

# **INSTITUTE AND FACULTY OF ACTUARIES**

## **EXAMINERS' REPORT**

April 2018

### **Subject ST5 – Finance and Investment Specialist Technical A**

#### **Introduction**

The Examiners' Report is written by the Principal Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and using past papers as a revision aid and also those who have previously failed the subject.

The Examiners are charged by Council with examining the published syllabus. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit. For essay-style questions, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

Luke Hatter  
Chair of the Board of Examiners  
July 2018

**A. General comments on the *aims of this subject and how it is marked***

1. The aim of this Finance and Investment Technical A subject is to instil in successful candidates the ability to apply, in simple situations, the principles of actuarial planning and control to the appraisal of investments, and to the selection and management of investments appropriate to the needs of investors.
2. A mix of questions styles is used, covering *knowledge* of the material set out in Core Reading, *application* of this in calculations and case studies and *higher order skills* such as synthesis and collation of recommendations. Marks are awarded for the constituent elements of calculations, not just for the final answer generated. Scenario appraisal will similarly provide credit for evidence of the issues considered, not solely for the conclusions reached.
3. Candidates who give well-reasoned points, not in the marking schedule, are awarded marks for doing so.

**B. General comments on *student performance in this diet of the examination***

This was a reasonably straightforward paper and students who had prepared well and read the questions did well. The calculations that were required were not time consuming; most candidates were able to make good attempts at all the questions within the time allowed.

**C. Pass Mark**

The Pass Mark for this exam was 63.

## Solutions

- Q1** (i) (a) Call option – gives the holder the right to buy the underlying asset by a certain date for a certain price. [½]
- (b) Put option – gives the holder the right to sell the underlying asset by a certain date for a certain price. [½]
- The agreed price in the contract is known as the exercise price or strike price [½]
  - European options can only be exercised on the expiration date. [½]

- (ii) (a) The payoff for an investor who purchases a call option can be expressed as  $S_T - K - O$  where:

$K$  is the exercise price

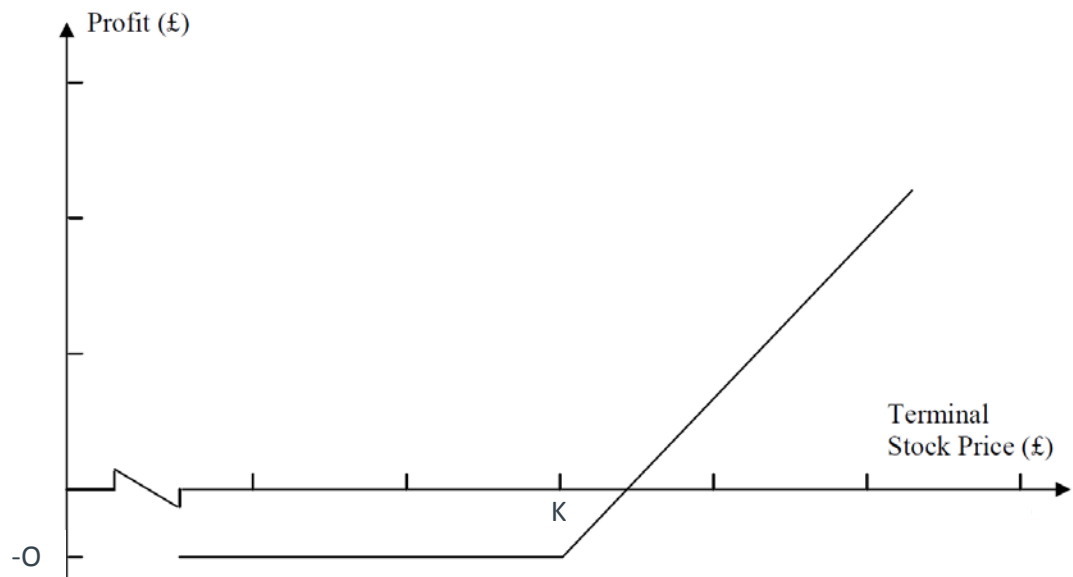
$S_T$  is the price of the underlying stock

$O$  is the price of the call option

Where  $S_T > K$ : payoff is  $S_T - K - O$

Where  $S_T < K$ : payoff is  $-O$

See diagram below



½ mark for labelling and 1 for graph

- (b) The payoff for an investor who sells a call option can be expressed as  $O - S_T + K$  where:

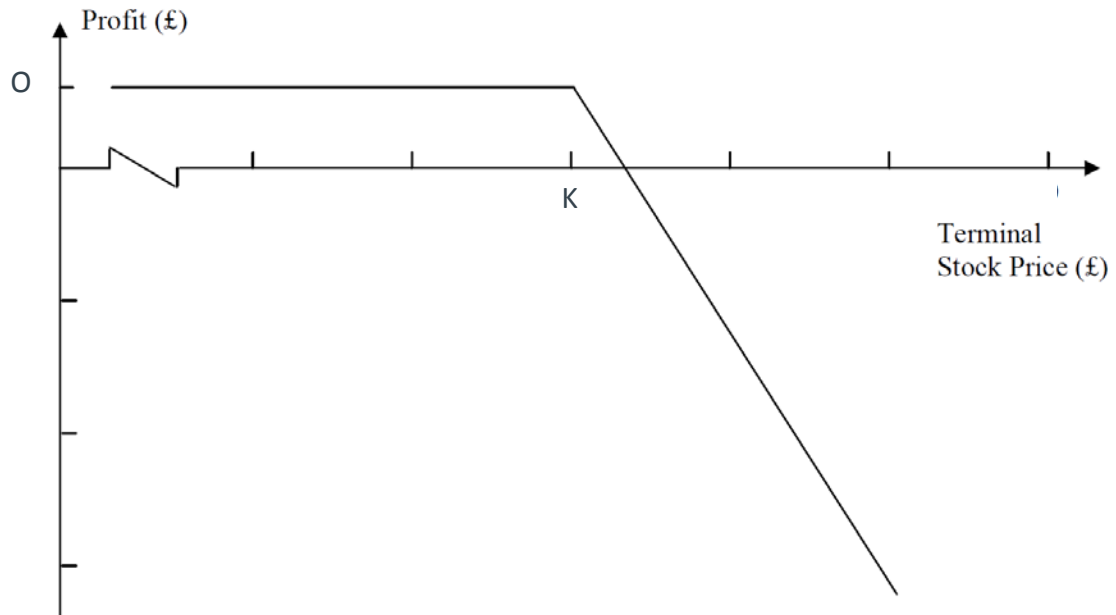
$K$  is the exercise price

$S_T$  is the price of the underlying stock

$O$  is the price of the call option

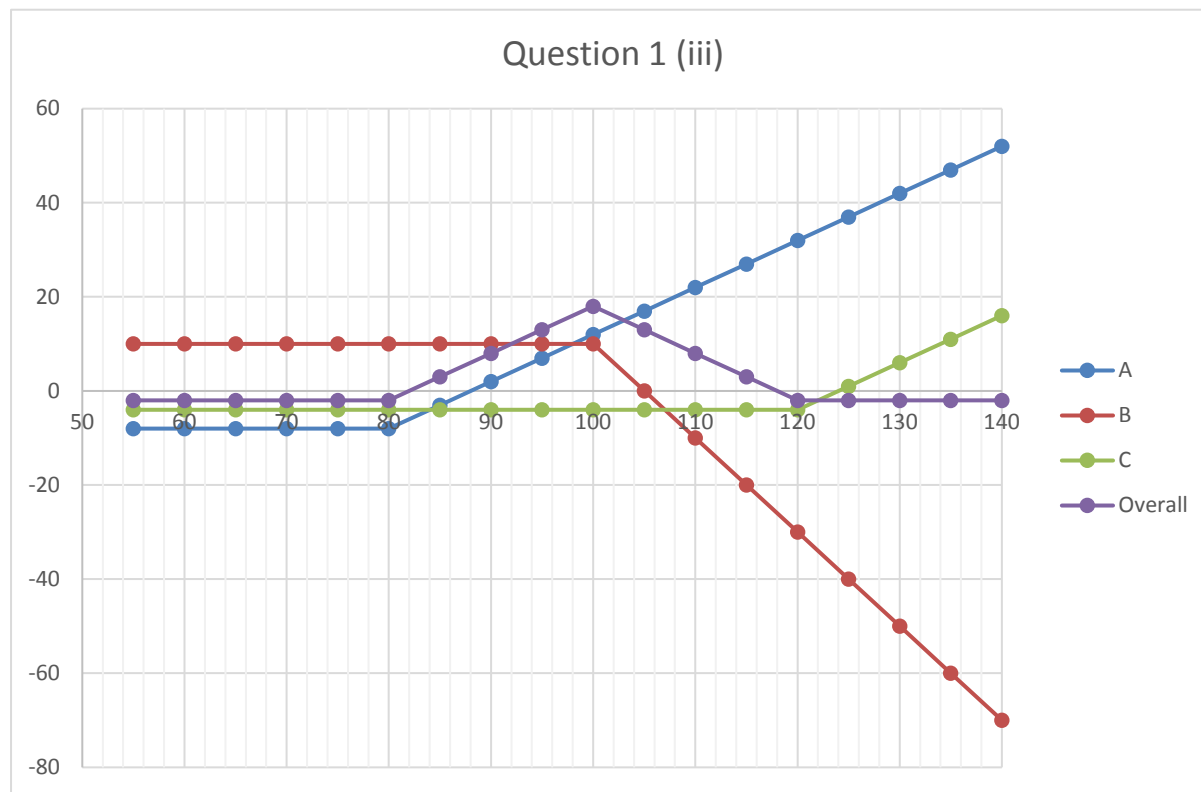
Where  $S_T > K$ : payoff is  $O - S_T + K$

Where  $S_T < K$ : payoff is  $O$



½ mark for labelling and 1 for graph  
[3]

(iii)



½ mark for each line, 1 mark for labelling  
[Max 3]

(iv) The strategy is intended to:

- produce a profit if the share price remains close to the middle strike price, whereas a loss if the share price moves in either direction from the middle strike price. [1]
- be appropriate if the trader's conviction on the strike price is shown to be correct and if the outcome is different from the majority of the market; otherwise the price of the options would reflect the expected move and reduce the potential profit. [½]
- limit the risk taken since the maximum losses that can occur are the cost of the original investment. [½]

The highest return that can be earned occurs when the price of the underlying stock is exactly at the strike price of the middle options. [½]

The trade would be expected to provide a high chance of earning a profit, albeit a small profit. [½]

However, given the option costs, the share price would have to remain in a narrow “corridor” to generate a profit so the trader’s rationale for a stable share price should be sound and reasonable before entering the trade. [½]

Additional credit given if candidates correctly name this strategy as a call option butterfly spread. [½]

[Max 3]

[Total 11]

*This question was well answered with many students scoring very highly.*

**Q2** i) Prospect theory is a theory of how people make decisions when faced with risk and uncertainty. [1]

It replaces the conventional risk averse / risk seeking decreasing marginal utility theory based on total wealth with a concept of value defined in terms of gains and losses relative to a reference point. [½]

This generates utility curves with a point of inflexion at the chosen reference point. [½]

[2]

(ii) The performance figures show that while the fund has increased in value over the three years they have underperformed their benchmark in two of the three years. [½]

The trust has risen by 12.2% whereas the benchmark has risen by 18.6%. [½]

The suggestion by the marketing manager states that the fund has outperformed the UK stock market. Assuming this to be true, this is not the benchmark against which the fund should be measured. [½]

However, it does show the performance of the fund in a better light and makes the shareholders feel that Abacus are doing well. [½]

The highlighting of 10% growth in year 3 ignores the lower growth levels in years 1 and 2, again enhancing the performance of Abacus in the eyes of the shareholders. [½]

While the letter mentions the two other fund managers, no detail is given making it difficult for the shareholders to properly compare the three fund managers. [½]

It is not clear whether the performance figures are gross or net of fees. If gross, allowance should also be made for fees. [½]

In the actual question, the marketing manager is also hoping that shareholders will be influenced by regret aversion whereby by retaining the existing arrangements, shareholders minimise the possibility of regret. [1]

This could also be classed as a preference for the Status Quo i.e. leaving things as they are. [1]

It could also be said that the question has been framed by the use of 'retain'. [½]

He is also hoping that the primary effect may come into play i.e. people are more likely to select the first option that they are faced with. [1]

However, the position in the list of Abacus is less crucial as while the marketing manager of Abacus seems to believe in the primary effect there are other theories e.g. recency effect; [½]

and the intermediate effect [½]

which point to people preferring the last option [½]

or even the option that is in the middle. [½]  
[Max 6]

- (iii) The communication should include information about the performance of all three fund managers. [½]

The performance of the three managers should be shown over the long, medium and short term. [½]

after fees have been deducted [½]

together with information regarding the performance of the benchmark. [½]

The information should be presented in such a way as to make a comparison easy, possibly by using a table. [½]

The communication could be written by an independent third party. [½]

A brief description of the approach adopted by the three fund managers e.g. the risk that the fund manager takes, [½]

whether they adopt an ethical approach, [½]

the size of the investment team, [½]

and how much money the fund managers invest. [½]

Any additional costs is switching fund managers could be stated. [½]

The word “retain” could be dropped, possibly using “appoint” in all three cases.

[1]

*Other sensible points can also be given credit.*

[Max 4]

[Total 12]

*This was reasonably well answered with most students making a reasonable attempt at parts (i) and (ii), however part (iii) was less well answered. A number of students failed to appreciate that the marketing manager was from Abacus Fund Management despite the question stating this; this reduced their chances of making relevant comments in part (ii).*

**Q3** (i) Hedge funds are characterised by:

- The placing of many aggressive positions on different assets. [½]
- A high level of borrowing given the limited size of the capital of the funds compared to the size of the individual investments. [½]
- A mix of investments for which the price movements would be expected mostly to cancel each other out, except for the positive effect the hedge fund is looking for. [½]
- A willingness to trade in derivatives, commodities and non-income bearing securities. [½]
- A higher risk tolerance than other funds. [½]
- Due to the ability to take short positions, often viewed as absolute return strategies which would produce positive returns even when markets were negative. [½]
- Strategies are sometimes not transparent, opaque. [½]
- Illiquidity of assets invested. [½]
- Traditionally higher fees (e.g. c. 1–2% p.a. plus c. 15–20% of annual performance against benchmark). [1]
- High minimum investment levels [½]



- Often having complex legal structures, with the fund structures held offshore to minimise tax and regulatory requirements (e.g. Cayman Islands and Bermuda popular locations). [½]
  - Historically subject to less regulation and financial reporting than mutual funds, although reporting is becoming more onerous due to changes in legislation. [½]
- [Max 4]

(ii) Some common strategies include:

- Global Tactical Asset Allocation funds  
  
which concentrate on economic change around the world and sometimes make extensive use of leverage and derivatives. [½]
- Event-driven funds  
  
Which trade securities of companies in reorganisation and/or bankruptcy (“distressed” securities) or companies involved in a merger or acquisition (“risk arbitrage”). [½]
- Market-neutral funds  
  
Which simultaneously enter into long as well as short positions at a market or sector level, while trying to exploit individual security price movements. [½]
- Multi-strategy funds  
  
Which invest in a wide range of investment strategies to provide a level of diversification. [½]  
[2]

(iii) Hedge fund performance data can be influenced by:

- Survivorship bias [½]  
  
– when the data does not realistically reflect survivors and failures. e.g. data has only been provided for 4 of the 20 hedge funds in existence [½]  
  
When the emphasis is on survivors, average returns will be overestimated and volatility will be underestimated. [½]  
  
Also when a fund is added to the database, data vendors tend to “backfill” that fund’s performance history. E.g. the funds shown

have different inception dates and it is not clear how the performance has been calculated for the gaps in years. [1/2]

- Selection bias [1/2]

– funds with a good history are more likely to apply for inclusion.  
e.g. the analyst may have specifically included these four funds due to bias

[1/2]

Backfilling will then cause a significant upward bias

- Marking to market bias [1/2]

– since the underlying securities may be relatively illiquid, funds will typically use either the latest reported price or their own estimate of the current market price for valuation. E.g. the prices shown may not reflect their actual price [1/2]

The use of “stale” prices can lead to underestimation of true variances and correlation. [1/2]

- Return distributions of hedge funds tend to be negatively skewed, [1/2]

- such that standard performance measures of a portfolio's alpha and its Sharpe ratio will be biased upwards. [1/2]

- Lack of knowledge regarding strategy/benchmark. [1/2]

- Lack of knowledge regarding risk profile. [1/2]

Applying these comments to the question data provided.

[Max 5]

(iv) Potential mitigations include:

- Ensure the performance data for the funds being analysed is full and complete. [1/2]

- When comparing funds within particular investment strategies, ensure that reasonable steps are taken include all funds within that “peer group” to ensure “failures” are not ignored. [1/2]

- When analysing performance data, ensure that each funds inception date is taken into account so that performance periods considered avoid any back-filling. [1/2]

- Only analyse performance for periods which actual valuations/prices are available (i.e. quarterly/half-yearly). [½]
  - Ensure full details of strategy and benchmarks are known. [½]
  - Analyse risk adjusted returns. [½]
  - Due to the negatively skewed distribution of returns, the investor should consider the whole return distribution. [½]
- [Max 2]  
[Total 13]

*This was another question that produced some good answers especially where the answers required book work. Part (iv) was well answered by some, however in general the answers were poor.*

**Q4** (i) For a futures contract in a commodity it will be necessary to specify:

- contract size
- the commodity involved
- delivery dates
- quality of the product
- method of packaging
- package size
- delivery site
- margin requirements
- whether cash or physical settlement
- method of resolving disputes about quality

½ mark per point  
[Max 3]

(ii) A contango occurs when the current price of a commodity is lower than prices for delivery in the future i.e. the spot price is below the futures price. [1]

i.e. people are prepared to pay more for the commodity in the future than the expected price of the commodity at the same time in the future. [½]

For commodities, such as precious metals, which are held as investments the futures price = spot price of underlying commodity + cost of carry. [1]

Here the cost of carry is the financing cost of holding the underlying commodity, plus storage costs. [½]

Backwardation is the opposite of contango – in a backwardation the futures price trades at a lower price than the current (spot) price. [1]

The usual situation is that there is a positive value to ownership of the physical commodity (e.g. as a protection against future shortages or in order to be able to take advantage of them by selling at a high price). [½]

This value is described as the convenience yield of the commodity [½]

and the formula becomes

Future price = spot price + cost of carry – convenience yield. [1]

When the convenience yield is higher than the cost of carry the futures price will be below the spot price - backwardation. [½]

For the above formula to be enforced by arbitrage the underlying commodity must be loanable. [½]  
[Max 4]

(iii) An institutional investor may wish to gain exposure to commodities because:

They believe they are undervalued either in absolute terms or relative to other forms of investment. [1]

As a means of diversification. [½]

As a hedge against inflation. [½]

As a speculative investment. [½]

Certain commodities such as gold are sometimes held at times of turmoil, either locally or globally. [½]  
[Max 2]

(iv) An institutional investor can hold metals directly, [½]

however this often presents problems:

Some metals e.g. steel will degrade if not stored correctly. [½]

Some metals such as the precious metals will require secure storage. [½]

Some metals are very bulky and transporting them or storing them can be difficult. [½]

The quality of some metals is variable and the fund manager would need to be able to ascertain quality. [½]

Therefore institutional investors can gain exposure to metals via commodity futures/forwards [1]

or Exchange Traded Funds (ETF) [1]

or equity in mining companies. [½]

These instruments avoid the issues associated with directly holding the commodity. [½]

Both commodity futures and ETFs can be very specific in terms of the exposure they offer and will usually directly reflect the price movement of the metal in question. [½]

Owning equity in mining companies will usually provide exposure to a number of metals as mining companies usually mine more than one metal. [½]

The correlation between metal prices and mining equity is also weaker [½]

than that for ETFs or commodity futures.

[Max 3]  
[Total 12]

*While some students did very well on this question the majority produced poor answers to part (ii) with many being unable to describe contango or backwardation.*

**Q5** (i) Possible restrictions that the investor would need to consider include:

- asset classes that are entirely prohibited – for example, the investor may wish to focus on government sponsored investments to reduce the risk of the investment. [1]
- The credit quality of companies/Governments. [1]
- limitations on the use of assets and asset classes, such as a prohibition on the *speculative* use of derivatives. [1]
- maximum permissible holdings in individual assets or asset classes, to provide for a diversified exposure to the emerging economy. [1]
- ethical or social limitations, e.g. particular sectors of the economy to be avoided. [1]

- restrictions on the choice of assets, for example in an emerging economy the investor may wish to impose a requirement that any equities have been actively traded for 12 months or the sector exposure. [1]
- Restrictions on the overall level of risk e.g. tracking error [1]
- Restrictions on counterparty exposure [1]
- Restrictions on exposure to a single currency [1]

A less prescriptive approach is where the nature of any restrictions is left to the discretion of those awarding the fund management mandates, but with the requirement that such restrictions are set out in a “Statement of Investment Principles” for the information (and scrutiny) of the ultimate investors.

[½]

Other valid restrictions

[1]

[Max 5]

- (ii)
1. Liquidate the investments in the emerging economy [1]  
and invest in a low risk vehicle, e.g. cash until the market has corrected. [½]
  2. Sell equity futures to lock into a fixed price for the investment. [1]  
  
This could be done with both equities and bonds with total contract size equal to the size of the portfolio. [½]  
  
Any fall in the value of the investments is then offset by profits on the futures. [½]  
  
A complication can arise with the bond futures which may be based on long term and hence volatile bonds. [½]
  3. Buy put options [1]  
  
– by buying put options on the assets, the minimum value of the combined holding can be fixed at the exercise price of the options. [½]  
  
If the value of the asset goes up the potential profit has only been reduced by the amount of the option premium. [½]
  4. Use Total Return swaps. [1]

The investor swaps all exposure to the market with another party in return for a series of payments often linked to LIBOR, therefore they cease to have exposure to the market. [1/2]  
[Max 6]

- (iii) Selling the investments – market risk, e.g. if markets rise the investor misses out on the upside. [1]

Investment in cash may be inconsistent to the investor's liabilities and objectives. [1/2]

There is a timing risk that assets are sold at the wrong time. [1/2]

There may liquidity issues. [1/2]

It may crystalize tax losses. [1/2]

Risks using futures:

- Basis risk [1/2]

– although the price of a future follows the cash price very closely, the basis may not move exactly as expected. [1/2]

- Cross hedging [1/2]

– unless the portfolio to be hedged behaves exactly the same as the underlying index, the hedge will not be perfect. [1/2]

For example, where a hedge ratio has been calculated to allow for the different volatility of a bond portfolio and the notional bond, there is a danger that the yield curve changes shape so the prices of bonds do not simply move in proportion to their volatility. [1/2]

- Short equity futures – market risk. [1/2]

- Buy puts – investment performance risk; might not be able to buy puts for all assets in the portfolio. [1/2]

- Swaps – market risk. [1/2]

For all derivative-based strategies, counterparty / default risk is a further issue when OTC approaches are used. [1/2]

Plus possible legal / operational risks due to the complexity of the arrangements. [1/2]

*Other valid comments were given credit*

[Max 6]

[Total 17]

*Most students performed well in parts (i) and (ii), however answers to part (iii) were generally poor.*

- Q6** (i) These figures are just for one year [½]
- which may be very different to other years, so in order to make any meaningful comment the results for a number of years [½]
- would be needed as well as comparative figures for similar companies. [½]
- Looking at the figures as they are given it is obvious that US is not doing well, [1]
- it seems to be heavily indebted with interest accounting for most of the trading profits. [½]
- Comments on interest cover, dividend cover, ROCE, quick/current ratio/gearing [½ mark each]
- It also looks as though once the dividend payment is included the cost of financing its debt and equity exceed the profits. This is not a sustainable position. [1]
- The main asset on the balance sheet is property; [½]
- we do not know when this was valued. [½]
- Assuming the property is the stores themselves, we also don't know what they would be worth if US stopped trading. [½]
- Would there be an alternative use for the stores;
- are there other operators who would buy them, e.g. restaurants? [½]
- The amount included for the property is exactly offset by the loans and corporate bonds in the
- liabilities. Depending on how accurate the valuation of the properties is, this could worry investors. [½]
- The cash flow statement reveals that US increased its indebtedness over the year; [½]
- again this is not something that can be repeated in the long term



unless US can access capital. [½]

*Other sensible observations should be given credit.*

[Max 8]

(ii) Given the financial situation of US it is unlikely that it will be able to access any loan capital [½]

and a bank is unlikely to want to lend money to US. [½]

Therefore the management will have to approach the shareholders for the extra money. [1]

The money could be raised via a rights issue [½]

or placing of shares. [½]

Raise money via private equity – this would require the permission of existing shareholders. [½]

It may be possible to raise money via a sale and leaseback arrangement on some or all of the stores. [½]

[Max 2]

(iii) The net asset value of US may not reflect the actual value of US. [1]

The property assets may be significantly undervalued. [1]

The rival may be able to trade much more profitably from the existing sites. [½]

The takeover may allow the rival to diversify. [½]

There may be a good geographical fit between the two retailers e.g. US is Southern based and their rival Northern based. [½]

The cost of building a chain similar to that of US may be even greater than \$20,000. [1]

The rival may be able to break up US and make a profit by selling it piecemeal. [½]

The rival thinks it can retain the customer base of US and gain market share. [½]

To achieve economies of scale. [½]

The rival may be able to utilise other items such as tax losses that the management of QS can't. [½]

*Other sensible reasons should be given credit.*

[Max 5]  
[Total 15]

*This was a poorly answered question. In part (i) many students failed to see how United Stores was struggling in terms of cash flow and was overloaded with debt. Those that did still produced the 'standard answer' to part (ii) i.e. a list of ways the company could raise more money – mainly through raising more debt, without considering who would lend the money. The answers to part (iii) were marginally better than to parts (i) & (ii) but still poor.*

## Q7 (i)

- Five common styles include:
  - Value [½]
  - Growth [½]
  - Momentum [½]
  - Contrarian [½]
  - and Rotational [½]
- Value managers will tend to hold stocks with low Price-to-book values. [½]
- Five distinguishing factors of value managers are: book to price, dividend yield, earnings yield, cashflow yield and sales to price. [½]
- Growth managers will tend to hold stocks with high Price-to-book values. [½]
- Five distinguishing factors of growth managers are: sales growth, earning growth, forecast earnings growth, return on equity and earnings revisions. [½]
- Momentum – purchasing (selling) those stocks which have recently risen (fallen) significantly in price on the belief that they will continue to rise (fall) owing to an upward (downward) shift in their demand curves. [½]
- Contrarian – doing just the opposite to what most other investors are doing in the market in the belief that investors tend to overreact to news. [½]
- Rotational – moving between Value and Growth depending on which style is believed to be attractive at any particular point in time. [½]

[Max 5]

- (ii) ½ mark for correct statement of the four risk adjusted performance measures and ½ mark for the correct formulae for the two betas.

$$\text{Beta}_X = (0.8) \times (0.10) \times (0.09) / (0.09)^2 = 0.89 \quad [1]$$

$$\text{Beta}_Y = (0.6) \times (0.15) \times (0.09) / (0.09)^2 = 1 \quad [1]$$

**Equity manager X**

$$\text{Treynor measure} = 0.07 - 0.03 / 0.89 = 0.045 \quad [1/2]$$

$$\text{Sharpe measure} = (0.07 - 0.03) / 0.10 = 0.4 \quad [1/2]$$

$$\text{Jensen measure} = 0.07 - (0.03 + 0.89(0.06 - 0.03)) = 0.013 \quad [1/2]$$

$$\text{Prespecified SD} = 0.07 - (0.03 + ((0.06 - 0.03)/0.09) \times 0.10) = 0.0067 \quad [1/2]$$

**Equity manager Y**

$$\text{Treynor measure} = 0.09 - 0.03 / 1 = 0.06 \quad [1/2]$$

$$\text{Sharpe measure} = (0.09 - 0.03) / 0.15 = 0.4 \quad [1/2]$$

$$\text{Jensen measure} = 0.09 - (0.03 + 1(0.06 - 0.03)) = 0.03 \quad [1/2]$$

$$\text{Prespecified SD} = 0.09 - (0.03 + ((0.06-0.03)/0.09) \times 0.15) = 0.01 \quad [1/2]$$

*Other sensible measures can also be given credit.*

[Max 8]

- (iii)
- Based on the Treynor measure, Y has outperformed X. [1/2]
  - Based on the Sharpe measure, the equity managers have performed the same. [1/2]
  - Based on the Jensen measure, Y has outperformed X. [1/2]
  - Based on the prespecified SD, Y has outperformed X. [1/2]
- (iv) Where the portfolio represents the whole of the investors wealth the appropriate measure is the standard deviation. [1]

If it is a subset of the assets, the appropriate measure is the portfolio beta. [1/2]

The reason for this is that the beta of a portfolio is a measure of its risk relative to a well-diversified portfolio [1/2]

and adjusting the return using beta tells us how good the manager is at picking outperforming securities, [½]

given the level of systematic risk assumed. [½]

Using standard deviation to adjust the return allows us to measure how well diversified the whole portfolio is [½]

as well as how good the manager is at picking individual stocks which produce an excess return relative to their betas. [½]  
[Max 3]

(v)

- To improve future performance. [½]
- Comparison of the rate achieved against a target rate. [½]
- Comparison against the performance of other portfolios, an index and/or a benchmark portfolio. [½]
- To appraise and remunerate investment managers. [½]

[2]

[Total 20]

*This was the best answered question on the paper with most students scoring well on the calculations and making reasonable attempts at the rest of the question.*

## END OF EXAMINERS' REPORT