

Interest Rate Swaps

Interest rate swaps allow fixed coupon bonds to be transformed into floating coupon bonds or vice versa.

This can be useful for the purpose of hedging, speculating, or achieving lower bond issue costs.

There are two parties in a swap, the party paying the 'fixed leg' which is the locked-in agreed-upon 'swap rate' and the counterparty paying the 'floating leg' which is pegged to some benchmark rate such as the 90-day LIBOR (London Inter-Bank Offer Rate) or 90-day BBSW (Bank Bill Swap).

The interest rate swap has a notional principal, notional because it is never paid at the start or end, and the fixed and floating leg payments will be:

$\text{FixedLegPayment} = \text{NotionalPrincipal} * \text{SwapRate}$

$\text{FloatingLegPayment} = \text{NotionalPrincipal} * \text{LIBOR}$

The payments are netted out so if the FixedLegPayment was \$1m and the FloatingLegPayment was \$0.9m then the net payment would be \$0.1m from the party paying fixed to the party paying floating.

The swap rate is written on the swap contract when the swap is agreed to, it's fixed.

The floating rate is changing all the time, but when the swap is first signed, and after each net swap payment is made, the next floating payment is known since it will be the LIBOR rate at that time multiplied by the notional principal.

Designing Swaps to Reduce Issue Costs

Some companies can issue bonds at lower interest rates in floating coupon markets rather than fixed coupon markets, or vice versa.

This may be because they have historically issued fixed coupon bonds and there are many trading in the market already so they're liquid. Particularly if the newly issued bond 'taps' the same line of existing bonds, which means the new ones have the same maturity date, coupon rate, seniority and so on as the existing bonds, then the new bond issue will be more liquid and thus more valuable. So the company can sell the new bonds for a higher price and a lower yield to maturity.

Example: Designing Swaps to Reduce Issue Costs using Comparative Advantage

Question: The below table summarises the borrowing costs confronting two companies:

Borrowing Costs		
	Fixed Rate (pa)	Floating Rate (pa)
Firm A	5%	6-month LIBOR + 0.9%
Firm B	5.8%	6-month LIBOR + 1.2%

Suppose Firm A wants to borrow at a floating rate and Firm B wishes to borrow fixed. Design an intermediated swap that provides a bank with a spread of **20** basis points p.a., and divides the remaining swap benefits **equally** between the two

companies. Use a clearly labelled diagram to summarise the terms of the arrangement.

Answer: Firm A has an absolute advantage in both markets since it can achieve lower yields than Firm B. But Firm A has a comparative advantage in the fixed rate market since it can achieve a 0.8% lower yield than Firm B, more than the 0.3% difference in floating.

Borrowing Costs		
	Fixed Rate (pa)	Floating Rate (pa)
Firm A	5%	6-month LIBOR + 0.9%
Firm B	5.8%	6-month LIBOR + 1.2%
Spread	-0.8%	-0.3%
 Spread diff 	0.5% (= -0.8 - - 0.3)	

Firm A should issue a fixed rate bond. Firm B has a comparative advantage in the floating rate market (since it's less bad in this market) so it should issue a floating rate bond.

The total benefit available to all 3 parties including the intermediary bank is called the **Quality Spread Differential (QSD)**. The QSD is equal to the absolute value of the difference in spreads:

$$\begin{aligned} \text{QSD} = \text{BenefitToABBank} &= |(5-5.8) - (L+0.9-(L+1.2))| \\ &= | -0.8 - - 0.3 | \\ &= 0.5\% \end{aligned}$$

Subtract the bank's spread to find the benefit to Firms A & B:

$$\text{BenefitToAB} = 0.5\% - 0.2\% = 0.3\%$$

Firm A and B will share the benefits equally, which is 0.15% (=0.3%/2) benefit each.

Step 1: Draw in Firm A, Firm B and the Intermediary Bank.

Step 2: Draw the physical bonds on the far left and right.

**Physical Fixed
Coupon Bond**

**Swap Between
A and Bank**

**Swap Between
B and Bank**

**Physical Floating
Coupon Bond**

A pays ← **Firm A**

Bank

Firm B → B pays

5

LIB+1.2

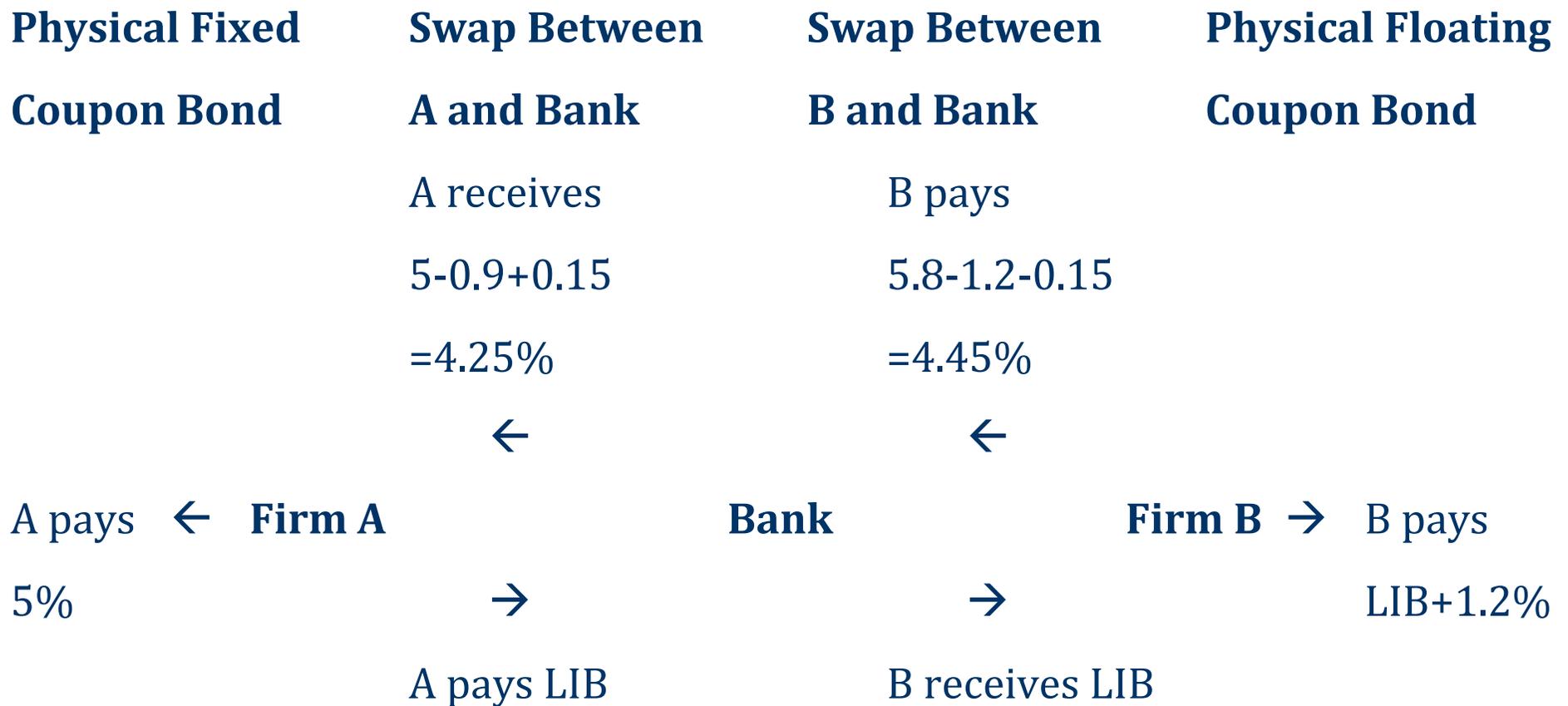
Step 3: Draw the swap cash flow arrows which represent the periodic cash flows. Ensure each firm's 3 cash flows (physical bond payments and the swap's fixed and floating legs) net to the firm's desire for fixed or floating.

Step 4: Fill in the swap leg rates with what each firm can issue in the physical fixed and floating markets.



Step 5: Make the two swaps flat to LIBOR (L+0), so put the premiums on the fixed leg side.

Step 6: Grant the companies the swap benefit of 0.15%.



Valuing an Interest Rate Swap

Like futures, interest rate swaps have zero initial value since nothing is paid initially and if the swap was worth something to one party, it would be worth a negative amount to the counterparty so they would have been foolish to agree to it.

$$V_{0 \text{ swap paying fixed}} = V_{0 \text{ swap paying floating}} = 0$$

After a swap is agreed upon, the floating benchmark LIBOR will change. Say it rises, for example, then the party paying the floating leg will lose and the party paying fixed will win.

The value of a fixed-for-floating interest rate swap is:

$$V_{\text{swap paying fixed}} = V_{\text{floating coupon bond}} - V_{\text{fixed coupon bond}}$$

To the counterparty paying floating it is the opposite:

$$\begin{aligned}V_{\text{swap paying floating}} &= -V_{\text{swap paying fixed}} \\ &= V_{\text{fixed coupon bond}} - V_{\text{floating coupon bond}}\end{aligned}$$

Note that floating bonds' prices are always equal to their face value just after a coupon is paid, so if the swap is being valued at this time, the floating coupon bond value will always be equal to the swap's notional principal.