

**Subject ST5 — Finance and Investment
Specialist Technical A**

EXAMINERS' REPORT

April 2009

Introduction

The attached subject report has been written by the Principal Examiner with the aim of helping candidates. The questions and comments are based around Core Reading as the interpretation of the syllabus to which the examiners are working. They have however given credit for any alternative approach or interpretation which they consider to be reasonable.

R D Muckart
Chairman of the Board of Examiners

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Comments

Pleasingly, a better answered paper than previous diets leading to a higher pass rate even with a higher pass mark. Candidates typically answered Questions 1, 4 and 5 much better than the others, with Questions 2 and 3 attracting the worst responses, considerably so. This is not surprising given that Questions 2 and 3 represented the opportunity to demonstrate higher level skills in terms of non-standard/practical application of theory to current issues in investment – hence candidates who wish to progress to SA6 will need to improve their understanding of and approach to this type of question.

That said, most candidates seemed to identify and understand the key issues being examined and so appreciated the general content of solutions that the examiners were looking for – however those that were unsuccessful will find their solutions lacked sufficient (and often the most basic) detail and scored lower accordingly (this was most evident in Question 6). Many candidates still deviate from the topic and include irrelevant material or over emphasise minor points – although candidates will not be explicitly penalised for this, it gives an impression of a lack of understanding and, more importantly, wastes limited time. Time and priority management are key skills actuaries need to have. Where candidates made relevant points in other parts of their solutions, the examiners have used their discretion as to whether to recognise these answers or not. Likewise the examiners share and agree alternative possible solutions to questions during the marking process.

Again there were many candidates close to the pass mark whom were awarded an FA – most candidates would be very surprised to see just how tightly distributed the marks are; deciding where the pass mark falls will have a material impact on the numbers of candidates who are successful and the examiners take great care to ensure a consistency of standard across candidates, subjects and diets. Several candidates were awarded an FD in this diet and the examiners remain concerned by the numbers of candidates still achieving only an FC grade, since this too would imply little preparation or, worse, knowledge and understanding.

Candidates are reminded of a bias in the paper towards recognising higher level skills and practical application – this is intentional and will continue. Likewise the examination system does properly allow for prior subject knowledge to be assumed. Investment is a necessarily practical subject and, at this level, the examiners expect candidates to demonstrate a breadth and depth of competency as would be expected from a senior student in a frequently evolving discipline. Hence simple regurgitation of bookwork will never be sufficient to ensure a Pass grade – and this was evident from the dispersion of candidates' responses in the more differentiating questions.

As noted before, in order to succeed, candidates must ensure they familiarise themselves with the prevailing investment issues and the general market background facing institutional investors in the 18 months preceding a diet, more so the solutions (and sources of) being debated by the various stakeholders. A recurring theme in recent years has been a move towards capital market rather than purely insurance and asset management solutions – hence questions regarding banking and derivative approaches to asset and liability risk management or modern financial theory and commercial applications should be considered likely scope for examination. New asset classes and ways of structuring investment will themselves generate new types of risk (such as operations, liquidity, credit and counterparty), so the need for new ways of monitoring and management. All extenuating and mitigating circumstances were considered in awarding grades and, where there was a genuine cause, credit given.

1 (i) There are various reasons why the performance of an investment portfolio will be measured:

1. *To improve future performance.* First, data collected during performance monitoring can form the inputs for planning future strategy. Secondly, if fund managers know that their performance is being measured, it might give them an extra incentive to maximise the returns of the funds they manage.
2. *Comparison of the rate achieved against a target rate.* Many funds will have one or more “target” rates of return. For example, the trustees of a pension fund will want to know the rate of return achieved on the investments compared with the rate of return assumed in the actuarial valuation.
3. *Comparison against the performance of other portfolios, an index and/or a benchmark portfolio.* Those responsible for the funds will want to know how the performance of the portfolio compares with other portfolios. On the basis of this information, they are able to make decisions regarding the future investment of the assets, e.g. should a new fund manager be hired?

Also, by analysing the performance against a notional portfolio, it may be possible to identify some relative strengths and/or weaknesses of individual fund managers (e.g. in sector or stock selection).

Other reasons could include the assessment of performance related fees or more generic assessments of success/failure of the portfolio.

(ii) There are several limitations and disadvantages of portfolio performance measurement.

Projection of past results: the fact that a particular result was attained in the past does not mean that it will occur in the future. There is a random element in investment returns and it may be difficult to determine how much a fund manager's results are due to method and how much to luck. Furthermore a technique that proved successful in a particular set of circumstances may not work so well in changed circumstances in the future.

Risk: in the long term we would expect a riskier strategy to produce higher average returns. The measurement of relative performance should therefore take account of the degree of risk taken on by a fund manager.

Timescale: determining the frequency of performance measurement calculations requires a delicate balance between assessing performance frequently enough so that problems can be spotted and corrected and avoiding spurious conclusions based on too short a measurement period.

Differing fund objectives: different funds may have different objectives and constraints. Comparisons between such funds may not be valid.

Impact on fund manager behaviour: knowledge of how, and how often he will be assessed is likely to influence the investment strategy of a manager. This may not be in the fund's best interests. For example, frequent monitoring can encourage a short term approach to investment.

Cost: users of performance measurement services must balance the value of the service against the cost. Also, for a number of assets (e.g. property), valuation is difficult, time-consuming and very subjective. Detailed, frequent calculations based on subjective valuations are inappropriate.

(iii) Index statistics will be influenced by:

- *Survivorship bias* — unlike in other asset classes, it is difficult to obtain data on hedge fund failures when “backfilling” a history at the time an index is launched by an index provider. This will create an upward bias.
- *Selection bias* — funds with a good history are more likely to apply for inclusion at the time of reviewing index constituents. Similarly, it is not always possible to obtain accurate performance information from a failing hedge fund so the provider may only be able to exclude the fund rather than report its full losses. Both of these factors will create an upward bias.
- *Marking to market bias* — where underlying securities are illiquid, funds may use “stale” prices or mark asset values to a valuation model. Whilst this does not necessarily result in a bias to the return data, it is likely to result in lower volatility figures than would be the case otherwise.

(iv)
$$S = \frac{R_p - r}{\sigma_p}$$

where R_p is the return on the portfolio

r is the risk-free rate of return (usually taken to be 3 month LIBOR)

σ_p is the standard deviation of portfolio returns

(v) The Sharpe ratio is widely understood by investors.

The Sharpe ratio can be calculated without reference to the beta of a portfolio...

...making it more practical to compare strategies across different asset classes...

...including asset classes where there may not be an obvious market portfolio that can be used as a reference point.

Both the Jensen and the Treynor ratios rely on beta being a proxy for the level of active risk taken by the asset manager.

[Credit was awarded for any other reasonable points made]

(vi) The key limitations of the Sharpe ratio with regard to hedge fund returns are as follows:

- **Mismatch with utility function** – the Sharpe ratio falls as downside or upside volatility increase. In practice, investors will specifically be concerned to avoid downside risks within their utility function.
- **Sampling issues** – historic calculations will be limited by the length of available history. With hedge fund strategies, it is possible to employ a strategy that appears low risk for an extended period but has a large tail risk (e.g. selling volatility by writing out-of-the-money put options), and the Sharpe ratio will not capture information about low frequency high severity events.
- **Non-normal return distributions** – the Sharpe ratio will give a consistent measure of excess return to risk for normal distributions, however standard deviation is not a useful proxy for risk for all return distributions. This is particularly the case for many hedge fund strategies.

All of these sources of distortion can result in sub-optimal investment decisions.

- 2
- (i) (a) The analysis should identify and analyse the key factors affecting the future profitability of companies within the sector...
...and offer an outlook for the sector as a whole.
The analysis should enable the portfolio manager to form a view on the attractiveness of the sector relative to other sectors...
...and also form a view on the relative attractiveness of individual companies within the sector.
The analysis should also comment on the timescale over which differences between perceived value and market prices might converge (or if not, why they might persist)...
...and the recommendations should be justified by a combination of numerical analysis and qualitative research...
- (b) The analysis should include historical statistics and forward-looking estimates for several of the following factors to enable a picture of the financial position of the companies to be built up:
- Revenues
 - Operating profit
 - Pre-tax profit
 - Earnings per share
 - Price/earnings ratio
 - Price/book value
 - Dividend yield
 - Outstanding debt

Where appropriate, the numerical analysis may need to be supplemented by qualitative commentary to justify the recommendations for each company.

- (ii) There should be additional commentary/analysis on the following:
- details of maturities of the company's existing bonds and loans
 - trends in the company's balance sheet over the next 5 years
 - trends in revenues and operating expenses [P&L alternatively] over the next 5 years
 - the likelihood of the existing borrowings being refinanced in the current climate without other compensating corporate actions
 - potential corporate actions that may need to be carried out to facilitate a refinancing (e.g. disposals or rights issues to raise cash)
 - the likely change in financing costs as a result of the refinancing, based on analysis of recent loan spreads for the sector and the economy
 - impact on credit rating
 - investor appetite for bonds/syndicated loans from this issuer
- (iii) A new investor will not necessarily gravitate to the established global equity fund, depending on his/her requirements.

Particular reasons why the new funds might offer a better fit for the investor's requirements could include one or more of the following factors:

Alpha based view

The investor believes that the fund manager has greater potential to deliver alpha in the Lower Leverage or Higher Leverage niches than in the main fund that invests in both categories of company.

This may reflect that the investor believes that a global approach to equity investment is better suited to, for example, the Lower Leverage category, where there are fewer country-specific factors that need to be accounted for in selecting stocks.

Beta-based views

- **Long term:** the investor wishes to have a long-term bias towards Lower Leverage or Higher Leverage companies.
- **Short-term:** the investor believes that at the current point in the economic cycle, Lower Leverage or Higher Leverage companies have better prospects.
- The above may reflect a risk-based view (e.g. more highly leveraged companies have higher volatility) or a return-based view (e.g. more highly leveraged companies will underperform at times of high interest rates / high credit spreads).

- Alternatively the above may reflect a preference to overweight particular sectors (e.g. mining companies and oil companies tend to employ less leverage than say financial companies) within the portfolio.
- Where one of the two niche funds is being chosen based on beta-based view (whether long-term or short-term), the particular product would only be appropriate if the investor believes that the manager is capable of delivering alpha in the chosen category (otherwise a passive strategy would better suit the investor).

Portfolio construction/style diversification

The investor may be working around other equity styles within the existing portfolio, and one of the two niche funds may be more appropriate (e.g. the investor wishes to invest in a style neutral manner but feels that the Lower Leverage fund will better complement an investment in a Global Equity Growth fund offered by another manager).

The investor may also have adopted a risk-budgeting approach and one of the two niche funds may be a more suitable addition to the portfolio from the earmarked funds for investment. This would assume that the investor does not have strong alpha and beta views, that would naturally lead to additional adjustments elsewhere in the investor's portfolio.

- (iv) At the launch date of the two niche funds it would appear that equal investments in the two funds would in aggregate equal the existing fund. However, the two approaches would begin to diverge almost immediately, although not greatly as they are based on broadly the same stock/sector selection decisions.
- Differences would arise due to inflows and outflows from investors into the different pooled funds, resulting in varying cash weightings and transaction costs which would impact on the relevant fund.
- Further differences will arise if a stock was reclassified as moving from the Lower Leverage category to the Higher Leverage category (or vice versa). This reflects that for the existing fund this would not lead to a buy/sell decision (in the absence of other factors), whereas for the two niche funds one would need to sell the stock and one would need to buy the stock (in the absence of other factors). Crossing trades will mitigate against market impact and transaction costs to the extent that the Lower Leverage and Higher Leverage funds are making equivalent but opposite changes in a particular stock.

- 3**
- (i) A swap agreement in which the fixed rate receiver has the right to terminate the swap on one or more dates prior to its scheduled maturity. This early termination provision is designed to protect a party from adverse effects of large changes in fixed rates.
- (ii) The pension fund wants to enter into swaps to reduce risk but the actual liabilities are subject to refinement which might mean swaps adjustment.

There is a yield pick up on the swap and therefore, is being held for tactical reasons and not as a long term investment.

(iii) Interest rate swap.

(iv)

<i>Period</i>	<i>Number of days in period</i>	<i>Annual Forward Interest</i>	<i>1/2 year interest rate</i>		
1	183	4.00%	2.03%	value	50000000
2	181	4.25%	2.14%	term	3
3	182	4.50%	2.28%	payment	semi-annual arrears
4	182	4.75%	2.40%	days	360
5	181	5.00%	2.51%		
6	183	5.25%	2.67%		

(a)

	<i>PV</i>	<i>Discount</i>	<i>PV of payments</i>	<i>Notional</i>
1	$1/[1+(\text{days}/360 \times \text{Interest})]$	0.9801	996406	24910160
2	$1/[1+(\text{days}/360 \times \text{Interest}) \text{ 2 periods}]$	0.9596	1025205	24122468
3	etc.	0.9382	1067229	23716197
4	etc.	0.9162	1100102	23160035
5	etc.	0.8938	1123398	22467962
6	etc.	0.8705	1161602	22125746
Total		5.5584	6473942	140502569

Candidates were given credit for rounded solutions rather than the level of detail shown. Full marks were not available if candidates assumed a half year rather than a specific day count.

(b)

PV of notional	140502569
PV of floating rate	6473942
Theoretical swap rate	4.61%

(v) $\text{PV of fixed rate} = 4.75 / 4.61 \times 6473942 = 6670520$
 Profit = $6670520 - 6473942 = \text{£}196,578$ (or the “rounded” equivalent)

The fixed rate is higher than the theoretical swap rate so assuming the payments reflect the assumed then the pension fund will be in the money, i.e. calculation should show a profit, as they have been paid a higher amount from the bank (via fixed) than paid out.

- (vi) The higher interest rates would mean the pension fund would be paying out more than assumed and therefore, the profit assumed would be reduced or turned into a loss (out of the money)

4 (i) (a) An option issued by a company. The holder has the right to purchase shares at a specified price at specified times in the future.

(b) Options can have more flexible exercise dates than warrants.

Warrants are new shares issued and therefore dilute share capital, options are right to buy existing share capital.

Warrants are OTC where as options tend to be exchange traded.

Warrants have longer expiry than options.

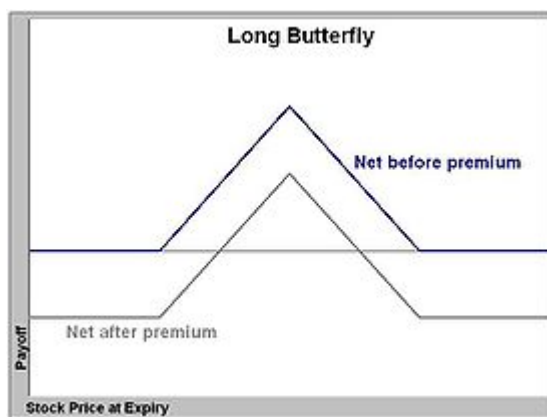
(ii) (a) European – right to purchase at set price at set date in future.

American – right to purchase at set price at any point before expiry date.

(b) American as it has the added flexibility.

(iii) The charts illustrate the basic shape of the payoff and credit was given for similar, suitably annotated graphs

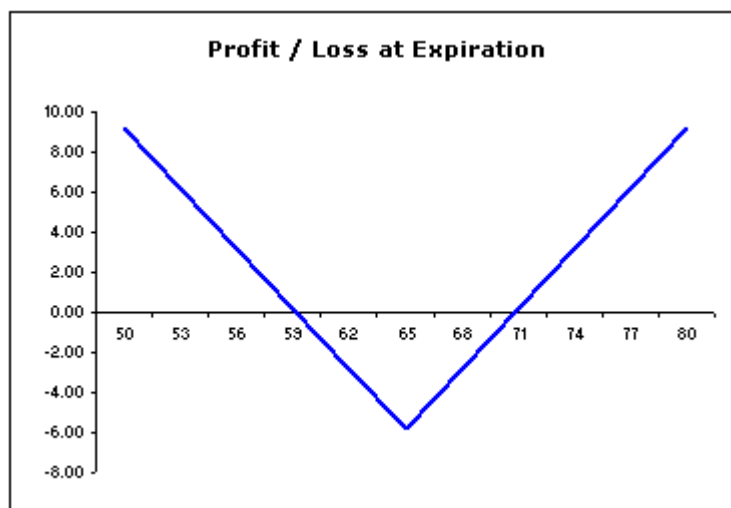
(a) Butterfly spread



Investor does not believe a stock will rise or fall much before expiry – thinks volatility will be low. Wants limited risk strategy – but also limits profit.

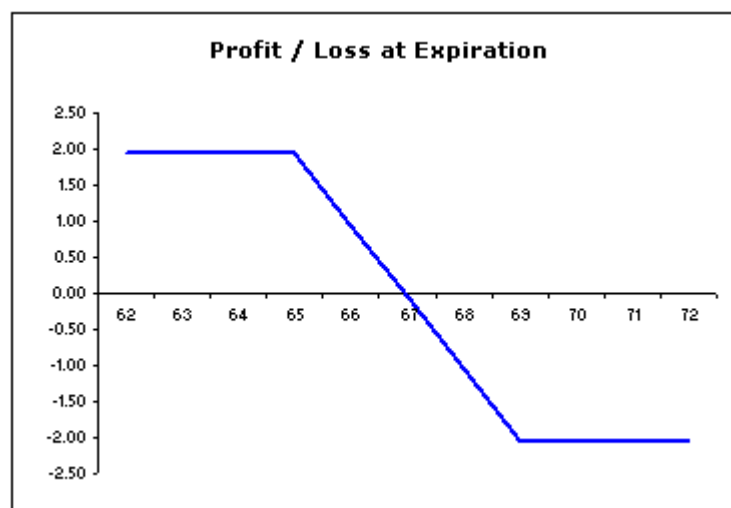
(b) Straddle

Investor believes the underlying price will change significantly but does not know which way it will go. Profit if volatility is high.



(c) Bear spreads

A bear call spread is a limited profit, limited risk options trading strategy that can be used when the options trader is moderately bearish on the underlying security. Thinks the share price will fall.



(iv) $O - S_t + K$ where S_t is greater than K , otherwise O . S_t = price of stock, K = exercise price, O is price of option.

(v) Chart would show £50 profit when share price starts at 0 until exercise price £1.50. The investor would then start to decrease the profit. At £2.00 exercise the investor profit would be £0. At £2.50 the loss would be £50

- (vi) £0.75 = £50 profit,
£1.50 = £50 profit assuming can buy stocks in market at zero cost
£2.15 = £15 loss assuming can buy stocks at zero cost. Loss on purchase of shares is £65 and profit from premium £50
- (vii) Initial margin is $0.2 \times 50p \times 100 \text{ shares} = £10$. Then have to post 100% of the movement which is 5p. The additional margin is then £5 for the 100 shares so the total margin = £15.

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- (i) The par yield is the coupon rate that would be required for a coupon-paying bond to be valued at par under the current interest rate curve.
- (ii) $1 = C_2 (1 + zc_1)^{-1} + (1 + C_2)(1 + zc_2)^{-2}$
- (iii)

Term	Par Yield	V(Bond)	V(Bond exc last)	ZC Yield
1	5.50%	100.000%		5.500%
2	5.40%	100.000%	94.882%	5.397%
3	5.35%	100.000%	90.114%	5.346%
4	5.30%	100.000%	85.679%	5.290%

- (iv) Any three from:

Yield differences: in considering possible anomaly switches, yield differences are widely used to identify individual bonds which seem cheap or dear, in relation to other bonds. However, because of the fact that high coupon bonds are likely to have higher gross yields than low coupons, a high gross yield does not in itself indicate that a bond is cheap. The investor must examine whether the yield difference is greater or less than it has been in the past.

A problem with the evaluation of individual bonds in relation to a fitted yield curve has been the stability of the method used to fit the curve. It is now more usual to review a computer generated history of yield spreads between pairs of actual bonds.

Price ratios: these can be monitored as well as yield differences. Ideally, a switch under consideration will look attractive, in relation to both yield and price histories. A practical problem in using price ratios is that they do not allow for the fact that the two bonds may have different coupons; they will have different prices but will both be redeemed at 100. So the ratio of the two prices will display a trend. This history of price ratios may be adjusted by this trend to produce what are often known as “stabilised” price ratios.

Price models: some bond analysts have devised price models which try to assess the “correct” price for a stock, given the key variables. A stock’s price is considered anomalous if the actual price differs from the price derived from the model.

Yield models: rather than compare a bond's yield with a redemption yield curve it can be compared with one of the alternatives such as a yield surface or par yield curve.

- 6** (i) (a) The primary purpose of the agreement is to act as a business contract between the investment manager and the investor/client. As a minimum it would set out the services to be carried out by the manager for the investor and the agreed fees.
- (b) Typical restrictions would include:
- limitations on permitted asset classes for manager to invest in
 - limitations on leverage (explicit and implicit, through derivative contracts)
 - maximum and minimum ranges for holdings in particular asset classes
 - maximum ranges for holdings in a single company or single industry sector
 - prohibitions on particular stocks for ethical/SRI reasons (e.g. cluster bomb manufacturers)
 - prohibitions on self-investment in the investor's own securities
- (ii) A fund will often have a number of different managers and mandates managing its assets. A prescriptive approach within manager agreements allows the asset allocation to be controlled and managed at a global level, whereas if the asset managers had complete discretion in security selection it is unlikely that the actual assets would closely resemble the target asset allocation.
- Additionally, many funds will wish to place restrictions on permitted investments and leverage as part of their overall risk controls and wider social responsibilities.
- Finally, a relatively prescribed agreement enables the investor to challenge the manager more easily in the event of the assets not being invested in line with the investor's wishes, or in the event of mismanagement taking place.

END OF EXAMINERS' REPORT