
ISMA CENTRE - THE BUSINESS SCHOOL
OF THE FINANCIAL MARKETS

UNIVERSITY OF READING
ENGLAND


# IFID Certificate Programme

## Rates Trading and Hedging

*Outright and Spread Trading*

# Table of contents



# 1. Overview

This module deals with the rationale behind some commonly-used fixed income cash trading strategies and how these are constructed:

- **Outright** or **market directional** strategies
- **Spread trades**
- **Butterflies** or **barbells**

Spreads and butterflies/barbells are types of relative value plays that aim to profit from changes in the relative prices (or yields) on different bonds, rather than from changes in their absolute prices. This involves going simultaneously long and short in different securities.

Unlike traditional investment funds, which are typically not allowed to short securities, hedge funds typically implement such relative value trades, which often have higher profit potential (for the amount of risk taken) than outright positions.

In this module we illustrate these trading strategies using cash bonds, but the same strategies can also be implemented using derivatives, as we shall explore in later modules.

**Learning Objectives**

By the end of this module, you will be able to:

1. Explain the strategy of riding the yield curve and analyse the total return on a roll-down, in terms of:
   - Accrued interest
   - Capital gain
2. Explain what is meant by outright market risk and yield curve pivot risk
3. Construct the following positions using government bonds:
   - Risk-weighted yield curve spread, switch or swap
   - Risk-weighted barbell or butterfly spread
4. Hedge the market risk on a corporate bond position using treasury bonds and identify the residual risks associated with such a hedged position
5. Calculate the net carry and forward breakeven on a position in fixed income securities
6. Calculate the breakeven spread on a yield curve spread position

# 2. Outright Strategies

## 2.1. Bull & Bear Positions

The shape and slope of the yield curve gives traders important information about market sentiment. In this section we focus on the basic **outright** (or **market directional**) cash market yield curve strategies and in the next section on **relative value** (or **spread trading**) strategies. In the final section, *Carry and Breakeven*, we examine their funding implications.

### Scenario 1 – Bull Position

**Situation:**
The inflation threat is receding and the authorities are expected to begin easing monetary conditions, so you anticipate the curve will shift down.

**Strategy:** go long the curve; buy duration

- Switch out of cash and into long-dated bonds
- Buy bond futures (see module Bond Futures)
- Receive fixed on swaps (see module Interest Rate Swaps)

**Evolution:**
The curve may already be inverted and may invert further before it shifts down as investors position themselves at the long end of the curve, for maximum price gearing.

### Scenario 2 – Bear Position

**Situation:**
Inflation may be accelerating or the currency is weak. You expect interest rates to rise, especially at the long end.

**Strategy:** go short the curve; short duration

- Switch out of bonds and into cash
- Sell bond futures
- Pay fixed on a swap

**Evolution:**
The curve may already be positive and may steepen further before it shifts up, as investors leave the long end for the relative safety of the short end.

## 2.2. Riding the Curve

### Scenario 3 – Steady Market

**Market yields (Semi-annual, Actual/Actual):**

| | |
|---|---|
| 6 MTHS | 5.75 - 5.70 |
| 12 MTHS | 6.05 - 6.00 |

**Situation:**
Rates are expected to remain on hold and the curve is mildly positive. You wish to place $1 million for 6 months (183 days).

**Strategy:**
**Roll down the curve** (or **ride the curve**): buy the 12 month paper and resell it after 6 months.

**Analysis:**
The horizon return on this strategy should exceed the yield on the 6 or the 12 month paper. Assuming the curve remains static, then after 6 months we should be able to sell the securities, at which point they only have 6 months to maturity so they should yield 5.75% bid. Using the formula developed in section *Horizon Return*:

$$\text{Horizon return} = \left[ \left\{ \frac{\text{Horizon cash flow}}{\text{Cash dirty price}} \right\}^{1/(a+m+b)} - 1 \right] \times t$$

Where:
t = Number of coupon payments per year; in this case 2
m = Number of complete coupon periods to horizon date; in this case 1
a = (1 - Current fractional coupon period); in this case 0
b = Fractional coupon period at horizon date; in this case 0

We shall assume for simplicity that the bond is bought at par, so the cash flow at spot settlement is $1 million.

Horizon cash flow = Dirty price of bond at @5.75% yield
= Current coupon + PV of final cash flow

$$= 60{,}000/2 + \frac{1{,}000{,}000 \times (1 + 0.06/2)}{(1 + 0.0575/2)}$$

= $1,031,215.07

Horizon return = [ (1,031,215.07 / 1,000,000) - 1 ] x 2
= **0.0624 or 6.24%**

We achieved a return which is higher than the original yield on the security because we were able to resell it for a lower yield. You can think of this return as consisting of two elements:

Gross profit = Yield on underlying bond (6.00%)
+ Capital gain (0.24%)

This is a gross profit because we have not yet considered the cost of funding the strategy.

**Fixed income investors and traders pay attention to the roll-down returns of the bonds they carry.**

They monitor whether other bonds with better roll-down returns could be considered when implementing strategies like the ones we looked at here, or indeed covered in the next section.

# 3. Spread Trading

## 3.1. Yield Curve Spreads

Settlement date: 14 October 2002

**Situation**
We observe the following:

- The 8½% German government bond (Bund) maturing 8 Sep 2004 yields 4.65%
- The 6% maturing 3 April 2006 yields 4.70%

The 5 basis point yield spread between 2 and 4 years appears to be too narrow. We expect the yield curve to steepen (i.e. pivot anticlockwise) and the spread between the two bonds to widen. That is, we expect the yield of the 2006 to rise relative to the yield on the 2004.

We want to profit from an expected widening of the yield spread between these two bonds, but we don't want to take an outright market exposure: risking a loss if the entire yield curve were to shift up or down.

**Analysis**
The technique is to create a **risk-weighted spread** position:

- Buy the 8½% of 2004
- Short-sell the 6% of 2006

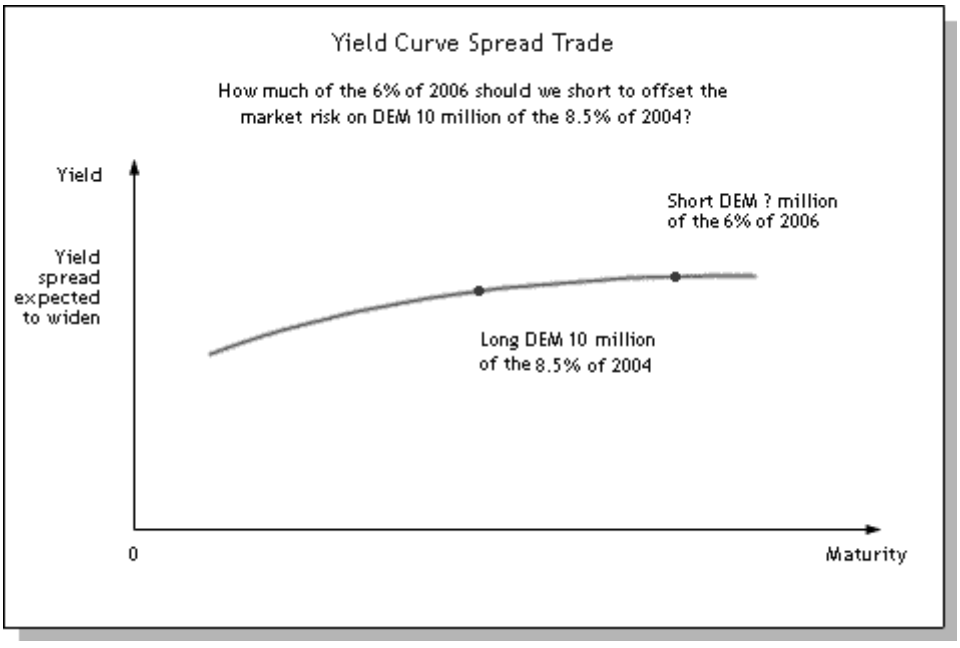
The amounts of the 2004 and the 2006 bonds traded should be such that:

1. The position has zero net market risk: parallel shifts in the yield curve have no net effect on the position's net profit/loss (losses on one bond should be exactly offset by profits on the other)

2. Only a change in the yield spread between the two bonds will make a profit/loss impact:

    - A steepening of the curve would increase the yield on the 2006 shorted relative to that on the 2004 bought, which would be profitable

    - A flattening of the curve would do the opposite and be unprofitable



# 3.2. The Solution

? How many of the 2006 bond should we short if we were to buy EUR 10 million of the 2004?

The solution involves a comparison of the BPV on each bond:

BPV of 8½% of 2004 ($BPV_{2004}$) = EUR 0.01877
BPV of 6% of 2006 ($BPV_{2006}$) = EUR 0.03227

The price of the 2004 changes by 1.88 cents, per EUR 100, for every basis point change in yield. The 2006 changes by 3.23 cents, so it is riskier and therefore we need less than EUR 10 million on this bond to offset the market risk on the 2004.

| | |
|---|---|
| Total risk-weight[1] on the 2004s bought | = Total risk-weight on the 2006s shorted |
| $BPV_{2004}$ / 100 x Nominal amount of 2004 | = $BPV_{2006}$ / 100 x Nominal amount of 2006 |
| $BPV_{2004}$ x Nominal amount of 2004 | = $BPV_{2006}$ x Nominal amount of 2006 |
| 0.01877 x 10,000,000 | = 0.03227 x Nominal amount of the 2006 |

Therefore, nominal amount of the 2006s to be shorted:

$$= \frac{0.01877}{0.03227} \times 10{,}000{,}000$$

= EUR 6,057,079[2]

**Yield curve pivot risk**: the risk of loss as a result of a steepening or a flattening of the yield curve.

Also known as: **Turning point risk**.

In the *Exercise* to this module you will construct your own yield curve spread trade and you will also learn how to construct a more sophisticated type of relative value play that is both market risk-neutral and pivot risk-neutral: the so-called **barbell**.

[1] **Risk weight = BPV of bond (per EUR 1 nominal) x Nominal amount**

Risk weight is the total mark to market profit or loss on a position for a given change in the bond's yield. In this example:

Risk weight on the 2004 bond position = 0.01877 / 100 x 10,000,000
= EUR **1,877**

In other words, the EUR 10 million position on this bond gives a profit/loss of EUR 1,877 for every basis point change in the bond's yield.

Notice that since the bond's BPV is per EUR 100 nominal, we have to divide it by 100 first, to convert it into a BPV per EUR 1 nominal, before multiplying it by the nominal amount actually traded.

[2] In practice we may only be able to trade a nominal amount rounded to the nearest EUR 50,000 - 100,000, although most market makers nowadays are well-used to trading odd amounts with their hedge fund clients.

## Spread Trading Vs Bond Switching

In the example above, we looked at a strategy for a trader wanting to profit from an anticipated change in the relative yield between two bonds.

Exactly the same calculation would be used by a traditional fund manager who would like to **switch** (or **swap**) out of her investment on the 6% of 2006 and into the 8½% of 2004, which she believes will perform better, while maintaining the same overall market risk on her portfolio:

**For every EUR 6 million of the 2006s that the fund manager liquidates, she needs to buy some EUR 10 million of the 2004s.**

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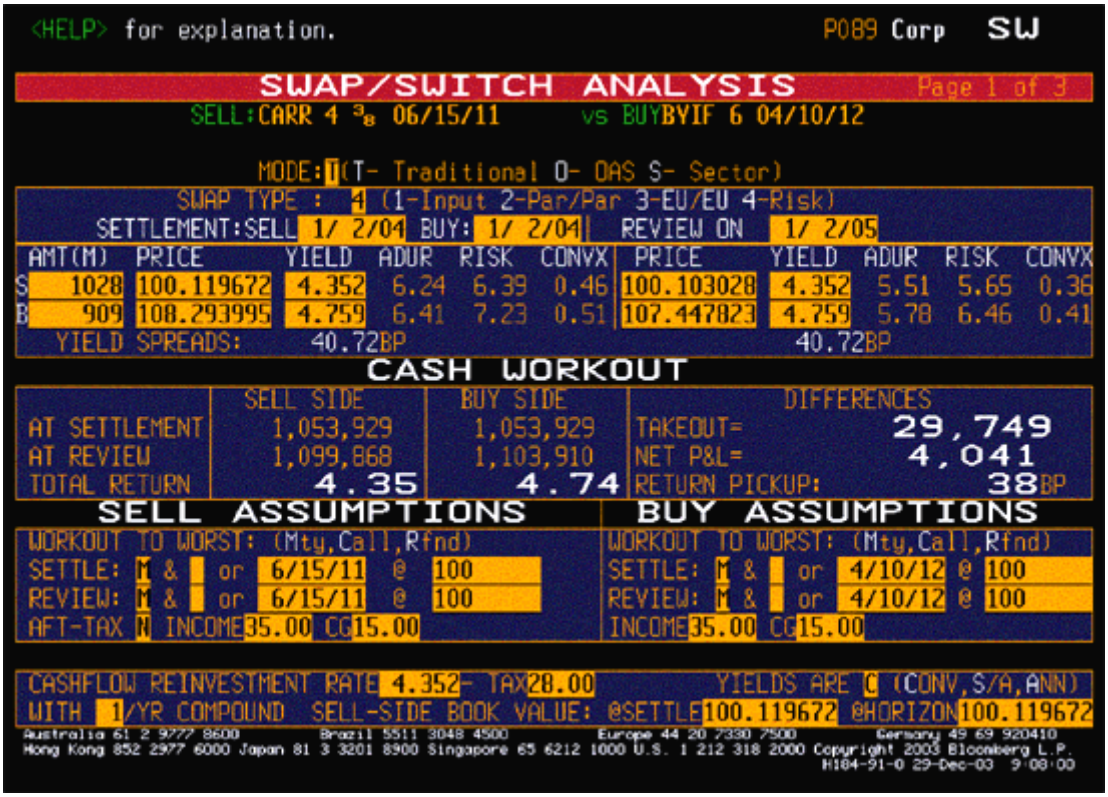
### Analytic systems

Examples of Bloomberg and Reuters bond spread/switch trading analysis functions

Below are sample screens from two widely-used providers of market information and analytics. **These examples are for illustration purposes only and do not form part of the IFID Certificate syllabus.**

### Bloomberg swap/switch analysis



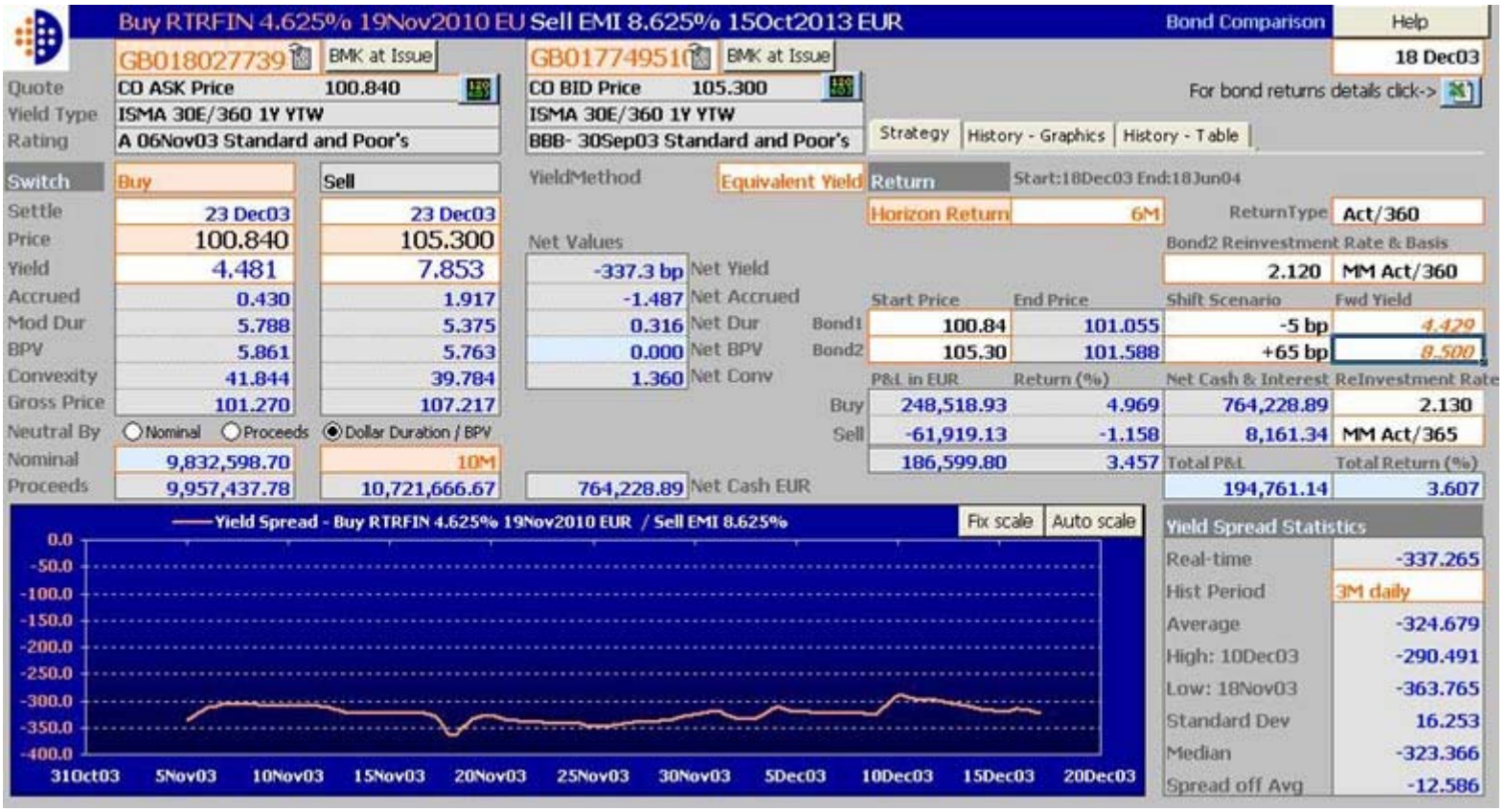

### Notes

- The top panel calculates how much of one bond you need to sell if you want to go long a given amount of another bond. You can specify whether you want the switch to be on the basis of equal par amounts, a cashflow-neutral basis or a market risk neutral basis (in this example we chose market neutral)

- The middle part of the screen shows you the horizon return that you would make on the buy and on the sell sides of the spread trade (given the horizon yield scenario that you specify on an adjacent page and your assumed net cashflow funding/reinvestment rate) and therefore your expected net profit/loss on this trade.

- In this example, we are analysing a spread trade which involves selling the 4.375% Carrefour bond of June 2011 and buying the 6.00% Bayer AG bond of February 2012.
    - The top panel calculates how much of the Carrefour bonds that you need to sell if you are (want to go) long the Bayer bonds. You can specify whether you want the switch to be on the basis of equal par amounts, a cashflow-neutral basis or a market risk neutral basis (in this example we chose market neutral)
    - The lower part of the screen shows you the horizon return that you would make on the buy and on the sell sides of the spread trade given a one-year horizon and therefore your expected net profit/loss on this trade.

**Reuters bond comparison function**




**Notes**

- This screen calculates how much of the bonds that you want to sell you need to sell if you are long a given amount of another bond (or vice versa). You can specify whether you want the switch to be on the basis of equal nominal amounts, a cashflow-neutral basis or a market risk neutral basis (in this example we chose market neutral – i.e. dollar duration/BPV neutral)
- The right part of the screen shows the horizon return that you would make on the buy and on the sell sides of this spread trade (given the horizon yield scenario that you specify and your assumed net cashflow funding/reinvestment rate) and therefore your expected net profit/loss on the spread trade (in cash and as an annualised percentage of capital invested on the bond that you bought).
- The chart at the bottom of the screen shows the historic evolution of the yield spread between the two selected bonds, and of course the strategy relies on the yield spread between the two bonds to increase by more than the net cost of carrying the position

## 3.3. Credit Spreads

The technique of risk-weighting is also used when designing a credit spread trade, for example:

- Short a corporate bond whose credit rating you expect to weaken
- Buy a government bond with comparable maturity to hedge the outright market risk

The net position should make a profit if the yield spread of the corporate bond widens over the yield on the government bond. Again, the amounts dealt should be BPV-weighted so that there is no net profit/loss if both the government and the corporate yield curves were to shift up or down together.

In the *Exercise* to this module you will have a chance construct a similar credit spread position - long a corporate bond and short a government bond - not in order to trade the credit spread but simply to hedge the market risk on the corporate bond.

# 4. Carry & Breakeven

Net Carry = Accrued interest - Funding cost

Positive carry: Accrued interest > Funding cost
Negative carry: Accrued interest < Funding cost

Trading positions seldom pay off immediately. They may have to be carried for days, weeks or even months. In this section we consider funding costs and we highlight some of the funding risks.

## 4.1. Scenario 1 –Positive Curve

A positive curve allows you to fund a trading book more cheaply by borrowing on a short term basis at lower rates. The positive carry builds up a useful cushion of profit, but the funding may have to be rolled over perhaps many times before the position is unwound. If funding rates rise the cost of carry may negate any trading profits.

### Example

Market yields:
O/N repo 5.70 - 5.65 (annual, Actl/360)
12 MTHS 6.05 - 6.00 (semi annual, Actl/Actl)

**Strategy:**
Expecting a stable market, we buy 12 month paper at 6.00% and fund it for 6 months (182 days) in the overnight repo market at 5.70%.

**Analysis:**
Over the 6 months we make a net 30 basis points (bps) profit on the carry. This raises the forward breakeven rate on the position.

**Forward breakeven**: the price (or yield) at which you need to unwind a position in order to cover net carry costs.

A seat-of-the pants calculation of the forward breakeven yield is:

Net carry = Current yield - Funding rate
= 6.00 - 5.70
= 0.30%

Breakeven yield = Cash yield + Net carry
= 6.00 + 0.30
= **6.30%**

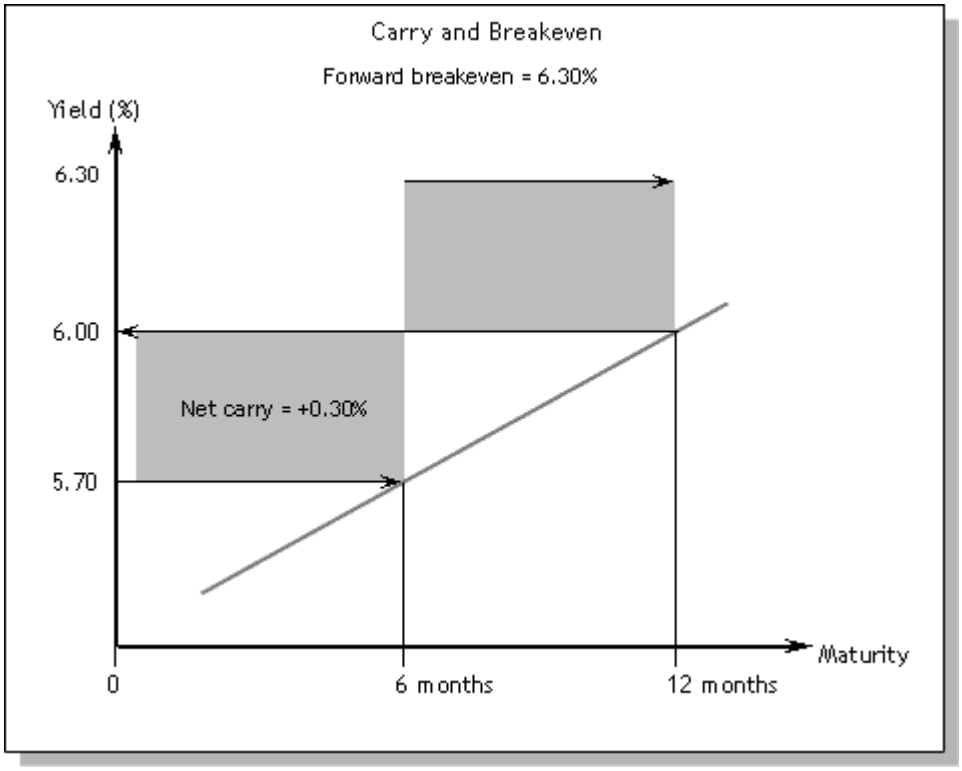
 

To make a profit we need to sell the **tail** of the bond position in 6 months for a yield of less than 6.30%. We have in fact created a synthetic futures position in the bond, at a yield of 6.30%. In effect, we are betting on the future yield on the bond being lower than its implied forward yield.

**In a positive yield curve:**

- **Being long the curve requires the view that yields will not rise by more than the forward rates**
- **Being short the curve requires the view that yields will rise by more than the forward rates**

The figure below highlights the risks involved from a funding perspective. The funding rate after 6 months has not yet been fixed: if the rate rises beyond the breakeven then we shall lose money overall.




# 4.2. Compounding Effect

The seat-of-the-pants calculation above does not allow for the different compounding or day-count conventions that may apply in the bond and the repo markets. The bond is funded with a series of overnight repos, so interest compounds daily and this will reduce the net carry benefit. As we show in Bond Futures - Pricing, the breakeven forward clean price (FP) is calculated from the clean price for cash or spot settlement (SP) as follows:

**FP + Forward accrued = SP + Spot accrued + Funding cost**

Assuming for simplicity here that the bond was purchased at par with no accrued interest and that the position can be rolled over in the overnight repo market at a constant rate of 5.70%:

FP + Forward accrued = SP + Funding cost

FP + 6.00/2 = $100 \times (1 + 0.057 / 360)^{182}$

FP = 102.92 – 3.0
= **99.92**

Now we can calculate the implied yield on this forward price. On the forward date, the bond pays a coupon, so on that date its forward dirty price = its forward clean price:

$$\text{Forward price} = \frac{\text{Maturity value}}{(1 + \text{Yield}/2)}$$

$$99.92 = \frac{103.00}{(1 + \text{Yield}/2)}$$

Yield = 0.0617 or **6.17%**

Having allowed for the different day-count conventions and compounding speeds, we discover that the net carry on this position is in fact less favourable than what we had estimated earlier: the bond's forward breakeven yield is only 17 basis points higher than its cash yield, not 30 basis points.

### Breakeven on a Yield Spread

Once you know how to calculate the forward breakeven price and yield on a single bond, calculating the forward breakeven spread on a spread trading position is simply more of the same:

1. Calculate the forward breakeven yield on each of the bonds in the position
2. Subtract one forward breakeven yield from the other[3]

## 4.3. Scenario 2 –Inverted Curve

Calculating the net carry and breakeven on a bond position in an inverted yield curve environment is exactly the same as above; the only differences are the implications.

Carrying a bull position in an inverted yield curve can become prohibitively expensive, because:

- The compounding effect is against you
- The carry is negative

An inverted yield curve indicates that the market believes that rates will come down from their current levels. But if yields on the bond held fail to fall far enough (or quickly enough) we could end up in a situation where the capital gain that is eventually made on the bond is not enough to cover the funding costs actually incurred.

On the other hand, if we are short a bond in an inverted curve, then both the carry and the compounding effect would work in our favour and we could end up making more on the carry than we lose on the bond[4].

[3] Calculating the forward breakeven on a butterfly is a little bit harder because its yield spread is the difference between the yield of its body and some weighted average of the yields of its wings.

The temptation here is to weight the yield of each wing by its market value relative to that of the body, but it is found that weighting it by its risk weight relative to that of the body gives a better approximation of the internal rate of return of all the cash flows of the wings.

A proof of this statement and calculating the forward breakeven on a butterfly spread are both outside the scope of the IFID Certificate syllabus.

**In an inverted yield curve:**

- **Being long the curve requires the view that interest rates will fall by more than the breakeven**
- **Being short the curve requires the view that interest rates will *not* fall by more than the breakeven**

# 5. Exercise

## 5.1. Question 1

Question 1

**Settlement date**: 15 March 2004

As the business climate in the UK continues to improve, you feel uncertain about the general direction of UK rates in the coming weeks, as it is uncertain how soon the Bank of England will start to reverse the easy-rates policy that it has followed in the past couple of years.

However, you believe that the UK bond market will start to discount slightly higher inflation in the near term, so the UK Gilts (government bonds) curve is likely to steepen.

You want to profit from your market view by entering into a market-neutral yield curve steepener spread position using the following bonds:

- 7½% of 7 December 2006 @ 107.34
- 5¾% of 7 December 2009 @ 104.21

a) Which one of these bonds should you buy and which one should you short-sell in order to set up your strategy?

- ☐ Go long both bonds
- ☐ Long the 2006 and short the 2009
- ☐ Short both bonds
- ☐ Short the 2006 and long the 2009

[4] In this case, there is an additional risk that we shall explore in more detail in module Repurchase Agreements: the securities shorted may go **on special** in the repo market and the repo rate on them may fall below the level required in order to breakeven.

b) **Coupon interest on UK Gilts is calculated on a semi-annual, Act/Act basis.**

Using a financial calculator or the bond pricing spreadsheet, calculate the yield and the risk factor on each of these bonds (risk factor = 100 x BPV per 100 nominal). Enter your prices and yields in percentages, both rounded to 3 decimal places, and your risk factors rounded to 4 decimal places.

| | Clean Price | Dirty Price | Yield | Risk factor |
|---|---|---|---|---|
| 7½% of 7 December 2006 | 107.340 | | | |
| 5¾% of 7 December 2009 | 104.210 | | | |
| Yield spread (2009 – 2006) | | | | |

c) If you plan to trade GBP 50 million of the 2006s, how many of the 2009s should you trade against that in order to make your net position market neutral? Enter your answer in absolute size, to the nearest pound.

| | Nominal amount traded |
|---|---|
| 7½% of 7 December 2006 | 50,000,000 |
| 5¾% of 7 December 2009 | |

d) How much net cash will this trade require you to invest? Use the dirty prices calculated in (b), rounded to 3 decimal places, and enter your results rounded to the nearest £100 and including the sign of the cash flows.

| | Cash proceeds |
|---|---|
| 7½% of 7 December 2006 | |
| 5¾% of 7 December 2009 | |
| Net | |

e) How much money do you stand to make or lose on this trade for each basis point change in the yield spread between the two bonds?

- ☐ Nil, the position is market neutral
- ☐ GBP 1,327,000
- ☐ GBP 26,540
- ☐ GBP 13,270

# 5.2. Question 2

Question 2

**Settlement date**: 15 March 2004

Similar scenario as in *Question 1* except that you now feel uncertain both about the general direction of UK rates and whether the Gilts curve is likely to steepen or to flatten.

However, you take the view that the 'elbow' or 'belly' that is currently noticeable around the 4-5 year part of the curve is likely to become even more pronounced, as the market discounts higher inflation rates in the medium term.

In other words, you expect yields in the 2008 - 2009 part of the yield curve to rise relative to yields on other parts of the curve and you want to profit from this view by entering into the following **risk-neutral butterfly** (or **barbell**) position:

- Long the 7½% of 7 December 2006 @ 107.34 (the 'S bond')
- Short the 5¾% of 7 December 2009 @ 104.21 (the 'M bond')
- Long the 5% of 7 March 2012 @ 100.42 (the 'L bond')

The position should be built such that it makes a profit only if the yield on the M bond (the 'body' of the butterfly) rises relative to weighted average yield on the S and the L bonds (the two 'wings') but should be risk-neutral in every other respect. The exercise below will show you, step by step, how to construct such a strategy[5].

a) Using a financial calculator or the Excel model spreadsheet, calculate the yield and the risk factor on each of the 3 bonds involved. Enter your yields in percentages, rounded to 3 decimal places, and your risk factors rounded to 4 decimal places.

| | Clean price | Dirty Price | Yield | Risk factor |
|---|---|---|---|---|
| 7½% of 7 December 2006 | 107.34 | | | |
| 5¾% of 7 December 2009 | 104.21 | | | |
| 5% of 7 March 2012 | 100.42 | | | |

b) If you plan to short GBP 50 million of the 2009s (bond M), what would be the total risk weight of the body of this butterfly – i.e. the profit/loss on the GBP 50 million position for a 100 basis point change in yield?

**Total risk weight = $Q_m$ x $R_m$ / 100**

Where:
$Q_m$ = Nominal amount of bond M
$R_m$ = Risk factor on bond M, per 100 nominal

Enter your answer as an absolute amount, rounded to the nearest pound.

[5] Exactly the same strategy would be used by a traditional fund manager, who would like to switch out of the 5¾% of 2009 and into a combination of the 7½% of 2006 and the 5% of 2012, which she feels will perform better, while maintaining the same overall market risk on her portfolio.

c) If you plan to short £50 million of the 2009s, what nominal amount of the 2006s and the 2012s should you buy in order to make this trade:

- **Market risk-neutral**:
  With parallel shifts (up or down) of the yield curve, losses on the wings should be exactly offset by profits on the body and vice versa

- **Pivot risk-neutral**:
  With simple yield curve pivots, any net losses on one of the wings (and possibly also on the body) should be exactly offset by profits on the other wing – i.e. the total risk weight on each wing should be the same

Enter your answer in absolute amounts, rounded to the nearest £100.

**Hint**

In symbols:

- Market risk-neutral:

  $\mathbf{Q_m \times R_m = Q_s \times R_s + Q_l \times R_l}$

- Pivot risk-neutral:

  $\mathbf{Q_s \times R_s = Q_l \times R_l}$

  Where:
  $Q_i$ = Nominal amount of bond i (S, M or L)
  $R_i$ = Risk factor on 100 nominal of bond i

For pivot neutrality, each wing of the butterfly has to carry ½ of the total risk weight of the body. In symbols:

$Q_s \times R_s = Q_l \times R_l = ½ \times Q_m \times R_m$

and therefore:

$\mathbf{Q_s = ½ \times Q_m \times R_m / R_s}$

$\mathbf{Q_l = ½ \times Q_m \times R_m / R_l}$

| | **Nominal Amount** |
|---|---|
| 7½% of 7 December 2006 | |
| 5¾% of 7 December 2009 | -50,000,000 |
| 5% of 7 March 2012 | |

d) How much net cash will this trade require you to invest? Use the results calculated above and enter the amounts rounded to the nearest pound and including the sign of the cash flows.

| | **Cash proceeds** |
|---|---|
| 7½% of 7 December 2006 | |
| 5¾% of 7 December 2009 | |
| 5% of 7 March 2012 | |
| Net | |

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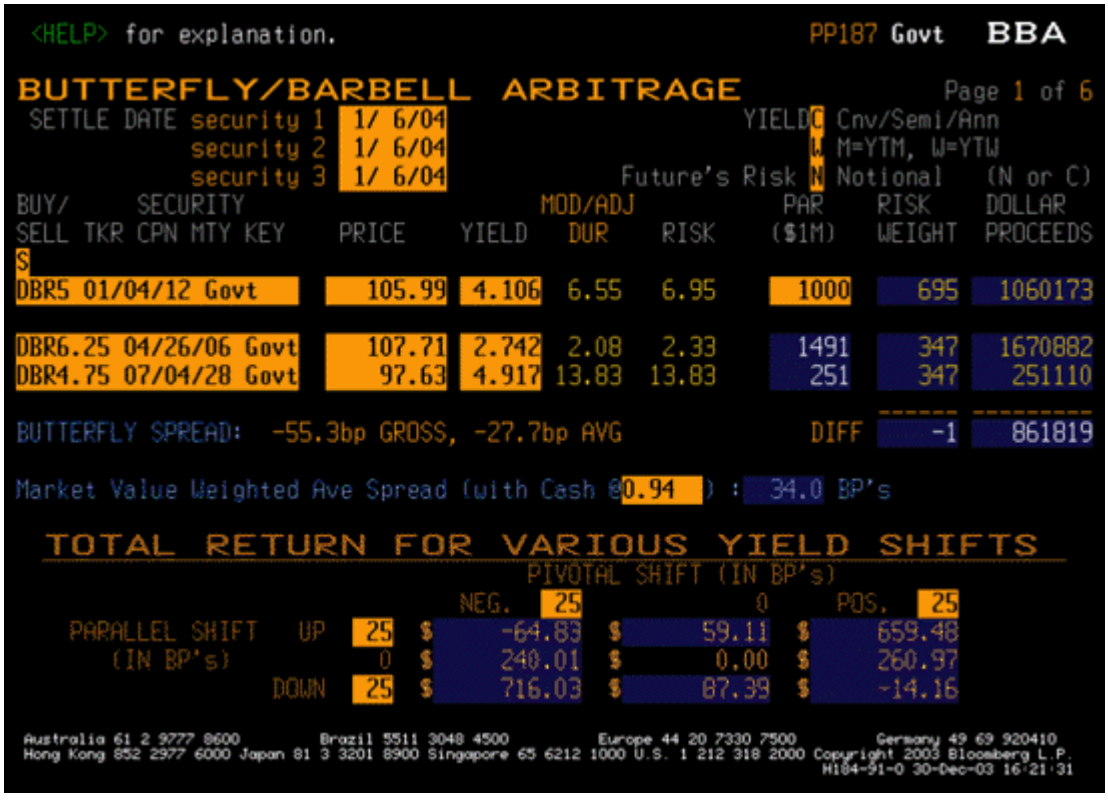
**Analytic systems**
Examples of Bloomberg and Reuters bond butterfly/barbell trading analysis functions

Below are sample screens from two widely-used providers of market information and analytics.

**These examples are for illustration purposes only and do not form part of the IFID Certificate syllabus.**

**Bloomberg butterfly/barbell arbitrage**




**Notes**

- This is a risk-neutral butterfly switch or spread. In the top half of the screen you specify the 2 bonds that you wish to buy (the 'wings' of the butterfly) in order to offset the market risk on the bond that you are selling (the 'body' of the butterfly). In the middle of the screen, the system calculates how much of each wing you need to buy so that:

  - Both wings together have an equal total **risk weight** as the body
  - Each wing has the same risk weight as the other one

- Since the wing with the short maturity has much lower duration than the other wing, notice how much more of the first one you need to buy in order to give the two wings the same risk weight

- In the bottom part of the screen, the trader can estimate the profit/loss impact of shifts and pivots on the yield curve. The net profits/losses from such market changes should be relatively small, since the strategy is designed to be shift and pivot neutral

- The weighted average statistics on the wings (its yield, modified duration, etc.) are calculated using the market values of the 2 wing bonds

- Notice that the strategy requires additional cash (shown in the *Proceeds* column) because the sale of the body does not generate enough cash to cover the cost of buying the wings. Function BBS on the Bloomberg system can structure for you a butterfly that requires no additional cash; however such a strategy will not be pivot neutral.

**Reuters barbell switch**


**Notes**

- This is a risk-neutral butterfly switch or spread. In the top half of the screen you specify the 2 bonds that you wish to buy (the 'wings' of the butterfly) in order to offset the market risk on the bond that you are selling (the 'body' of the butterfly). In the middle of the screen, the system calculates how much of each wing you need to buy so that:

  - Both wings together have an equal total **risk weight** as the body
  - Each wing has the same risk weight as the other one

- Since the wing with the short maturity has much lower duration than the other wing, notice how much more of the first one you need to buy in order to give the two wings the same risk weight

- The bottom-right panel allows the trader to estimate the profit/loss impact of shifts and pivots on the yield curve. The net profits/losses from such market changes should be relatively small, since the strategy is designed to be shift and pivot neutral

- The weighted average statistics on the wings (its yield, modified duration, etc.) are calculated using the market values of the 2 wing bonds. In this example there is a net loss of both yield and of convexity on the barbell, so the trader must believe that the weighted yield on the wings will continue to fall relative to that of the body (i.e. the trend on the chart will continue to be downward) in order to compensate for this loss in carry and in convexity

- Notice that the strategy requires additional cash (shown in the *Proceeds* column) because the sale of the body does not generate enough cash to cover the cost of buying the wings. If you select the *Duration and Cash Neutral* tab, the system can structure for you a butterfly that requires no additional cash; however such a strategy will not be pivot neutral.

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# 5.3. Question 3

Question 3

**Settlement date**: 15 March 2004

You work on the origination desk of a bank and today your bank has done a bought deal for GBP 500 million of Abbey National bonds with a coupon of 5.375% and maturity of 30 December 2009 at a clean price of 99.98 (Annual, E30/360).

a) You are planning to hedge the risk on this position using the 6¼% UK Gilt maturing on 25 November 2010, which is currently being offered at 107.48 (semi-annual, Act/Act). What is the nominal amount of this bond that you should short?

   Enter your answer as an absolute nominal amount, rounded to the nearest £100.

b) Having shorted the amount of 6¼% of 2010 calculated in the previous question, what residual risks does your position still have?

   - ☐ Market risk
   - ☐ Credit risk
   - ☐ Yield curve pivot risk
   - ☐ Funding risk