Fixed Income Investment

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Lecture 9

- Forward Rate Agreements
- Interest Rate Swaps
- Credit Risk Spread
- Downgrade Risk
- Default Options

Forward Rate Agreements

Forward Rate Agreement: is a contract that specifies a cash payment at contract maturity determined by the difference between an agreed interest rate and the realized interest rate at maturity.

There are FRAs on Eurodollar deposit rates (LIBOR) and FRAs on euro deposit rates (Euribor).

Example:

Consider a one-month FRA contract, expiring in 30 days, based on 3-month LIBOR. The underlying rate on the contract is the 3-month LIBOR that will prevail in 30 days. Suppose the two parties to the contract agree on a fixed rate of 2.5%. The buyer of the FRA will receive a payment from the seller if the actual 3-month LIBOR rate at expiration of the FRA contract is greater than 2.5%. The seller of the FRA will receive a payment from the seller if the actual 3-month LIBOR rate at expiration of the FRA contract is less than 2.5%.

Calculate and Interpret the payoff of a FRA

Two parties agree to make a loan to the other at the maturity of the FRA. They enter in a 30-day FRA contract based on 3-month LIBOR with a FRA (fixed) rate of 2.5% and a notional of $100,000,000.
This is s 1×4 FRA maturing in 1 month, at which time a 3-month loan will be exchanged (a relationship lasting a total of 4 months).

At maturity date (30 days from inception)
The seller of the FRA agrees to make a $100 million loan to the buyer at a rate of 2.5% for three months (buyer pays 2.5% interest to the FRA seller).
The buyer of the FRA agrees to loan the seller $100 million at whatever 3-month LIBOR is at maturity, again for 3 months.

No money actually changes hands at the inception of the FRA.

30 days later, 3 month LIBOR is 2.73%.

$$Interest\ Paid\ by\ FRA\ Buyer = Notional \times \left[Interest\ Rate \times \frac{t_{days}}{360}\right]$$
$$= \$100{,}000{,}000 \times \left[0.0250 \times \frac{90}{360}\right] = \$625{,}000$$

$$Interest\ Paid\ by\ FRA\ Seller = Notional \times \left[Interest\ Rate \times \frac{t_{days}}{360}\right]$$
$$= \$100{,}000{,}000 \times \left[0.0273 \times \frac{90}{360}\right] = \$682{,}500$$

The seller will simply pay the buyer the present value of the difference between the interest payments discounted at the current 3-month LIBOR rate.

$$Payment\ to\ FRA\ Buyer = PV_{LIBOR}\ of\ (Interest\ Owned\ to\ Buyer\ - Interest\ Owned\ to\ Seller)$$

$$Payment\ to\ FRA\ Buyer = \frac{\$682{,}500 - \$625{,}000}{1 + 0.0273 \times \left(\frac{90}{360}\right)} = \$57{,}110.22$$

$$FRA\ Payment = Notional\ Amount \times \frac{(Actual\ Rate - Agreed\ Rate)(t_{days}/360)}{1 + Actual\ Rate(t_{days}/360)}$$

Interest Rate Swaps

Swap: Agreement between two companies to exchange cash flows in the future. The agreement defines the dates when the cash flows are to be paid and the way in which they are calculated.

Usually the calculation of the cash flows involves the future value of an interest rate, an exchange rate, or other market variable.

Mechanics of Interest Rate Swaps

Plain Vanilla: Most common type of swap (Interest rate swap)

Company agrees to pay cash flows equal to interest at a predetermined fixed rate on a notional principal for a number of years. In return, it receives at a floating rate on the same notional principal for the same period of time.

One party makes a fixed interest rate payment to another party making a floating interest rate payment

- Only the net payment is made, difference check
- The firm paying the floating rate is the swap seller
- The firm paying the fixed rate is the swap buyer

LIBOR: floating rate used in most rate swap agreements.

The swap market is standardized partly by the International Swaps and Derivatives Association (ISDA)

The *swap facilitator* will find a counterparty to a desired swap for a fee or take the other side

A facilitator acting as an agent is a swap broker

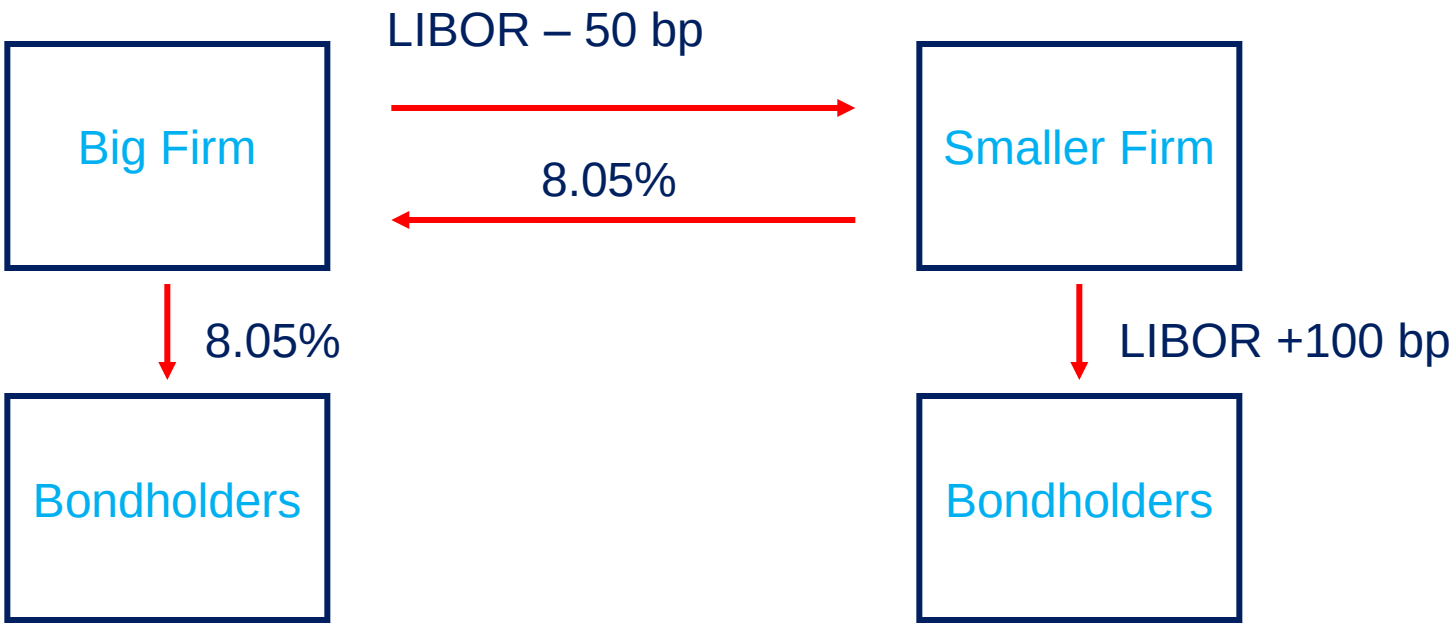
A swap facilitator taking the other side is a swap dealer (swap bank)

Plain Vanilla Swap Example

A large firm pays a fixed interest rate to its bondholders, while a smaller firm pays a floating interest rate to its bondholders.

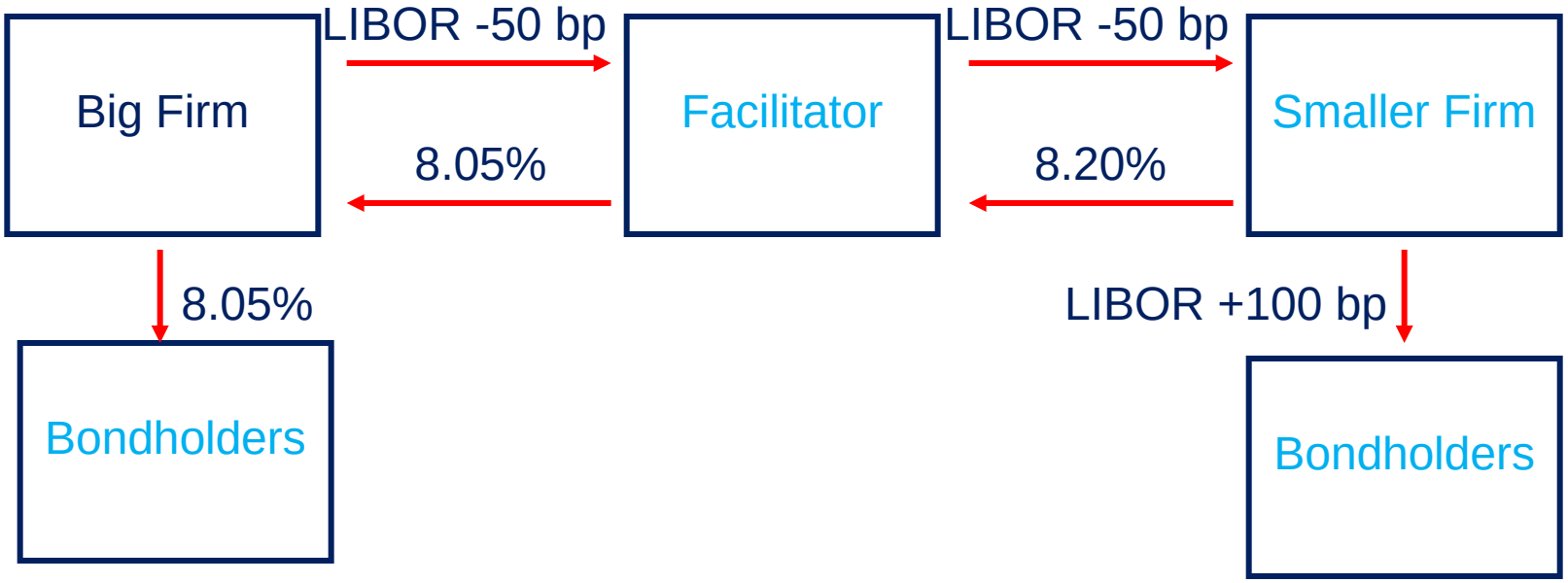
The two firms could engage in a swap transaction which results in the larger firm paying floating interest rates to the smaller firm, and the smaller firm paying fixed interest rates to the larger firm.

Plain Vanilla Swap Example (cont'd)



A facilitator might act as an agent in the transaction and charge a 15 bp fee for the service.

Plain Vanilla Swap Example (cont'd)



The swap price is the fixed rate that the two parties agree upon

The tenor is the term of the swap

The notional value determines the size of the interest rate payments

Counterparty risk refers to the risk that one party to the swap will not honor its part of the agreement

Example 2

In this five-year swap, 12-month LIBOR is swapped for 2.67% fixed, on $100 million.

At initiation, the planned payments are:

Year	1-yr LIBOR	Payment	Fixed rate	Payment
0	1.52%		2.67%	
1	2.00%	$1,520,000	2.67%	$2,670,000
2	2.60%	$2,000,000	2.67%	$2,670,000
3	3.30%	$2,600,000	2.67%	$2,670,000
4	4.12%	$3,300,000	2.67%	$2,670,000
5		$4,120,000		$2,670,000

Credit Risk Spread

Risk that the interest rate spread for a risk bond over a riskless bond will increase after the risky bond has been purchased.

Example: In the USA, US Treasury securities are generally considered to be without credit risk (default free). Therefore, corporate bonds, agency debentures and the debt of foreign governments are typically priced at a spread to comparable US treasury securities.

October 1997, rapid decline in Asian Market spilled over into the US stock markets, causing a significant decline in financial stocks.

Flight to safety of investment capital resulted in a significant increase in credit spreads of corporate bonds to US Treasuries.

Example

June, 30, 1997, corporate bonds rated BB by Standard & Poor's were trading at an average spread over US Treasuries of 215 basis points.

October, 31, 1997, the spread has increased to 319 basis points.

For a $1,000 market value BB-rated corporate bond with a duration of 5, resulted in a loss of value of about $52.50 per bond.

Spread Duration: approximate percentage change in the bond's price for a 100 basis point increase in the credit spread (holding the treasury rate constant).

A spread duration of 3 means that for a 100 basis point increase in the credit spread, the bond's price will decline approximately 3%.

Downgrade Risk

Occurs when a nationally recognized statistical rating organization such as Standard & Poor's, Moody's Investor Services or Fitch ratings reduces its outstanding credit rating for an issuer based on an evaluation of that issuer's current earning power versus its capacity to pay its fixed income obligations as they become due.

Credit Options on a Credit Risky Asset

A Default Option on a credit risky asset is another form of credit default products.

In a binary credit option the option seller will pay out a fixed sum if and when a default event occurs with respect to a reference obligation or reference entity. Represents two states of the world: Default and no default

At maturity of the option, if the reference obligation or reference entity has defaulted, the option holder receives a predetermined payout. If there is no default at maturity of the option, the option buyer receives nothing.

A binary credit option could also be caused by a rating downgrade, both by a put and a call.

Example: Binary Credit Put Option

Assume that the portfolio manager purchased at par $1 million of Company X bonds, currently rated AA. The portfolio manager purchases a put option where he can sell the bonds at par value to the put option seller should the credit rating for Company X fall bellow investment grade (below BBB). The payoff to this binary put option can be described as:

$$Payoff = \begin{cases} \$1{,}000{,}000 - market\ value\ of\ bonds, if\ the\ credit\ rating \\ of\ Company\ X\ falls\ below\ a\ BBB\ rating \\ or \\ \$0 - if\ the\ credit\ rating\ of\ Company\ X \\ remains\ investment\ grade \end{cases}$$

Portfolio Manager receives a payout on the credit put option only in one state of the world: Company X is downgraded to below the investment grade

Example: Binary Credit Call option

Whenever Company X is downgraded, the portfolio manager gets to call for a payment that will compensate her for the greater credit risk associated with her bond holdings.

This is like receiving additional coupon income to reflect the higher credit risk associated with company X's bonds.

Portfolio manager gets to call for an additional 25 basis points of income should Company X be downgraded one credit rating, 50 basis points of income should Company X be downgraded two steps and so forth.

The pay out of this credit option may be described as:

$$Payoff = \begin{cases} \$2{,}500 \ - if \ the \ credit \ rating \ of \ Company \ X \ declines \ by \ one \ credit \ rating \\ or \\ \$5{,}000 \ - if \ the \ credit \ rating \ of \ Company \ X \ declines \ by \ two \ credit \ rating \\ or \\ \$0 \ - \ if \ the \ credit \ rating \ of \ Company \ X \ is \ not \ downgraded \end{cases}$$

Where \$2,500 = 0.25% × \$1,000,000
And \$5,000 = 0.25% × \$1,000,000

The payout to the binary credit call option is not a function of the bond's market value