Interest Rate and Currency Gap Management. Structured finance

Swap Applications

1. Interest rate gap management
2. Currency gap management
3. Credit risk arbitrage
4. Structured finance
5. Asymmetric information

Interest rate management

Duration is a measure of the interest rate sensitivity of an asset value. The durations of the assets and liabilities are obtained as weighted averages of the individual items. A duration gap of zero implies a hedged position against interest rate risk. A conservative bank will attempt to set its duration gap to zero. The positive duration gap means that the bank is exposed to rising interest rates. Implementing the desired duration gap without derivatives is difficult. The long position in a swap or FRA transaction will lengthen liability duration and decrease duration gap. The negative duration gap means that the bank is exposed to falling interest rates. The short position in a swap or FRA transaction will lengthen asset duration and increase duration gap.

The notional capital of a FRA or swap transaction is derived using the following equation:

(1) $L_B\ A + D_S\ K = L_P\ (A+K)$

where:
L_B – the existing duration gap,
A – assets
D_S – swap's duration,
K – notional principal,
L_P – required duration gap.

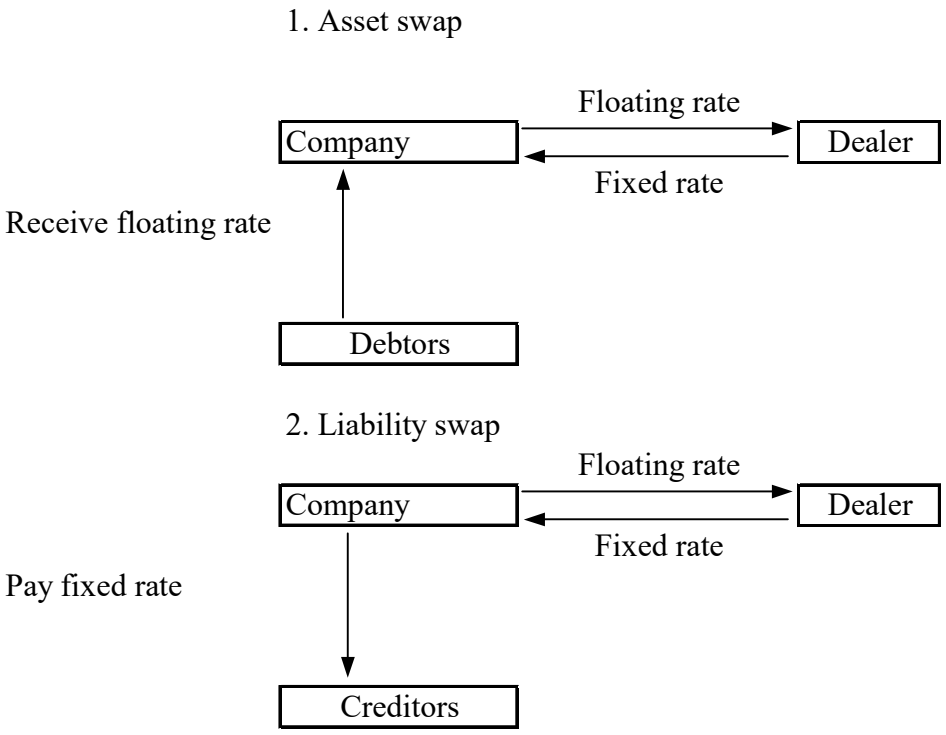
Solving for K we obtain:

(2) $$K = \frac{A(L_B - L_P)}{L_P - D_S}$$

The duration of the FRA or swap transaction should be higher than the required duration gap.

A swap used to restructure assets is referred to asset swap. A swap used to restructure liabilities is called a liability swap. Both of them may imply increase or decrease of a duration gap (figure 1).

Increase duration gap



Decrease duration gap

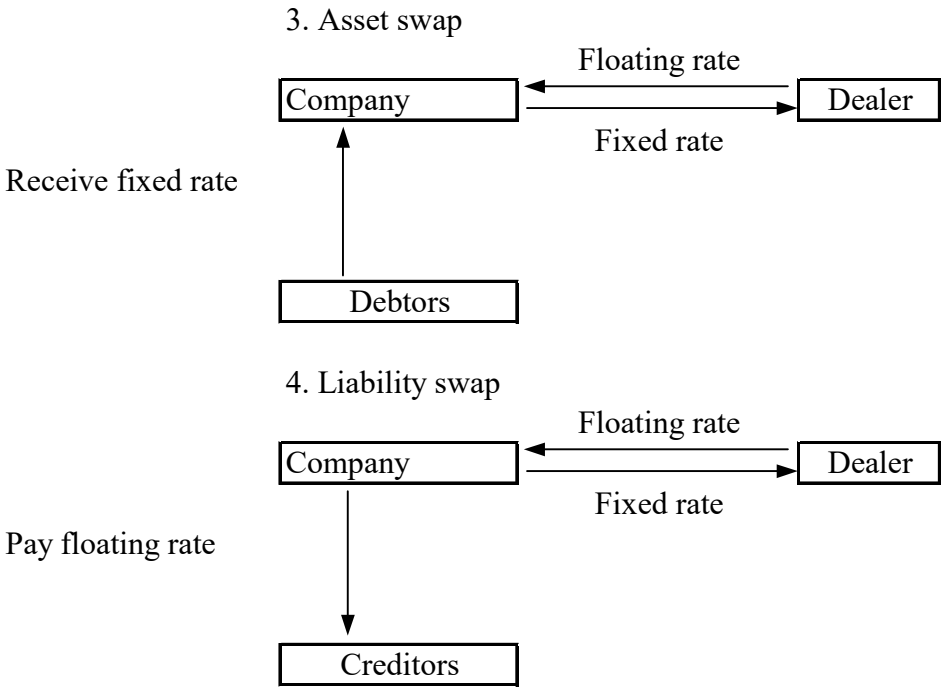


Figure 1. Asset Swap and Liability Swap

Problem 1. Duration Gap

Consider the following balance sheet

Assets	$ million	Duration	Claims	$ million	Duration
Group I	100	0,00	Group I	600	1,00
Group II	200	2,00	Group II	100	2,00
Group III	100	3,00	Group III	100	3,00
Group IV	100	5,00	Group IV	100	4,00
Group V	500	6,00	Equity	100	0,00
Total	1000	4,20	Total	1000	1,50

(a) Calculate the duration gap. What is the interest rate exposure ?
What is the impact of a 300-basis-point increase on the equity ?
(b) Calculate the notional principal of a swap transaction to set the duration gap to zero.
Assume that the duration for a swap transaction is -4,5 years.
Show a new balance sheet.
(c) Calculate the notional principal of a swap transaction to set the required duration gap equal to 1,0 year. Show a new balance sheet.

Solution

(a)

Duration gap is equal to 4,20 - 1,50 = 2,70.

The positive duration gap means that the market value of equity would decline if interest rates rose.

The rise in interest rates of 3 basis points will decrease the market value of equity approximately by 2,70 * 3% * 1000 = 81.

(b)

The notional principal should be 1000 * (2,70 - 0,00) : (0,00 - (-4,50)) = 600.

	Assets		Claims on assets	
	$ million	Duration	$ million	Duration
balance sheet	1000	4,20	1000	1,50
swap	600	1,00	600	5,50
total	1600	3,00	1600	3,00

(c)

The notional principal should be 1000 * (2,70 - 1,00) : (1,00 - (-4,50)) = 309.

	Assets		Claims on assets	
	$ million	Duration	$ million	Duration
balance sheet	1000	4,20	1000	1,50
swap	309	1,00	309	5,50
total	1309	3,44	1309	2,44

Currency Risk Management

Currency swaps change not only interest rate gaps but also currency gaps. The foreign currency assets or liabilities may be converted to local currency assets or liabilities or vice versa. Currency swaps may be used to hedge positions or to speculate on an appreciation or depreciation of foreign currencies.

Credit Risk Arbitrage

The pure arbitrage transactions occur when a swap contract is used to take advantage of pricing inconsistencies. The credit-spread differentials create opportunity for credit risk arbitrage based on the principle of comparative advantage.

Structured finance

Swaps are used to convert floating rates to fixed rates (stabilization) and to lower cost of capital.

Asymmetric Information

Swaps may be use to take advantage of superior knowledge of the company's true financial condition.