

BFC2340

Subject notes

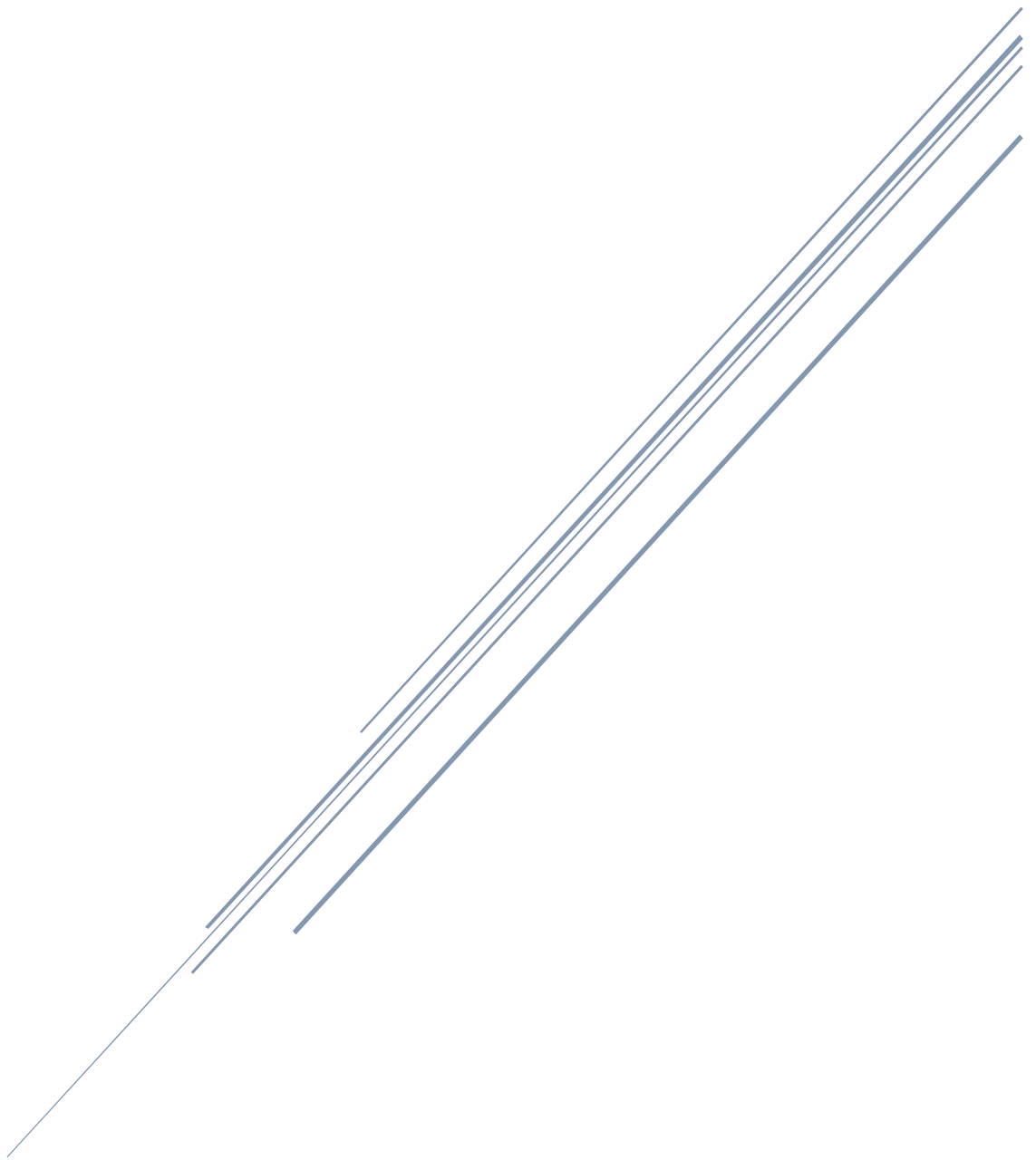


Table of Contents

Measuring yield	4
What is yield?	4
What are some ways of measuring yield?	4
Current yield	4
Yield to maturity	4
Yield to call/Yield to put/Yield to worst/Yield to sinker	4
Yield/IRR of a portfolio	4
Yield spread measures for floating-rate securities	4
Potential sources of a bond's dollar return	5
Determining the interest-on-interest return (for non-amortising securities)	5
Yield to maturity/Cash flow yield and reinvestment risk	5
Total return	5
Bond price volatility	6
Review of price-yield relationship for option-free bonds	6
Price volatility characteristics for option-free bonds	6
Characteristics of a bond that affect its price volatility	6
Measures of bond price volatility	6
Price value of a basis point (PVBP) (DV01)	6
Yield value of a price change	6
Duration.....	6
Properties of duration	6
Approximate percentage/dollar price change	7
Spread duration	7
Portfolio duration	7
Analytical vs Empirical Duration	7
Convexity	7
Properties of convexity	8
Factors affecting bond yields	9
Base/benchmark interest rate	9
Benchmark spreads	9
Factors that affect yield spread	9
The type of issuer	9
Perceived creditworthiness of the issue.....	9
Term or maturity of the issue	9
Options	9
Taxability of interest.....	9
Expected liquidity	10
Financeability of an issue.....	10
General obligations and revenue bonds	10
Term structure of interest rates	11
The yield curve	11
Why the yield curve should not be used to price a bond	11
Constructing the theoretical spot rate curve for treasuries	11
On-the-run Treasury issues	11
On-the-run Treasury issues and selected off-the-run Treasury issues	11
All Treasury coupon securities and bills	12
Treasury coupon strips	12
Forward rates	12
Determinants of the shape of the term structure	12
Pure expectations theory	12
Liquidity theory.....	12

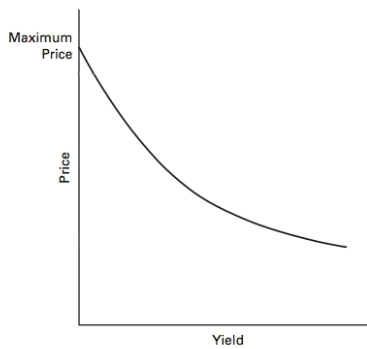
Preferred habitat theory.....	13
Market segmentation theory	13
Main influences on the shape of the yield curve.....	13
Swap rate yield curve	13
Treasury and federal agency securities	14
Treasury securities	14
Types of Treasury securities	14
Fixed-principal Treasury securities	14
Treasury inflation protection securities (TIPS)	14
The Treasury auction process	14
Secondary market	14
Price quotes for Treasury bills	15
Quotes on Treasury coupon securities.....	15
Accrued interest.....	15
Stripped treasury securities.....	16
Federal agency securities	16
International bonds.....	17
Classification of global bond markets	17
Non-US bond issuers and bond structures	17
Foreign exchange risk and bond returns	17
Bonds issued by non-US entities.....	18
Eurobonds.....	18
Credit risk.....	19
Corporate debt instruments	20
Seniority of debt in a corporation's capital structure	20
Bankruptcy and creditor rights	20
Corporate debt ratings	20
Corporate bonds	20
Traditional call provisions.....	21
Make-whole call provisions	21
Sinking fund provision	21
Special structures for high-yield (junk) corporate bonds	21
Secondary market for corporate bonds	21
Commercial paper	22
Default risk for corporate debt instruments	22
Corporate downgrade risk.....	22
Corporate credit spread risk	23
Credit risk modelling	24
Difficulties in credit risk modelling	24
Overview of credit risk modelling.....	24
Reasons why credit ratings are not reliable as a forecaster of default.....	24
Structural models.....	24
Fundamentals of the BSM model	24
Extensions of the BSM model.....	25
Disadvantages of structural models	25
Estimating portfolio credit risk	26
Reduced form models	26
The Jarrow Turnbull model.....	26
The Duffie-Singleton model (fractional recovery model)	26
Advantages and disadvantages of reduced-form models	26
Incomplete information models	26
Bond portfolio management strategies	27

The asset allocation decision	27
Portfolio management team	27
Spectrum of bond portfolio strategies	27
Bond benchmarks	28
Bond market indexes.....	28
Alternative bond indexes.....	28
Risk based schemes	28
The primary risk factors.....	29
Top-down vs bottom-up portfolio construction and management.....	29
Active portfolio strategies	29
Smart beta bond strategies	30
Bond portfolio construction	31
Portfolio theory and risk decomposition	31
Applications of portfolio theory to bond portfolio construction	31
Tracking error.....	31
Calculation of tracking error (see textbook page 555 for example).....	31
Two faces of tracking error.....	31
Tracking error and active vs passive strategies	32
Cell-based approach to bond portfolio construction	32
Complications in bond indexing.....	32
Portfolio construction with multi-factor models.....	32
Considerations in corporate bond portfolio management	33
Risk-return for corporate bonds vs equities.....	33
Corporate bond benchmarks	33
Constraint-tolerant investing.....	33
Downgrade-tolerant investing: Case of fallen angels.....	34
Using credit risk modelling to construct corporate bond portfolios.....	34
Portfolio construction.....	34
Liquidity management for corporate bond portfolios	35
Bond performance measurement and evaluation.....	36
Performance measurement.....	36
Alternative return measures	36
Performance attribution analysis	37
Performance attribution analysis models	37

Bond price volatility

Review of price-yield relationship for option-free bonds

Exhibit 4-2 Shape of Price-Yield Relationship for an Option-Free Bond



The price-yield relationship is not linear. It is a convex relationship.

Price volatility characteristics for option-free bonds

There are a few of properties to take note of, each of which can be observed graphically:

- For small changes in yield, the percentage change in price is roughly the same for both an increase or a decrease
- This is not the same as large changes in yield – there is a greater change for a decrease than for an increase
- Higher yields are less volatile than lower yields

Characteristics of a bond that affect its price volatility

- Coupon – the lower the coupon, the greater the volatility
- Maturity – the longer the maturity, the greater the volatility

Measures of bond price volatility

Price value of a basis point (PVBP) (DV01)

The change in the price of a bond if the yield changes by 1 basis point. The greater the price change, the greater the volatility.

Yield value of a price change

Difference between two yields after a certain dollar change in the bond's price. The lesser the yield change, the higher the volatility (smaller change in yield to produce a change in \$1)

Duration

Duration is interpreted as the percentage change in the price of a bond per 100 basis point change in yield – this is for modified duration. Graphically, duration is the steepness of the tangent line at that point. Note that we assume all cash flows are discounted at the same rate, and this only applies for option-free bonds.

Properties of duration

- The lower the coupon rate, the greater the modified duration, the greater the price volatility (same as characteristics of a bond)
- The longer the maturity, the greater the modified duration, the greater the price volatility (same as characteristics of a bond)
- For a coupon bond, both Macaulay and modified durations are less than the maturity

Approximate percentage/dollar price change

$$dP/P = -(modified\ duration)(dy)$$

$$dP = -(dollar\ duration)(dy)$$

Spread duration

- Recall that every non-treasury security trades at the equivalent treasury rate plus a given spread to account for credit risk. This exposes credit spread risk. A measure of this change is spread duration
- For a fixed rate security, it is the approximate change in price of a fixed-rate bond for a 100-basis-point change in the spread
- For a floating-rate security, it is a measure used to estimate the sensitivity of a floater's price to a change in spread

Portfolio duration

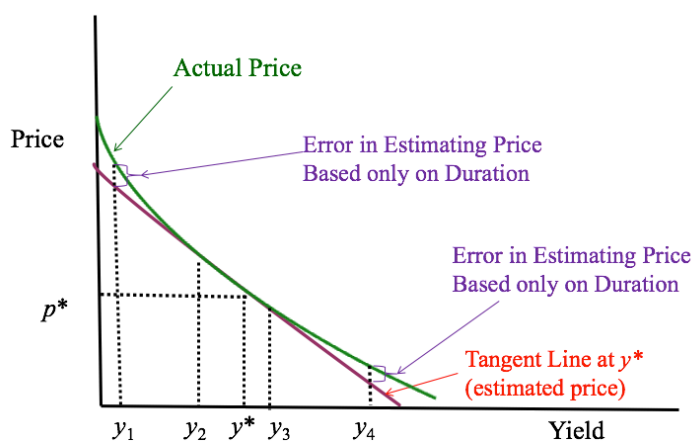
- Duration of a portfolio is simply the weighted average duration of the bonds in that portfolio
- We are also able to calculate a spread duration for portfolios

Analytical vs Empirical Duration

- For low-credit bonds, equity risk is greater than interest rate risk and therefore duration may not be a good measure of interest-rate risk
- Empirical duration uses historical data and regression to calculate
- Analytical duration uses the formula (what we are doing)

Convexity

- As duration only considers small changes in yield, we also calculate convexity for large changes to go together with duration. We do this by considering Taylor Series



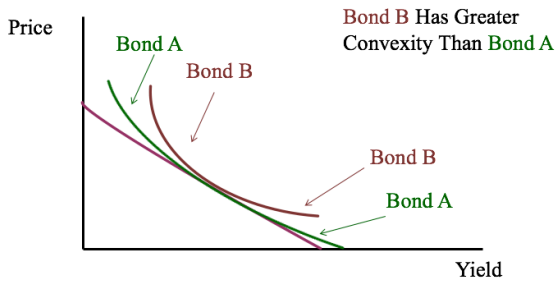
When yields decrease, the estimated price change will be less than the actual price change, thereby underestimating the actual price.

On the other hand, when yields increase, the estimated price change will be greater than the actual price change, resulting in an underestimate of the actual price.

- Convexity is measured in terms of periods squared

• We use the Taylor Series approximations and add duration and convexity together to give a better approximation of the actual price change for a large change in yield

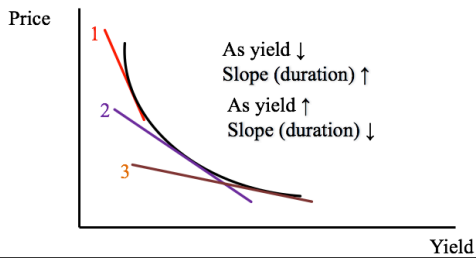
Comparison of Convexity of Two Bonds



Convexity is considered when pricing a bond. If convexity is priced high, bond B will trade at a lower yield.

Properties of convexity

Change in Duration as the Required Yield Changes



As yield increases, convexity decreases. Convexity is measuring the rate of change of the dollar duration as yield changes. For a given yield and maturity, lower coupon rates will have greater convexity.

For a given yield and modified duration, lower coupon rates will have smaller convexity.