

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2012 examinations

Subject ST5 – Finance and Investment Specialist Technical A

Purpose of Examiners' Reports

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 who are 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. Although Examiners have access to the Core Reading, which is designed to interpret the syllabus, the Examiners are not required to examine the content of Core Reading. Notwithstanding that, the questions set, and the following comments, will generally be based on Core Reading.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report. Other valid approaches are always given appropriate credit; where there is a commonly used alternative approach, this is also noted in the report. For essay-style questions, and particularly the open-ended questions in the later subjects, this report contains all the points for which the Examiners awarded marks. This is much more than a model solution – it would be impossible to write down all the points in the report in the time allowed for the question.

T J Birse
Chairman of the Board of Examiners

July 2012

General comments

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

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

Given the greater volatility in recent years and globalisation/integration of markets and economies, delivering an acceptable return from a long term strategy against an increasing short term focus and political/regulatory backdrop has become increasingly challenging for investors. In order to succeed, candidates must ensure they familiarise themselves with the prevailing investment issues and the general market background facing institutional investors in the 12–18 months preceding a diet, more so the solutions (and sources of) being debated by the various stakeholders. Hence questions regarding banking and derivative approaches, as well as active and passive asset management and insurance solutions, to asset and liability risk management (including model risk) or modern financial theory and commercial applications should be considered likely scope for examination. Against a background of the credit crisis, new asset classes and ways of structuring investments will themselves generate new types of risk (such as operations, liquidity, credit and counterparty), so the need for new ways of regulation, monitoring and management. Finally the examiners encourage candidates to recognise there are different types of investor beyond solely pension funds, and that different taxation, time line and cost considerations will apply to each type of investor – it would seem that candidates have taken this on board.

Whilst the examiners will tolerate bullet point style responses, some candidates' handwriting was too poor to assess and they will have lost marks. "Text speak" abbreviations will not be accepted.

Specific comments on April 2012 paper

This paper had a similar pass mark to the September diet and resulted in a higher pass rate, which was a pleasing result. Candidates typically answered Question 7 much better than the others (albeit still foregoing a third of marks available), with Questions 4 and 1 attracting the worst responses, considerably so, with average scores of between a quarter and a third of the available marks. Question 1 was predominantly bookwork knowledge so the scores are disappointing.

Conversely, Questions 5 and 7 were two of the more calculation biased ones and it was pleasing to see more skill demonstrated in this area.

Question 2 focussed on different derivative contracts and pricing, an increasing area of focus for actuaries generally as liability driven investment grows in popularity. Questions 3 and 5 focussed on the practical aspects of investment as distinct from theory, highlighting that the client could more likely be an individual than a institution requiring different considerations. Many questions represented opportunities to demonstrate higher level skills in terms of non-standard/practical application of theory to current or unusual issues in investment – hence candidates who wish to progress to SA6 will need to improve their understanding of and approach to such questions.

- 1** (i) A debenture is a loan made to a company which is secured against the assets of the company. Debentures usually have a “floating” charge over the assets of the company, so that debenture holders rank above other creditors should the company be wound up. Alternatively, mortgage debentures have “fixed” charges – they are secured against specific assets set out in the legal documentation.

(ii) **Issuers**

Issuers are likely to be able to obtain funding via the debt capital markets at lower borrowing spreads if they issue debentures than if they borrow on an unsecured basis.

Funding may be available at longer maturities, or in larger size, than if borrowing on an unsecured basis.

At times of market stress it is desirable to have multiple sources of funding to maximise the likelihood of being able to source new funds, therefore issuers often want to ensure they have a presence in the debenture markets.

Financial institutions often have significant illiquid assets (e.g. mortgages) that are available for use as collateral cover, therefore it is efficient to use them in this way to reduce funding costs.

Debentures are issued with a fixed redemption date and carry a fixed rate of interest, so the issuer has a known debt servicing commitment.

Interest payments are tax deductible.

Debenture holders have no right to interfere with the running of the company.

Investors

Investors may be willing to invest in debentures to a greater extent than unsecured bonds with some issuers due to concerns about credit risk.

Debentures are likely to have a higher credit rating than unsecured bonds, so may fit elsewhere in a portfolio for a given issuer.

Due to the different credit characteristics, a debenture will provide some diversification compared to an unsecured bond, as it is exposed to different risk premia (both the issuer's credit risk, and that of the collateral assets).

For a hold to maturity investor, debentures have very low risk as they are likely to offer very high recovery rates due to the collateral pool.

Credit will be given for relevant points from part (ii) that were included in part (i)

- 2** (i) Forwards are over the counter instruments. Futures are exchange-traded.

Forwards are bespoke contracts. Futures are standardised.

For a forward, there is no cash flow until the maturity. For a future, there is daily marking-to-market and settlement of margin requirements.

- (ii) To convert futures to forward interest rates, a *convexity adjustment* is applied:

$$\text{Forward rate} = \text{Futures rate} - \frac{1}{2}\sigma^2 t_1 t_2$$

where t_1 is the time to maturity of the futures contract t_2 is the time to maturity of the rate underlying the futures contract and σ is the standard deviation of the change in the short-term interest rate in one year.

- (iii) $t_1 = 6$, $t_2 = 6.25$, $\sigma = 0.01$ so the convexity adjustment is .001875 (or 0.1875%)

The (nominal) futures rate $i^{(4)}$ is 4%, so the equivalent annual rate is 4.0604%.

Thus the forward rate is $4.0604 - 0.1875 = 3.8729\%$

Using a continuous compounding then the alternative answer is 3.8655% which will be given similar credit.

- (iv) The procedure is:

1. Calculate forward rates for each of the floating rates that will determine swap cash flows.
2. Calculate swap cash flows on the assumption that the floating rates will equal the forward rates.
3. Set the swap value equal to the present value of these cash flows.

- 3** (i) Capital intensive
Highly geared
Volatile profits
Labour costs important
Domestic market is most important
Highly regulated

- (ii) In low economic growth a consumer non-durable stock is less affected by the economy than an organisation with volatile profits (banks) which are expected to decrease. Conversely in high economic growth you would expect banks to make higher profits. Therefore, in low economic growth you would expect the durables to outperform the bank stock, whereas in higher growth bank stocks are expected to outperform the consumer durables.

Variations in demand for the shares will exacerbate these effects.

- (iii) Because the individual is retired it is likely they are concerned with capital preservation and equities being volatile are not usually suitable for risk averse individuals.

On this occasion the individual wants capital growth so equities might be suitable. However, given their retired status their time horizon might be shorter than economic recovery period when bank stocks are expected to underperform.

Also, the economy might make it difficult for banks to produce profits and the bank stocks are not at the bottom of their valuation cycle.

The investor might wish to diversify away from one sector.

- (iv)
- A pooled fund holding bank stocks
 - An ETF invested in bank stocks
 - Derivatives
 - Bond holdings

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Property losses can rapidly result in losses being “transmitted” to other parts of the economy as property assets are often purchased using borrowed funds, rather than purchased on an outright basis.

This means that if a property falls in value, the owner (borrower) will see an increase in their loan to value (LTV), and hence represent a greater credit risk for the lender. If the funds have been borrowed from a regulated financial institution (e.g. a bank) then they will need to hold more capital against the loan, creating balance sheet strains, and potentially the bank may need to sell long-term assets such as loans to restore capital levels.

If a number of lenders are impacted simultaneously, as would often happen if property prices fall, then they will all face capital strains. This will reduce their ability to advance funds to new borrowers, and create shareholder losses. They will also become less creditworthy themselves, resulting in funding strains or higher borrowing costs.

Householders would experience problems when selling properties in the depressed market. As the property value was now lower than their mortgage borrowing, they would experience “negative” equity. This would in turn limit their ability to fund a new property purchase and thus cause the property market to stagnate. Where the move was needed due to a planned change in employment, this would then influence the labour market. A regional differential in property price movements, so that prices were falling in some parts of the country but remaining stable elsewhere, could exacerbate this problem.

Where property loans had been used as collateral in asset-backed securitisations such as mortgage-backed securities or collateralised debt obligations, the fall in property prices would reduce the demand for such assets by investors. Equally, lenders would find that short-term funding, e.g. on the interbank market, would become more expensive (or might even become unavailable). This problem would be particularly acute if the lender's activity concentrated on property loans.

The fall in property values and transactions might reduce government tax revenues. Business supporting the property market, such as estate agents and conveyancing solicitors, would also be adversely affected. Conversely, there might be increased demand for property refurbishments or improvements from homeowners unable to move. However the availability of "second" mortgages and further loans would be limited due to the reduced collateral available and exacerbated by additional caution from lenders.

Similar effects would be experienced in the commercial property sector if real estate prices fell. The use of property values to support debenture loans or "sale and leaseback" transactions could be affected. The property development sector (builders, architects, material suppliers, etc.) would also be adversely affected, particularly if the decline in prices was expected to persist for a substantial period.

The fall in capital values will be reflected in an increase in rental yields. Indeed the lack of turnover in the property market and the increase in required LTVs may generate excess demand for rental property leading to a further increase in rents. This will effect an income transfer from tenants to landlords and the resulting change in disposable income may have wider economic impacts and consequent changes in asset capital values according to relative consumption patterns.

- 5** (i) Capital gains tax is usually payable on disposal of an asset. This can lead to investors attempting to defer tax liabilities by avoiding the crystallisation of a capital gain.

Using capital losses to offset capital gains in the same year.

Derivatives can be used to reduce exposure to an asset rather than selling the asset itself.

The existence of an annual tax-free allowance can also lead to investors selling and repurchasing assets to crystallise a gain in order to take advantage of their annual allowance.

(ii)

Country A	Year 1	Year 2	Year 3	Total
Income tax	150000	250000	250000	650000
Capital gains tax	165000	1275000	–210000	1230000
Total	315000	1525000	40000	1880000

Country B	Year 1	Year 2	Year 3	Total
Income tax	30000	50000	50000	130000
Capital gains tax			1968750	1968750
Total			2018750	2098750

(iii) Declare income tax in Country B and capital gains in Country A.

Have main residence in Country A.

Sell all assets in Country B every 3 years to exempt from capital gains tax.

(iv) Overall tax paid in country of residence might be lower (i.e. lower income tax).

Might not have any assets which are subject to capital gains.

Has some capital losses which are more advantageous to be written off in country of residence.

If tax is only paid on capital *gains* (compared to a country where rates are lower but tax is on the *value* of the assets).

Non-financial reasons as described.

6 (i) *Absolute pricing* prices assets by reference to exposure to fundamental sources of macroeconomic risk. The consumption-based and general equilibrium models (such as CAPM) are examples of this approach, which can be used to predict how prices might change if policy or economic structures change.

Relative pricing, as exemplified by Black-Scholes option pricing and Arbitrage Pricing Theory, considers the value of an asset given the price of some other assets. Here we use as little information about fundamental risk factors as possible, and we do not ask where the prices of the other assets came from.

(ii) Beta is a measure of a stock's volatility relative to movements in the whole market. Usually defined as the covariance of the return on the stock with the return on the market, divided by the variance of the market return. It is a measure of the stock's exposure to non-diversifiable systematic risk. Beta is useful because it allows the expected return of any security to be expressed as a linear function of the security's covariance with the market as a whole.

- (iii) Expected return = $5\% + (0.1 / 0.2) (9 - 5) = 7\%$
- (iv) Empirical evidence suggests that the line relating return to beta has been too “flat” in recent years, and that while return has not risen with beta it has been related to other measures such as market capitalisation or book-to-market ratio. CAPM predicts that beta is the *only* reason that expected returns differ

The “risk free” rate is not truly attainable, due to factors such as default, inflation and currency risk.

CAPM assumes that investors can borrow money at the same rate of interest as at which they can lend. In practice, borrowing rates are higher than lending rates.

Markets are not “perfect” (with information freely and instantly available to all investors). Similarly, investors will not share the same estimates of expected returns, standard deviations and covariances of securities.

- 7**
- (i) The MSCI style indices take the universe of a standard index and ranks the securities according to Price-to-Book values. The top half – stocks with low Price-to-Book values – is associated with the Value style and the bottom half – stocks with high Price-to-Book values – is associated with the Growth style.
- (ii) Five Growth factors are:
- Sales Growth
 - Earnings Growth
 - Forecast Earnings Growth
 - Return on Equity
 - Earnings Revisions
- and five Value factors:
- Book to Price
 - Dividend Yield
 - Earnings Yield
 - Cash Flow Yield
 - Sales to Price
- (iii) Other equity investment styles include:
- *Momentum* – purchasing (selling) those stocks which have recently risen (fallen) significantly in price on the belief that they will continue to rise (fall) owing to an upward (downward) shift in their demand curves.
 - *Contrarian* – doing just the opposite to what most other investors are doing in the market in the belief that investors tend to overreact to news.

- *Rotational* – moving between Value and Growth depending on which style is believed to be attractive at any particular point in time.

- (iv) Big Bang – Tech stock in market which is expanding – growth stock
 Power 2u – Utility which is non-cyclical stock – classic value stock
 Classic Wooden Furniture – mature, stable market – value
 Superfluid – Expansion into markets that are growing – growth
 In the sticks– expansion plans – growth
 GiveMeSomeCredit.com – stable client base, seems to be value

(v)

<i>Company</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Total return</i>	
Big Bang Theory Ltd	12%	5%	2%	19.95%	Growth Value Value Growth Growth Value
Power2u	7%	8%	8%	24.80%	
Classic Wooden Furniture Ltd	4%	7%	9%	21.30%	
Superfluid	21%	2%	–6%	16.01%	
In the sticks	5%	11%	1%	17.72%	
GiveMeSomeCredit.com	9%	8%	9%	28.31%	
Total Benchmark return	11%	5%	4%	21.21%	
Growth Benchmark return	14%	5%	–1%	18.50%	
Value Benchmark return	7%	7%	8%	23.65%	

Total portfolio return	9.7%	6.7%	3.7%	21.35%
Growth portfolio return	12.7%	5.8%	–1.1%	17.89%
Value portfolio return	6.7%	7.7%	8.7%	24.80%

Workings

<i>Company</i>		<i>Year 1</i>		<i>Year 2</i>		<i>Year 3</i>	<i>Total Return</i>
Big Bang Theory Ltd	£100.00	12.0%	£112.00	5.0%	£117.60	2%	£119.952
Power2u	£100.00	7.0%	£107.00	8.0%	£115.56	8%	£124.805
Classic Wooden Furniture Ltd	£100.00	4.0%	£104.00	7.0%	£111.28	9%	£121.295
Superfluid	£100.00	21.0%	£121.00	2.0%	£123.42	–6%	£116.015
In the sticks	£100.00	5.0%	£105.00	11.0%	£116.55	1%	£117.715
GiveMeSomeCredit.com	£100.00	9.0%	£109.00	8.0%	£117.72	9%	£128.315
Portfolio return	£600.00	9.7%	£658.00	6.7%	£702.13	3.7%	21.35%
Growth portfolio return	£300.00	12.7%	£338.00	5.8%	£357.57	–1.1%	17.89%
Value portfolio return	£300.00	6.7%	£320.00	7.7%	£344.56	8.7%	24.80%

Answer

	<i>Calc</i>	<i>Answer</i>
Total portfolio return	21.35%	
Total benchmark return	21.21%	0.14%
Total Growth portfolio return	17.89%	
Growth benchmark return	18.50%	–0.61%
Total benchmark return	21.21%	–3.32%
Value portfolio return	24.80%	
Value benchmark return	23.65%	1.16%
Total benchmark return	21.21%	3.59%

- (vi) From the calculations it shows that value stocks have outperformed growth stocks. When an economy is contracting, value stocks tend to outperform so it is likely the economy was contracting.

END OF EXAMINERS’ REPORT