

# **EXAMINERS' REPORT**

*November 2017 examinations*

## **Subject F105 — Finance and Investment Fellowship Principles**

### **INTRODUCTION**

The attached report has been prepared by the subject's Principle Examiner. General comments are provided on the performance of candidates on each question. The solutions provided are an indication of the points sought by the examiners, and should not be taken as model solutions.

## QUESTION 1

- i. The principal aims of financial market regulation are:
- To correct market inefficiencies and to promote efficient and orderly markets;
  - To protect consumers of financial products;
  - To maintain confidence in the financial system;
  - To help reduce financial crime.
- ii.
- Compilation and maintenance of a registry of funds and administrators:
- To enable stakeholders (e.g. potential new ‘clients’) to identify funds subject to (or not) to the code;
  - To provide information to the government on the size of industry.
- Integrity and competence of community members managing / administrating the funds:
- Minimum requirements to demonstrate ethic e.g. no prior criminal records;
  - Provision of minimum level of training to ensure basic competency;
  - Avoidance or proper disclosure of any conflicts of interests in making investments obo members.
- Minimum level of proper governance:
- Appropriate legal vehicle(s) for housing savings.
  - Guidelines on structures for strategic decision making, and how the responsible body/person should be chosen.
  - Minimum number of member meetings.
  - Minimum level of governance documentation e.g. aims, member composition, benefit calculation (if there is any cross subsidy between members) etc.;
  - Requirements for record keeping and independent audits (e.g. by a member of a recognised accounting body);
  - Separation of assets (i.e. independent bank account) for premiums and benefits and appointment of an independent custodian for assets;
  - Adequate information records of members and their dependants.
- Minimum level of disclosure and communication:
- For existing members (frequency, minimum disclosures) and for new members.
- Benefit design and admin:
- Type of benefits (e.g. only lump sums);
  - Benefit design and extent (if any) of cross subsidies;
  - Payment of benefits in circumstances other than death (incl. exit the scheme);
  - Standards of recordkeeping (salaries, beneficiaries, contact details).
- Investment guidelines:
- Permissible assets, excluded investments;

- Diversification of risk;
- How investment decisions are made;
- The use of advisors.

Maximum fees and expenses that can be deducted:

- For administration or other functions performed for members.

Industry body/office to deal with complaints and settle matters:

- Powers of such an office (if any);
- Whether an industry-wide fund is established to compensate victims, and how this should be funded.

## Examiners Comments

*Generally well answered.*

*Part (i) was easy bookwork for most students.*

*For part (ii) the weaker students wrote about trustees and their roles, which is not appropriate in this case (unless students justified that the legal vehicle for savings could be a trust, however this is an unlikely and impractical vehicle in this scenario). It is highly unlikely that benefit structures will be so complex to require an actuary to be appointed, and for actuarial reserves and solvency margins to be calculated. The concept of self-investment is meaningless in the context of this question (yet a number of students made reference to this).*

## QUESTION 2

i.

a) Labour Intensive:

Some Consumer services (e.g. travel agents and media companies, PR agencies) have a high human labour (and low capital) input components and therefore labour costs constitute a large portion of the overall cost of providing the service.

Some Financial Services e.g. insurers have a high sales and administrative staff component and therefore a high wage bill. The same applies to banks, although less so.

Technology e.g. software and computer services. Software development has a high labour component, compared to other input costs.

Mining in the Basic Materials industry. Some mines e.g. gold mines, have a large labour bill. The industry is exposed to labour union wage negotiations and strikes.

b) Monopolistic:

Utilities are often monopolies. Historically many of these companies have been state-run monopolies. High level of required infrastructure act as a barrier to entry. Legal / licencing restrictions.

Technology. Some industries (e.g. computer software and hardware) amend consumer behaviour to such an extent that through licencing monopolies do occur.

c) Highly competitive:

Consumer goods can be highly competitive, leading to low profit margins. Due to both a fairly low-tech product nature and low capital requirement, the barriers to entry are low.

Financial services. Some products such as short-term insurance, annuity rates, banking charges are reasonably competitive.

IT - one technology can quickly be replaced by another. There are low capital barriers to entry.

d) Highly exposed to regulation:

Utilities are vulnerable to some political risk and to changes in the regulations under which they operate. They are usually subject to tight government regulation of prices. The regulation is intended to prevent abuse of their monopoly position.

Banks and Insurers (Financials) are subject to regulation regarding the capital required for conducting their business.

*Marks awarded for other reasonable answers not included above.*

ii.

- We should expect companies that do well economically during the start and middle part of a new trade cycle to increase in price once significant economic growth become evident. These are typically cyclical companies.

Industries and sub-sectors include:

- General industrials, construction companies
  - Dependent on the level of investment spending. During a time of lower interest rates and economic growth, corporates would be more likely to borrow to invest.
  - Due to lower interest rates, projects may be more viable now.
  - Investment and company profits tend to move ahead of the trade cycle - profit margins are high when economy grows.
- Consumer durables e.g. car manufacturers, furniture, washing machines, consumer electronics.

- Consumers often delay spending until easier economic times. Consumers would have more disposable income and would be more likely to obtain loans.
- Leisure industry
  - Consumers more likely to take holidays due to increased consumer spending.
- Financials
  - With increased economic activity and borrowing (due to lower interest rates) financials, especially banks, might do well. Less bad debt provision. The endowment effect may work to dampen the effect somewhat.
- Companies with high variable-rate gearing should benefit from the lower interest rate environment. These may include
  - a) Banks
  - b) Hotels that own their properties
  - c) Property companies
  - d) Some consumer good companies
- Information Technology
  - Companies may delay upgrading IT systems until a period of economic growth is evident.

## **Examiners Comments**

*Overall this question was answered well by the majority of candidates.*

*Part (i) intended to refer to industries as found on a stock exchange. Some candidates interpreted the question more broadly and their answers reflected this understanding. Credit was given for this interpretation.*

*Part (ii) was mostly well answered. The scenario in the question was based on a local economy, as opposed to the world-wide economy. The prices of oil, gas and most basic materials would depend more on the state of the world economy than on the local economy.*

### QUESTION 3

i.

- The insurer needs to ensure that it can meet its obligations and not go insolvent:
  - Bonuses are guaranteed – the insurer wants to minimise risk of its asset values falling below the guaranteed liability value.
  - This objective encourages hedging liabilities and holding low risk assets. This reduces risk exposure but comes at a cost of lower expected returns.
- A secondary objective for the insurer will be to maximise returns for the benefit of its shareholders.
  - This objective encourages moving away from the matched position and holding more risky assets, which may conflict with the objective of ensuring that obligations can be met and remaining solvent.
- A further objective while designing the product (and determining a value for X%) will be to maximise returns for policyholders.
  - This in turn increases sales and returns for shareholders, however this may conflict with the objective of ensuring that obligations can be met and remaining solvent within acceptable risk tolerance.

*Students might reasonably have assumed X% is fixed or variable.*

ii. Maximise the insurer's profits subject to the assets being at least be equal the liabilities at the end of every year for the next 10 years with 99% confidence level.

iii.

- To enhance the solvency position of the insurer:
  - A mismatch reserve is set up to cover possible levels of shortfall of assets relative to liabilities (which is possible over short periods due to volatile assets).
  - It may be a regulatory requirement.
- It protects members by financing bonuses during periods of poor investment performance.
- The reserve will help to stabilise the insurer's profits.
- By keeping such a reserve, there is greater scope to move away from the matched position and potentially increase returns.

iv.

- Stochastic asset liability modelling involves projecting assets and liability values into the future under a range of possible conditions or assumptions in order to establish the extent to which assets and liabilities are mismatched.
- The level of the mismatch reserve can be included as a variable in the model.
- A number of projections/simulations are performed for a given investment strategy and level of mismatch reserve.
- The outcome of a ALM provides:
  - projections into the future of assets and liabilities;
  - and estimates of the range of likely outcomes.

- From these results expected profitability (taking into account the cost of holding a mismatch reserve) and probability of ruin can be calculated.
- Simulations should be run testing different combinations of investment strategies and mismatch reserve to find the combination that maximises the insurer's profits and maintains the probability of ruin below an acceptable level.
- Optimisation methods could assist with finding the most suitable arrangement.
- The most suitable arrangement is that combination of investment strategy and mismatch reserve that maximises profits while ensuring the insurer's assets are sufficient to cover all but a specified proportion of the shortfalls.

## **Examiners Comments**

*This question deals with an insurance company selling an investment product for pre-retirement (and not post-retirement) savings to pension funds. Many students were not able to distinguish the role of the pension fund from the insurance company. It is the solvency of the insurance company and not the pension fund that is of greater importance here.*

*In Part (i) a poor understanding of the scenario presented resulted in some candidates not being able to outline two distinctive objectives, one related to maximizing profits/returns, and the other related to solvency or risk. In terms of discussing the conflict between the objectives, it was not enough to simply state that higher risk assets are expected to produce higher returns, and vice versa. Reference had to be made to the matched position.*

*Parts (ii) and (iii) were answered fairly well.*

*Part (iv) was very poorly answered. The question did not ask candidates to explain the workings of an ALM, but to explain how it can be used to determine the level of the mismatch reserve. Only those parts of the ALM process that are relevant to the calculation of the mismatch reserve, or that would need to be amended for the value to be determined had to be explained. Candidates spent a lot of time explaining the data and assumptions needed in an ALM, which are not directly relevant, without showing insight into those parts of the ALM that are actually relevant to determining the level of the mismatch reserve. Some candidates stated that the risk measure calculated on the distribution of the outcome from the model (e.g. VaR or probability of ruin) can be used to determine the level of the mismatch reserve. This was also awarded marks.*

*Reference to a deterministic model was not appropriate given that the question stated that a stochastic ALM is going to be used.*

## QUESTION 4

i.

Equities: For equities either formulae below are acceptable:

$$TRI(t) = TRI(t - 1) \times \frac{CI(t) + (1-T)[XD(t) - XD(t-1)]}{CI(t-1)} \quad (\text{method 1})$$

$$TRI(t) = TRI(t - 1) \times \frac{CI(t)}{CI(t-1) - (1-T)[XD(t) - XD(t-1)]} \quad (\text{method 2})$$

Bonds:

$$TRI(t) = TRI(t - 1) \times \frac{CI(t) + (1 - T)[XD(t) - XD(t - 1)] - T[ACC(t) - ACC(t - 1)]}{CI(t - 1)}$$

ii.

Equity:

(1)	(2)	(3)	(4)	(5)	(6)
t	Capital I(t)	XD(t)	change XD(t)	net TRI(t) method 1	net TRI(t) method 2
0	1435.1	0		1000	1000
1	1503.6	20.9	20.9	1059.383	1060.083
2	1528.3	47.3	26.4	1091.666	1092.847

From columns (5) or (6), Equity return=  
 $1091.666/1000-1=9.1666\%$  [method 1], or  
 $1092.847/1000-1=9.2847\%$  [method 2]

Bonds:

(7)	(8)	(9)	(10)	(11)	(12)	(13)
t	Capital I(t)	ACC(t)	change ACC(t)	XD(t)	change XD(t)	net TRI(t)
0	95.43	0.19		0		1000
1	95.94	0.11	-0.08	4.27	4.27	1036.917
2	96.55	0.24	0.13	8.59	4.32	1075.772

From column (13), bond return= $1075.772/1000-1=7.5772\%$

iii. Reasons might include:

Management fees and trading costs will cause lower returns.

In a developing country, the smaller general equity index constituents may be less liquid than large shares, and exact replication might not be possible, or costly. Market bid/offers might be wide for smaller shares/bonds.

The fund may hold a representative selection of constituents, instead of doing full replication. This is to eliminate the smallest of trades (and hence reduce costs). Where there are many small equity components in the index, this may total up to a significant return deviation.

Stratified sampling may require a multi-factor model (increasing management costs/fees), which may become inaccurate and needing regular updating, possibly triggering trades.

The timing of cash-flow reinvestment: the index calculation in (ii) assumes reinvestment at the end (or start) of the period. The calculation chain-links semester returns. In practice for an index-tracking fund, cash-flows are reinvested as soon as it is available.

There might be delayed or insufficient communication on index changes.

## **Examiners Comments**

*This question was answered poorly. It is disappointing to see that that candidates find switching between higher order thinking and doing calculations so hard.*

*Part (i) performance was poor for this bookwork question. Some candidates ignored tax. Many were confused about the XD for bonds and thought it is subject to dividend tax. Many gave a formula for return, with no mention of a total return index. Many candidates gave one joint formula for equities and bonds, despite clues pointing to more than one formula: 'formulae' and 'write down...for both'.*

*Part (ii) was poorly done. Even though the data is available, few students chose to calculate returns for the two semesters and then linking them. Instead a return formula for the whole year was applied, ignoring the hint from part (i) of the question. Despite lenient marking, marks were low due to careless errors.*

*Part (iii) was reasonably attempted by most students.*

## QUESTION 5

- i. The field of behavioural finance looks at how a variety of mental biases and decision-making errors affect financial decisions. It relates to the psychology that underlies and drives financial decision-making behaviour.
- ii.
  - (a) Member A behavioural biases:
    - Prospect theory (and framing):
      - People are typically risk-averse when considering gains relative to a reference point and risk-seeking when considering losses relative to the reference point.
      - In this case the reference point might be the target benefits at retirement, and Member A has become risk-seeking in an attempt to make up the deficit relative to the target.
      - The decision to become risk seeking may have been influenced by how the information was presented or “framed” (e.g. that there is a deficit relative to the target).
    - Anchoring:
      - People base their views on the likelihood of an event on recent experience or “expert” opinion.
      - The equity fund may have performed well in the past, causing Member A to believe that history will repeat itself, and to downplay the volatility information.
    - Overconfidence and Confirmation bias:
      - Individuals are typically overconfident about their own skills and insights.
      - The discrepancy between confidence and accuracy increases as an individual’s expert knowledge increases (even when accuracy improves with knowledge, confidence increases by more).
      - Member A has many years of financial services experience and may regard himself as expert at understanding and predicting investment markets – hence he has decided to opt out of the default fund.
      - The choice of high-equity may be based on his view that equity will perform well (and thus decreases the chance of his fund not being sufficient at retirement).
      - Member A will look for signs that confirms his view and ignore information that is contrary to his view.
    - Myopic loss aversion:
      - Investors are less risk averse when faced with multiple period of ‘gambles’ or investment choices.
      - Member A may be more willing to take risk knowing that he will be able to alter his choice next year.
    - Dislike of negative events:
      - The degree to which an outcome is considered negative or positive has a significant influence on an estimate of its likelihood.

- Member A might be optimistic and overestimate the likelihood of positive events (i.e. the equity fund performing well).
- (b) Member B behavioural biases:
- Prospect theory (and framing):
    - As for Member A, the reference point might be the target benefits at retirement, and Member B may be risk-averse if their fund value is on track to meet or exceed target benefits at retirement (e.g. the fund might have been invested in superior growth assets before being switched to cash).
    - As before, the decision to become risk-averse may have been influenced by how the information was presented or “framed” (e.g. that there is a surplus relative to the target).
  - Dislike of negative events:
    - The degree to which an outcome is considered negative or positive has a significant influence on an estimate of its likelihood.
    - Member B might be under-estimating the likelihood of cash not matching wage inflation and creating a deficit relative to target benefits at retirement.
  - Overconfidence, Confirmation bias:
    - Member B might also be overconfident in their belief to predict markets, hence the choice not to be invested in the default fund.
    - Member B might have chosen to be in cash if they believe other assets are likely to underperform, and will look for signs to confirm their view.
  - Mental accounting:
    - Member B might be fearful of losses and market crashes without considering the aggregate performance over time and appreciating the long-term benefits of equities.
- (c) Member C behavioural biases might include:
- Overconfidence and confirmation bias:
    - Member C might be overconfident in her belief to pick winning fund managers, hence the lack of interest in passive funds. Any information conflicting with her view will not be given proper consideration.
  - Status Quo bias:
    - Member C might have a marked preference for keeping things as they are - she may be happy with existing arrangements and hence does not see the need for any change.
  - Effect of too many options:
    - Too many options tends to discourage decision-making, hence the lack of interest in passive funds. This reinforces status quo bias.
  - Anchoring:
    - The member may have personal experience, or obtained “expert” opinion, that favours active management over passive management.

iii. Behaviours by the trustees:

- Regret aversion:
  - By retaining the existing arrangements, people minimise the possibility of regret.
  - Prior trustees might have wanted to avoid the regret of firing the fund manager only to see his performance subsequently improve, and thus losing out on this out-performance.
- Status Quo bias:
  - Prior trustees might not have wanted to change the manager to keep things unchanged.
- Overconfidence, Hindsight/Confirmation bias:
  - The trustees might have been overconfident in their ability to pick winning managers and their belief the manager's poor performance would be temporary.
  - Prior trustees might have ignored the manager's poor performance, while looking for other signs to substantiate retaining the fund manager (e.g. positive news articles about other aspects of the manager's business) and believing the fund manager's future performance will improve (i.e. confirmation bias).
  - The trustees might have believed that the poor performance was predictable in light of prevailing market conditions (i.e. hindsight bias).

## **Examiners Comments**

*This question was generally well answered.*

*For part (ii) the weaker students generated fewer points (e.g. by providing only one possible bias per member in question) and thus did not obtain much credit. For member B a number of students wrote about "status quo" despite the question clearly stating that the member "recently chose a cash fund". The weakest students did not write about biases but rather offered opinions on the merits or otherwise of the choices made by the members and trustees.*

## QUESTION 6

- i. The value of the interest rate cap is made up of two interest rate call options with the following valuation inputs:

We have the following for any one payment under the interest rate cap arrangement.

$$c = L\delta_k P(0, t_{k+1}) [F_k \Phi(d_1) - R_X \Phi(d_2)] \text{ where,}$$

$L =$  nominal value of the loan  
 $F_k =$  the forward rate for the period between  $t_k$  and  $t_{k+1}$  for  $F_0$   
 $T = t_{k+1} =$  maturity date of the option  
 $R_X =$  the interest rate cap rate

$$d_1 = \frac{\ln\left(\frac{F_k}{R_X} + \frac{\sigma^2 t_k}{2}\right)}{\sigma \sqrt{t_k}}$$

$$d_2 = \frac{\ln\left(\frac{F_k}{R_X} - \frac{\sigma^2 t_k}{2}\right)}{\sigma \sqrt{t_k}} \text{ [OR } d_2 = d_1 - \sigma \sqrt{t_k}] \text{ for both } d_1 \text{ and } d_2 \text{ formulae and correct definitions above}$$

### Caplet 1:

Since the interest rate for the loan is set at the beginning of the year, the value for the first caplet is nil as the floating rate payment to be made at the end of the year equals the interest rate cap rate.

### Caplet 2:

Value of interest rate cap payment at  $t_k = 1$  with the following inputs:

Derivation of forward rate between time 1 and 2:

$$(1.06)^2 = (1.05) * (1 + F_1)$$

$$F_1 = \text{Forward JIBAR Rate}_1 = 0.070095238$$

$$X = 0.05$$

$$\sigma = 20\%$$

$$t_{k+1} = 2$$

$$d_1 = \frac{\ln\left(\frac{0.070095238}{0.05} + \frac{0.2^2 * 1}{2}\right)}{0.2 * 1} = 1.789159$$

$$d_2 = \frac{\ln\left(\frac{0.070095238}{0.05} - \frac{0.2^2 * 1}{2}\right)}{0.2 * 1} = 1.589159$$

$$\text{Caplet 2} = 500 * (1.06)^{-2} * [0.070095238 * \Phi(d_1) - 0.05 * \Phi(d_2)]$$

$$\text{Caplet 2} = 500 * (1.06)^{-2} * [0.070095238 * \Phi(1.789159) - 0.05 * \Phi(1.589159)]$$

$$\text{Caplet 2} = 500 * (1.06)^{-2} * [0.070095238 * 0.963205 - 0.05 * 0.943988]$$

$$\text{Caplet 2} = R9.04m$$

### Value of the interest rate cap

$$\text{Interest Rate Cap} = \text{Caplet 1} + \text{Caplet 2}$$

$$\text{Interest Rate Cap} = R9.04m$$

ii. Possible derivative strategies that may be used include:

- Purchasing / Long a call option to buy Rands for USD at an agreed exchange rate at the date of annual delivery.
- Purchasing a put option to sell USD for Rands at an agreed exchange rate at the date of annual delivery.
- Purchase / Long of a forward / future to buy Rands for USD at an agreed exchange rate at the date of annual delivery.  
Or equivalently,
- Short a forward / future to sell USD for Rands at an agreed exchange rate at the date of annual delivery.
- Purchase / Long a currency swaption that provides one with the option to enter into an agreement to swap Rands for USD over the period of the contract at an agreed fixed rate.
- Purchase a swap to exchange USD for Rands over the period of the contract at an agreed fixed rate.

iii. In relation to the appropriateness of OTC vs. exchange traded derivatives for the fund:

- OTC derivatives would allow the company to tailor the deal to match the agreement entered into with the US customer i.e. bespoke and tailored client-specific solution.
- Exchange traded derivatives will have lower transaction costs but still allow for a suitable amount of hedging although unlikely to be as well tailored.
- Given that management are quite risk averse, consideration would need to be given on whether the credit risk that exists and is higher on an OTC derivative is a risk that they are willing to accept.

- The lower liquidity on the OTC derivative would likely result in higher costs to the company and hence may reduce the feasibility of allowing for this through the proposed strategy of increased logistic costs.
- OTC strategies are less liquid possibly comprising the company's ability to close out on a position earlier (if they receive earlier payment).
- The company may not have sufficiently liquid assets to support margin payments that may be required on exchange traded derivatives.

## Examiners Comments

*Part (i) was generally well answered, however many students incorrectly applied the option formula in pricing the first caplet, and used incorrect inputs for the second caplet (e.g. the weaker students did not recognise that the forward rate had to be calculated and instead used the spot rates provided in the question).*

*Part (ii) was generally poorly answered. Most students ignored the instruction to "Outline" and provided detailed descriptions for one or two derivative strategies only. This resulted in most students not providing a sufficient number of derivative strategies as expected of the question.*

*Part (iii) was generally well answered. Only the very strong students were able to link the merits of OTC and exchange-traded derivatives to management's risk appetite.*

## QUESTION 7

- i.
  - Absolute pricing:
    - Price assets by reference to its exposure to fundamental sources of macroeconomic risk such as inflation, economic growth and interest rates;
    - The prices obtained are capable of economic interpretation;
    - E.g. consumption based and general equilibrium models.
  - Relative pricing:
    - Asset price is based on the price of some other asset;
    - Not concerned with where the prices of these assets came from;
    - Therefore uses as little information about fundamental risk factors as possible;
    - E.g. Black-Scholes option pricing and APT.
  - Multifactor models attempt to explain historic return as a function of the sources of systematic risk it is exposed to and its estimated factor returns.
  - It therefore links returns to the fundamental sources of macroeconomic risk the investment is exposed to.
  - Therefore a multifactor model would be classified as an absolute pricing approach.

ii.

- It may be difficult to identify the sources of systematic risk (i.e. the factors that influence performance) and to estimate factor returns:
  - Infrastructure assets tend to exhibit the characteristics of natural monopolies, with each project likely to have many unique features.
  - Therefore factors influencing performance are likely to differ between projects.
  - Risks specific to an infrastructure asset are likely to differ from broader asset class risks.
- Lots of data is needed to determine factors and factor returns. It might be difficult to obtain sufficient and relevant data.
  - It is unlikely for infrastructure assets to have known market values, and valuations might only be available infrequently.
  - Infrastructure assets have long lives. Therefore one would need data going back many years.
  - The data available may be obsolete as economic and other conditions may have changed.
  - Survivorship bias may distort past performance data on which factor returns are based.
- Since the focus of the fund is on projects having a positive developmental impact on the country, should ideally only include such projects when determining factor returns. This can be very subjective.
- Infrastructure assets are subject to regulatory and political risks, which might be difficult to quantify and therefore incorporate into a multifactor model.
- Estimates based on past data might not be applicable in future.

## **Examiners Comments**

*Part (i) was generally well answered, but part (ii) answers generally lacked relevant points.*

*For part (ii) it was important to not simply state the difficulties related to valuing infrastructure projects, or with using multifactor models, but to link the two together. What characteristics of an infrastructure project would make valuing it using a multifactor model, given the workings of this model, difficult? Some candidates indicated that it would be difficult to allow for the developmental requirement of the projects in the model. Many candidates also mentioned difficulties in using the model to make future predictions of returns. The purpose of the model however is simply to value projects selected.*

## QUESTION 8

- i. The beta for the two funds are required to calculate two of the four risk adjusted performance measures where,

$$\beta_i = \frac{\text{cov}(R_i, R_m)}{\sigma_m^2}$$

$$\beta_{Oakmont} = \frac{0.0045}{(0.15)^2} = 0.2$$

$$\beta_{Infinity} = \frac{0.027}{(0.15)^2} = 1.2$$

	Oakmont	Infinity
Sharpe Measure $\frac{R_p - r}{\sigma_p}$	$\frac{0.09-0.07}{0.05} = 0.4$	$\frac{0.13-0.07}{0.2} = 0.3$
Trenor Measure $\frac{R_p - r}{\beta_p}$	$\frac{0.09-0.07}{0.2} = 0.1$	$\frac{0.13-0.07}{1.2} = 0.05$
Jensen Measure $R_b = r + \beta_p(R_m - r)$ $R_p - R_b$	$0.07 + 0.2 * (0.10 - 0.07)$ $= 0.076$ $0.09 - 0.076 = 0.014$	$0.07 + 1.2 * (0.10 - 0.07)$ $= 0.106$ $0.13 - 0.106 = 0.024$
Pre-specified SD $R_b = r + \left(\frac{R_m - r}{\sigma_m}\right)\sigma_p$ $R_p - R_b$	$0.07 + \frac{0.03}{0.15} * 0.05 = 0.08$ $0.09 - 0.08 = 0.01$	$0.07 + \frac{0.03}{0.15} * 0.20 = 0.11$ $0.13 - 0.11 = 0.02$

- ii.
- The beta for Infinity investments suggests that the fund is more volatile / has more systematic risk than the market as a whole in comparison to Oakmont investments which is less risky than the market.
  - This is supported by the standard deviation (SD) measures given for the investment funds which shows the SD for Infinity is much higher than Oakmont Investments.

- The lower risk strategy adopted by Oakmont investments is also apparent in the mean return which is lower in absolute terms than the average benchmark (ALSI) return.
- Infinity investments has outperformed the ALSI benchmark in absolute terms, which is expected given the higher systematic risk taken on by the fund.
- Oakmont investments performs better on Sharpe and Treynor measures (i.e. was able to generate a higher level of return per unit of risk assumed) mainly driven by the low volatility of returns on this fund.
- The risk-adjusted benchmarks measures (Jensen and Pre-specified SD) however do suggest that Oakmont has outperformed although less so than Infinity investments i.e. Infinity has produced higher absolute returns relative to its own risk adjusted benchmark.
- Since both funds have outperformed their risk-adjusted benchmarks and the endowment product aims to provide a return in line with the ALSI, SLIC will need to balance potentially lower return (although not significantly so based on its historical average) and low risk on Oakmont against the higher expected returns and volatility on the Infinity fund.
- The performance of SLIC's own investment team also needs to be considered in determining whether the potentially lower expected return (from Oakmont) would be offset by high expected returns from SLIC's team or;
- If the higher systematic risk of the Infinity fund will be sufficiently diversified away with the ultimate objective of tracking the ALSI.
- SLIC's marketing information, target market and policyholder expectations should be considered e.g. less risk-averse policyholders would suggest Infinity may be more attractive due to higher expected returns (but higher risk) and more risk-averse policyholders would suggest Oakmont is more suitable.

iii. Limitations to be highlighted include:

- The historical experience considered spans 10 years and may not necessarily provide a credible basis on which to form a final decision. There may have been significant changes to the mandate of the fund, the investment managers and the market over this period.
- Further, historical experience cannot be expected to continue in the future. More information may be required from the investment managers in order to understand their strategy going forward, as well as on the expected future conditions affecting the market.

- The exact mandate of the funds are unknown and should be investigated in order to ensure alignment and compatibility with SLIC's objectives.
- The Sharpe and Jensen measures are based on the assumptions underlying the CAPM framework which may not be valid here.
- No consideration has been given to transaction costs, management fees and taxes.
- The measures do not take into account any differences in mandate, objectives of these funds e.g. Socially responsible investment objectives.
- The use of the standard deviation of return may not be a suitable measure of risk (e.g. may be interested in the downside semi deviation of returns instead).

## Examiners Comments

*Part (i) was generally well answered. The calculation of the beta was the one area where students most frequently lost marks, and this impacted their solutions for the Treynor and Jensen measure.*

*Part (ii) was very poorly answered. Most students provided simple comparisons of expected return, standard deviation and risk adjusted measure performance between the two investment choices. Students therefore displayed very limited insight as to possible drivers of these differences, and the factors that SLIC would need to consider in choosing the best investment.*

*Part (iii) was generally very well answered.*

## QUESTION 9

- (i) **Anomaly switching** involves switching between stocks that have similar volatility, thereby taking advantage of temporary anomalies in price. It is a relatively low risk strategy, but widespread use of computer-based analysis limits opportunities for significant anomalies between similar bonds.

**Policy switching** is a more risky approach that involves taking a view on future changes in the shape or level of the yield curve and switching into bonds with quite different terms to maturity and/or coupon. For example if yields generally were expected to fall, the portfolio might be switched into longer-dated, more volatile stocks.

(ii) *Marks for any three from:*

- Yield Differences:
  - This method is used to identify the dearness or cheapness of an individual bond relative to another bond (or the yield curve) by comparing yields;
  - The current yield difference is compared to a history of the difference;
  - A problem with evaluating a bond relative to the yield curve is the stability of the method used to fit the curve.
- Price Ratios:
  - This method is used to identify the dearness or cheapness of an individual bond relative to another bond by calculating a ratio of prices;
  - The current ratio is compared to a history of the ratio;
  - A problem with this method is when comparing two bonds that have different coupons but both are redeemed at 100, the ratio of prices will display a trend – this history of price ratios may be adjusted by this trend to produce “stabilised” price ratios.
- Price Models:
  - This method relies on the use of models to assess the “correct” price for a stock, given key variables;
  - A stock’s price is considered anomalous if the actual price differs from the model.
- Yield Models:
  - This method compares a bond’s yield with a yield surface or par yield curve;
  - A comparison of the current yield difference with its history may indicate an anomalous opportunity.

(iii)

Pricing/return issues:

- What price will the bonds be issued at, and is this a fair price given the risks and benefits - a comparison with other “green” bonds and also with other municipal bonds will help establish this.
- As these bonds are tax-free to all investors, not just select investors (such as pension funds) the demand for this bond might make the price unattractive to the fund relative to other bonds.
- Furthermore pension funds are likely to be tax exempt anyway, making this feature less attractive to the fund than other investors.

Credit risks:

- Consider the rating by rating agencies and whether the bond fits in with the fund’s risk-reward profile.
- If rating agencies have not issued a rating, the fund will have to investigate and assess the risk itself, which could be an onerous exercise.
- Concentration risk: what other exposure does the fund have to debt issued by this municipality.
- Consider whether the underlying green projects likely to be feasible and generate sufficient cashflow to meet coupon payments.

- Consider whether the bonds carry any special covenants or underlying guarantees (for example a provincial or national government guarantee).

Portfolio management issues:

- As this is a developing country it may mean that there is unlikely to be a deep market for fixed income investment.
- Secondary market: The pension fund may want to sell the bonds prior to maturity, in which case liquidity is affected by where/how the bonds are listed and traded.
- The “green” status of the bond may make it more liquid than other municipal bonds.
- The extent to which this bond fits into the fund’s portfolio depends on the extent to which it provides some diversification benefits from other assets held.

Matching considerations:

- Investigate the duration of the bond and whether it matches the liabilities.
- Are the bond returns real (inflation linked) or nominal given that we are matching real liabilities.
- Similarly do coupons match liability cashflows, and are there reinvestment risks if coupons cannot be reinvested at required rates.

Practical issues:

- Will the bonds be introduced to the market by auction or private placement, and does the fund’s asset manager have expertise and experience to price the bonds and participate in the issue.
- Does the bond meet the fund’s requirements to be considered a SRI investment.
- Consider whether other pension funds are investing in these bonds and if investigate the reasons.
- Consider how they are recognised in terms of regulatory requirements/restrictions (e.g. Reg 28 in SA).

*Marks awarded for reasonable solutions given*

(iv)

- A credit default swap is a contract that provides a payment if a particular credit event associated with the “green” bond (“reference bond”) occurs.
- The term of the CDS contract could be the same as the term of the bond (but does not need to be).
- The pension fund pays a fee (usually a regular premium over the term of the contract) for this protection to the bank that sells the protection.
- If the credit event occurs within the term of the contract a payment is made from the bank to the fund. There are two ways to settle a claim under a credit default swap:
  - A pure cash payment, representing the fall in the market price of the defaulted security. However, the market value may be difficult to determine.

- The exchange of both cash and a security (physical settlement). The protection seller pays the buyer/fund the full outstanding notional amount and receives, in return, the defaulted security.
- Examples of credit events include:
  - Bankruptcy of the municipality
  - Qualified audit or other evidence of fraud at the municipality
  - Rating downgrade of the municipality (as issuer) and/or its bonds
  - Repudiation – the municipality simply chooses to cancel all of the outstanding interest payments and the capital repayment of the debt
  - Failure to pay a particular coupon or maturity
  - Cross-default: a cross-default clause on a bond means that a credit event on another security issued by the municipality will also be considered as a credit event on the bond in question.
- A credit event or default does not necessarily mean that all the money loaned is lost. In fact, it is usually possible to recover (eventually) at least some of the money loaned in event of a default, the proportion recovered being referred to as the recovery.
- If the credit event does not occur within the term of the contract, the fund receives no monetary payment but has benefited from the protection during the tenure of the contract.
- The fund is still exposed to the credit risk of the issuing bank.

## **Examiners Comments**

*A significant proportion of this question comprised /knowledge bookwork questions (parts (i) (ii) and (iv)).*

*Parts (i) and (ii) were generally well answered. For part (ii) many students described the CDS structure from the issuer's point of view (ie the bank) which was not appropriate given the context of the question.*

*Part (iii) required application of knowledge around SRI, credit and retirement fund liabilities. Many candidates generated the main points around credit, but just assumed that since the bonds were "green" they would suit the investors ESG/SRI objectives. Most students covered the liabilities at a high level ie stating the investment should match liabilities by nature term and currency, but failed to discuss the specifics eg cashflows required for liquidity, real vs nominal returns, duration of the bonds compared to liabilities. Very few highlighted that a retirement fund is likely to be tax exempt making the tax status of the bonds potentially less attractive to the fund relative to other tax-paying investors.*

**END OF REPORT**