, which is at the current exchange rate of $1.70/,. Interest is to be settled every 6 months.
MECHANICS of the FIXED/FIXED CURRENCY SWAP
On the Origination date, ABC borrows $34,000,000 from the US bank at a fixed rate of 8% and delivers US $ to XYZ. Concurrently, XYZ borrows ,20,000,000 from a UK bank at a rate of 9% and delivers the currency to ABC



In 6 months, the 2 companies exchange the following interest payments



These payments are then used to make the interest payments on their respective loans
At the end of the contract, the principal amounts, plus the last interest payments are exchanged: ABC pays ,20,900,000 of principal and interest to XYZ and XYZ pays $35,360,000 to ABC



5. ***Factors Affecting Swaps Pricing***

Factors Affecting the Actual Rate a Dealer will Quote for a Particular Swap are:

1.) The TERM STRUCTURE of INTEREST RATES. This is because the Swap Fixed rate depends upon Market Expectations of what Future FLOATING (LIBOR) rates will be, as embodied in the forward market for 3-month Eurodollar deposits.
2.) The CREDITWORTHINESS of the Swap Partner. If a swap dealer enters into a swap agreement with another party and said party defaults, the dealer must either absorb the loss or seek recovery through the courts (very costly). For less creditworthy parties, a RISK PREMIUM may be added to the Swap rates listed in the Indication Swap Pricing table. Parties whose creditworthiness is in serious doubt may be excluded from the swap market altogether.
3.) The ABILITY to OFFSET RISK by ENTERING INTO SWAPS. Swap dealers are usually interested in making money by earning a bid/ask spread on the swaps in which they enter. To do this, for each swap a dealer enters into as the fixed-rate payer, it wants to enter into another swap with exactly the same parameters as the fixed-rate receiver. To the extent that a large pool of available counter-parties exist so that there is an opportunity for the dealer to have a net investment of zero in its swap portfolio, the bid/ask spread can be low and swaps can be relatively cheap; when the pool of available swap counter-parties is small so that the dealer is apt to be unable to eliminate swap mismatches, bid/ask spreads will widen and swaps will become more expensive.
4.) The VOLATILITY of the TED Spread can produce risk for the dealer. Even though interest rate swaps are priced off of the forward yield curve for Eurodollars or the Eurodollar futures market, dealer quotes are usually stated as a spread over the Treasury Yield on bonds that mature at the same time as the swap. The relationship between these two rates is the TED Spread. If the dealer quotes are based on an assumed normal TED Spread, and the TED spread changes, the dealer could be subject to some BASIS RISK

6. ***Risks in Swap Portfolio Management***

Swap Dealer Face 3 PRIMARY Risks

1.) BASIS RISK; the risk that the TED Spread might change
2.) DEFAULT RISK: risk that counter-party defaults
3.) MISMATCH RISK: risk that the dealer cannot exactly match all of his swap agreements with reverse or counter-swaps. This leaves the dealer exposed to INTEREST RATE RISK because when the dealer is a net floating or net fixed-rate payer, the net value of the portfolio can significantly change depending on rates

- Whenever Mismatches occur, dealers can try to use the EURODOLLAR FUTURES market to offset swap exposure

For Example: Suppose a dealer enters into a 5-year 7% v LIBOR Swap with a notional amount of $4,000,000 as the FLOATING-RATE payer with Party A. This swap is matched against a $4,000,000 3-year 7% v LIBOR swap with Party B where the dealer is the FIXED-RATE payer. This leaves the Dealer exposed for Years 4 & 5. See the Cash Flow Table:

Year	Receive from A	Pay to A	Receive from B	Pay to B	Net Exposure
1	$280,000	LIBOR	LIBOR	$280,000	0
2	$280,000	LIBOR	LIBOR	$280,000	0
3	$280,000	LIBOR	LIBOR	$280,000	0
4	$280,000	LIBOR	--	--	LIBOR - $280,000
5	$280,000	LIBOR	--	--	LIBOR - $280,000

Ideally, the dealer would like to find a 3rd Counter-party willing to enter into a swap like the one with Party B for the 4th & 5th Years. However, if such a party cannot be found, the Risk Exposure (which is unknown regarding LIBOR in years 4 &5) can be OFFSET by SELLING A STRIP of EURODOLLARS FUTURES CONTRACTS that MATURE on (OR near) the SETTLEMENT DATES of Swap 4 & 5 years forward. THIS will Hedge the Dealer's Risk Because:

- LIBOR is HIGHLY Correlated with Eurodollar rates
- The EURODOLLAR futures contract prices are based upon the 3-month Eurodollar rate that the market expects will prevail at the time the contracts settle (in years 4 & 5). If LIBOR is higher than current expectations at tat time, the FUTURES prices will FALL and the holder of the SHORT position (Dealer) will realize a GAIN. This gain will offset the dealer's risk associated with the uncertainty of the value of LIBOR in the future relative to the current expectations. But, if LIBOR is lower than current expectations at that time, the futures prices will RISE and the holder of the SHORT (DEALER) will incur a LOSS> But, this loss is offset by the fact that the dealer's LIBOR obligation will be less in the future if LIBOR falls below current expectation. If Current Expectations about LIBOR are realized, the dealer will realize no gain and incur no loss.
- If, at some future date, a reversing swap can be entered into, it will be priced at the (THEN) LIBOR FORWARD Rate. However, by covering the short sale of the Eurodollar futures contracts, the dealer will realize a gain or incur a loss that offsets the loss or gain in the pricing of the NEW Reversal Swap
- NOTE: Eurodollar Futures Hedges will not likely fully and effectively hedge the risk since swap cash flows and futures cash flows are unlikely to match perfectly. Plus, since the size of a Eurodollar futures contract is $1,000,000, settlement dates and notional amounts may not be perfectly matched. Plus, the dealer still faces some BASIS RISK because LIBOR does NOT exactly correlate with Eurodollar rates. Thus, the dealer will normally continue to search for an offset swap to offset the mismatch exposure.

7. Interest Rate Swaptions

- An interest rate SWAPTION is an OPTION an INTEREST RATE SWAP. By convention, Swaptions are defined so that their behavior will mirror BOND CALLS; i.e., when interest rates fall, their value increases, and when interest rates rise, their values decline.
- Bondholders are Fixed-rate Receivers. Therefore, the Holder of a RECEIVER (Call) SWAPTION has the RIGHT (but not the obligation) to Enter into a SWAP as the FIXED-RATE RECEIVER, paying a Floating rate and receiving a Fixed Rate Equal to the Exercise Rate of the Call. This Right TERMINATES at the Maturity Date of the Swaption. The SELLER of the Call Swaption has the other side of the Swap. Other terms are dictated by agreement.
- The Holder of a PAYER (Put) SWAPTION has the Right, but not the obligation to enter into a Swap as the FIXED-RATE PAYER, paying a Fixed-rate equal to the exercise rate of the swaption and receiving a floating rate in return. Same termination and other terms as above.
- PREMIUMS are paid by the PURCHASER of the Swaption to the SELLER. Usually, the premium is stated as a PERCENTAGE of the NOTIONAL Amount of the Underlying Swap. The Size of the premium depends upon the **exercise rate**, the **time** until the swaption expires, and the **volatility of interest rates**. Swaptions can be either European or American. The typical premium on a swaption is **20-40 basis points** times the Notional Amount of the underlying swap.

- Mechanics of the Swaption (by example)

For Example: Consider a 6-month Call Swaption whose underlying Swap is a 5-year swap with a fixed rate of 7% v. LIBOR on the notional amount of $1,000,000. If the Premium on this swap is 25 basis points, a BUYER of the swaption would pay $2,500 to Acquire the Call. This would give the owner the right to exercise the call option up until expiration. Upon exercising the call swaption, the owner of the call would enter into a 5-year swap as the FIXED-RATE Receiver, receiving 7% and paying LIBOR on the notional amount of $1,000,000 for the next 5 years; the counter-party to the swap would be the seller of the call swaption. The owner of the call swaption would find it advantageous to exercise the swaption if 5-year fixed rates fall below the exercise rate of 7%. By exercising the call, the owner of the swaption would be receiving 7% and paying LIBOR. However, the owner could then enter into a REVERSING SWAP, paying the lower market swap fixed rate and receiving LIBOR. The net effect of exercising the call swaption and simultaneously entering into a reversing swap is shown below in a situation where the swap fixed rate drops to 6.5% shortly after the call option is purchased.

Call Option Owner's Profit per Year = $1,000,000(7.0% + LIBOR – LIBOR – 6.5%) = $5,000

Note that the owner of the call option will now receive 0.5% per year on the $1,000,000 notional amount for the next 5 years. The present value of this cash flow is $20,778. If this is regarded as the present value of the swaption, then the profit on the swaption is $18,278

PV of $5,000 per year for 5 years at 6.5%	$20,778
Cost of Swaption	(2,500)
Profit	$18,278

- USES of SWAPTIONS
  - Callable Bonds issued by corporations consist of 2 components: a Non-callable bond that is sold by the Issuer to the Bondholders + a Call OPTION that is bought by the firm from the Bondholders by offering them a higher coupon on the issue. If, at current rates, the firm won't exercise the call, then, from the firm's POV, the call has NO Value. But, as long as the call feature is outstanding, the market will place some value on it.
  - The Firm can take advantages of this in the SWAPTION market. It could sell a swaption with the same terms as the call feature on the bond. If it does so, the firm can realize (in cash) the market's valuation of the call feature, while at the same time holding the call feature itself.
  - When interest rates remain unchanged or rise above current levels during the call's remaining life, the swaption will not be exercised and will expire worthless. Then, the firm profits by the premium it received from the sale of the swaption.
  - If rates decline, the swaption could be exercised. Then, the firm might call the bond and refinance its debt with new, lower-coupon bonds. The interest saved by refinancing at the lower rates should pay for the cash flows that it has to pay to the holder of the call swaption since the firm is now the Fixed-rate payer.
- EXTENDABLE & CANCELABLE SWAPS
  - An Extendable Swap gives the owner the right, but not the obligation, to enter into an EXTENSION SWAP (a swap agreements that extends the tenor of an existing swap with all other terms unchanged).
  - A Cancelable Swap gives the owner the right, but not the obligation, to CANCEL an Existing Swap at a Specific Time before it would normally expire.
  - Extendable & Cancelable Swaps are like Plain Vanilla Swaps + Swaptions

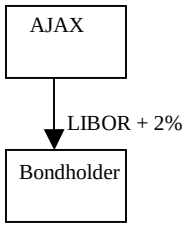
Extendable Pay – Fixed Swap = Plain Vanilla Pay – Fixed Swap + Payer Swaption
Extendable Receive – Fixed Swap = Plain Vanilla Receive – Fixed Swap + Receiver Swaption
Cancelable Pay - Fixed Swap = Plain Vanilla Pay – Fixed Swap + Receiver Swaption
Cancelable Receive – Fixed Swap = Plain Vanilla Receive – Fixed Swap + Payer Swaption

8. ***Applications of Swaps and Swaptions***

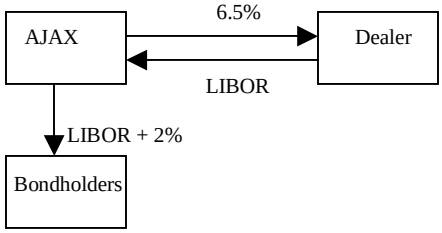
Converting Floating-rate Debt into Fixed-rate Debt with Swaps

- To Convert Floating-rate Debt into Fixed-rate Debt, Enter into an INTEREST RATE SWAP as the FIXED-RATE PAYER

For Example: AJAX Corp. has issued $100,000,000 of floating-rate bonds whose coupons are reset to LIBOR + 2% each year. The bonds mature in 3 years. The firm fears short-term rates will be rising in the future and would like to convert this floating rate debt into fixed rate debt. A Swap Facilitator indicates that Dealers are quoting 6 – 6 ½ % on 3-year swaps with annual settlements. The Facilitator suggest that by entering into a $100,000,000 notional amount 3-year swap with annual settlements as the Fixed-rate payer, AJAX can effectively turn its floating debt into fixed debt.
To illustrate:
Currently:



Then, if AJAX enters into a Swap, paying a 6.5% fixed rate (the asked side of the market) for LIBOR

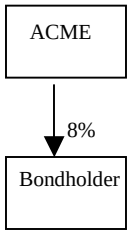


Note that the combination of AJAX's current LIBOR+2% floating payments on $100,000,000 of principal to its bondholders and the swap of 6.5% for LIBOR on a notional amount of $100,000,000 produces a net cost of funds to AJAX of
Net Cost of Funds = LIBOR + 2% + 6.5% - LIBOR = 8.5%
By entering into the swap with a dealer as the FIXED RATE PAYER, AJAX has effectively converted its floating rate of LIBOR + 2% into a FIXED Rate of 8.5% for the next 3 years.

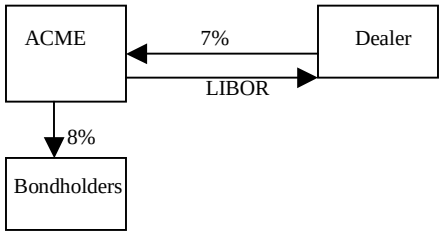
Converting Fixed-rate Debt into Floating-rate Debt with Swaps

- To Convert Fixed-Rate Debt into Floating-rate debt, enter into an Interest Rate Swap as the FLOATING-RATE PAYER

For Example: Suppose ACME issued $100,000,000 of conventional 8% coupon bonds, whose coupons are paid semi-annually. The bonds mature in 5 years. The firm believes interest rates will fall in the future and would like to convert this fixed-rate debt into floating-rate debt. In the swap market, dealers are quoting 7-7 ¼ % on 5-year swaps with semi-annual settlements.
Currently:



Now, when ACME enters into a Swap as the FLOATING-RATE PAYER with a Dealer, Paying LIBOR for 7% (the dealer paying a fixed rate equal to the Bid side of the market).



Note that the combination of ACME's current 8% Fixed-rate payments to its bondholders and the SWAP of LIBOR for 7% produces a NET Cost of Funds of:

Net Cost of Funds = 8% + LIBOR – 7% = LIBOR + 1%

By entering into the Swap with a Dealer as the FLOATING-RATE Payer, ACME has effectively converted its fixed rate of 8% to a Floating rate that is 1% over LIBOR for the next 5 years.

NOTE: One can also Convert Fixed to Floating via the Futures Market as well (watch for an essay question on this during exam)

Converting Non-callable Debt into Callable Debt by using Swaptions

- To Convert Non-callable Debt into Callable Debt, BUY a CALL SWAPTION

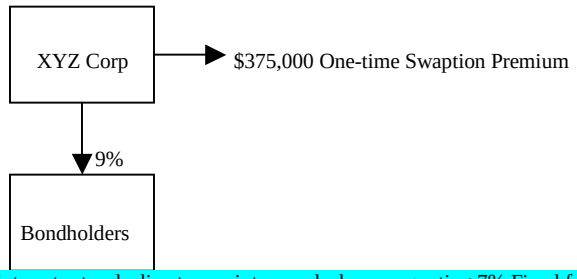
For Example: Suppose XYZ has issued $50,000,000 of Non-callable 9% bonds that mature in 5 years. Interest rates are currently 9%. But, the firm believes that the rates may fall substantially before this debt matures, and it wishes the debt were callable so it could refinance at lower rates when its belief comes true.

XYZ can effectively convert its non-callable debt into callable debt by BUYING a CALL SWAPTION from a dealer with a notional amount of $50,000,000 and a maturity of 5 years. To determine what kind of Swaption is Appropriate for its objective, Reason in the Following Manner.

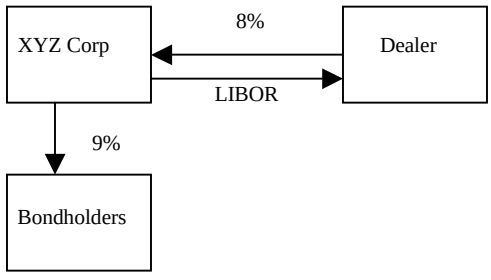
1. The Corporation wants to OWN the SWAPTION because it Want the Right to Exercise or not Exercise the option, depending upon future interest rate conditions
2. Since the Purpose of having a Call provision in a bond's structure is to give the issue the right to call the bond if interest rates decline in the future, to replicate a call provision, XYZ wants to own the swap whose value will rise when rates decline. In a Swap, it is the FIXED RATE RECEIVER who benefits in a declining interest rate environment because fixed rate receivers are like bondholders. Thus, XYZ will want to buy a Swaption giving it the right to enter into the swap with the parameters outlined above as the fixed-rate receiver.
3. Such Swaption is a CALL SWAPTION
4. ERGO, to Convert a NON-CALLABLE BOND into a CALLABLE BOND, the ISSUER should BUY A SWAPTION, Giving it the right to enter into a Swap as the FIXED-RATE RECEIVER (CALL SWAPTION);

Suppose XYZ acquires a 5-year Swaption for 75 Basis Points, giving it the right to enter into a swap as the Fixed-Rate Receiver with a dealer, receiving a fixed rate of 8% for LIBOR From XYZ Corp.'s POV:

- If interest rates RISE or REMAIN unchanged over the next 5 years, XYZ will NOT find it advantageous to exercise the swaption. It will continue to pay 9% fixed rate on its non-callable debt. As the swaption will expire worthless, XYZ will suffer a loss equal to the cost of buying the swaption (75 bp * $50,000,000 = $375,000). In effect, this raises the price of its debt by $375,000, amortized over 5 years. This is a relatively low cost considering it normally costs a firm a significant number of basis points in the coupon interest to issue a callable rather than non-callable bonds.

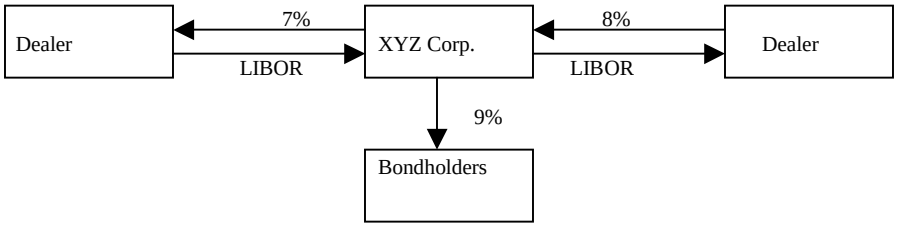


- But, when interest rates decline to a point were dealers are quoting 7% Fixed for LIBOR, XYZ would find it advantageous to exercise its swaption and enter into the swap as the FIXED RATE RECEIVER. Once it exercises the swaption, it has transformed its 9% fixed-rate debt into a floating rate of 1% over LIBOR (plus the amortized cost of the swaption premium-not shown in diagram)



Net Cost of Funds to XYZ = 9% + LIBOR – 8% = LIBOR + 1%

Alternatively, once interest rates decline, XYZ could exercise its Swaption and, at the same time, enter into a reverse swap with another dealer paying 7% fixed for LIBOR. It would then find itself in the position below. If it uses this alternative, XYZ will effectively convert its 9% Fixed rate debt into 8% fixed rate debt.



Therefore, when rates decline, XYZ will be able to either convert its current 9% fixed-rate non-callable bond into an effective cost of funds equal to either a floating rate of LIBOR+1% or a new Fixed rte of 8%. This is similar to what a Call provision allows a company to do; refinance its debt at a lower rate and/or in a different form.

Converting Callable Debt into Non-callable Debt by using Swaptions

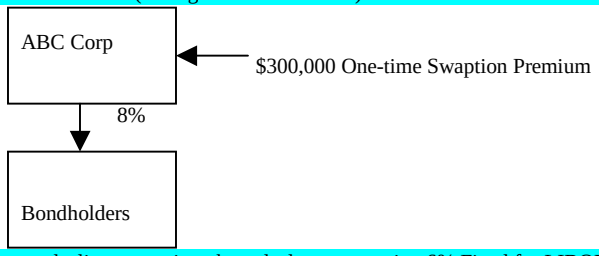
- To Convert Callable Debt into Non-Callable Debt, SELL a CALL SWAPTION

For Example: Suppose ABC Corp. has issued $50,000,000 of CALLABLE 8% coupon bonds that mature in 3 years. Interest rates are currently 8% and the firm believes that rates will remain the same or rise in the future, so that it is unlikely that the bonds will be called. Since it believes the call feature will expire worthless, but the market still places some value on it (as may be assumed from the fact that the bond is selling at a yield that is above those of equivalent non-callable bonds), the firm would like to effectively sell its (imbedded) call option (the issuer owns the call in a callable bond structure) at the (overpriced) market value.
ABC can effectively convert its callable debt into non-callable debt by SELLING A SWAPTION to a Dealer with a notional amount equal to the $50,000,000 principal of its outstanding bonds and a maturity of 3 years (the remaining life on the bond). To determine what kind of a swaption is appropriate to accomplish its objective, reason in the following manner.

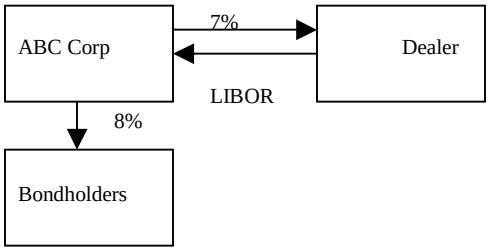
1. The Corporation wants to SELL a SWAPTION because it no longer believes that the right to call the bonds has any value. It has this belief because it does not believe interest rates will fall enough to justify calling the bonds.
2. The Buyer of the Swaption must have the opposite belief, i.e., that rates will fall. Thus, the buyer of the swaption must be a FIXED-RATE RECEIVER
3. A Swaption that benefits the FIXED-RATE RECEIVER is a CALL SWAPTION

Therefore, to convert a Callable bond into a non-callable bond, the ISSUER should SELL a CALL SWAPTION
Now, if the Corporation sells a 3-year swaption for 60 Basis Points. From the Corp.'s POV:

- If rates RISE or REMAIN unchanged over the next 3 years (remaining life of the bond), the Dealer WILL NOT Find it advantageous to exercise the Swaption. Then, ABC will never be forced to enter into the swap and the swaption will have expired worthless. Thus, ABC will continue to pay its bondholders their coupon interest. But, it wall have received $300,000 for selling the swaption; in effect realizing the current market value of the call feature on its bonds (selling the imbedded call).

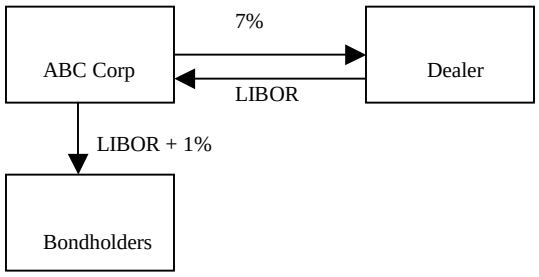


- Suppose rates decline to a point where dealers are quoting 6% Fixed for LIBOR in the Swap market. With rates down substantially, the dealer would find it advantageous to exercise its swaption, forcing ABC to enter into the Swap as the FIXED-RATE PAYER, paying 7% for LIBOR. ABC will then find itself:



Net Cost of Funds to ABC = 8% + 7% - LIBOR = 15% - LIBOR

This Cost of Funds Excludes the one-time $300,000 amortizable amount received from selling the swaption that, actually, reduces ABC's net cost of funds below this cost. However, because its bonds are callable, ABC can call its bonds and replace them with Floating-rate, short-term notes at (an assumed rate of) LIBOR + 1%. Once this is done, ABC's situation will be:



Net Cost of Funds to ABC = LIBOR + 1% + 7% - LIBOR = 8%

In effect, the Firm has converted its callable 8% Debt into non-callable 8% fixed-debt, while still receiving the value of its call via the premium received from the sale of the swaption (which actually lowers its new cost of funds even lower than shown above)

The previous examples use the Corporate POV; on exam, they may try to reverse it and say look at it from a Portfolio Mgr. POV or a Bank's POV → need to understand the concepts and know how to reverse it.

Creating Synthetic Dual Currency Debt from Conventional Debt using Currency Swaps

- A DUAL Currency Bond is a bond whose principal is denominated in ONE CURRENCY (e.g., US $) while its interest payments are denominated in another currency (e.g., French francs). Combining a conventional US $ bond with a Fixed/Fixed Currency Swap in which the swap agreement stipulates that ONLY interest payments and not any principal will be exchanged can synthetically create a dual currency bond

For Example: The ACE investment firm purchases an 8% 5-year US bond for $10,000,000. This means that every 6 months Ace will receive $400,000 of coupon interest. It then enters into a 5-year FIXED/FIXED Currency Swap with a Dealer, agreeing to Swap its US $-denominated interest income for French Francs at the current exchange rate of $1.00 = Fr 5.0000. Therefore, every 6 months, ACE will swap its $400,000 interest income for fr 2,000,000. Since only the interest and not any principal is swapped in this agreement, when the bond matures, the firm will receive its $10,000,000 of principal back from the corporation that issued the bond. Therefore, the bond, plus this FIXED/FIXED Interest-only Currency Swap, effectively, turns the conventional US Bond investment into a Dual Currency Bond.