

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2015

Subject ST5 – Finance and Investment Specialist Technical A

Introduction

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

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

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

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

F Layton
Chairman of the Board of Examiners
December 2015

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

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

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

As in past diets, there was a broad span of performance. Well-prepared candidates clearly demonstrated their familiarity with the course material and the ability to use this knowledge in constructing answers. Weaker candidates, however, lacked such skills and ability. These candidates were generally less able to address the 'discursive' nature of the later questions in the paper.

C. Comparative pass rates for the past 3 years for this diet of examination

Year	%
September 2015	44
April 2015	49
September 2014	45
April 2014	45
September 2013	59
April 2013	45

Reasons for any significant change in pass rates in current diet to those in the past:

The pass rate for this examination diet is broadly in line with previous diets (with the exception of the particularly good pass rate in September 2013). Some variation in the pass rate between sessions is expected as different cohorts of students sit the examination.

Solutions

- Q1** (i) Trade cycle – The periodic fluctuations of national output around its long-term trend.

Price-earnings ratio (PER) – The ratio of a share's price to its net earnings.

$$\text{PER} = \frac{\text{ordinary share price}}{\text{earnings per share}}$$

The earnings per share used can be historic or prospective.

Defensive company – A company whose fortunes are reasonably immune to the state of the economy.

Any security that exhibits less volatility than the market as a whole (i.e. its beta is less than 1.0), providing lower, but more stable, returns.

Cyclical company – A company whose fortunes are very closely linked to the state of the economy.

The share price, relative to the rest of the market, will therefore depend on the current state of the economy and any (discounted) expected future changes in the economy.

- (ii) If the economy is moderately buoyant and profits are fairly stable, both defensive and cyclical companies might be similarly rated.

As the economy starts to move into recession PERs for cyclical companies are likely to fall while those of defensive companies will remain stable or may even rise slightly.

At the bottom of the cycle PERs of cyclical companies will probably have risen from their low point as earnings have fallen, but defensive stocks will still be more highly rated.

As the economy starts to recover, the PER of cyclical companies will rise as the price increases in anticipation of future earnings growth.

PERs of defensive companies may be below those of cyclical companies.

As growth continues, the earnings of cyclical companies will catch up with the share price and PERs will fall back.

Answers to part (i) displayed a lack of familiarity with the Glossary of Terms set out in Unit 17 of Core Reading. Part (ii) was generally well answered, although not all candidates compared the PERs of the two types of companies.

$$\begin{aligned}\mathbf{Q2} \quad \text{Present value of coupon payments} &= 40 \left(e^{-0.167 \times 0.05} + e^{-0.667 \times 0.05} \right) \\ &= 78.355\end{aligned}$$

$$\begin{aligned}\text{Forward price of bond} &= (960 - 78.355)e^{0.05 \times 0.75} \\ &= 915.334\end{aligned}$$

$$\text{Price of the option} = P(0,T) [F_0 \Phi(d_1) - X \Phi(d_2)]$$

$$\text{Where } P(0,T) = e^{-(0.05 \times 0.75)} = .96319$$

$$F_0 = 915.334$$

$$X = 1000$$

$$S = 0.10$$

$$T = \frac{9}{12}$$

$$\begin{aligned}d_1 &= \frac{\ln\left(\frac{F_0}{X}\right) + \sigma^2 \frac{T}{2}}{\sigma \sqrt{T}} \\ &= \frac{\ln \frac{915.334}{1000} + \frac{0.10^2 \times \frac{9}{12}}{2}}{0.10 \sqrt{\frac{9}{12}}} \\ &= \frac{(-0.088466 + 0.00375)}{0.086603}\end{aligned}$$

$$= -0.9782$$

$$\begin{aligned}d_2 &= d_1 - \sigma \sqrt{T} \\ &= -0.9782 - .086603 \\ &= -1.0648\end{aligned}$$

$$\begin{aligned}\text{So price of call option} &= 0.96319 [915.334 \Phi(-0.9782) - 1000\Phi(-1.0648)] \\ &= 0.96319[150.1056 - 143.49] \\ &= £6.372\end{aligned}$$

Weaker candidates showed a lack of familiarity with the material set out in Section 4.1 of Unit 6 of Core Reading and its application.

- Q3** (i) There are three main systems of corporation tax.

Classical

In the classical system of corporation tax, company profits are taxed twice: once in the hands of the company and once in the hands of the investor. The investor may be subject to income tax on distributions and capital gains tax arising from increases in the share price.

Split-rate

The split rate system is similar to the classical system but different rates are levied on distributed profits and retained profits. This system is often used when income and capital gains are taxed at different rates. Thus, a higher level of income tax than capital gains tax would be coupled with a higher tax rate on retained profits than on distributed profits.

Imputation

In the imputation system the company has to deduct some of the tax payable by investors on distributions and pay it directly to the government. This amount can then be set off against the total corporation tax bill of the company. The tax deducted by the company is “imputed” to the shareholder who may be able to reclaim it if they are not liable to tax. If the rate at which they are liable to tax is greater than the rate imputed they may have to pay some more tax on their dividend.

- (ii) If the country they currently live in is also free of income tax, they will be no better off.
The overall tax system in the new country might have higher tax rates on investments than in current country.
Tax allowances such as thresholds before Capital Gains Tax become payable may be lower in the new country
Consultant might get a lot of income from investments as independently wealthy which means his overall net of tax income is lower than currently.
The consultant's assets might enjoy some tax benefits which would be lost if registered in another country, or additional taxes (such as non-dom tax) would be payable as result of being registered in another country.

In the absence of double taxation agreements, some elements of income may be taxed twice

Higher taxes might be payable in respect of monies sent abroad

The consultant might get tax benefits/incentives for being married with children. He might lose these when moving country which could affect overall net of tax income.

There might be pension contribution tax incentives in current country which mean contributions are paid gross of tax. The new country might tax pension contributions.

Some non-salaried benefits such as universal health care may not be available in the new country

Other sensible suggestions based on the list in Unit 2 Section 1 of Core Reading were also given credit. The question related to the impact of taxation, so non-tax points were not given credit.

Q4 (i) The uses to which indices can be put include:

- a measure of short-term market movements.
- providing a history of market movements and levels.
- as a tool for estimating future movements in the market, based on past trends.
- as a benchmark against which to assess the investment performance of portfolios.
- valuing a notional portfolio.
- analysing sub-sectors of the market.
- as a basis for index funds which track the particular market.
- to provide the basis for the creation of derivative instruments relating to the market or a sub-section of the market.

(ii) Two popular indices are the Nikkei Stock Average 225 and the Tokyo Stock Exchange First Section Index, commonly known as Topix.

The Nikkei Stock Average 225, commonly known as the Nikkei or Nikkei Index, is a price weighted arithmetic index of the shares of 225 Japanese companies.

It is listed on the Tokyo Stock Exchange and measured in Yen.

The constituents are reviewed annually and the index is designed to reflect the overall market in Japan .

It is the most widely used indicator of short term movements in the Japanese market.

The Tokyo Stock Exchange First Section Index, commonly known as Topix, comprises approximately 1,700 shares.

It is a market capitalisation weighted arithmetic index reflecting “free float” from June 2006 (i.e. a weighting based on the number of shares available for trading).

The constituents represent the leading companies in the market, so the index is much more comprehensive than the Nikkei index, and is more suitable for use in performance measurement.

- (iii) The formula to obtain a total return index at time t is:

$$TRI(t) = TRI(t-1) * \frac{I(t)}{I(t-1) - [XD(t) - XD(t-1)]}$$

where $TRI(t)$ is the total return index, $I(t)$ is the capital index and $XD(t)$ is the value of the accumulated XD adjustment at time t .

The total return over 2011 is therefore:

$$\frac{676}{684 - [48 - 40]} - 1 = 0\%, \text{ i.e. a return of zero}$$

if the XD adjustment is not reset to zero at the end of the year. If it is reset (as suggested in Core Reading), the total return is $676 / (684 - 48) - 1 = 6.29\%$.

- (iv) The total return index has remained flat over the year despite the capital index suffering a fall of 1.2%. The total return index includes income received and dividends were received, which are assumed to be reinvested in the index.

This has offset the reduction in the capital index.

- (v) An alternative method is to use a yield adjustment. The income received over the 12 months prior to time t is $I(t) * y_t$ where y_t is the dividend yield at time t . The total return is obtained by adding the yield adjustment to the capital only index.
- (vi) A limitation of the XD dividend adjustment method is that there is an assumption that reinvestment takes place on the ex dividend date. It is important to ensure that tax and re-investment assumptions are understood. A limitation of the yield adjustment approach is that over shorter time periods, the income is estimated on a proportionate basis.

This only provides an approximation as dividend income is not generally received uniformly over the year.

Part (ii) Discussion of the recent performance of the indices was also given credit.

Description of other Japanese equity indices were given equivalent credit.

Weaker candidates were not able to reproduce these points (as set out in Section 3.1.3 of Unit 3 of Core Reading).

Part (iii) Credit was also given if the XD adjustment was added to the numerator rather than deducted from the denominator.

Part (iv) Equivalent comments based on the alternative results in part (iii) were also given credit.

Part (v) Weaker candidates struggled to make much of this question.

Q5 *Boxes of documents containing client addresses and personal details left in hallways, under desks and in the staff canteen*

Information about customers

– the firm should have proper policies and procedures to keep information secure

Internal organisation

– the business should be run in a proper manner and information stored appropriately

Empty files in the Know Your Customer directory on the computer's main server

Information about customers

– firm should have information on its customers so can understand risk appetite and act appropriately depending on customers' needs.

Only one registered bank account. The bank account was in the name of the investment manager

Customer assets

– need to maintain segregated assets for safeguarding client assets in case of bankruptcy etc.

An employee incentive scheme which invested in the investment managers best stock ideas one day prior to client monies being invested in the stocks

Market Practice

- this is front running and is outlawed in most markets

Integrity

- not acting in best interests of clients and putting employees first

Marketing materials which gave information on only 70% of the asset classes that the investment manager actually invested in

Information for clients

- need to provide adequate information on the investment products due to asymmetry of information and knowledge

Integrity

- provide full disclosure to clients to show what they will be investing in and acting with integrity

A \$1m loan from a local bank which was due for payment in 30 days. The company had no provisions set aside to meet the payment

Financial resources

- they need the financial resources to continue as a going concern, if no provision to pay for loan how will they continue to survive?

No written procedure documents

Internal organisation

- firm should be managed in a professional way and have appropriate documentation so individuals know their roles and duties

Other relevant issues raised were also given credit. Weaker candidates found difficulty in identifying the relevant issues contained in the described scenario.

Q6 (i) The main stages in an ALM exercise are usually as follows:

1. The key objectives that investment should aim to achieve need to be clarified. These involve objectives such as:
 - a. future solvency levels
 - b. ruin probabilities of insolvency
 - c. the level of risk between assets and liabilities
2. Suitable assumptions to use in the study need to be agreed.
3. Data on the liabilities needs to be collected to carry out the projections.

4. The overall nature of the liabilities is considered — an analysis of cash flow projections under different scenarios is considered
 5. An analysis would be carried out to identify how the fund might progress in the future if different investment strategies were adopted.
 6. Different asset mixes would then be analysed in more detail to assess the risks (relative to the liabilities) and the rewards of each alternative under consideration.
 7. The results would be summarised and presented.
- (ii) The insurer could hold a portfolio of government bonds (in the appropriate currency) until maturity to meet the future payments from the annuities. This approach is often described as 'immunisation'.

This has the advantage of being a relatively simple strategy to adopt if there are sufficient bonds available in the market to match the liability payments.

Difficulties with this approach arise for the following reasons:

Such an approach requires a bond asset to be held that is equal in present value to the future payments discounted at bond yields (using the full yield curve). Therefore, only a partial hedge is only possible if asset cover is less than 100%.

This may be an issue if the insurer is struggling to maintain adequate capital reserves.

However, a leveraged exposure can be created using repo contracts

If the latter payments are payable after the principal payment of the longest available government bond then it will not be possible to hedge these payments at present (until longer maturity bonds become available, i.e. creating reinvestment risk).

Due to "gaps" between bond maturities (particularly at longer durations), there may be a need to reinvest or disinvest bonds prior to maturity, and the hedge may therefore be imperfect.

The use of government bonds gives rise to a (small) degree of credit risk that may not necessarily be reflected in the liability.

If the tax treatment of government bonds worsens, this may mean the assets are insufficient to meet the liability payments.

Due to the above factors, there may be some mark to market risks between the asset value of the bond portfolio and the present value of the liability payments discounted using the bond yield curve.

In some cases this may be a material risk factor, but in other cases this will be much smaller than uncertainties in the liability payments themselves or other portfolio risks.

This approach can be extended to annuity payments that are subject to indexation, provided there are bonds of the appropriate maturity available with the appropriate indexation built into their payment.

In markets where liquid and deep interest rate derivative markets have developed, additional flexibility in hedging fixed payments is available through the use of interest rate swaps.

Inflation-linked payments can similarly be hedged using inflation swaps in combination with an interest rate swap.

The use of swaps rather than bonds has the following advantages:

Interest rate and inflation swap markets may have longer maturities available than bond markets.

Swap markets may have greater liquidity and lower transaction costs than bond markets.

Swaps permit hedging to be achieved without full asset cover being required, as they are a contract for difference rather than a funded asset.

Swaps are in most cases bespoke contracts that are agreed with a single counterparty, rather than a standardised listed security (like a bond). Therefore greater flexibility is possible within the schedule of payments.

The use of swaps does create the following complications and disadvantages:

If the investor wishes to enter into a swap contract directly then they will need to have ISDA documentation in place with one or more market counterparties (typically investment banks), which is a legal document that is negotiated and can be expensive and time consuming to set up.

If the swaps are subject to collateralisation (to mitigate credit risk), then this will require the movement and investment of collateral on a daily or weekly basis.

The bespoke nature of a swap means that closing out a swap position is more complex than selling a bond.

However, in a liquid market closing out a swap may in fact have lower transaction costs than selling a government bond.

Swaps are subject to counterparty risk,

if the counterparty bank defaults. Whilst collateralisation will limit losses, if this happens a new swap will need to be put in place at potentially higher cost (replacement risk) or the hedge lost.

Under an interest rate swap, the receiver of the fixed interest rate will need to pay a floating interest rate to the counterparty. To the extent that there is investment risk in the assets that are used to generate the floating rate (e.g. cash or other assets), the swap will not mitigate these risks, whereas a government bond portfolio is intrinsically low risk from a credit standpoint.

If the swap interest rate curve moves differently to the government bond interest rate curve, this can create a basis risk, which could lead to a mark to market loss.

The mandate may prohibit the use of derivatives

Other valid methods of hedging interest-rate risk were also given credit. Credit was given where an advantage listed for one method was instead described as a disadvantage of the other (and vice versa).

- Q7** (i) Exchange Traded Funds (ETFs) are the “closed-ended” investment trust equivalents of (mutual) Index Funds.

An ETF represents shares of ownership of a unit investment trust which holds portfolios of stocks, bonds, currencies or commodities.

The investor purchases the shares on a stock exchange in a process identical to the purchase or sale of any other listed stock.

The ETF's performance tracks an underlying index, which it is designed to replicate.

Although the first ETFs tended to track broad market indices, more recent ETFs have been developed to track sectors, investment styles, fixed income, global investments, commodities and currencies.

ETFs will not exactly replicate index performance due to tracking error. This is due to differences in composition, management fees, expenses and handling of dividends. However, in practice ETFs track markets closely.

In general, management fees levied are low.

The ETF price should remain close to Net Asset Value. If not, arbitrage opportunities will exist.

- (ii) The portfolios are aimed at long-term accumulation of contributions and reinvested income with no fixed target value to achieve.

As the proceeds will not be drawn on for many years, volatility of portfolio value in the accumulation period is not a particular concern (and “pound / cost averaging” of regular contributions means that periods of depressed asset values can be beneficial)

Given the planned use of the accumulated funds, investment in ‘real’ assets would seem appropriate.

Based on historical returns, longer-term investment in cash or fixed interest assets would appear to be inappropriate for these portfolios during their accumulation period. However, as the beneficiaries approach maturity, it may be appropriate to transfer the accumulated funds into such asset classes in order to safeguard their value against market fluctuations.

So, during the accumulation period equity or property investment (including infrastructure) would seem most appropriate. However, given the “modest” size of the planned contributions it will be important to consider how diversification of holdings can be achieved. It is also important to consider the costs of investment and any minimum investment considerations that may be encountered.

There are no indications that a restriction to domestic assets is necessary, particularly if passive collective investment is to be used, but again the issues of cost and diversification need to be considered.

However, it would also be appropriate to consider the risk appetite of the beneficiaries, to ensure that the assets chosen met their needs

- (iii) Given the focus on equities and property, suitable vehicles would be unit trusts and investment trusts (including REITs for property investment).

However, while these will generally offer a suitable degree of diversification of the underlying holdings, they can incur significant management costs and, possibly, minimum investment levels that would be too high for the modest contributions planned. Using insurance vehicles to access these collective investments will add to the cost burden and may limit the flexibility of contributions in size and frequency.

For all these reasons, it is likely that “passive” investment will be most appropriate. The fact that this is a “retail” investor with, presumably, little investment expertise supports this view.

Since diversification and cost are the key considerations, use of Exchange Traded Funds to access the chosen asset classes would seem appropriate. For many “passive” index-tracking ETFs, annual management charges of 0.1% or

less are levied, although there will usually be additional charges for the “platform” that provides the trading and hosting of the funds.

While there are no specific taxation issues identified in the question it would clearly be appropriate to consider any local tax-favoured instruments and the impact of income and capital gains taxes on beneficiaries and donors. In some jurisdictions, there may also be tax issues in respect of the transfer of funds between parties, so that the use of vehicles such as trusts may be appropriate.

Relevant points raised under parts (ii) and (iii) were given credit irrespective of which part of the answer they appeared in. Credit was given for consideration of relevant issues rather than the precise conclusions reached.

END OF EXAMINERS' REPORT