

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2018

Subject SA6 – Investment Specialist Applications

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 the Investment Specialist Applications subject is to instil in successful candidates the ability to apply knowledge of the United Kingdom investment environment and the principles of actuarial practice to the selection and management of investments appropriate to the needs of investors.
2. Candidates are reminded to ensure that their answers are sufficiently detailed to demonstrate understanding, as there were instances where inadequate explanations led to candidates scoring less well on questions than they might have done. The model solutions are intended to reflect the level of detail that a high scoring candidate might be able to produce. For many questions there are more marks available than the question requires to achieve full marks. This reflects that the examiners will give credit for valid alternative solutions, particularly in questions focussed on higher level skills.
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 paper was reasonably well answered. Candidates in general demonstrated a good grasp of Core Reading and were able to apply this knowledge in familiar situations. Candidates overall scored less well in numerical questions or where more detailed application skills were being assessed. Candidates generally made good attempts at parts of questions testing higher order skills.

C. Pass Mark

The Pass Mark for this exam was 55.

Solutions

- Q1** (i) As donations and investment income are in excess of current expenditure, the cash flow position is positive. [1]
- There may be scope to reduce expenditure providing some flexibility to absorb investment losses [½]
- Cash inflows and outflows could be lumpy due to one-off large donations or capital expenditure [½, either inflows or outflows]
- If the fund is expected to be cash flow positive for some time then it may be able to make long-term investments, [1]
such as long dated infrastructure projects, [½]
- or private equity. [½]
- There is less need to sell assets early or be a forced seller to meet cash flow requirements [1]
allowing the fund to invest in less liquid opportunities [1]
There is less need to invest in income generating assets [1]
- New cash flows can be used to rebalance the fund's asset allocation [½]
and fund future new opportunities [½]
potentially without the need to sell other assets [½]
[Max 6, credit given for other relevant comments]
- (ii) The stated primary objective of the fund is not an explicit or guaranteed liability, [1]
and is more of an ambition [½]
- Ideally the assets will at least grow with any increase in the cost of providing the university services. [1]
- A suitable benchmark may therefore be based on the cost of education, [1]
but as this is unlikely to be available the closest proxy may be some sort of inflation linked benchmark. [1]
- As this is a Euro-zone institution, this could be a Euro inflation measure such as the Euro area HICP [1] or French CPI [½]
- The benchmark could allow for a margin of outperformance, especially given the potentially long time horizon, higher risk appetite and belief in active management [1]
- The benchmark could be set in line with the return objectives and amount of risk taken, e.g. French CPI + 4% [1]

The objective is a long term ambition, so results over rolling periods or longer periods may be suitable [1]

Some endowments may consider peer group benchmarks or a benchmark relative to a equity index, but these may be less suitable as they do not address the objective of the endowment [½]

[Max 8, credit given for other relevant comments]

(iii) Value – focuses on purchasing shares that are relatively cheap or good “value” [1]

when considering factors such as Book to Price, [½]

Dividend Yield, [½]

Earnings Yield, [½]

Cash Flow Yield [½]

and Sales to Price [½]

[Max 2]

Momentum – purchasing (selling) those stocks which have recently risen (fallen) significantly in price [1]

on the belief that they will continue to rise (fall) [1]

owing to an upward (downward) shift in their demand curves. [½]

[Max 2]

(iv) Pros of managing the infrastructure investment in-house:

- Closer alignment of interests [1]

- Close monitoring and interaction possible [1]

- Potentially lower cost [1]

- Full control over investment [1]

- Ability to have more focussed portfolio (because of diversification with other assets, less need to have a lot of diversification within the portfolio) [1]

- More flexibility to incorporate the endowment’s philosophy of active management and ESG factors [1]

Cons of managing the infrastructure investment in-house:

- Potential requirement to hire additional specialist resource [1]

- Difficulty in attracting the most talented investors in this specialist area [1]

- Fixed costs of setting up new capability can be large [1]

- Less ability to diversify and pool with other investors [1]

- Access to infrastructure markets may be complex and require more experience compared to investing in stocks and bonds [1]

- Infrastructure specific issues, including regulatory, legal and tax issues make outsourcing to a specialist more attractive [1]

[Max 10, credit given for other relevant comments]

(v) Agency risk is the risk that arises from the misalignment of interests between stakeholders. [1]

When a principal hires an agent to work for him/her, the agent will not necessarily act in the interests of the principal, and instead may act in their own interests. [1]

The existence of information asymmetry contributes to the potential occurrence of agency issues. [1]

The internal investment team (as agent) may for example have an incentive to:

- Increase financial rewards for its senior management/staff [1]

- Focus more on expansion of the team than cost control. [1]

- Prioritise internal management of assets, instead of outsourcing which could be more efficient from the university's perspective [1]

- Take too much risk, so to boost bonuses or status [1]

- Focus too much on peer group performance [1]

- Maintain the status quo, rather than adapt to meet the university's needs [1]
[Max 8, credit given for other relevant comments]

(vi) This issue can be managed and reduced somewhat by attempting to align the interests of the principal and the agent. [1]

This could be done by having a variable pay element for staff or management of the internal investment team based on performance. [1]

Variable pay could be deferred [½]

The principal could employ another party to oversee the internal investment team and verify that they are acting in the principal's interest. [1]
However, this usually adds an extra dimension to the principal-agent problem. [1]

Having a clear benchmark or financial objective, [½]
that takes into account risk taken and is being monitored closely [1]

A process for requiring sign-off by an independent body or university representatives for significant investments, staff number budgets and the decision to in-source or outsource [1]

The university could ensure greater oversight of the internal investment team through representation on boards or committees [1]
[Max 6, credit given for other relevant comments]

Question 1 was well answered, although the scenario may have been somewhat unfamiliar to many candidates. Parts (ii) and (v) tested

higher order skills and were less well answered than the other parts of the question.

- Q2** (i) To achieve the Fund's objectives it is not sufficient for managers to outperform the benchmark index (net of fees), [1]
it is also necessary to have a lower absolute volatility. [1]
- It is unlikely for the volatility objective to be achieved alongside the performance target if all the managers follow the same or similar styles [1]
since the amount of diversification will be modest. [½]
- This is true even if the style is not highly correlated to the index, [½]
unless the style itself happens to have a lower volatility over the period in question. [½]
[Max 4]
- (ii) (a) The Fund needs to assess if a manager is producing superior risk-adjusted returns relative to other managers. [1]
- This will involve analysis of the manager's historic returns. [1]
A skilful manager will achieve a number of the following, relative to the index [½]
and to the average for the style: [½]
- Positive excess return net of fees
 - Low absolute volatility
 - Information ratio (absolute return / absolute volatility) higher than index or style average
 - Higher skew than index or style average
 - Lower average monthly drawdown than index or style average
 - Lower maximum monthly drawdown than index or style average [½ per measure]
- (b) Correlation analysis to other managers within the style or the style average should also be carried out. [1]
Where a manager is in fact following a different style to that expected this should be investigated. [1]
Other analyses that could be carried out – historic VaR, [½]
tracking error vs different indices [½]
Where a manager is following the style but correlations are lower than expected this is a positive factor. [1]
[Max 7, credit given for other relevant analyses]

(iii) Manager A – good information ratio, good skewness

Manager B – weak information ratio, poor returns, high drawdowns

Manager C – weak information ratio, high volatility, high drawdowns, poor skewness

Manager D – weak information ratio, poor returns, high volatility, high drawdowns

Manager E – very good information ratio, very high returns, good skewness

Manager F – good information ratio, high returns, good skewness

[1 mark per manager for any two characteristics as given]

(iv) (a) Either manager B or D could be replaced as they are the weakest managers in terms of returns achieved. [1]
D has higher returns and slightly better drawdown and skewness characteristics, [1]
so B should be replaced. [1]
[Max 2]

(b) Managers C or D are the weakest managers in terms of contribution to volatility. [1]
Manager B also has poor drawdown characteristics, like managers C and D. [1]
Manager D should be replaced. [1]
[Max 2]

(v) The key limitations of using historic data on monthly returns are:

- **Past performance** may not have high predictive power for future performance. [1]
- **Manager outperformance** may not be consistent over time. [1]
- **Style drift** – managers' styles may not be constant over time. [1/2]
Monthly return data alone is often not sufficient to assess if style is constant [1]
since even with 5 years of data there are only 60 data points. [1/2 for relevant example]
- **Sampling issues** – historic calculations will be limited by the length of available history. [1]
Whilst statistical significance is increased by using a longer history, [1/2]
managers will have changes of process and personnel over time. [1/2]
As such a compromise will be necessary. [1/2]
- **Non-normal return distributions** – where a manager is investing in a highly idiosyncratic manner, [1]

or using additional strategies such as call overwriting or holding convertibles, [½]
 their return distribution could have significant negative skew. [½]
 This may be difficult to observe from monthly returns data. [½]
 [Max 4, credit given for other relevant comments]

(vi) Historic analyses of manager performance are subject to the following sources of bias:

- **Selection bias** – when screening manager databases, managers with strong performance will be focussed upon. [1]
 Assuming that strong performance reflects a combination of skill (positive expected return) and luck/idiosyncratic factors (zero expected return), [1]
 this will result in an upward bias. [½]
- **Survivorship bias** – the manager database itself may be biased towards the inclusion of strongly performing managers. [1]
 This will overstate the added value of a particular style relative to the index. [1]
 [Max 4, credit given for other relevant comments]

Question 2 was generally well answered, and was an application focussed question. However, part (vi) was poorly answered, with many candidates unable to identify the relevant issues.

Q3 (i) The pay-off of this option strategy can be replicated by purchasing a call [½]
 and a put, [½]
 both with a strike equal to the current share price, [½]
 which is 76. [½]

(ii) The price of this option strategy can be calculated by working backwards and valuing a replicating portfolio of cash and shares.

At the “up” node time 1, the delta of the strategy is $1(11 - 1) / (87 - 77)$ and the strategy can be replicated by:

- Long 1 share (value 81)
- Short 76 cash (so to match the option value)
- Net value 5

[2]

This will lead to a pay-off of:

- “up-up” skewness” node time 2: $87 - 76 = 11$
- 2up-down” node time 2: $77 - 76 = 1$

At the “down” node time 1, the delta of the strategy is $-0.8 (1 - 9) / (77 - 67)$ and the strategy can be replicated by:

- Short 0.8 share (value -57.6)
- Long 62.6 cash (so to match the option value)
- Net value 5

[2]

This will lead to a pay-off of:

- “down-up” node time 2: $-0.8 * 77 + 62.6 = 1$
- “down-down” node time 2: $-0.8 * 67 + 62.6 = 9$

At time zero the delta will therefore be 0 and the no-arbitrage price of this option strategy is therefore 5.

[1]

- (iii) The value of the strategy increases as the volatility increases and vice versa. If the trader expects realised or actual volatility to be lower than is currently implied in the pricing of the option, then the option is over-priced.

[2]

The trader should therefore sell the above option strategy.

[1]

Parts (i) and (iii) of this question were well answered, however part (ii) which was application focussed was poorly answered.

Q4 (i) Auctions [½]

The primary method used now for public offerings of conventional gilts is the auction.

[1]

Auctions are held in most weeks, with the Bank of England setting out the calendar for the next few months in advance at the end of each quarter.

[1]

Bids can be made on a competitive basis or non-competitive basis.

[1]

Successful bidders on the competitive basis will pay the price they bid, whereas bidders on the non-competitive basis will pay the average price of the successful competitive bids.

[1]

Syndication

[½]

Syndication, where an issuer appoints a group of banks to manage the sale of the bond on its behalf, is now used extensively for the sale of gilts, including index-linked gilts.

[1]

Taps

[½]

As well as public offers, the government may issue relatively small amounts of an existing stock directly to GEMMs.

[1]

The shop window [½]

The “shop window” is the listing of the gilts that the Bank of England is prepared to offer for sale in response to offers from GEMMs. [1]

[Max 8]

- (ii) 21. [½]

There would be twenty coupon strips as gilts are semi-annually compounded [½]
and one redemption strip. [1]

- (iii) Strips trade on a yield basis. The formula used for converting yield to price is:

$$P = \frac{100}{\left(1 + \frac{y}{2}\right)^{\frac{r}{s} + n}}$$

where: P = Price per £100 nominal of the strip
 y = Gross redemption yield
 r = Exact number of days from the settlement/issue date to the next quasi-coupon date
 s = Exact number of days in the quasi-coupon period in which the settlement date falls
 n = Number of remaining quasi-coupon periods after the current period
 r and s are not adjusted for non-working days.

[2]

$$P = \frac{100}{\left(1 + \frac{0.01}{2}\right)^{\frac{59}{183} + 39}}$$

$P = 82.1912$ [2]

- (iv) Coupons are payable half-yearly [½]
 and the redemption payment is payable at maturity [½]
 together with the last coupon payment. [½]

The coupons and capital repayments of index-linked gilts are increased in line with the growth in the RPI index. [1]

If the RPI falls over the indexation period, then the coupon or principal payment would fall. [1]

The RPI increase relates to the increase between the base date three months before the date of issue of the gilt [1]
 and a date three months before the payment date. [½]

For older index-linked gilts [½]
 issued before September 2005, [½]

an eight-month, rather than three-month lag is used.

[1]
[Max 5]

Question 4 was generally not well answered, which was unexpected since it was largely knowledge based with some straightforward numerical applications.

END OF EXAMINERS' REPORT