

Interest rate risk management 1

- Managing interest rate risk
- Forward rate agreements
- Interest rate futures
- Margins on futures
- Options on interest rate futures

Managing interest rate risk

Interest rate risk

This is the risk of adverse movements interest rate such that it will cost the company, or an individual, money. Interest rate risk is faced by both borrowers and lenders

- For a **borrower** the risk is that interest rates may rise
- For a **lender** the risk is that interest rates may fall

Note

All decisions about managing interest rate risk will be taken from the company's perspective.

Managing interest rate risk

Internal methods of reducing interest rate risk include the following:

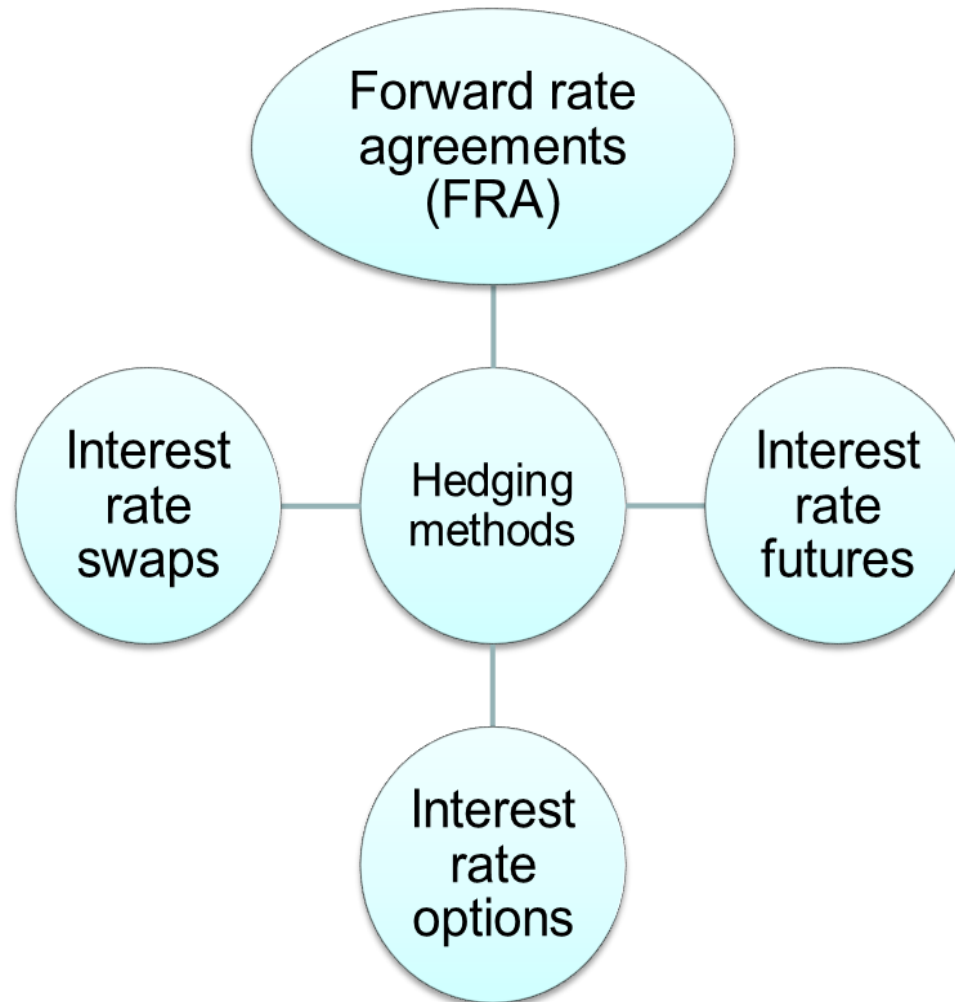
- **Netting** – aggregating all positions, assets and liabilities, and hedging the net exposure
- **Smoothing** – maintaining a balance between fixed and floating rate borrowing
- **Matching** – matching assets and liabilities to have a common interest rate.
- **Pooling** – asking bank to pool amounts of all subsidiaries when considering interest levels and overdraft limits. It should reduce the interest payable, stop overdraft limits being breached and allow greater control by the treasury department. It also gives the company the potential to take advantage of better rates of interest on larger cash deposits.

Managing interest rate risk

External methods

- Forward rate agreements (FRAs)
- Interest rate futures
- Interest rate options on futures
- Interest rate caps + floors = collars
- Interest rate coupon swaps

Managing interest rate risk



Forward rate agreements

- **A forward rate agreement (FRA)** is contract with a bank (ie over-the-counter) covering a notional amount of money to be borrowed or deposited over a specific time period at an interest rate agreed now.
- If the actual interest rate proves to be higher than the agreed rate, the bank pays the company the difference, and the company pays the bank the difference if the interest rate is lower.
- **Terminology:** a 3-9 FRA 4.75%-4.95% can be used to fix the rate on a loan or deposit which begins in 3 months and lasts for 6 months. The borrowing rate would be the higher of the 2 quoted rates.

Question Forward rate agreements

It is now 1 October 20X7 and a company expects to receive D27,000,000 on 31 January 20X8. The company wants this money to be invested until 30 June 20X8. The company's treasury team is aware that economic conditions in the country in which they operate are currently uncertain. The central bank base rate is currently 4.2% and the treasury team believes that it can invest funds at the central bank base rate less 30 basis points.

A local bank with which the company has not dealt before, has offered the following FRA rates:

4–9: 5.02%

5–10: 5.10%

Required

Advise the company of the likely outcome if on 31 January 20X8 the central bank base rates increase by 1.1% or decrease by 0.6%.

Forward rate agreements

Advantages of FRAs

- Protection from adverse movements
- Tailored to the company's precise requirements (in terms of amount of cover needed).
- Simple relative to other derivative arrangements
- Can be free or low cost in terms of arrangement fees
- Can be available for greater than one year

Forward rate agreements

Disadvantages of FRAs

- Fixed date agreements
- Rates quoted may be unattractive
- Cannot take advantage if interest rates move in favourable direction
- Higher default risk than an exchange-based derivative

Interest rate futures

These are similar agreements to FRAs ie agreements on a fixed interest rate but are available on an exchange for standard amounts (sizes) and standard periods (3 months).

Contracts

- Contracts are issued on a 3-month rolling cycle and mature or expire at the **end** of the following delivery months: **March, June, September** and **December**

Which month contract to select?

- It is normal to buy or sell the contract that is next to expiry after the actual lending or borrowing is required.
- For example assuming today is 15th December and a company needed to borrow or lend money in three months time for a period of 6 months. **Since actual transaction date is 15th March select March contracts**

Interest rate futures

Pricing of futures

- The futures price represents $(100-r)\%$, where r = the expected interest rate or interbank rate on the contract expiry date.
- For example a price of short-term futures quoted at 93.40 indicates expected interest rate on maturity is 6.6%). I.e. $100 - 6.6 = 93.40$

Contract size - standardised in currencies.

- For example Pound sterling contracts is £500,000 per contract

Interest rate futures

Tick size

A tick represents the smallest movement in future prices. For example
 $(95.00 - 95.01) = 0.01\% = 0.0001 = 1 \text{ tick}$. I.e. $1.25\% = 125 \text{ ticks}$

Tick value = Tick size(0.01%) x contract size x 3/12 (contract duration)

Interest rate futures

The Basis

The futures rate (as implied by the future price) and the cash market rate are normally different and this difference is called the basis

The basis risk

This is the risk that between now and the expiry of the contract the futures rate will not move exactly by the same amount as the cash market rate

Interest rate futures

The Decision to **BUY** or **SELL** future contracts

- **Buying** a contract is equivalent to making a notional **deposit**
- **Selling** a Contract is equivalent to **borrowing** a notional sum
- Since the depositing/ borrowing is notional, **the initial position is reversed** before the actual depositing or borrowing starts.

	Lenders	Borrowers
Opening position	BUY futures	SELL futures
Closing position	SELL futures	BUY futures

Question: Interest rate futures

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The treasury team has also obtained the following information about exchange traded Dinar (D) futures:

Three-month D futures, D500,000 contract size. Prices are quoted in basis points at 100 – annual % yield:

December 20X7: 94.84

March 20X8: 94.78

June 20X8: 94.66

Question: Interest rate futures

It can be assumed that futures and options contracts are settled at the end of each month. Basis can be assumed to diminish to zero at contract maturity at a constant rate, based on monthly time intervals. It can also be assumed that there is no basis risk and there are no margin requirements.

Required

Advise the company of the likely outcome if on 31 January 20X8 the central bank base rates increase by 1·1% or decrease by 0·6%.

Interest rate futures

Step 1 set up process

- (a) Decide whether to buy or sell futures
- (b) Which future contract to chose?: That which expires after actual borrowing or lending begins. (This becomes your opening future price)
- (c) Choose number of contracts: $\text{Amount involved} / \text{contract size} \times \text{Loan or deposit period in months} / \text{length of contract (3 months)}$
- (d) Calculate tick value = $\text{Tick size (0.01\%)} \times \text{contract size} \times 3/12$ (contract duration)

Interest rate futures

Step 2 estimate closing futures price

- To do this, you should be able to identify these three things; the current date, the transaction date (this is the date you will borrow or deposit the money) and then expiry date of your chosen future.
- Basis = Current interbank rate – opening futures price
- Basis is for period between now and maturity of contract. Basis should diminish to zero on contract maturity
- Closing future price = Expected Interbank rate at date of borrowing/lending +/- unexpired basis.

Interest rate futures

Step 3 hedge outcome

(a) Futures outcome

- Opening futures price: 95.40
- Closing futures price: 95.60
- Movement in price: $0.20\% = 20$ ticks
- Profit or loss on futures : $\text{Price movement in ticks} \times \text{Tick value} \times \text{Number of contracts}$

(b) Cash flow

- | | \$ |
|--------------------------------|--------------|
| • Actual interest/return | (X) |
| • Futures market profit/(loss) | <u>X/(X)</u> |
| Net payment | <u>(X)</u> |

Interest rate futures

Margins

This is essentially a deposit held by the exchange on behalf of futures traders as security against the trader defaulting upon their obligations. This is done by operating an margin and daily variation margin system.

The initial margin

- The clearing House requires that an initial margin is placed on deposit in a margin account when the futures position is opened. This is to act as security against possible default particularly on losses suffered from first day of trading
- The size of the margin depends on the futures market, the level of volatility of the interest rates and the risk of default.

Interest rate futures

The daily variation margin

- The future price is marked to the market on a daily basis the close of each trading day, the clearing to use calculates the profit/loss on the futures position and added to the margin account. The margin account balance is usually maintained at the initial margin.
- Therefore if a loss is made on the first day of trading the losing party must place the funds in the margin account the following morning to cover the loss.
- Failing to do this will cause a default and the contract is close do. Similarly, a profit is added to the margin account balance and may be withdrawn the next day.

Interest rate futures

The daily variation margin

Interest rate futures

Advantages of interest rate futures

- Relatively low cost compared to options
- Flexible dates – for example a March future can be used on any date until the end of March
- Lower credit risk because exchange-traded

Interest rate futures

Disadvantages of interest rate futures

- Only available in large contract sizes
- Basis may not diminish at a constant or linear fashion over time (basis risk)
- Margin needs to be topped up on a daily basis to cover expected losses

Exchange traded options on futures

Exchange-traded interest rate option:

- An agreement with an exchange to pay or receive interest at a pre-determined rate on a standard notional amount over a fixed standard period (usually three months) in the future
- Exchange traded options are agreements on an interest rate for standardised amounts (£500,000).
- They do not have to be exercised (you can't make a loss on an option)
- But they require a premium to be paid regardless.

Exchange traded options on futures

Types of option contracts:

Call option:

- This is an option to **receive interest** at a pre-determined rate on a standard notional amount over a fixed period in the future.
- Therefore to hedge **Lending**, purchase **call** options (gives holder right to **buy** futures at the selected strike (exercise price))

Put option:

- This is an option to pay interest at a pre-determined rate on a standard notional amount over a fixed period in the future.
- Therefore to hedge **Borrowing**, purchase **put** options (gives holder right to **sell** futures at the selected strike (exercise price))

Exchange traded options on futures

Options on three-month D futures, D500,000 contract size, option premiums are in annual %

Calls			Strike price	Put		
December	March	June		December	March	June
0·417	0·545	0·678	94·25	0·071	0·094	0·155
0·078	0·098	0·160	95·25	0·393	0·529	0·664

It can be assumed that futures and options contracts are settled at the end of each month. Basis can be assumed to diminish to zero at contract maturity at a constant rate, based on monthly time intervals. It can also be assumed that there is no basis risk and there are no margin requirements.

- **Strike (exercise) price** is price agreed or paid for futures contract
- Numbers under each of the months represent premium paid for options

Question: Interest rate options

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Exchange traded options on futures

Set up process

- **Decide** whether put or call option is required
- **Choose** contract date

For each strike price:

- **Calculate** how many contracts are required (same as futures)
- **Calculate premium:** No of contracts \times (Premium $\times 100$) \times Tick value

Exchange traded options on futures

Estimate closing future rate

- Same as futures

Hedge outcome

- **Outcome in options market** will involve comparison of interest rates and decide on whether to exercise or not

Futures outcome

- Strike price : 95.40
- Closing futures price: 95.60
- Exercise? Yes : 0.20% (assumed lending-worth exercising)
- Profit on options : Tick movement (20 ticks) × Tick value × Number of contracts

Exchange traded options

- **Cash flow** \$
 - Actual interest/return (X)/X
 - Premium (X)
 - Profit on options (if exercised) X
 - Net payment X

Exchange traded options

Advantages

- Flexible dates
- Allow a company to take advantage of favourable movements in interest rates
- Useful for uncertain transactions, can be sold if not needed

Exchange traded options

Disadvantages

- Only available in large contract sizes
- Expensive as margins may be required to be paid upfront
- Maturity may be limited to one year

Over-the-counter options

- Options are also available directly from a bank
- These are tailored to the precise loan size and timing required by a company
- They will be more expensive and cannot be sold on if not needed
- Like exchange traded options caps, floors and collars are available