

# **INSTITUTE AND FACULTY OF ACTUARIES**

## **EXAMINERS' REPORT**

September 2020 Examinations

### **Subject SA7 - Investment and Finance Advanced**

#### **Introduction**

The Examiners' Report is written by the Chief 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.

Mike Hammer  
Chair of the Board of Examiners

December 2020

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

1. The aim of Investment and Finance Advanced (SA7) is for the candidate to develop a broad working understanding of financial and investment markets, across all major areas of investment expertise. The intent is to achieve expertise up to a level that allows for critical analysis of others, rather than up to the level of full specialist expertise in any particular area. This might be considered the level of expertise needed to be a Chief Investment Officer (CIO) of an investment management organisation or to hold a comparable role in a financial institution with significant involvement in financial markets.
2. Candidates should 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. Comments on *candidates' performance in this diet of the examination***

Overall the paper was well attempted by most candidates. Candidates scored relatively well on application and higher order questions. Suitably prepared candidates were able to score highly across the four questions demonstrating their ability to apply their SA7 knowledge and techniques to a range of familiar and unfamiliar scenarios.

With the online format candidates benefit from the ability to carry out calculations in Excel. It is important that assumptions are stated and intermediate steps shown for calculations are shown so that maximum credit can be given.

**C. Pass Mark**

The pass mark for this exam was 59.

112 candidates presented themselves and 54 passed.

## Solutions

### Q1

(i)

- Pensions are payable until members' death, timing of which is uncertain [1]
- Members may have options e.g. to convert pension into cash lump sums at retirement, or to take a transfer value, creating further uncertainty [1]
- Long duration of deferred member and dependents liabilities [1]
- Shorter duration for pensioners [1]
- Fixed or real payments (inflation component) [1]
- Pensions will be denominated in domestic currency [1]
- Open/closed scheme [1]
- Inflation caps/floors [1]

**[Marks available 8, maximum 5]**

(ii)

- Pension fund liabilities are long duration, and sovereign bonds allow close duration matching. [1]
- Sovereign bonds have lower risk than other assets. [1]
- Pension fund liabilities have inflation linkage and sovereign inflation linked bond markets allow close inflation matching. [1]
- Sovereign bonds are generally high quality, so have low default risk. [1]
- Sovereign bonds are highly liquid. [1]
- Low management fees. [1]

**[Marks available 6, maximum 4]**

(iii)

QE decreases the availability of assets suitable to match pension fund outgo. [1]

Pension fund liabilities likely to be of longer duration than assets. [1]

This duration mismatch means in cases where rates are low, liability values are impacted more than assets. [1]

Low yields on assets backing pension fund liabilities also have a negative impact on funding levels. [1]

QE could lead to currency volatility [1]

Asset valuations driven more by yields than fundamentals [1]

Risk of asset bubbles due to QE [1]

*Credit given for other relevant comments*

**[Marks available 7, maximum 5]**

(iv)

- Bond and mortgage defaults will reduce the regular payments which can be used to meet regular payment requirements. [1]
- An increase in the probability of default over time means there is a higher likelihood of pension payment shortfalls in the case of defaults. [1]
- Mortgage prepayments mean that funds are received earlier than expected. This can lead to mismatches in regular asset and liability cashflows. [1]

- Prepayment also leads to a need to reinvest the funds received and the yield received under reinvestment may be lower than previously. [1]
- Any void periods on commercial property can lead to a mismatch in asset and liability cashflows as no income is received in that period. [1]
- The proportion of the bond nominal that can be retrieved under default will impact the shortfall in regular income as well as future nominal amounts which can be used to get future income. [1]
- Construction delays for infrastructure which delays when income can be paid. This will have an impact on the ability to match asset and liability cashflows. [1]
- Actual payments being materially different to those expected for some infrastructure investments will reduce the amount of investable assets. [1]
- Escalation of costs for specific types of infrastructure. This would reduce the capital available to invest in income bearing assets. [1]

**[Marks available 9, maximum 6]**

(v)

- Will there be sufficient capacity in all of these asset classes? [½]
- Geographic mix of assets, and diversification. [½]
- Will nature of the asset income sufficiently match the pension fund outgo with respect to currency, fixed or real payments? [1]
- Do trustees have sufficient knowledge of the relevant assets in order to perform their oversight responsibility? [½]
- How are the risks of investing in each asset class assessed? [1]
- Are the expected returns on assets sufficient to justify the risks? [1]
- Are there additional costs related to investing in particular asset? [1]
- Invest in both residential and commercial mortgages (i.e. is one more attractive than the other and is there sufficient diversification to include both)? [1]
- Should infrastructure debt investment focus on a specific sector (e.g. construction, energy) [1]
- Should infrastructure debt investment be focused on projects that are at an early stage (brownfields) or those that are more established and hence have lower risk? [1]
- Does Alpha have the capability to invest in these assets (e.g. perform risk and return assessment) [1]
- Liquidity [1]
- ESG policy [1]
- Diversification to sponsor business [1]

**[Marks available 12½, maximum 6]**

(vi)

- Alpha should ensure that its fees are fully disclosed and transparent to maximise trust. [1]
- Alpha could demonstrate that its fund fees are competitive [1]
- by benchmarking them relative to its peer group, for mandates of a similar size. [1]
- Alpha could obtain ratings from manager research firms, [1]
- to demonstrate that its funds are high quality relative to its competitors. [1]
- Alpha could show that its asset class recommendations are in line with current best practice [1]
- by sharing survey data or research on how other pension funds are investing. [1]
- Alpha could also offer external fund management options. [1]
- Staff training on conduct. [1]

*credit given for other relevant comments*  
**[Marks available 9, maximum 6]**

(vii)

For example:

- Alpha could obtain commission payments from external managers in return for placing assets. [1]
- Alpha could obtain non-monetary benefits from external managers such as research or other services. [1]
- Alpha could ask managers to cover its costs of conducting manager research. [1]
- Alpha could promote asset classes that require additional services such as drawdown management (e.g. private markets). [1]
- Alpha could promote asset classes that are more complex to manage that would make it more difficult for the pension fund to change provider at a future date. [1]
- Alpha might advise both the sponsor and the trustee. [1]

*credit given for other relevant comments*

**[Marks available 6, maximum 5]**

**[Total 37]**

*This question was reasonably well answered with most candidates scoring well in parts (i) to (v). Answers to parts (vi) were generally weak, with few candidates able to construct credible responses or actions for Alpha to take to address the conflicts of interest. Part (vii) was also poorly answered.*

## Q2

(i)

Price Return =  $3100/2840.7 - 1 = 9.13\%$  [1]

(ii)

Assuming that dividends are paid at the end of the month [1]

Total return for April =  $(2900 + 3.407)/2840.7 - 1 = 2.21\%$

Same marks for calculations for May and June

Total returns are: 2.21%, 1.01%, 6.4% respectively [½ x 3]

Total return =  $(1 + \text{total return(April)}) \dots (1 + \text{total return (June)}) - 1 = 9.85\%$  [½]

*credit given for other formulae*

**[Marks available 4, maximum 3]**

(iii)

The total return index could be calculated based on the following formula:

Total Return Index (time t)  
= Total Return Index (time t-1) \* Total Return (from time t-1 to t) [2]

And where,

Total Return (from time t-1 to t) =  $[1 + (\text{Capital Index time t} - \text{Capital Index time t-1}) + \text{Dividend adjustment}] / (\text{Capital Index at time t-1})$

[1]

The time intervals would ideally be each day but other time periods could also be used, albeit assumptions would have to be made regarding the average payment times of the dividends [1]  
The distinction between when stocks go ex-dividend and when the dividends are actually paid could also be brought into the formula [1]

*other reasonable formulae, comments and descriptions were also given credit*

**[Marks available 5, maximum 4]**

(iv)

The two most important factors will be the **asset classes** available, and **investment costs**. [1]

Worked example

Assumptions for an average person:

- Earnings £30k p.a.
- Contribution rate of 5%, or £125/month from pre-tax earnings
- Price inflation 3% [1]
- Annual salary growth of 1% relative to inflation [½]
- Asset growth of 3% relative to inflation (net of fees) [½]
- Annuity rate at 65 = 25 [1]

*credit given for other plausible assumptions*

This would accumulate over 40 years to about £360,000 if invested in assets with a relatively high expected return. [3]

Allowing for conversion into an annuity, this would purchase an annual pension of £14,400. [1]

*Alternatively: real sum of £193,000, which would purchase an annual pension of £7,700 in real terms.*

Impact of higher charges

If charges were increased by 1% per annum, this would reduce the pension by about 20% to £11,600.

*Alternatively: £6,400 in real terms.* [3]

Impact of adopting a lower expected return strategy

If the expected asset return was to be 2% lower due to a lower risk investment strategy, this would reduce the pension by about 35% to £9,400. *Alternatively: £5,300 in real terms.* [3]

*credit given for other relevant calculations*

**[Marks available 14, maximum 12]**

(v)

**Investment choice**

Many of the contributors will have relatively low expertise in investments [1]

so they may not achieve a suitable balance of risk and return if they have a completely unconstrained choice. [1]

Therefore good default fund design is important. [1]

The degree to which investment choice that would be given to contributors is also an important consideration.

[1]

**Other investment considerations**

The investment strategies involved should incorporate ESG considerations in their design. [½]

As a minimum all managers should ensure that they are taking account of stewardship and corporate governance in their investment decision making. [1]

Beyond this it may be desirable for the default strategy to make use of responsible investment strategies to a significant extent in its portfolio construction. [1]

Investment choices should include low carbon or other positive impact strategies to allow contributors to invest in such a way if they wish. [1]

Some contributors will have beliefs (eg Sharia) that should be respected where practical within the investment strategy. [1]

Equity management styles [1]

Liquidity [1]

Derivative based protection / tail hedges [1]

*credit given for other relevant comments*

**[Marks available 11½, maximum 8]**

(vi)

### **Review process**

A future review process of the new system should be considered to assess how well it is working and how well it is achieving its objectives and whether remedial action is needed. [1]

This could be along the lines of the actuarial control cycle. [1]

### **Annuitisation**

Any requirement or otherwise to buy an annuity on retirement should be discussed along with other alternatives. [1]

If such a requirement is not included, what actions might the state need to make to deal with older pensioners running out of money [1]

alongside moral hazard implications. [1]

If annuitisation is mandatory the method should be considered - eg open market, predefined conversion terms, etc. [1]

Death benefits prior to retirement should also be considered - eg return of fund, dependent's annuity, etc. [1]

### **Risk sharing**

Should the system be individualized or incorporate risk sharing to achieve a better aggregate outcome for the state. [1]

This could include risk sharing via annuitization or in the pre-retirement accumulation phase. [1]

### **Communication process**

The format for member communications and engagement should be considered. [½]

This could include the use of regular paper statements, on-demand statements (eg online), online modelling tools and other approaches. [1]

High levels of engagement will improve members' understanding of their benefits and investments, and their overall satisfaction. [1]

*Credit given for other relevant comments*

**[Marks available 11½, maximum 6]**

**[Total 34]**

*This was the least well answered question on the paper. Parts (i) and (ii) were generally well answered, given they were application questions. Part (iv) was poorly answered with many candidates not able to construct a clear narrative supported by analysis to illustrate the impact of charges on savings. Parts (v) and (vi) were also poorly answered, and required candidates to apply their knowledge to the specifics of the scenario to score well.*

### Q3

(i)

An individual sees the world partly the way the world is and partly the way they are. [1]

The Ego is the individual, his/her self, as distinct from others. [1]

Ego is the Latin word for 'I'. [1]

An individual likes to feel good about his/her Ego. [1]

The Ego is a filter through which an individual sees the world. [1]

**[Marks available 5, max 3]**

(ii)

An individual with a 'healthy' Ego tends to see the world as it really is, and constructively tries to engage with the world.

[1½]

An individual with an 'unhealthy' Ego will use varying degrees of self-deception to excuse or justify their actions to make themselves feel better about the world. [1½]

**[Total 3]**

(iii)

If an individual has a big ego, they have higher self-regard, a greater sense of self [1]

then they are more liable to ego defence mechanisms being activated in order to protect their high self-regard. [1½]

But it is possible to have a high self-regard and a healthy ego - although it is less likely to happen in practice. [1½]

*Other sensible comments were also given credit*

**[Marks available 4, maximum 3]**

(iv)

When an individual makes a judgment based partly on the way they are and partly on the way the world is, this is referred to as a rationalisation [2]

**[Total 2]**

**[Total 11]**

*This was the best answered question on the paper. The majority of candidates constructed good answers to all three parts of the question.*

**Q4**

(i)

Betas (= correlation coefficient \* stdev fund / market stdev)

$$\text{REIT A} = 0.8 * 14/14.7 = 0.7619$$

$$\text{REIT B} = 0.9 * 15/14.7 = 0.9184$$

*Credit given for beta calculations where subsequent calculations incomplete*

Treynor Ratio (= (return on fund - risk free return) / Fund Beta) [1]

$$\text{REIT A} = (8.5\% - 1\%)/0.7619 = 9.84\% \quad [1/2]$$

$$\text{REIT B} = (9\% - 1\%)/0.9184 = 8.71\% \quad [1/2]$$

Sharpe Ratio (= (return on fund - risk free return) / Fund stdev) [1]

$$\text{REIT A} = (8.5\% - 1\%)/0.14 = 0.536 \quad [1/2]$$

$$\text{REIT B} = (9\% - 1\%)/0.15 = 0.533 \quad [1/2]$$

*Credit also given for net information ratio*

Jensen measure (= (return on fund - E[R] using CAPM)

$$E[R] \text{ using CAPM} = \text{risk free return} + \text{fund beta} * (\text{market return} - \text{risk free return}) \quad [1]$$

$$E[R] \text{ REIT A} = 1\% + 0.7619 * (8.2\% - 1\%) = 6.49\% \quad [1/2]$$

$$E[R] \text{ REIT B} = 1\% + 0.9184 * (8.2\% - 1\%) = 7.61\% \quad [1/2]$$

$$\text{REIT A} = 8.5\% - 6.49\% = 2.01\% \quad [1/2]$$

$$\text{REIT B} = 9\% - 7.61\% = 1.39\% \quad [1/2]$$

Pre-specified standard deviation (= (return on fund - E[R] using pre-specified standard deviation)

$$E[R] \text{ using pre-specified standard deviation} = \text{risk free return} + \text{fund stdev} / \text{index stdev} * (\text{market return} - \text{risk free return}) \quad [1]$$

$$E[R] \text{ REIT A} = 1\% + 14 / 14.7 * (8.2\% - 1\%) = 7.86\% \quad [1/2]$$

$$E[R] \text{ REIT B} = 1\% + 15 / 14.7 * (8.2\% - 1\%) = 8.35\% \quad [1/2]$$

$$\text{REIT A} = 8.5\% - 7.86\% = 0.64\% \quad [1/2]$$

$$\text{REIT B} = 9\% - 8.35\% = 0.65\% \quad [1/2]$$

*Candidates are also awarded attempt marks where the method used was correct. The correct answers were given full marks.*

**[Total 10]**

(ii)

The fund returns have been given net of fees, whereas the index returns are gross of fees. [1]  
Therefore a fund that generates positive risk adjusted returns will be performing well above the average fund in this sector. [1]

The Treynor and Jensen measures are more suitable risk measures for parts of a portfolio, [1] rather than a whole portfolio, in which case the Sharpe and Pre-specified standard deviation measures are the most suitable. [1]

The results are based on past performance. Past performance is not necessarily a guide to the future. [1]

The frequency of the performance assessment is important - it needs to be short enough to spot a problem and long enough so as not to be spurious. [1]

The two funds might have different objectives - so a direct comparison may not be appropriate. [1]

Short termism / behavioural implications [1]

*credit given for other relevant comments*

**[Marks available 8, maximum 5]**

(iii)

As the leverage ratio is variable, the new fund will have an unstable beta. [1]

Therefore calculating the risk adjusted return using the pre-specified standard deviation measure will not be possible unless an assumption is made for beta. [1]

The other three approaches will be valid as they rely on observed portfolio volatility in adjusting for risk. [1]

Under all methods the risk adjusted returns will include components relating to financing costs, [1]

Whichever method is used, performance measurement will become more complex due to these factors. [1]

**[Marks available 5, maximum 3]**

**[Total 18]**

*This question was reasonably well answered. Most candidates scored well on parts (i) and (ii). Part (iii) was poorly answered with only a few candidates explaining the impact that leverage has on risk adjusted return measures.*

**END OF EXAMINERS' REPORT**