

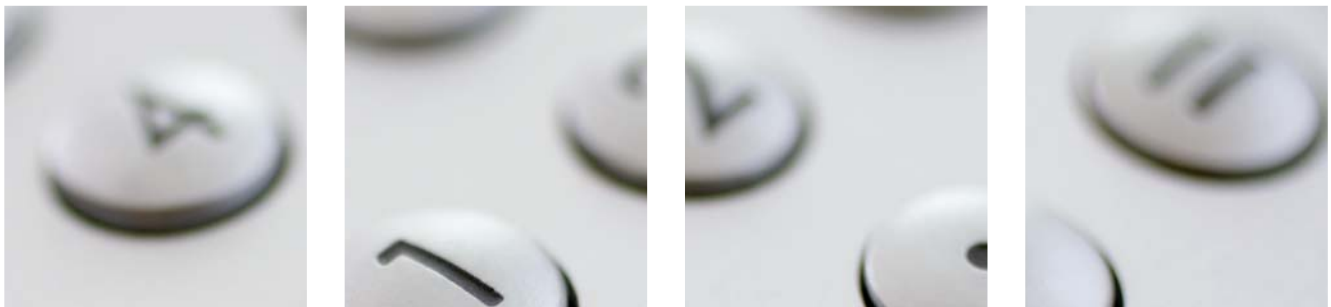
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Fixed interest library

Volume three: duration



This is the third issue in a series of papers that aims to demystify a number of fixed interest concepts. In this issue we will discuss the concept of 'duration'.

The term 'duration' is often used in reference to fixed interest portfolios. Duration has a number of uses which can sometimes lead to the belief that it is a complicated concept, but in reality it is surprisingly simple.

Understanding the concept of duration,

1. Is the key to understanding the factors affecting fixed interest portfolio performance.
2. Is one of the key drivers of portfolio performance relative to benchmark for most active fixed interest managers.
3. Provides a measure to assess whether the fund manager's portfolio strategy matches their stated view of the market.

Before we explore the concept of duration, lets recap the key components of a bond

- The coupon (interest) – paid half yearly reflecting the cost to the borrower of borrowing money from you.
- The principal – the repayment of the original sum that you lent the borrower.
- Term to maturity – the life of the bond, ie. 1 year, 3 years, 10 years etc.

These components are shown in the following diagram.

Components of a bond



What are the uses of duration?

- It is a measure of the risk being taken by the manager
- It is a tool for calculating the impact of a change in interest rates on the value of a portfolio.

The first use of duration is as a measure of risk.

Concept One: The longer you lend someone money, the greater the risk that the money may not be repaid.

Assume that you lend money to a borrower for one year (the term to maturity) and instead of receiving the coupons over the life of the bond, you receive them in one payment at the end of the year along with the principal.

The duration of that bond would be one year, reflecting the time to maturity.

Similarly for a three year bond that has no interest paid until the third year when the principal is repaid, the duration would be three years... and so on.

However in reality, as shown in the above diagram, coupons are paid during the life of the bond.

Building on Concept One, if any part of the funds are received earlier, ie. through coupons being paid during the life rather than at maturity, the level of risk must be regarded as being reduced.

A bond will therefore have a duration slightly less than its term to maturity.



Duration – less than term to maturity

If you think of the picture as a see saw, the point of duration reflects a point of equilibrium. If there are changes in the bond, eg. payments are made earlier, the equilibrium or duration will change.

What is true for one security, is true for a whole portfolio. You can simply add up the duration for each of the individual securities in a portfolio to get the duration for the portfolio as a whole. A simple example is as follows:

Assume a portfolio contains two securities that are equally weighted:

- 1 year bond (with interest paid at maturity), ie. duration = 1 year
- 10 year bond (with interest paid at maturity), ie. duration = 10 years

The duration is calculated by multiplying the individual security's duration by it's weighting in the portfolio. In this case each security is 50% of the portfolio.

Security	Duration of bond	% of portfolio	Calculation (duration x weighting)	Portfolio duration (years)
1 year bond	1 year	50%	1 year x 50%	0.5
10 year bond	10 year	50%	10 years x 50%	5.0
Total		100%		5.5

The above portfolio's duration is expressed as 5.5 years.

By knowing a portfolio's duration, you can compare the level of risk being taken by the fund manager's portfolio relative to the benchmark that you are measuring that fund manager against.

For example, say the benchmark UBSA Composite Bond Index currently has a duration of 3.5 years, and the XYZ Australian Fixed Interest Fund has a duration of 3.2 years. This reflects a shorter than benchmark duration of 0.3 years.

So what does this difference in duration relative to the benchmark tell us?

Concept 2: A portfolio's duration (relative to the benchmark) will reflect the fund manager's view on future interest rate changes.

If a portfolio manager believes interest rates are going up, they should have a duration number less than the benchmark, or to quote industry speak: hold a 'short position'. If they believe that interest rates are going down, they should have a duration number greater than the benchmark, ie. a 'long position'.

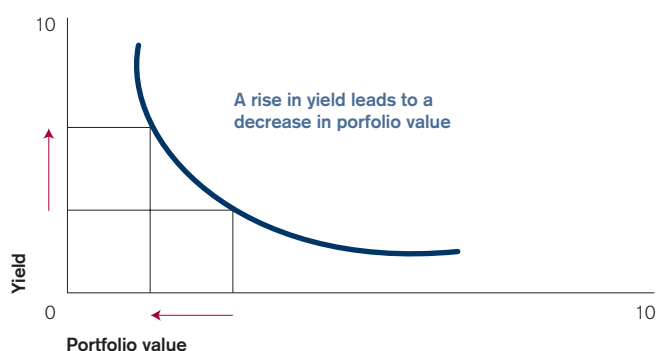
Following on from the example above, the shorter than benchmark duration of the XYZ Australian Fixed Interest Fund reflects a belief that interest rates will rise.

So next time a fund manager explains which way they think interest rates are going, you can check their duration numbers to see if they are true to their word!

In addition to measuring duration in a relative sense, the absolute value of duration can also be informative.

This brings us to the second use of duration, as a calculation tool.

Graphically the relationship between yield and portfolio value can be shown as follows:



The yield/portfolio value relationship

Duration can be used to estimate the dollar value impact on a portfolio for a 1% change in yields.

For example, based on the portfolio in our earlier example that had a duration of 5.5 years:

If interest rates were to rise by 1%, the portfolio will fall in value by 5.5%. Conversely if interest rates were to fall by 1%, the portfolio would rise in value by 5.5%.

If you play with the above rule of thumb, you will find that the size of the duration is directly proportional to the impact on the portfolio value. Clearly, the higher the duration, the larger the impact that a change in interest rates will have on the value of a portfolio.

The task for fund managers is to be able to correctly assess the direction, amount and timing of the movements in interest rates and determine the impact this will have on bonds. The sensible strategy for fund managers in a rising interest rate environment is to have a 'short position'. Conversely during periods of falling rates, a 'long position' is appropriate.

Generally fund managers will manage their portfolio duration within a band around the benchmark to avoid taking on too much risk, for example: ± 1 year. This is because duration is constantly fluctuating, essentially making the duration of the benchmark a 'moving target'. If we were to use a benchmark duration of 3.5 years as an example, with a band of ± 1 year, the portfolio should have a duration in the range of 2.5 to 4.5 years.

Recall that a portfolio's duration is simply the sum of the duration of the individual securities that make up the portfolio. If the manager wishes to change the portfolio's duration, they can replace one or more of the existing bonds with a bond/s of different duration in order to achieve their desired duration relative to the benchmark for the portfolio as a whole.

