

Interest Rate Risk Management

Interest Rate Risk

Perception about IR Risk

Borrower

Lender

Borrowing & Lending Categories:

1. Market & Non Marketable
2. Fixed & Floating

More focus about marketable debts

Short term & long term

Relationship between MV of Bonds & Interest Rate

Interest Rate Risk Exposure:

Gap exposure

The interest rate gap measures a firm's exposure to interest rate risk. The gap is the distance between assets and liabilities. The most commonly seen examples of an interest rate gap are in the banking industry. A bank borrows funds at one rate and loans the money out at a higher rate. The gap, or difference, between the two rates represents the bank's profit.

Gap exposure considers groups of interest-sensitive assets and liabilities with similar maturities and determines whether liabilities exceed assets (a negative gap) or assets exceed liabilities (a positive gap), in evaluating sensitivity to interest rate increases and decreases.

Basis Risk

Interest

Even if interest-sensitive assets and liabilities are matched, interest rate risk can arise if variable interest rates on assets and liabilities are determined on different bases (basis risk).

Forex

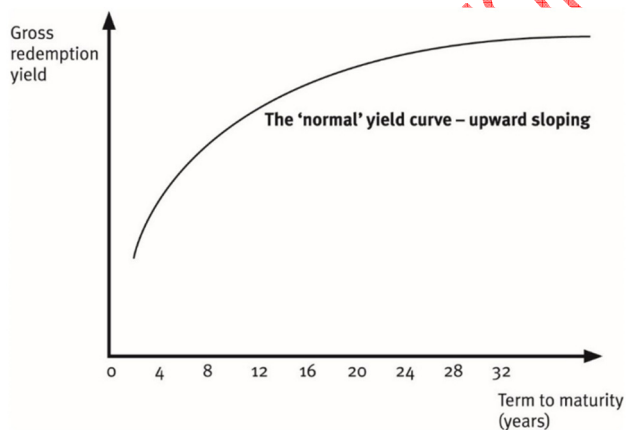
Basis risk is the possibility that movements in the currency futures price and the spot exchange rate will be different. It is one of the reasons for an imperfect currency futures hedge.

When there is a basis, there will not be a perfect hedge. This is known as basis risk.

Why Interest Rate Fluctuates?

Interest Rate Yield Curve:

The yield curve is an analysis of the relationship between the yields on debt with different periods to maturity.

Question Time:

Which of the following is shown by a yield curve?

- A. The relationship between liquidity and bond interest rates
- B. The relationship between time to maturity and the return to bond investors
- C. The relationship between risk and bond interest rates
- D. The relationship between bond interest rates and bond prices

The relationship between time to maturity and the return to bond investors, shown as the form of a yield (return in relation to the price paid).

A yield curve can have any shape, and can fluctuate up and down for different maturities.

There are three main types of yield curve shapes:

Normal yield curve = upward sloping:

- Yield is higher on instruments with a longer-remaining term to maturity.
- Longer maturity bonds have a higher yield compared with shorter-term bonds due to the risks associated with time
- The higher yield compensates the investor for tying up capital for a longer period.
- Although the yield curve slopes upwards, the gradient of the curve is not steep. A normal yield curve might be expected when interest rates are not expected to change or will rise gradually over time.

Inverted yield curve = downward sloping

- Yield is lower on instruments with a longer-remaining term to maturity.
- Shorter-term yields are higher than the longer term yields, which can be a sign of upcoming recession
- An inverse yield curve might be expected when interest rates are currently high but are expected to fall.
- Many analysts believe that this is indicative of an upcoming recession.

Question Time:

Which TWO predictions are normally associated with an inverted yield curve?

- A. An expected fall in interest rates
- B. An expected rise in interest rates
- C. A fall in inflation
- D. A downturn of the economy into a recession

A and D

The main reason for an inverted curve is when interest rates are high but expected to fall. Historically, yield curves often invert before a major turning point in the business cycle and an economy heads into recession. A good example is when the U.S. Treasury yield curve inverted in 2000 just before the U.S. equity markets collapsed.

Flat (or humped) yield curve – the shorter- and longer-term yields are very close to each other, which is also a predictor of an economic transition.

Steep upward-sloping curve. When interest rates are expected to rise, the yield curve is likely to have a steep upward slope, with yields on longer-term investments much higher than the yield on shorterdated investments. Yield curves are usually drawn for 'benchmark' investments that are either risk free (government securities) or low risk (such as yields on interest rate swaps). However, they are representative of the slope of the yield curve generally for all other financial instruments,

The shape of the yield curve at any point in time is the result of the three following theories acting together:

Liquidity preference theory Investors have a natural preference for more liquid (shorter maturity) investments. They will need to be compensated if they are deprived of cash for a longer period.

Investors have a natural preference for holding cash rather than other investments, even low-risk ones such as government securities. They therefore need to be compensated with a higher yield for being deprived of their cash for a longer period of time. The normal shape of the curve as being upwards sloping can be explained by liquidity preference theory.

Expectations theory .The normal upward sloping yield curve reflects the expectation that inflation levels, and therefore interest rates will increase in the future.

This theory states that the shape of the yield curve varies according to investors' expectations of future interest rates.

A curve that rises steeply from left to right (Increasing trend) indicates that rates of interest are expected to rise in the future. There is more demand for short-term securities than long-term securities since investors' expectation is that they will be able to secure higher interest rates in the future so there is no point in buying long-term assets now. The price of short-term assets will be bid up, the price of long-term assets will fall, so the yields on short-term and long-term assets will consequently fall and rise.

An inverted yield curve, since it represents the opposite of the usual situation implies that interest rates are expected to fall.

In the early 1990s, interest rates were high to counteract high inflation. Everybody expected interest rates to fall in the future, which they did. Expectations that interest rates would fall meant it was cheaper to borrow long-term (less attractive) than short-term (more attractive).

A flat yield curve indicates expectations that interest rates are not expected to change materially in the future.

Market segmentation theory .The market segmentation theory suggests that there are different players in the short-term end of the market and the long-term end of the market. The yield curve is therefore shaped according to the supply and demand of securities within each maturity length.

As a result of the market segmentation theory, the two ends of the curve may have different shapes, as they are influenced independently by different factors.

Investors are assumed to be risk averse and to invest in segments of the market that match their liability commitments, e.g. – banks tend to be active in the short-term end of the market – pension funds would tend to invest in long-term maturities to match the long-term nature of their liabilities.

The supply and demand forces in various segments of the market in part influence the shape of the yield curve.

Market segmentation theory explains the 'wobble' seen in the middle of the curve where the short end of the curve meets the long end – it is a natural disturbance where two different curves are joining and the influence of both the short-term factors and the long-term factors are weakest.

Question Time:

Which of the following would NOT be a possible explanation for the normal yield curve observed?

- A. Expectations theory
- B. Liquidity preference theory
- C. Market segmentation theory
- D. An expected rise in interest rates

C

Market segmentation theory helps explain any 'wiggle' on the yield curve rather than why it might be normal instead of inverted.

Question Time:

In relation to the yield curve, which of the following statements is correct?

- A. Expectations theory suggests that deferred consumption requires increased compensation as maturity increases
- B. An inverted yield curve can be caused by government action to increase its long-term borrowing
- C. A kink (discontinuity) in the normal yield curve can be due to differing yields in different market segments
- D. Basis risk can cause the corporate yield curve to rise more steeply than the government yield curve

C *A kink in the normal yield curve can be due to differing yields in different market segments.*

The significance of the yield curve

Financial managers should inspect the current shape of the yield curve when deciding on the term of borrowings or deposits, since the curve encapsulates the market's expectations of future movements in interest rates.

For example, a normal upward sloping yield curve suggests that interest rates will rise in the future. The manager may therefore:

- Wish to avoid borrowing long-term on variable rates, since the interest charge may increase considerably over the term of the loan
- Choose short-term variable rate borrowing or long-term fixed rate instead

Expectations of future interest rate movements are monitored closely by the financial markets, and are important for any organisation that intends to borrow heavily or invest heavily in interest-bearing instruments. A company might use a 'forward yield curve' to predict what interest rates might be in the future. For example, if we know the current interest rate on a two-month and a six-month investment, it is possible to work out what the market expects the four-month interest rate to be in two months' time.

Interest Rate Hedging:

Interest rate risk can be managed using

Internal Hedging:

- Asset and Liability Management
- Matching and
- Smoothing

External Hedging Instruments

- Forward Rate Agreements
- Interest Rate Guarantee
- Interest Rate Futures
- Interest Rate Futures Option
- Interest Rate Swaps

Internal hedging:

Asset and Liability Management = Match the duration of their assets and liabilities.

Asset and liability management aims to achieve similar durations for payments and earnings.

Fixed interest rates for payments or earnings may have different maturity time scales. For example, say a business has a 10 year mortgage on a building at a fixed rate of interest of 5% per year. It rents out the building for six years at a rate of 7% per year. This is fine for six years but then if rental yields fall to 4% per year, the business will start to lose money.

A safer option would have been to match the loan period to the rental period.

Matching = liabilities and assets with a common interest rate are matched.

For example, subsidiary A of a company might be investing in the money markets at LIBOR and subsidiary B is borrowing through the same market at LIBOR.

If LIBOR increases, subsidiary A's borrowing cost increases and subsidiary B's returns increase. The interest rates on the assets and liabilities are therefore matched.

This method is most widely used by financial institutions, such as banks, who find it easier to match the magnitudes and characteristics of their assets and liabilities than commercial or industrial companies.

Smoothing = where a company keeps a balance between its fixed rate and floating rate borrowing.

Some loans or deposits have fixed rates of interest and some have variable rates.

A rise in interest rates will make the variable rate loan more expensive but this will be compensated for by the less expensive fixed rate loan. However, the company may incur increased transaction and arrangement costs.

Major companies with large amounts of borrowing may try to maintain a balance between fixed rate and floating rate debt.

Forward rate agreements (FRAs) = Hedge risk by fixing the interest rate on future short-term borrowing.

- Lock the company into the effective interest rate
- Hedge both adverse and favourable interest rate movements.

Legal binding contract

OTC

Example

Lynn plc is a UK listed company. It is 30 June. Lynn will need a £10m six-month fixed rate loan from 1 October. Lynn wants to hedge its exposure to the risk of a rise in the six-month interest rate between the end of June and 1 October, using an FRA. The relevant FRA rate is 6% on 30 June and the reference rate for the FRA is the six-month LIBOR rate. The current six-month FRA rate is 6.25%.

1. State what FRA is required.
2. What is the result of the FRA and the effective loan rate if the spot six-month LIBOR rate (the benchmark or reference rate for the FRA) is:
 - A. 5%
 - B. 9%

Interest rate guarantees (IRGs) = Option on an FRA.

It allows the company a period of time during which it has the option to take on an FRA at a set price. IRGs, like all options, protect the company from adverse movements and allow it to take advantage of favourable movements.

Decision Rule:

- Adverse Movement = Exercise the option
- Favorable Movement = Lapse the option

Need to pay upfront premium = IRGs are more expensive than the FRAs

Interest rate futures

Interest rate futures offer a means of hedging against the risk of interest rate movements. Such contracts are effectively a gamble on whether interest rates will rise or fall.

Like forward contract

- Lock the company into the effective interest rate
- Hedge both adverse and favourable interest rate movements.
- Legal binding contract

MSC

IRF Rules

For a Borrowing, Sell futures now and buy them back on close out (BS)

For a Deposit, Buy futures now and sell them on close out (DB)

Basis risk

The gain or loss on the futures contracts may not exactly offset the cash effect of the change in interest rates, i.e. the hedge may be imperfect. This is known as basis risk.

The risk arises because the price of a futures contract may be different from the spot price on a given date, and this difference is the basis.

This is caused by market forces. The exception is on the expiry date of the futures contracts, when the basis is zero. The other main reason why a hedge may be imperfect is because the commodity being hedged (be it currency or interest) must be rounded to a whole number of contracts (you can't buy and sell part contracts), causing inaccuracies.

Interest Rate Future Options

Structure like IRG but MSC

Upfront premium

IRFO Rules

For a Borrowing, Sell futures now and buy them back on close out (BS)

Sell Now = Buy Call option (Higher Rate = Set CAP)

Rule:

IR Up = Adverse Movement = Exercise

IR down = Favorable movement = Lapse

For a Deposit, Buy futures now and sell them on close out (DB)

Buy Now = Buy Put Option (Lower Rate = Set Floor)

Rule:

IR down = Adverse movement = Exercise

IR Up = Favorable Movement = Lapse

Interest rate caps, floors and [collars](#)

Option contract (B/L)

Advantage: Lapse in case of adverse movement

Disadvantage: Premium Payment

COLLARS = MAKING COLLARS FOR SAVINGS OF PREMIUM COST

Borrowing

Lending

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Interest Rate Swaps = is an agreement where two parties agree to exchange interest rate payments.

Interest rate swaps can act as a means of **switching** from paying one type of interest to another, raising **less expensive loans** and **securing better deposit rates**.

A **fixed to floating rate currency swap** is a combination of a currency and interest rate swap.

Just for knowledge

In the simplest form of interest rate swap, party A agrees to pay the interest on party B's loan, while party B reciprocates by paying the interest on A's loan.

If the swap is to make sense, **the two parties must swap interest which has different characteristics**. Assuming that the interest swapped is in the same currency, the most common motivation for the swap is to switch from paying floating rate interest to fixed interest or *vice versa*.

This type of swap is known as a '**plain vanilla**' or **generic** swap.

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QB:INTEREST RATE RISK MANAGEMENT**Q1**

Which of the following statements about interest rate risk hedging are correct or incorrect?

1. An interest rate floor can be used to hedge an expected increase in interest rates.
2. The cost of an interest rate floor is higher than the cost of an interest rate collar.
3. The premium on an interest rate option is payable when it is exercised.
4. The standardised nature of interest rate futures means that over- and under-hedging can be avoided.

Incorrect, Correct, Incorrect, Incorrect

Q2

Which of the following statements are correct?

1. The general level of interest rates is affected by investors' desire for a real return
2. Market segmentation theory can explain kinks (discontinuities) in the yield curve
3. When interest rates are expected to fall, the yield curve could be sloping downwards

- a) 1 and 2 only
- b) 1 and 3 only
- c) 2 and 3 only
- d) 1, 2 and 3

CORRECT ANSWER IN D

Q3

Which of the following statements are correct?

- (1) Interest rate options allow the buyer to take advantage of favourable interest rate movements
- (2) A forward rate agreement does not allow a borrower to benefit from a decrease in interest rates
- (3) Borrowers hedging against an interest rate increase will buy interest rate futures now and sell them at a future date

- a) 1 and 2 only
- b) 1 and 3 only
- c) 2 and 3 only
- d) 1, 2 and 3

CORRECT ANSWER IN A

Q4**FOUR WAY EQUIVALENCE THEORY**

Country X uses the dollar as its currency and country Y uses the dinar. Country X's expected inflation rate is 5% per year, compared to 2% per year in country Y. Country Y's nominal interest rate is 4% per year and the current spot exchange rate between the two countries is 1.5000 dinar per \$1.

According to the four-way equivalence model, which of the following statements is/are true or false?

1. Country X's nominal interest rate should be 7.06% per year
2. The future (expected) spot rate after one year should be 1.4571 dinar per \$1
3. Country X's real interest rate should be higher than that of country Y

1ST & 2ND Statements are TRUE.

1. $(1.04 \times 1.05/1.02) - 1 = 7.06\%$
2. $1.5 \text{ dinar} \times 1.02/1.05 = 1.4571 \text{ dinar}/\$$
3. Real rates should be the same

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