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Chapter 18 - Long term financing (continuation)

Last lecture

Long term financing is done through the World Bond Market.
Three segments:

1. Domestic
2. Foreign
3. Eurobond

Foreign Mkt + Eurobond Mkt form the International Bond Market.
Eurobond is 85% of Intl Market because it is unregulated, etc.

• **Pricing Bonds: Review**

P = Discounting of the cash flows.

$$P = C_1/(1+YTM) + C_2/(1+YTM)^2 + C_3/(1+YTM)^3 + ... + C_T/(1+YTM)^T$$

CFs for bonds (C_1, C_2, …, C_T) are the coupon payments.
Note: There is a 1:1 relation btw price of bond and yield to maturity.

If we get YTM, then we know Price of bond

Investment Bankers set the YTM
YTM = Base Rate (k_f) + Spread (Risk of Company)

• **Q: How do we get the spread?**

1. Look for outstanding debt
2. benchmark(similar companies/industry)
3. Analyze the firm, phone calls (lots of research)

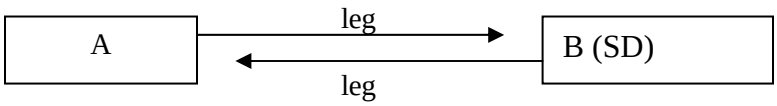
This Lecture

This class introduces a new debt instrument, a swap, which is very flexible and allows companies to change the profile of CFs.

1. Swaps

Definition: Swap
A swap represents a periodic exchange of CFs between 2 parties. In general, one of the parties is a swap dealer (SD). Each payment to the counterparty is called a *leg*.

Typical exchange of CFs between 2 counterparties:



A usual swap contract has to specify:
◊ Frequency of the payments (f)
◊ Duration of the swap (T),
◊ How the legs (payments) are calculated. (In general, one leg is a *fixed* payment and the other leg is a *floating* (market price) payment. The fixed payment is based on a fixed rate called the *coupon* of the swap).

There are different types of swaps. They differ in how the payments (legs) are indexed. For example, if the legs are denominated in different currencies: currency swap.

• Market Organization
- Most swaps are tailor-made contracts.
  ◊ Swaps trade in an OTC type environment.
  ◊ Swap specialists fill the role of broker and/or market maker.
  ◊ Brokers/market makers are usually large banks.
  ◊ Prices are quoted with respect to a standard, or generic, swap.
  ◊ Reference interest rates are *inter banking offered rates* (IBOR): USD LIBOR, JPY LIBOR, Euribor (EUR IBOR), etc.

- *All-in-cost*: price of the swap (quoted as the rate the fixed-rate side will pay to the floating-rate side).

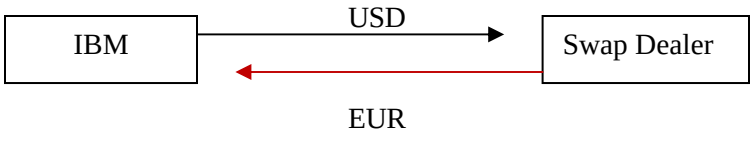
- It is quoted on a semiannual basis (s.a.):
  ◊ absolute level ("9% fixed against six-month *LIBOR flat*")
  ◊ bp spread over the U.S. Treasury yield curve ("Treasury yield + 57 bps against 6-mo *LIBOR flat*," where "LIBOR flat" = LIBOR is quoted without a premium or discount).

- It is a big market, with a USD 425 trillion of outstanding notional amounts (in December 2014).

• Q: Why use a swap?
A: To change the profile of cash flows.

Example: IBM pays bondholders of a Eurobond in EUR

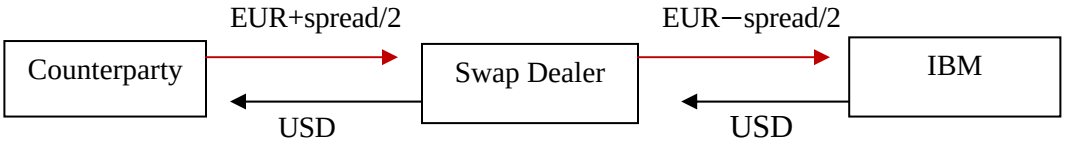
Situation: Payments in EUR. IBM wants to pay in USD
Solution: A currency swap



Net result: IBM pays USD:

• Swap Dealers

The SD is an intermediary, usually a large financial institution. They make a living of the bid-ask spread, usually paid as a premium/discount over one of the legs. Usually, SDs attempt to match the sides –i.e., find a counterparty to any swap they enter (with opposite direction). In the previous example:



Thus, the SD does not face interest rate/currency risk. It only faces credit risk (this is why, only companies with good reputations enter into the swap market).

If a swap dealer matches the two sides of a swap is called *back-to-back transaction* (or "*matched book*" transaction). But, if a counterparty to a swap cannot be quickly found, the SD enters a swap and then hedges the interest rate risk using interest rate derivatives, while waiting for a counter party to appear. This practice is called *warehousing* swaps.

In practice it is difficult to find a perfect counterparty to a swap, with the same amounts and maturity needs. In this case, the swap dealer also faces *mismatch risk.* SDs also warehouse the unhedged portions of swaps.

2. Five Types of Swaps

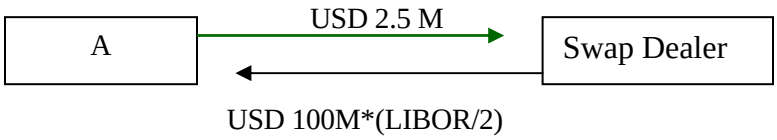
• Interest rate swap (Plain vanilla)

One party (A) pays a fixed interest rate. The other (B) pays a floating market rate.
The floating interest rate is set every period according to market conditions. Usually, one of the parties is a bank (SD).

Example: A pays 5% to swap dealer; SD pays floating rate (LIBOR) to A.
Frequency = f: Semi-Annual (s.a.)
Duration = T: 4 years
Notional Principal: USD 100M

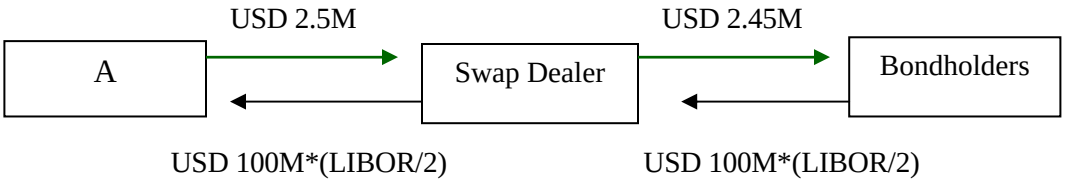
Legs = Fixed: 5%; Variable: 6-mo LIBOR.

Every 6 months, A pays USD 2.5M and receives 6-mo LIBOR.



Today, suppose 6-mo LIBOR = 6%. In 6 months, SD pays USD 3M. Net difference is USD 0.5M. Only the net payment will be exchanged. ¶

Note: Recall the SD is an intermediary. The SD will try to find a counterparty to the swap, but with opposite direction. For example:



In this situation, the SD does not face interest rate risk. It only faces credit. ¶

Day count convention (on short-term rates): In the example, the first floating payment is listed as 6%. But, since it is a money market rate, the 6-month LIBOR should be quoted on an actual/360 basis. Assuming 183 days between payments the actual payment should be:

USD 100M x (0.06) x (183/360) = USD 3.05M

The fixed-rate side is also adjusted. Payments may not be equal at each date.

Remark: In interest rate swaps, the notional principals are never exchanged (only the net changes hands).

A popular variation to the plain vanilla swap is the *basis swap*, where the two legs are indexed to floating interest rates. For example, Party A pays 6-mo LIBOR, while the SD pays 12-mo LIBOR.

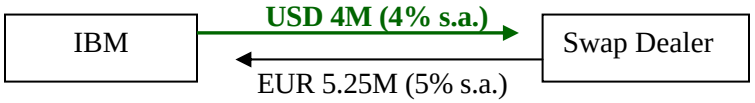
• ***Currency Swaps (also called Cross-Currency Swaps,* XCCY)**

Both legs are denominated in different currencies. There are different possibilities here:

1. Fixed-Fixed

Example: IBM pays 4% in USD and receives 5% in EUR.
f = Semi-Annual
T = 3 years
Notional Principals: USD 200M, EUR 210M
Legs = Fixed USD: 4%; Fixed EUR: 5.25%.

Every 6 months, IBM pays USD 4M and receives EUR 5.25M



2. Fixed-Floating (also called *Circus swap*)

Example: IBM pays LIBOR in USD and receives 5% in EUR. ¶

3. Floating-Floating (also called *Cross-currency basis swap*, if initial exchange of notionals occurs)

Example: IBM pays LIBOR in USD and receives LIBOR in EUR. ¶

The difference between the two floating rates in a currency swap is called the *basis swap spread*. The USD LIBOR is usually one of the rates. It is quoted USD LIBOR vs. FC LIBOR ± spread or *premium* (positive or negative).

If the XCCY spread is negative, banks are willing to receive lower interest rate payments on funds lent in non-USD currencies, in exchange for USD. The XCCY spread is taken as an indicator of funding conditions.

Note: Unlike interest rate swaps, in currency swaps the notional principal can be exchanged. This makes a currency swap more like an exchange of bonds.

Example: Back to the IBM USD/EUR fixed-for-fixed swap. The swap involves three sets of cash flows:

At inception, IBM receives USD 200 million and the swap dealer receives EUR 210 million:

Then, there are the semi-annual interest payments:

Finally, at the end of the swap, the principals are repaid:

Notes: Since at the end both parties are simply returning the notional principals they exchanged at inception, the exchange rate at the end is the same as the initial rate. There is no FX risk involved in the repayments of principals. ¶

• ***Commodity Swap***

One party (A) pays a fixed commodity price. The other (B) pays a variable commodity price.

Example: Coffee Commodity Swap

Situation: Maxwell House (MH) buys 100M lbs of coffee every 6 months. MH receives 100M lbs of coffee and pays the market price for the coffee. MH decides to use a swap to fix the price of coffee.

Terms: MH pays a fixed price and receives from a SD a variable market price.

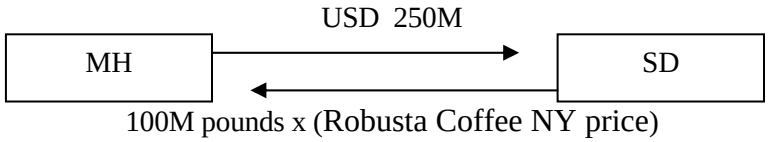
f = Semi-Annual

T = 5 years

Notional Principal = 100M lbs of coffee

Legs = Fixed: 2.5 USD/lb; Variable: Robusta Coffee NY cash price.

Every 6 month, MH pays USD 250M to the SD and receives market price*100M lbs.



Suppose Robusta Coffee NY price = 2.2 USD/lb. MH pays: USD 30M (net). ¶

• ***Equity Swaps***

One party (A) pays a fixed amount, usually calculated as a fixed interest rate. The other (B) pays a variable amount based on the performance of an equity index –S&P 500 or Nikkei 225.

Example: A Mutual Fund pays LIBOR in GBP and receives the returns of the FTSE 100 (in GBP).

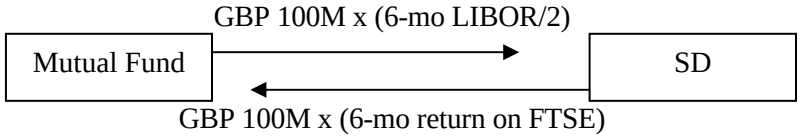
f = Semi-Annual

T = 3 years

Notional Principals: GBP 100M

Legs = Floating Rate: 6-mo LIBOR; Equity Variable: 6-mo return on FTSE.

Every 6 months, the Mutual Fund pays a fixed amount (GBP 100M x 6-mo LIBOR/2) and receives a floating amount (GBP 100M x 6-mo return on the FTSE 100).



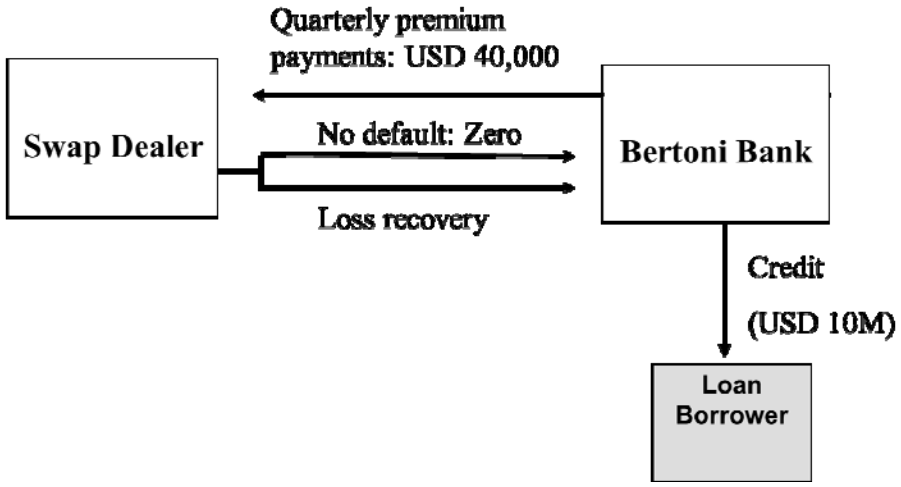
If the return on the FTSE is negative, the Mutual Fund pays the SD. ¶

• ***Credit Default Swaps*** **(CDS)**
One party (A) buys protection against specific risks associated with credit events –i.e., defaults, bankruptcy or credit rating downgrades. It is said that Party A buys a CDS or protection –i.e., "sells" risk or "short credit exposure- and the counterparty, usually a Swap Dealer, sells a CDS or protection –i.e., "buys" risk or credit exposure.

Cash flows:
- The protection buyer pays a periodic fee (the *spread*) to the protection seller.
- The protection seller pays a set amount if there is a credit event (usually, default).

Example: Bertoni Bank buys protection against a borrower's default.
f = Quarterly
T = 5 years
Notional Principal: USD 10M (same as loan)
Credit Event: Default
Spread (or **Premium**) = 160 bps.

Diagram of CFs:



Payment calculation: (0.0160 / 4) x USD 10M = USD 40,000 *(every quarter as a premium for protection against company default).* ¶

Remark: In Chapter 17 we mentioned that CDS spreads are a very good indicator of country risk.

• **Market size per segment: Outstanding amount & Value (in December 2014)**
- ◊ Interest rate swap: USD 381.0 trillion & USD 13.9 trillion.
- ◊ Currency swaps: USD 24.2 trillion & USD 1.3 trillion.
- ◊ Equity swaps & Forwards: USD 2.4 trillion & USD 0.19 trillion.
- ◊ Commodity swaps & Forwards: USD 1.4 trillion & 0.3 trillion.
- ◊ Credit default swaps: USD 16.4 trillion & 0.59 trillion.

3. Valuation of a Swap

The value of a swap is equal to the difference of the NPV of the CFs exchanged.

V = Value of Swap = NPV(Receivables) - NPV(Payables) (denominated in same currency)

At inception (T=0), the value of a swap to both parties should be 0 (or very close to 0). This would be a "*fair*" valuation. But, as time goes by, interest rates and exchange rates will change and, thus, V will change too.

Example: Back to IBM's fixed-fixed currency swap.
Value of Swap (IBM) = V_{IBM} = NPV(Receivables in EUR)*(S_t) - NPV(Payables in USD)

Situation: 2 years have passed. Payments left = 2 (T=1 year)

f : Semi-Annual
T: 1 year
Notional Principals: USD 200M, EUR 210M
Coupons: 4% USD (USD 4M), 5% EUR (EUR 5.25M)
$\mathbf{S_t}$ = 1.05 USD/EUR
Discount rates: In USD: 6 mo= 5%, 1 yr= 5.1%
In EUR: 6 mo= 6%, 1 yr= 6.2%
Notional principals are repaid at the end of swap.

V_{IBM} = [EUR 5.25M/(1.03) + EUR 215.25M/$(1.031)^2$]*1.05 USD/EUR -
- [USD 4M/(1.025) + USD 204M/$(1.0255)^2$] = USD 20,094,054

If IBM wants to liquidate the swap, IBM has to receive USD 20,094,054 to sell the swap.¶

• **Remark:** ***Credit Risk***

Credit risk in the swap market: Potential loss to a counterparty of the present value of a swap position if the swap party defaults.

IBM has credit risk exposure from the currency swap only in years when the value of swap is positive (in this example, always). In the previous example, if S_t = 0.95 USD/EUR then,

V_{IBM} (1st-year) = [EUR 5.25M/(1.03)*.95 USD/EUR] - [USD 4M/(1.025)] = USD .94M
V_{IBM} (2nd-year) =USD-1.61M. $\Rightarrow$ SD would face credit risk in year 2.

A CDS can be used to deal with this risk.