

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2014 examinations

September SA6 – Investment Specialist Applications

Introduction

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

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

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

The report is written based on the legislative and regulatory context at the date 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 2014

General comments on Subject SA6

As actuaries move into wider fields, the examiners are likely to focus on the practical application of core skills in what may appear unfamiliar situations. However, better candidates should be able to identify the key principles and considerations that a solution demands, since this should be a regular feature of their “day job”. Indeed, the ability to bring these familiar principles to bear on unfamiliar situations is, primarily, what is being assessed in this subject and others at SA level.

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 recently qualified actuary or 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 parts of questions.

Whilst the examiners accept bullet point style responses, handwriting that is too difficult to read will lose marks. It should also be stressed that “text speak” abbreviations are not appropriate for professional communications, including exam solutions, and will not be accepted.

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, disclosure regime and fluid political/regulatory backdrop has become increasingly challenging for investors, albeit it is really just a more complex variant of the traditional risk/reward trade-off. The “return-free risk” is becoming increasingly and unfortunately common particularly as investors move into markets and asset types with less history or public data/scrutiny. Investors generally only have assets because they have liabilities and it is the latter that will drive strategy. As regulatory scrutiny increases, the market mindset is changing from one of “play to win” to one of “play not to lose” and this change in behaviour will impact pricing, particularly of “risk free” assets or hedging instruments. Consequently the opportunity set of acceptable investments is also changing, forcing institutions to innovate in both how they invest and what they invest in.

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 an examination diet, more so the solutions (and sources of) being debated by the various stakeholders. Hence questions regarding banking and derivative approaches to hedging or the interaction with state policy, to asset and liability risk management (including model risk) or modern financial theory and commercial applications should be considered likely scope for examination. Although the global economy is recovering, as investors are keen not to repeat the errors that led to the credit crisis, new asset classes or ways of structuring investments will themselves generate new types of risk (such as benchmark, model, operations, liquidity, credit and counterparty) and also the need for new ways of regulation, monitoring and management. This is increasingly so for “alternative” investments where the associated illiquidity demands greater due diligence prior to investment as errors or poor judgements can rarely be easily or cheaply corrected. Finally the

examiners encourage candidates to recognise there are different types of investor and stakeholders beyond purely group/defined benefit pension funds where different risk perspectives/tolerances, taxation, time line and cost considerations will apply.

The examiners are setting questions premised on an assumption that candidates are likely to be working already as investment/financial advisers or asset managers in this most practical of fields, rather than being those looking to transfer from another discipline. If candidates don't have this practical experience, they will struggle in the application and higher skills parts of questions, being both unable to recognise the key issues to analyse in the problems presented and also communicate their answers in the language of capital markets or as expected by clients.

Comments on the September 2014 paper

A very poorly answered paper consistent with recent diets – the pass mark was lower than the previous diet and the average mark remains much lower than the examiners feel ought to be achievable by candidates. Even the better candidates' scores were too low and would have been insufficient to have passed previous diets whereas the lowest scores, achieving 25% or less of available marks indicates poor technique and preparation.

Previous papers had looked to examine capital market or government policy detail, whereas this paper reflected the practical portfolio management issues that arise from changing state activity – infrastructure investing has been a key consideration for many governments looking to enhance economic activity and for institutions seeking real assets to match their liabilities as treasury yields fall. Likewise quantitative easing has been a common policy tool in developed markets with direct impacts on the financial sector. The final question looked at the interaction between sponsor and fiduciary given that the sponsor covenant is often the fiduciary's greatest asset backing long term funding plans. All these areas should be familiar to candidates as issues facing their clients and other industry stakeholders for the last four or five years or more, so the apparent lack of familiarity with the subject matter was very disappointing. However, even where a paper includes topics not previously examined, candidates should be able to carry out their analysis using the same fundamentals of economics, portfolio management, investor requirements, etc. that underpin more familiar issues and are covered in other subjects.

Given an overall appraisal framework of "quality, security, profitability and liquidity", candidates need to be able to explore the trade off each opportunity represents and any new types of risk (such as reputation, operations, liquidity, credit, model and counterparty) and conflicts of interest incurred that justify these new ways of regulation, monitoring (and against what benchmark) and management.

Candidates typically answered Question 3 slightly better than the other two, but the better answers still forgo around half of the available marks. Questions 1 and 2 saw average scores of less than 30% of the 79 available marks with even the best candidates failing to achieve half marks.

Those candidates 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 during the marking process.

1 Infrastructure characteristics, equity and debt

The financing of long-term infrastructure, industrial and public services projects is based upon a non-recourse (or limited recourse) financial structure, where project debt and equity used to finance the project is paid back from the cash flow generated by the project.

Infrastructure projects tend to be separated into two broad subsets – economic and social.

Economic infrastructure includes transport and utilities, whereas social infrastructure encompasses schools, universities, hospitals, public housing and prisons.

Infrastructure projects are generally characterised by high development costs and long lives.

Therefore financing structures tend to have long terms.

Both equity and debt financing will be used.

Many infrastructure assets are single project in nature (e.g. pipeline, toll road, hospital).

Infrastructure projects are often natural monopolies, or have similar characteristics.

This reflects the high capital requirements and other constraints for a project (e.g. need for planning approvals, long construction phase, location/physical constraints).

In such a scenario, revenue streams are likely to be relatively stable, as are operating margins.

This often allows infrastructure projects to have a relatively high level of gearing and hence significant amounts of debt or loan financing. Long-term equity financing will also be required.

Due to their monopoly status, in some cases infrastructure projects have significant pricing power (e.g. toll roads), which allows higher than expected gains to accrue to equity investors or (depending on the terms) debt investors to receive their capital sooner than expected.

Risks of infrastructure debt and equity

The risks of infrastructure investments divide into macroeconomic / general factors and specific factors.

Specific factors will include risks relating to the design, construction and operation of the project. Specific risks are at their highest during the construction phase due to the risk of cost overruns and unanticipated requirements. Once a project has been built,

specific risks will typically diminish over time as debt financing is gradually paid and loan to value ratios increase.

Macroeconomic factors will include interest rates, growth rates (economic risk), regulatory and political risks.

Rising interest rates result in falling values of cashflow streams, and are therefore one of the key short-term risks. Whilst in the medium term this is likely to be offset by rising revenues derived from inflation-linked prices and increasing demand, in the short-term this can result in loan to value covenants being breached.

Conversely the key longer-term risk is that of weak domestic growth.

Scheme specific criteria

Infrastructure debt and equity is typically private in nature, with no liquid secondary market (with a few exceptions).

Therefore, before making an allocation to infrastructure assets, the Investment Committee will need to be comfortable that the scheme has a sufficiently long time horizon to be able to invest in the asset with a low likelihood of being a forced seller.

The Investment Committee will also need to consider the following:

- Existing allocations to infrastructure debt and equity.

- Risk appetite, and target split between bonds and risk assets.

- Appetite for illiquid assets at the current time (e.g. there may be a view that illiquid premia are high or low at present).

- Current liquidity and ability to fund commitments during the investment phase.

- Alternative infrastructure debt and equity opportunities at the present time.
Planned divestments over the investment phase.

Target distribution of infrastructure investments based on:

- Equity or debt
- Type of asset (pipeline, hospital, etc.)
- Region or country
- Build phase or operating phase

Size of allocation

Having considered the above constraints, the Investment Committee will be in a position to determine the maximum possible allocation to these funds.

An allocation of £1.5bn to infrastructure debt is likely to be well within the maximum possible allocation for the scheme, provided the scheme has not made significant allocations to long-term debt already.

The equity participation rights are likely to be significantly lower than the maximum £1bn allocation to infrastructure equity. As such it is likely that the scheme will be able to use the rights if it so chose.

It is reasonable to allocate more to a transport fund than a clean energy fund, as the risks of the former are lower due to its focus on projects enjoying a natural monopoly.

Further due diligence will be required on the funds themselves before making an allocation.

Unique characteristics of the fund

These funds have the following key differences from more typical institutional funds of infrastructure debt:

- Government involvement.

- Large size, hence economies of scale should lead to lower costs.

- Large size enables a diversified stake to be created even with a large allocation.

- Ability to invest a large allocation with reasonable certainty over a defined time horizon.

- Investor base includes industry representation.

- Focus on national infrastructure, and national energy.

- Opportunities unlikely to be available to other investors, except for largest projects where co-investment may occur.

- Equity rights are also an unusual feature.

- Open-ended nature is also unusual.

Agency issues and alignment of interests

The government equity stakeholder creates a number of alignment issues.

It may be expected that preferential access will be given to some opportunities.

Even if not, it is likely that projects will have lower regulatory or political risks than for many other projects.

Offsetting this, the fund may be pressed to participate in opportunities with a weaker commercial rationale that other funds may choose to not invest in.

Additionally the government will be looking for an exit opportunity.

The nature of the investor base will ensure that the fund maintains a long-term focus.

Overall this is a positive for the scheme, as its co-investors are likely to have a long time horizon and be relatively engaged with the projects.

It is possible however that the lack of retail investors may mean that future regulators or governments will lead to lower political leverage in the future once the government has divested its stake.

Open ended nature

The open ended nature of the fund creates complexities in maintaining equity between existing and future investors.

This is likely to be seen as a disadvantage by early investors who will bear the drag of “j-curves” as future projects bear their own initial costs. However, for a debt fund these issues are less severe than for an equity fund.

Seed investors may see the benefit of equity rights as being adequate compensation for the above effect.

Seed investor rights

If the funds are successful in growing, seed investors could gain significant upside through the equity participation rights granted.

This is particularly the case as the fund is open.

However, it is possible that the equity rights will need to be conferred to investors in future rounds of fund raising to ensure that investors continue to allocate to the funds. Even if this were the case, seed investors would be able to participate in equity placements resulting from their own debt investments.

Therefore the fund could be regarded as providing investors with an opportunity to invest in debt plus call options on the equity.

[42]

- 2** (i) Quantitative Easing (QE) is a monetary policy used by some central banks to increase the supply of money. It usually involves both a direct increase in the money supply and a knock-on effect from the fractional reserve system, increasing the money supply further. Although it can involve just making changes to the fractional reserve system, which increases the money supply.

QE is usually implemented by a central bank by first crediting its own account with money it creates ex nihilo (“out of nothing”). It then purchases financial assets, for example government bonds, agency debt, mortgage-backed securities and corporate bonds, from banks and other financial institutions in a process referred to as open market operations. It can also involve changing the reserve requirements which through the fractional reserve system would increase the money supply.

[4]

- (ii) Quantitative easing should result in a direct increase in the demand for bonds and an expected future increase in the demand for bonds, resulting in rising bond prices.

The consequently lower bond yields should result in an increase in the present value of future earnings of companies resulting in high equity prices.

The additional liquidity in the financial markets resulting from lower bond holdings and higher cash holdings of banks is likely to feed into a general increase in demand for investment assets.

Expectations of higher prices resulting from QE should increase demand for commodities resulting in higher commodity prices.

Any direct increases in the money supply should put upward pressure on prices generally.

This can be explained using the Quantity Theory of Money.

$$M * V = P * Q$$

M = the amount of money in an economy

V = the velocity of money – the number of times money circulates around the economy over a specified period

P = the average price level of goods, services and assets

Q = the volume of goods, services and assets produced/transacted

If M increases – unless there is an increase in economic activity, there should be upward pressure on prices.

The main way that QE typically increases the money supply is indirectly through the fractional reserve system – whereby bank assets are bought from the banks by the central bank in exchange for money which then, due to the fractional reserve system / money multiplier, results in an increase the money supply.

The impact of this is typically greatest initially in the asset markets where the increase in the money supply is experienced both directly and indirectly, through an increase in the expectations of future money supply increases (as the QE results in an increase in the money supply over time through the fractional reserves system).

Other reasonable answers should also be given credit.

[6]

(iii) $18,000 * (450,000 - 250,000 * 1.1) = \text{Act\$ } 3.15 \text{ billion}$

Assume mortgages have on average gone into default uniformly over the last two years – so that they are on average one year away from repossession and sale of the property.

[3]

(iv) Pre-boom mortgages
 $2\% * 40,000 * 150,000 * (1 - (1/1.05)^5)/0.05 = \sim \text{Act\$}520 \text{ million}$

Boom mortgages
 $0.75\% * 30,000 * 420,000 * (1 - (1/1.05)^{20})/0.05 = \sim \text{Act\$}1180 \text{ million}$

Post-boom mortgages
 $4\% * 4,000 * 200,000 * (1 - (1/1.05)^{26})/0.05 = \sim \text{Act\$}400 \text{ million}$

Total = Act\$2.1 billion

All cash flows arise at the end of the year.

Other relevant assumptions stated.

[4]

(v) To estimate the share price for BMB, a value needs to be placed on future mortgage business by BMB.

Assume, conservatively that:

New business continues at 2000 mortgages per annum.

Average mortgage values remain at Act\$200,000 (no house price increases)

Or Average mortgage values remain at Act\$220,000 (a 10% house price increase)

Net interest margins decline from 4% to 2%

Future net income from these mortgages can be estimated using an Increasing Annuity Formula.

$$= 2\% * 2000 * 200,000 * (1.05)^* [(1 - (1/1.05)^{20})/0.05 - 20*(1/1.05)^{20}]/0.05 \\ = \sim \text{Act\$}890 \text{ million}$$

Assuming at 10% increase in house prices and an increase in mortgages to an average of Act\$220,000 gives a value of ~Act\$970m

$$\text{Plus a level annuity in perpetuity starting in 20 years [0.5]} \\ + 2\% * 20,000 * 200,000 * (1/0.5) * (1/1.05)^{20} = \sim \text{Act\$}600 \text{ million}$$

Assuming at 10% increase in house prices and an increase in mortgages to an average of Act\$220,000 gives a value of ~Act\$660m

$$\text{The NPV of future cash flows from the mortgages} \\ = 2100 + 890 + 600 = \sim \text{Act\$}3.59 \text{ billion}$$

$$\text{Or if a 10\% increase in mortgages was assumed} \\ = 2100 + 980 + 660 = \sim \text{Act\$}3.74 \text{ billion}$$

Other factors to consider:

- The valuation of BMB is highly dependent on the healthiness or otherwise of the housing market in Actuaria – consider other likely scenarios, e.g. the market returning to growth.
- House price appreciation is likely to result in bigger mortgages – and consequently greater profits for BMB.
- There is a risk to the portfolio of more defaults from the mortgages issued during the boom as they are significantly in negative equity.
 - various scenarios for these defaults should be considered.

All reasonable / sensible comments were accepted.

[11]

(vi) Sensitivity of reserves for defaulted mortgages

10% fall in prices

$$18,000 * (450,000 - 250,000 * 0.9) = \text{Act\$} 4.05 \text{ billion} \\ \Rightarrow \text{reserves increase by Act\$}900\text{m} \\ \text{Or a reduction of Act\$}0.9 \text{ per share}$$

OR:

New mortgage business drops to Act\$180,000
=> a drop of Act\$300m in the value of new business

Or a reduction of Act\$0.3 per share

Other reasonable estimates were given credit.

[3]

- (vii) Investing in BMB is likely to be a leveraged way to get exposure to an improvement in the housing market in Actuarial.

Assuming a 10% house price increase:

Reserves for defaults
= Act\$3.15b and future income from the mortgage business
= Act\$3.74

Which would mean BMB is worth Act\$0.59 per share.

Other factors to consider:

General factors:

Existing portfolio – existing/comparable exposure, themes, management style
Client mandates – objectives/targets, restrictions, risk tolerances, cash flows
Liquidity, ability to execute transactions

Recommendation: BUY

Assuming that it is appropriate for the equity fund, BMB looks to be good value should the Actuarial housing and mortgage market improve over the next year and beyond.

Credit was given for additional relevant points and arguments.

[6]

[Total 37]

- 3** (i) Defined benefit funds offer a promise of a benefit at retirement linked to an employee's years of service and salary.

The security of the promise depends on the funding level of the pension fund, the returns achieved on investments and the sponsor's ability to fund the "balance of cost" and specifically any shortfall against plan.

Investment strategy is the primary driver of balancing the return on investments (to reduce the cost of the pension fund to the sponsor) and the risks of "bad" outcomes.

Some companies (e.g. financial institutions) are required to hold specific capital reserves to be able to fund any requirement for additional contributions, others simply rely on future revenues and profitability.

Some countries have national "life boat" funds to take on the pension arrangements of failing companies which are funded by levies on the other occupational pension arrangements.

Historically pension funds did follow investment strategies which broadly aimed to outperform the "average pension scheme".

Some sectors, such as local authority funds, still make peer group comparisons, possibly due to behavioural finance driven tendencies such as "anchoring" and "status quo bias".

However most trustee groups realise that beating the average is a universally unobtainable objective (by definition half of funds must always "underperform") and can lead to irrational decision making.

The "average" asset allocation may also be misleading – in the case of real estate, a few large funds may have significant allocations whereas the majority of smaller funds have nothing yet the average would suggest everyone has some small allocation.

Overtime the average asset allocation will change to reflect the introduction of new asset classes or the abolition/introduction of constraints.

However the actual allocations reflect what has performed well in the past rather than what will in the future.

And generally take no account of the change in the value of the liabilities – good asset returns alone don't always mean better funding levels.

The increase in the value of liabilities has been caused by a reduction in the level of yields which are not forecast to rise for some time given the ongoing economic malaise and deleveraging.

Consequently investors need to find "growth" assets in order to reduce legacy funding deficits.

Pension funds may define a hurdle rate – the rate of return required for the funding level to stay still.

This is typically expressed in relation to the liabilities discount rate or as some margin over government bonds of a suitable duration as a proxy.

A more underfunded pension scheme would have a higher hurdle rate. The asset allocation of a pension fund is the distribution across the various asset classes according to their expected returns, risks and correlations. The same hurdle rate can give rise to different allocations according to the trustees and sponsors attitudes to risk.

However some general trends have been observed:

- a reduction in equity exposure
- an increase in bond and other liability matching investments
- an increase in “alternative” investments
- an increase in non-domestic investments

In addition, more mature funds (lower duration, proportionately higher pensioner liabilities) have less time to make up deficits before pension payments fall due, and so may follow lower risk investment strategies.

Likewise pension funds with higher asset/liability ratios only need follow lower risk approaches.

This is reflected in “hedging” strategies which better “match” assets and liabilities, possibly using derivatives, so that tail risk (the risk of extreme events) is reduced as assets and liabilities move more closely together.

This may lead to “portfolio insurance” where a counterparty compensates the pension fund after a tail risk event (albeit such options have explicit premiums and introduce counterparty risk).

The strength of the sponsor covenant can vary between pension funds of otherwise similar characteristics which should lead to different investment strategies. A lower covenant generally leads to a lower liability discount rate, hurdle rate and so lower risk (more matched/more bond) investments.

Liquidity of investments becomes more important as time horizon of investments shortens.

Diversification is generally desirable but can be harder to achieve as size of fund decreases.

Likewise an increasing focus in bond type investments, particularly for hedging purposes, may reduce the scope for diversification.

The above commentary is generic – candidates will gain additional credit for referencing and comparing the two competitor company situations. However as incomplete information is provided, candidates will have to make reasonable assumptions and infer conclusions from them.

[15]

- (ii) Financial strength could be defined as a function of funding level, contributions and the sponsor covenant.
Trustees of pension funds with higher financial strength have greater freedom in choosing investments.

Investment returns rather than contributions form the much greater part of pension funding.

All else being equal, sponsoring companies prefer to pay less rather than more.

Taking more investment risk means being more reliant on the sponsor to make up any shortfalls if things go wrong.

The covenant of a sponsor reflects both their commitment to pay *and* their ability to do so.

When both are clear, the covenant can be said to be strong.

If either is in doubt, then the covenant is weak.

Generally most companies' covenants have weakened in recent years.

But may be mitigated by contingent asset arrangements.

If the covenant is weak, then trustees may be comforted by a high funding level.

Likewise, if the funding level is low, trustees may be comforted by a stronger covenant.

If the covenant is strong but the funding level weak, trustees could take more investment risk to repair the deficit or conversely adopt a lower risk strategy in anticipation of higher planned company contributions.

If the covenant and funding level are strong, then the trustees could take more risk, supported by the covenant if things go wrong and the cushion of "surplus" assets or conversely take less risk since the hurdle rate of return doesn't need to be high.

With a weak covenant and funding level, more risk may be necessary to restore funding albeit not supported by the covenant if things go wrong. A lower risk approach may be preferred in the absence of the back stop security, but this crystallises the deficit which is unlikely to be repaired.

If the funding level is strong, but the covenant weak, more risk can be taken to try and repair the deficit, cushioned by the existing “surplus” assets or else less risk is necessary as the required return is lower.

[6]

[Total 21]

END OF EXAMINERS' REPORT