FitchLearning

Chapter 13
Portfolio Theory

15-20 questions

2. Portfolio Considerations

Key factors

- Risk
- Liquidity
- Growth

Strategies

- Stock selection
  - Fundamental analysis
    - Use of fundamental data on the company, its management, industry sector, etc.
    - Attempt to assess an intrinsic value of the company
  - Technical analysis
    - Analysis of historic prices and volumes
    - Use of graphs and charts to identify repeatable patterns or trends

2. Portfolio Considerations

Management styles

- Value funds
  - Low P/E ratios
  - Low price to book value ratios
    - Contrarian approach
  - High yielding stock
    - Conservative approach
- Growth funds
  - High P/E ratio
- Market oriented funds
  - Focus on market average of business cycle
- Socially responsible investing (SRI)
  - Screening
    - Positive or negative
  - Shareholder advocacy
    - Encourages corporate responsibility

3. Passive vs. Active styles

Passive fund management

Believes that markets are efficient and that share prices reflect their true worth.

- Tracker funds
  - Choose a benchmark and attempt to replicate the returns
    - Replication
      - Buying all the shares in the benchmark with the correct weighting
    - Stratified sampling
      - Buying the most influential shares in the benchmark from each sector
- Tracking error
  - Total return on portfolio – total return on benchmark
  - Causes could be:
    - Poor replication
    - Investment costs
    - Changes to the benchmark

Hints

In order to outperform a predetermined benchmark the active portfolio manager must be prepared to assume an element of tracking error (or active risk) relative to the benchmark.

Further information

Excess returns can be decomposed in the following way:

- Return due to asset allocation
- Return due to currency movement
- Return due to stock selection
- Return due to interaction (timing)

3. Passive vs. Active styles

Active fund management

Believes markets are inefficient and attempts to outperform a benchmark

- Top down:
  - Asset allocation
    - E.g. proportion in cash, equity and bonds
    - Strategic asset allocation
    - Tactical asset allocation
  - Sector selection
    - E.g. looking at proportion in sensitive sectors, such as financials, and those in less sensitive sectors, such as utilities
  - Stock selection
    - Seeking out mispriced stocks
- Bottom up:
  - Focuses on stock first

Hints

Strategies do not have to be outright active or passive. Hybrids exist. Two examples are:

- Core satellite funds
- Index tiling

Keeping on target

Which of the following would form part of a passive rather than active portfolio management style?

A. Buying index based equity derivatives which emulates the FTSE 100
B. Selling short securities that are overvalued
C. Selecting securities based on quantitative research and P/E ratios of similar sector companies
D. Hedging existing securities using over-the-counter derivatives to take advantage of out of hours trading opportunities.

4. The Efficient Markets Hypothesis

The efficient markets hypothesis (EMH)

- Describes and efficient market
  - Where information is freely available to all
  - Where information is correctly priced into the security

The three forms of the efficient market hypothesis	
The weak form	The market price of shares reflects all relevant information implied in: • Historic share prices
The semi-strong form	The market price of shares reflects all relevant information implied in: • Historic share prices • All publicly available information
The strong form	The market price of shares reflects all relevant information implied in: • Historic share prices • All publicly available information • All private information

Hints

The weak form of EMH eliminates the need for technical analysis.

The semi-strong form of the EMH eliminates the need for technical and fundamental analysis.

Keeping on target

The weak form of efficient markets hypothesis (EMH) suggests that there is no place for which of the following in the markets?

A. Technical analysis of historic prices

B. Fundamental analysis of a company's activities

C. Official disclosure of inside information

D. Clandestine disclosure of inside information

Answer to the question on the previous slide:

A

Passive management is constructing a portfolio to track or mimic the performance of an index. Using equity index based derivatives can emulate the total returns without requiring an outright purchase of at the companies within the FTSE 100.

5. Behavioural Finance

- Rationale
  - Investors are not rational and suffer from errors in processing information and errors in making decisions
- Information processing errors
  - Memory Bias – Too much weight given to recent events
  - Overconfidence – Overestimation of precision of forecasts and beliefs
  - Conservatism bias – Too slow to update beliefs
  - Sample size neglect – Deduce a population-wide reaction from a small sample
- Decision making errors
  - Framing Bias – Missing the links between financial activities
  - Regret avoidance – Avoid realising a loss
- Financial Amnesia
  - Historical occurrences are forgotten
  - Can lead to price bubbles

Further information

Key drivers in financial amnesia:

- Incentives by employers
- Moral hazard – a belief that others will bare the risk
- Cognitive biases, for example groupthink, band-wagon effect, overconfidence and regret avoidance.

Answer to the question on the previous slide:

A

Technical analysis of historic prices.

6. Performance Measurement

Returns to a portfolio

The holding period return

$$HPR = \frac{Val_{END} - Val_{START}}{Val_{START}}$$

Example: The value of a portfolio at the start of year 1 is $97.5m. At the end of the annual period it has grown to $104.5m. Calculate the holding period return.

Further information

Holding period return is a form of total or absolute return. It can be adapted to include cash flows to and from the fund.

$$\text{Total return} = \frac{(\text{End val} - \text{Start val}) + \text{Income received}}{\text{Start val}}$$

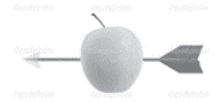
Hints

Holding period return does not include the time value of money. Any calculations may need to adjusted for the period being assessed and the timings of any cash flows.

Keeping on target

You buy a 3% bond for £95 . If it has 4 years remaining until maturity. What is the HPR?

A. 17.89%
B. 12.00%
C. 17.00%
D. 12.89%



6. Performance Measurement

Returns to a portfolio

The money weighted rate of return (MWRR):

1%

2%

3%

4%

	T0	T1	T2
Value of fund	97.5	98	104.5
New money	0	5	
Total	97.5	103	

Further information

The MWRR is equivalent to the internal rate of return of the portfolio.

The MWRR is designed to take some account of cash inflows and outflows but can still be affected by the timing and size of flows. This overstates returns when the fund does well and understates returns when the fund does badly. The TWRR aims to remove the distorting affect of these cash flows.

Keeping on target

If an investment is worth £143.38m at the start of the year, £150m at the end of the year and it is subject to a withdraw of £10m 6 months into the year, what is the MWRR?

A. 1.5%

B. 3.00%

C. 5.36%

D. 12.00%

Keeping on target

If an investment is worth £57.58m at the start of year 1, £15m is deposited at the end of year 1 and it is worth £70m at the end of the year 2, what is the MWRR?

A. (5%)

B. (2%)

C. 24%

D. 50%

Answer to the question on the previous slide:

A

$$\frac{4 \times £3 + £100}{£95} - 1 = 17.89\%$$

6. Performance Measurement

Returns to a portfolio

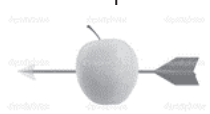
Calculate the **total** time weighted rate of return (TWRR); and calculate the **average** time weighted rate of return (TWRR):

	T0	T1	T2
Value of fund	97.5	98	104.5
New money	0	5	
Total	97.5	103	

Keeping on target

An investment is worth £144m at the start of the year, grows £2m in the first 6 months and is worth £150m at the end of the year. If it is subject to a withdraw of £10m half way through the year, what is the TWRR?

A. 10%
B. 12%
C. 14%
D. 16%



Answers to questions on the previous slide:

$$PV\,\text{inf}\,low - PVoutflow = 0$$

D

$$\frac{£150m}{1.12} + \frac{£10m}{1.12^{0.5}} - £143.38 = 0$$

B

$$\frac{£70m}{0.98^2} - \frac{£15m}{0.98} - £57.58 = 0$$

7. Risk and reward

Systematic risks

- Economic, political and global events that impact on markets – hard to predict
  - Liquidity – in a crisis liquidity dries up e.g. a bank failure
  - Interest rates – impact on markets, and on consumer spending of gearing
  - Inflation – erodes savings, around 3% inflation has led to lower interest rates
  - Currency – will we make or lose money when we convert the foreign currency back to sterling?

Unsystematic risks

- Business risks – (internal business risks)
  - Products – successful vs. unsuccessful; labour relations – strikes, disputes; costs of raw materials; strength of balance sheet
- Industry risks – (industry sectors)
  - Affect an industry as a whole not only a company (tariffs and trade barriers)
- Management risks
  - Calibre of the management
- Financial risks
  - Related to the level of debt financing in the capital structure

Hints

Systemic risk

A systemic risk must not be confused with systematic risk as it is used in capital markets theory. In finance and economics, systemic risk is often discussed in connection with the risk of collapse of an entire financial system or entire market.

Further information

Other risks

Fraud risk – the risk of being mislead in investment decisions

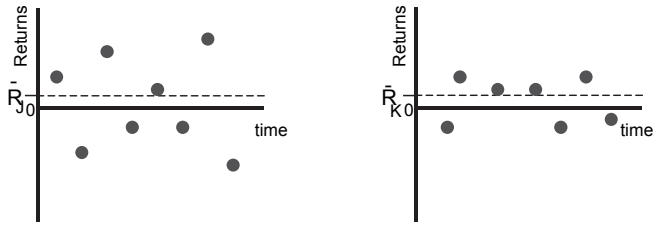
Counterparty risk – the risk of someone not fulfilling their obligations.

Answers to questions on the previous slide:

B $\frac{£146m}{£144m} x \frac{£150m}{£136m} - 1 = 11.83\%$

8. Measuring Risk

Standard deviation as a measure of risk



Stock J is clearly more risky than Stock K.

The standard deviation around the mean ($\bar{R}_J$) will be larger for stock J.

Standard deviation (σ) is used to measure the comparative risk of stocks.

Further information

Problems with using standard deviation

- It is based on past patterns of returns, which may not be representative of future patterns in returns
- It assumes that upside is equally as likely as downside – the standard deviation, by definition, is the average upside or downside movement
- Volatility generally is not a complete measure of risk

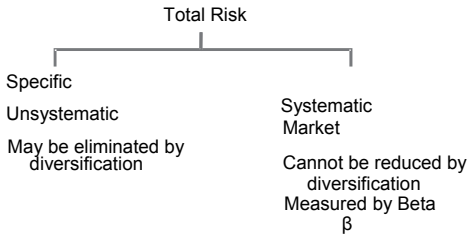
Further information

Alternative measures of risk

- Semi-variance – Similar to variance but only measures returns below the mean
- Probability of a shortfall – Measures likelihood of a shortfall but not size of gap
- Expected shortfall – Probability of a set value shortfall
- Value at risk (VaR) – Probability of losses exceeding a set value

8. Measuring Risk

Summary



Calculating total risk

$$TotalRisk = \sqrt{\text{var}_{MarketRisk} + \text{var}_{SpecificRisk}}$$

Keeping on target

Matt Everett is a wealthy individual holding a portfolio of large cap equities that he plans to hold until his retirement some 30 years later. He has heard a number of terms for the risks involved in holding equities and is unsure which of the following four types of risk apply to his portfolio:

- Systemic risk
- Systematic risk
- Counterparty risk
- Liquidity risk

Which one of the following is most accurate in relation to Matt's portfolio?

A. All of the four risks apply equally

B. Primarily it is systemic and systematic risks that apply to Matt's portfolio

C. Primarily it is systematic and counterparty risks that apply to Matt's portfolio

D. Primarily it is systematic and liquidity risks that apply to Matt's portfolio

Keeping on target

An asset has a systematic standard deviation of 6 and an unsystematic standard deviation of 9. What is the asset's total risk?

A. 7.5

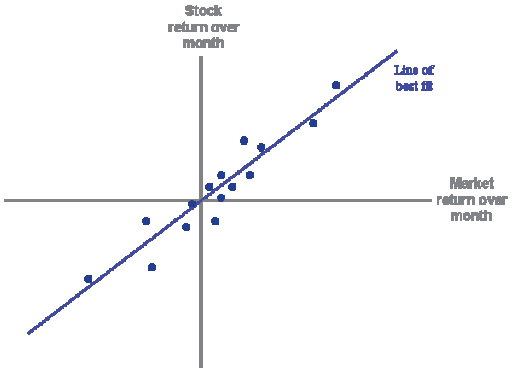
B. 10.8

C. 17

D. 54.4

8. Measuring Risk

Beta coefficient



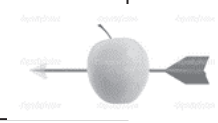
Beta, $\beta = \dfrac{\text{Change in return to stock}}{\text{Change in return to market}}$

Beta, $\beta_J = \dfrac{\text{Cov}(R_M, R_J)}{\text{Var } R_M}$

Keeping on target

Share B has a covariance with the market of 90. If the market variance is 225, what is the stock's β?

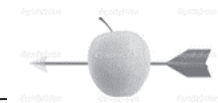
A. 0.4
B. 40
C. 2.5
D. 15



Keeping on target

Share C has a β of 1.5 and a covariance with the market of 170. What is closest to the standard deviation of the market?

A. 255.4
B. 113.3
C. 16.0
D. 10.7



Answer to questions on the previous slide:

B

Primarily it is systematic and systemic risks that apply to Matt's portfolio

B $TotalRisk = \sqrt{\text{var}_{MarketRisk} + \text{var}_{SpecificRisk}}$

$\sqrt{6^2 + 9^2} = \sqrt{117} = 10.82$

8. Measuring Risk

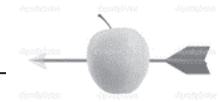
Portfolio Beta

	Stock J	Stock K	Stock L	Stock M
Weighting of each stock:	25%	15%	40%	20%
Each stock's beta:	0.71	0.6	1.4	0.9
Stock's beta x weighting:	(0.71 x 0.25) 0.1775	(0.6 x 0.15) 0.09	(1.4 x 0.4) 0.56	(0.9 x 0.2) 0.18
Portfolio's beta:	1.0075			

Keeping on target

A portfolio has 3 shares in the following proportions 10%, 25%, 65%. If the respective β's are 0.9, 1.7 and 1.9, what is the portfolio's β?

A. 1.00
B. 1.26
C. 1.75
D. 1.88



Answers to questions on the previous slide:

A $\frac{90}{225} = 0.4$

D $\beta = \frac{Cov(R_m, R_c)}{VarR_m}$

$\frac{170}{VarR_m} = 1.5$

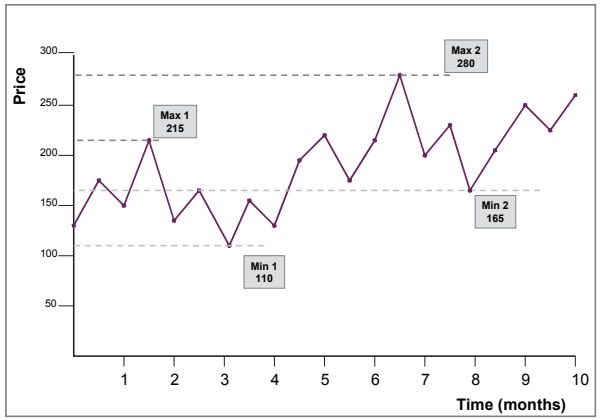
$VarR_m = \frac{170}{1.5} = 113.33$

If $VarR_m = 113.33$ then $\sigma R_m = \sqrt{113.33} = 10.65$

8. Measuring Risk

Drawdown measure of risk

A worst case variability in price.



Further information

Value at risk

The maximum potential change in value of a portfolio of financial instruments with a given probability over a certain horizon. For example, a one-day VaR of $10m at the 95% confidence level.

Answer to the question on the previous slide:

C

0.1 x 0.9 + .25 x 1.7 + .65 x 1.9 = 1.75

9. Pricing models

Capital asset pricing model (CAPM)

The CAPM calculates the expected return from a security given its systematic risk.

Assumptions

- Risk-free rate equal for all
- All investors have well diversified portfolios
- No tax or transactional costs
- All investors want maximum returns for minimum risks
- All investors have the same expectations of risk and return

Links

Beta, Alpha and the Securities Market Line

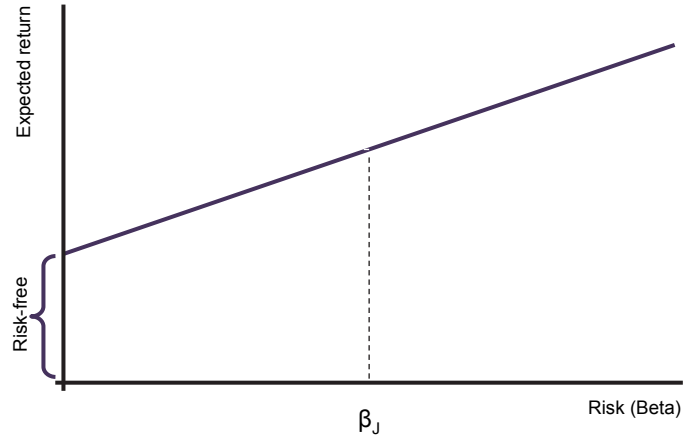
Beta is an expression of a portfolio's sensitivity relative to its benchmark. A portfolio beta of 1.2 suggests a portfolio 20% more sensitive than the benchmark.

Alpha measures the difference between the fund's actual return and its expected return. A positive alpha suggests outperformance; a negative alpha suggests underperformance.

The **securities market line** (SML) from **CAPM** shows the expected return for a stock with any given beta. If alpha is positive, this means the actual return from the stock will be above the securities market line, sometimes abbreviated to 'above the line performance'.

9. Pricing models

Securities market line



Keeping on target

An analyst is presenting his findings in relation to the capital asset pricing model. He stresses the importance of identifying non-zero Alpha stock relative to the securities market line when stock-picking.

Why might this be?

I. Non-zero Alpha stock may show an overvalued stock and give you a signal to sell

II. Non-zero Alpha stock may show a correctly valued stock and give you a signal to hold

III. Non-zero Alpha stock may show an undervalued stock and give you a signal to buy

IV. Non-zero Alpha stock shows the stock that incurs extra service costs when buying and selling

A. I only

B. II only

C. I and III

D. IV only

9. Pricing models

The CAPM formula

$$E(R_p) = R_F + \beta_P \underbrace{(R_M - R_F)}_{\text{Market risk premium}}$$

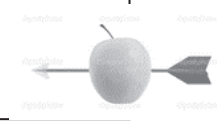
Arbitrage pricing theory

- Attempts to derive a rate of return that will be used to price assets
- Breaks down market risk into risk factors:
  - Inflation
  - Interest rate
  - Liquidity
- Creates a Beta value for each factor

Keeping on target

A share has a beta of 0.8, the risk free rate is 3% and the market return is 12%. What is the expected return?

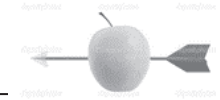
A. 7%
B. 10%
C. 15%
D. 17%



Keeping on target

A share has a beta of 1.2, the risk free rate is 3% and the market risk premium is 5%. What is the expected return?

A. 5
B. 6
C. 8
D. 9



Answer to the question on the previous slide:

C

The Alpha is referring performance relative to the securities markets line (SML).

If a security displays the characteristics predicted by CAPM, it would appear on the SML. If, however, the security displays a return higher or lower than CAPM predicts, it will appear above or below the SML.

10. Risk Adjusted Performance Measures

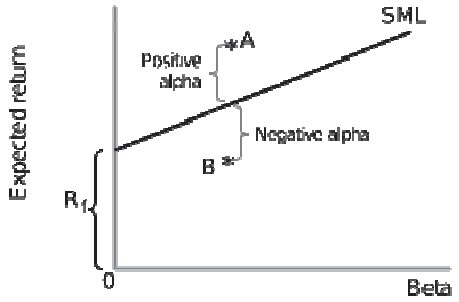
Jensen's Alpha

Jensen measure = R_p - R_{CAPM}

Where

R_p is the return to the portfolio

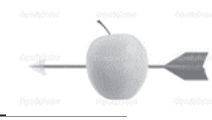
R_{CAPM} is the return predicted by CAPM



Keeping on target

A share has an expected return of 15% and an actual return of 13% the alpha and performance are:

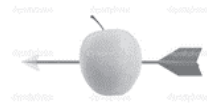
A. 2% overperformed
B. 2% underperformed
C. (2%) overperformed
D. (2%) underperformed



Keeping on target

A share has a beta of 1.3 the risk free rate is 4% and the return on the market is 9%, If the stock return was 15% the alpha is:

A. 11
B. 5
C. 4.5
D. (5)



Answer to the questions on the previous slide:

B

3 + 0.8 x (12-3) = 10.2

D

Expected return 3 + 1.2 x 5 = 9

10. Risk Adjusted Performance Measures

Four risk adjusted return methods

Sharpe ratio: $\frac{\text{Portfolio return - risk-free}}{\text{Portfolio standard deviation}}$

- Uses total risk, as it assumes the portfolio is not diversified
- The higher the value, the greater the risk-adjusted return

Treynor ratio: $\frac{\text{Portfolio return - risk-free}}{\text{Beta of the portfolio}}$

- Uses systematic risk only, as it assumes the portfolio is diversified
- The higher the value, the greater the risk-adjusted return

Hints

The Sharpe, Treynor and the information ratios all look at the return generated per unit of risk.

Keeping on target

Consider the following information about four funds.

Fund A: Return = 17.68%, Volatility = 8.65%, Sharpe measure = 0.48

Fund B: Return = 16.58%, Volatility = 5.55%, Sharpe measure = 0.51

Fund C: Return = 14.81%, Volatility = 10.10%, Sharpe measure = 0.47

Fund D: Return = 17.15%, Volatility = 7.77%, Sharpe measure = 0.53

Which fund has the highest risk adjusted return?

A. Fund A
B. Fund B
C. Fund C
D. Fund D

Keeping on target

A diversified portfolio has a return of 7%, a beta of 0.5, and a standard deviation of 4. If the risk free rate is 4% the portfolio risk adjusted return is:

A. 7
B. 6
C. 0.75
D. 14

Answer to the questions on the previous slide:

D

13-15 = (2)

C

Expected return 4 + 1.3 x (9-4) = 10.5

15 - 10.5 = 4.5

10. Risk Adjusted Performance Measures

Four risk adjusted return methods

Information ratio: $\frac{\text{Portfolio return - benchmark return}}{\text{Standard deviation of excess return}}$

- The top of the equation is the 'excess return' or 'Alpha'
- The bottom is the risk that was taken to earn the Alpha
- Higher values indicate successful fund managers

Jensen's Alpha

- Discussed after the capital asset pricing model (CAPM)

Links

Jensen links with the capital asset pricing model (CAPM) which is explained previously.

Answer to the question on the previous slide:

D

The Sharpe measure is a measure of risk adjusted return. The higher the value, the better the risk adjusted return. The other data is not relevant to the question.

B Use Treynor for a diversified portfolio

$$\frac{(7-4)}{0.5} = 6$$

11. Bond Portfolios

Measuring bond portfolio risk

- Portfolio duration
  - The weighted average value of the portfolio's constituent bonds

	Bond A (25 %)	Bond B (30%)	Bond C (20%)	Bond D (25%)
	Duration 1.2	Duration 2.6	Duration 3.4	Duration 2.1
Weighted duration	0.25 x 1.2	0.3 x 2.6	0.2 x 3.4	0.25 x 2.1
	0.3	0.78	0.68	0.53

Portfolio duration 2.29

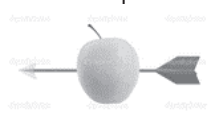
- Relative duration
  - Duration of bond (portfolio) / Duration of market
  - CAPM for bonds

$$E(R_p) = R_F + \frac{D_P}{D_M}(R_M - R_F)$$

Keeping on target

A portfolio has 3 bonds in the following proportions: 10%, 25%, 65%. If the respective durations are 5 years, 2 years and 6 years, what is the portfolio duration?

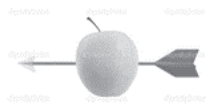
A. 3 Years
B. 4 Years
C. 5 Years
D. 6 Years



Keeping on target

A bond portfolio has a duration of 7 years, the risk free rate is 3%, the market return is 12% and the market duration is 4 years. What is the expected return?

A. 13.55%
B. 14.23%
C. 15.99%
D. 18.75%



12. Management of Bond Portfolios

Liability Driven Investments (LDIs)

- Use of a dedicated portfolio strategy to meet future (known) liabilities
- Construction
  - Cash flow forecasts
  - Risk tolerance
  - Possibility of out-performance
  - Implementation

- Measuring performance
  - Planned surplus
    - Assets minus liabilities
  - Surplus tracking error
  - Volatility of surplus

Keeping on target

A company wishes to fund the repayment of the principal of a £2,000,000 mortgage in five years.

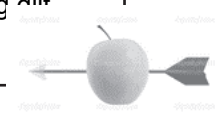
Which of the following gilt strategies would be the most appropriate?

A. Buy £2,000,000 nominal of a five-year gilt strip

B. Buy less than £2,000,000 nominal of a five-year coupon paying gilt, reinvesting the coupons over the period

C. Buy £2,000,000 nominal of a five-year coupon paying gilt, reinvesting the coupons over the period

D. Buy more than £2,000,000 nominal of a five-year coupon paying gilt, reinvesting the coupons over the period



Answer to the questions on previous slide:

C

$$0.1x5 + 0.25x2 + 0.65 + 6 = 4.9 years$$

D

$$Er = 3\% + \frac{7}{4}x(12\% - 3\%)$$

$$= 18.75\%$$

12. Management of Bond Portfolios

Passive bond portfolio management

- Cash matched/dedicated portfolios
  - Where the fund manager chooses bonds that generate cash flows of the same size and timing as the fund's liabilities
- Immunisation
  - Matching the duration of its constituent bonds with the duration of its liabilities
  - Bullet
    - All bonds have a duration close to the duration of the liability
  - Barbell
    - The portfolio has a weighted average durations that matches the liability

Answer to the question on the previous slide:

A

The £2,000,000 strip is certain to raise the needed capital. Strips can precisely meet the liabilities of the investor, removing any 'reinvestment risk' that is normally faced when covering liabilities with coupon paying bonds.

12. Management of Bond Portfolios

Active bond portfolio management

- Policy switching
  - Switching between two different bonds to take advantage of market conditions
- Anomaly switching
  - Switching between two similar bonds where mispricing seems apparent

- Riding the yield curve

Example: A fund manager decides to invest in a 6-month T-bill for three months which is valued at 97.95, rather than a 3-month T-bill valued at 99.00. What is the fund manager's extra return?

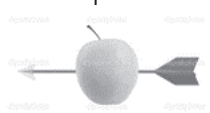
Hints

Riding the yield curve – allows the bondholder to profit from the declining yield that occurs over the life of the bond. The investor is exposed to movements in the yield curve, this risk is taken to enhance returns.

Keeping on target

A 1 year T bill is priced at £91 and a similar 6 month T bill is priced at £96. What would be the additional annualised return for riding the yield curve?

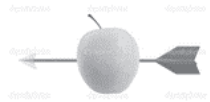
A. 1.32%
B. 2.64%
C. 4.17%
D. 5.49%



Keeping on target

A 3-month T-bill is priced at £98 and a similar 6-month T-bill is priced at £94. The additional annualised return for riding the yield curve on a compound basis is closest to:

A. 2.0%
B. 4.5%
C. 8.5%
D. 10.0%



Answers to questions on the previous slide:

B

Return on 6mth T - bill held to redemption

$$\frac{(£100 - £96)}{£96} = 4.17\%$$

Return on 12mth T - bill held for 6mths

$$\frac{(£96 - £91)}{£91} = 5.49\%$$

Additional annualised return

$$(5.49\%x2) - (4.17\%x2) = 2.64\%$$

D

Return on 3mth T - bill held to redemption

$$\frac{£100}{£98} = 1.0204$$

Return on 6mth T - bill held for 3mths

$$\frac{£98}{£94} = 1.0426$$

Additional annualised compound return

$$1.0426^4 - 1.0204^4 = 9.74\%$$