Solution Guide to Exercises for
Chapter 17 Swap contracts and swap markets

1. (Plain vanilla interest rate swap.) Companies A and B both plan to borrow £15m for 7-years. The companies face differing borrowing costs. Company A can borrow for a fixed rate of 9% per annum or a floating rate of LIBOR+100b.p. per annum. Company B can borrow for a fixed rate of 11% per annum or a floating rate of LIBOR+120b.p. per annum.

(a) Under what conditions would companies A and B find an interest rate swap beneficial? Suppose that the necessary conditions hold and that you are employed by a financial intermediary to arrange interest rate swaps. Propose a swap agreement which would benefit both companies and the intermediary.

Answer:

(i) The companies face different borrowing costs according to whether they borrow at a fixed rate or a floating rate:

<table>
<thead>
<tr>
<th></th>
<th>Fixed Rate</th>
<th>Floating Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>9.00%</td>
<td>LIBOR+100b.p.</td>
</tr>
<tr>
<td>Company B</td>
<td>11.00%</td>
<td>LIBOR+120b.p.</td>
</tr>
</tbody>
</table>

(ii) Company A has an absolute advantage in both markets but has a comparative advantage in the fixed rate market. (Company B has a comparative advantage in the floating rate market.)

(iii) If Company A prefers to borrow at a floating rate and Company B prefers to borrow at a fixed rate, there is scope for a mutually advantageous swap agreement.

(iv) Consider the following operation:
A. Company A borrows £15m for 7 years in the capital market at 9.00%. Company B borrows £15m for 7 years in the capital market at LIBOR+120b.p.
B. Company A arranges a swap with an intermediary to pay a floating rate of interest equal to LIBOR+110b.p. in return for a fixed rate of 10% per annum.
C. Company B arranges a swap with an intermediary to pay a fixed rate of interest equal to 10% in return for a floating rate equal to LIBOR+90b.p.

The payoffs are as follows:

|-----------|----------------------------|-----------------------------|---------------------------|------------------------|

(v) All three parties to the swap gain by the deal: company A borrows at a floating rate of LIBOR+10b.p. (i.e. 90b.p. less than it would have to pay in the floating rate market); company B borrows at a fixed rate of 10.30% (i.e. 70b.p. less than it would have to pay in the fixed rate market); the intermediary collects 20b.p. for its services in arranging the deal.
(b) Explain the relationship between the swap agreement and a sequence of forward contracts for the exchange of interest payments.

Answer:

(i) The swap agreement is equivalent to a sequence of forward contracts in which the ‘price’ (set at the outset) is the fixed rate payment and the floating rate payment is analogous to the spot value of the ‘underlying asset’ at the maturity of each forward contract. If the swap occurs every six months, the maturity dates of the hypothetical forward contracts are at these six month intervals.

(ii) It is as if Company A has taken a short position and Company B has taken the equivalent long position in a sequence of forward rate contracts.

(c) Discuss the view that swap agreements are possible only because capital markets are imperfect.

Answer:

(i) What is meant by a ‘perfect’ capital market? This is often left rather vague. It does not mean that information is perfect but perhaps that:

A. there are asymmetries of information (some individuals, institutions, or companies) have more or better information than others;

B. positive transaction costs;

C. regulations which prohibit (or favour) some transactions rather than others;

D. capital markets may be ‘out of equilibrium’ in the sense that arbitrage opportunities exist—and may be in the process of being eliminated.

(ii) Companies may well face different borrowing costs even if capital markets are perfect. Some companies may just be riskier than others (for many different reasons).

(iii) Imperfect capital markets could help to explain why comparative interest costs differ.

(iv) Whether the existence of differing comparative interest costs are a result of imperfect capital markets is a matter of interpretation. It could be argued that the different comparative interest costs are a reflection of fundamental economic phenomena and should not be interpreted as imperfections at all. (This just seems to be a quibble about the meaning of ‘perfect capital markets’.)

(v) There remains the issue of why companies have different preferences for borrowing in one capital market rather than another. Such preferences would seem to have nothing to do with capital market imperfections.

2. Two companies, A and B, borrow at different interest rates in US dollars and pounds sterling, as follows:

<table>
<thead>
<tr>
<th></th>
<th>Dollar rate</th>
<th>Sterling rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>8%</td>
<td>14%</td>
</tr>
<tr>
<td>Company B</td>
<td>6%</td>
<td>9%</td>
</tr>
</tbody>
</table>

(Interest rates are quoted as per cent, per annum.)

(i) Describe a set of circumstances for which a currency swap would be to the advantage of both companies.

Answer:

For a currency swap to be advantageous to both companies, they should both seek to borrow the same amount for the same period of time. This is a necessary condition but is not sufficient.
A second necessary condition is that the comparative borrowing costs should differ between the two currencies for the two companies. In this case, although company A has an absolute disadvantage in both currencies, it has a comparative advantage in borrowing dollars (200 b.p. above company B, while borrowing in sterling costs 500 b.p. more for A than B).

A third condition, which together with the first two is sufficient for a swap to be advantageous, is that each company prefers to borrow funds in the market in which it has a comparative disadvantage. Company A prefers to pay pounds sterling for its borrowing. Company B prefers to pay dollars for its borrowing. (Companies could have these preferences for a variety of reasons that have no relevance in answering the question.)

Given these conditions, company A would borrow funds in the dollar market (where it has a comparative advantage), and company B would borrow funds in the sterling market. Company A would then agree to pay pounds sterling to B in return for dollars from B (this is the swap). If the terms of the swap are mutually beneficial, A would end up facing borrowing costs in sterling but at a rate less than £14%, and B would end up facing borrowing costs in dollars but at a rate less than $6%.

(ii) Explain how an intermediary could devise a currency swap that would be attractive to both companies and to the intermediary.

Answer:
The intermediary arranges for A to go to the capital market and obtain a loan denominated in dollars. Similarly, B goes to the capital market and obtains a loan in sterling, equal (at the current exchange rate) to the amount of A’s loan.

The two companies then swap the principal (i.e. the amount borrowed) — remember A prefers to borrow sterling, while B prefers to borrow dollars.

Now at regular intervals (say, every six months) each company receives from the intermediary the interest that it must pay on the loan it has obtained. That is, company A receives 8% in dollars and company B receives 9% in pounds.

In exchange, company A agrees to pay an amount in pounds to the intermediary and B agrees to pay an amount in dollars. The amount paid by each company depends on its negotiations with the intermediary (i.e. on the terms of the swap contract). As an example consider the following:

<table>
<thead>
<tr>
<th>Company A</th>
<th>Capital market:</th>
<th>Pay</th>
<th>($)8.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swap deal:</td>
<td>Pay</td>
<td>(£)12.50%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Receive</td>
<td>($)8.00%</td>
<td></td>
</tr>
<tr>
<td>Net cost=</td>
<td>(£)12.50%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company B</th>
<th>Capital market:</th>
<th>Pay</th>
<th>(£)9.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swap deal:</td>
<td>Pay</td>
<td>($)5.00%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Receive</td>
<td>(£)9.00%</td>
<td></td>
</tr>
<tr>
<td>Net cost=</td>
<td>($)5.00%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intermediary</th>
<th>Swap deal:</th>
<th>Pay</th>
<th>($)3.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Receive</td>
<td>(£)3.50%</td>
<td></td>
</tr>
<tr>
<td>Net gain=</td>
<td>0.50%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note that the most that A would agree to pay in pounds is 14%. It pays 12.5% and hence has gained.

The most that B would agree to pay in dollars is 6%. It pays 5% and hence has gained.

The intermediary gains a net 0.5% but has to face the risk of exchange rate fluctuations during the life of the swap.

Note that the above swap agreement is an illustration. The companies will benefit from the swap so long as each has net borrowing costs lower than it would have to pay in the capital market for the currency of its choice. But the size of the benefit depends on
contract agreed with the intermediary. Similarly, the intermediary will only participate if it gains, but the amount of the gain depends on the contract negotiated.

The illustration above shows that a mutually advantageous swap is possible. It does not purport to demonstrate the terms of the swap: these would depend on other information (e.g. bargaining strength) that is not provided here.

3. Compare and contrast commodity swaps with interest rate swaps.

Answer:

(a) In principle, the swaps are the same. Two parties (typically companies) agree to exchange flows of cash for a specified time period according to an agreed rule.
(b) For interest rate swaps, the cash flows are based on the rates of return on two different bonds (e.g. a floating rate bond and a fixed rate bond).
(c) For commodity swaps, the cash flows are based on the prices for two different commodities. Typically (not necessarily), the two commodities will be ‘similar’ in their physical properties. For example, the two prices could be for different grades of fuel oil.
(d) For interest rate swaps, the interest rates are applied to a notional principal (face value of the bond). For commodity swaps, the prices would be multiplied by an agreed notional volume of the commodities.
(e) Note that for interest rate swaps, the principal is not exchanged. For commodity swaps, the commodity does not change hands, just the difference in the price (multiplied by the notional quantity) at each interval.

4. What are the main risks associated with swaps? What actions can be taken to control these risks?

Answer:

(a) Credit risk This is the risk of default by one of the parties, i.e. the risk that one of the parties will become bankrupt and unable to continue with the agreed payments. Interest rate swaps are less risky than loans because no principal changes hands. Even so, the possibility of default may be non-negligible. The same is true of other sorts of swap.
Action to control the risk: Arrange for an intermediary to guarantee the swap (in return for a fee). The intermediary will typically require a ‘good faith deposit’ from at least one of the parties.
(b) Market risk (sometimes called basis risk). This is the risk of divergences between the two prices (e.g. interest rates) which are being swapped. Of course, it is precisely this risk which swaps are designed to exchange (and share) between the parties to the swap.
Action to control the risk: Arrange for the swap to be reviewed at given intervals (by the intermediary, if there is one). In the swap contract, include a provision for early termination (and the appropriate penalties).
(c) Funding risk. This is the risk that a party which is called upon to make a ‘good faith’ deposit will be unable to do so. The institution (typically an intermediary) to which the deposit should be made will then have the option to terminate the contract (and to seek compensation).
Action to control the risk: As for market risk.

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