

# **INSTITUTE AND FACULTY OF ACTUARIES**

## **EXAMINERS' REPORT**

April 2018

### **Subject SA5 – Finance 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 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.

Luke Hatter  
Chair of the Board of Examiners  
July 2018

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

1. The aim of the Finance Specialist Applications subject is to instil in successful candidates the ability to apply knowledge of the United Kingdom financial environment and the principles of actuarial practice to the financial management of clients' affairs.
2. The SA5 exam generally requires bullet point form or short form essay style answers that apply general principles to directly address specific circumstances. The answers given below are the most suitable but are just one possible set of acceptable answers.

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

1. The paper covered a normal range of topics, including capital projects, market environment, mergers and acquisitions and financial risk management. A section on taxation was included which is less commonly examined, and less well prepared students found this correspondingly more difficult.
2. Overall student performance was satisfactory.
3. Some students missed out on marks by not reading the question carefully – in for example Q1(x) or Q3(vii).
4. This paper had no calculation sections however marks would be awarded for workings in the case of numerical answers.

**C. Pass Mark**

The Pass Mark for this exam was 60.

## Solutions

### Q1 (i)

Generic factors applicable to any bond issue include

- What currencies to offer the bond in
- Whether any collateral will be offered (unlikely but theoretically possible)
- The appropriate duration / term for the bond
- Whether the coupon is fixed or floating
- Target market – retail vs institutional
- Any need for roadshows and marketing
- How it will be sold (e.g. by auction / through brokers)
- Credit rating / working with rating agencies to rate this issue
- Tax status
- Any optionality in the bond (e.g. whether callable or not)
- Cost of issue
- Whether there will be a series of issues
- Market appetite for this type of security
- Structuring of the bond (SPV or other structure)
- Regulatory issues around the listing itself and afterwards eligibility for banks, insurance companies etc.
- Size of issue (also in relation to existing government debt market)

[½ per point, unless otherwise stated;  
max 3 points for generic factors]

Specific factors to this bond include

- How to control the government's ability to anti-select against bondholders by subsequently having an overly generous aid programme, including:
  - Definition of aid payments and possible limitations by region or type of event
  - Any restrictions/guarantees given in relation to the level of aid payments that will be made
  - Guaranteed minimum maturity payment of zero / clarity on what happens if cumulative aid payments exceed defined principal
- Balance between what would be advantageous for the government vs what would make this more appealing to the end investor;
- How to model the expected size and frequency of aid payments
- ... including information on historic aid donation levels by region and events
- Selecting the initial yield to maturity (coupon rate plus any issue discount) to compensate for the expected "haircut" at maturity, any inherent sovereign default risk and for the complexity of the bond (compared to alternatives) [1]
- Covenants are unlikely but may exist in relation to other aid programmes
- Potential difficulty of valuation, especially while a disaster is ongoing
- Formula for accumulation of aid pay-outs (and hence deduction from redemption proceeds)

- Similar bonds possibly already in issue, e.g. catastrophe bonds issued by insurers

[½ per point, unless otherwise stated;  
no max for specific factors]

[Max 7]

*This was well answered in view of the large number of points that could be made. More marks were available for factors specific to this somewhat unique bond rather than generic factors applying to all bonds.*

(ii)

- Pre-fund/reserve in advance, i.e. transfer pre-defined amounts into a funding account and use this pot to pay out aid donations as needed
- Implement a matched pay as you go system where either donations are limited to any available budget surplus at the time or are immediately matched by an increase in taxation
- Issue more conventional government bonds to provide the funding as and when needed
- Have a policy to limit (or stop) aid donations
- ... or restrict it to certain types of events, etc
- Stagger aid donations over a period of time
- Buy approximate hedges for disasters in other poorer countries generally
- e.g. CDS contracts on their government debt
- ... or put options on the relevant country's stock market
- ... or be long volatility generally, assuming the disaster affects stockmarkets negatively in general
- Transfer the risk through weather derivatives / loss warrants / catastrophe derivatives
- Set up an SPV with full capital structure from equity layer to senior debt layers
- Sell traditional catastrophe bonds
- Use a captive insurance operation
- Contract with a reinsurance company
- 'Co-insure' with other parties – e.g. other governments or aid agencies contributing towards the payments
- Encourage relevant private charitable donations through e.g. tax incentives
- Improve disaster forecasting

[½ mark each]

[Max 4]

*This was less well answered.  
Solutions needed to address managing the risk of large, unpredictable payments, therefore (for example) raising taxes would be only*

*marginally useful unless the taxes are accumulated over time into a fund.*

*Some students suggested bank borrowing which is improbable. The government might borrow from the central bank but unlike corporations would not have credit facilities with the commercial banking system.*

(iii)

- It could become significantly more generous in its foreign aid donation policy. [1]
- ... both in the amount of payments made and the range of events covered
- The government could default on payment of one or more coupons and/or on payment at maturity
- The government could deliberately devalue the currency or impose exchange controls, thereby acting against overseas holders
- The government could change laws / regulations
- E.g. it could making the bonds ineligible or too capital intensive for banks, insurance companies etc. to hold on balance sheet
- There could be the introduction of restrictions on investment / bond holders. e.g. it could restrict foreign investment in the bond.
- It could act in a way that generates high inflation which would reduce the real value of the fixed payments
- There could be a change in government, with the new government seeking to change the terms of the bond
- There could be the introduction of onerous taxes / tax increases / withholding taxes
- The government could increase interest rates...
- ... reducing the value of the bond / making the fixed coupon less attractive
- If the bond is callable, the government could invoke the option when interest rates fall
- It could restrict the liquidity of the bond, for example by restricting exchange trading.
- It could cease further issuance, preventing a liquid market from developing and causing "rump" trading issues etc.
- It could create alternate financing structures which remove investor interest in this type of bond
- It could issue large amounts of debt, negatively affecting its credit rating and hence the price of these bonds

[½ mark per point unless otherwise stated]

[Max 6]

*This was also less well answered.*

*Points like simply being more generous in the aid decisions or changing laws and regulations were missed by many candidates.*

(iv)

- Use credit ratings [1]
- ... offered by a number of different credit rating agencies
- Compute an implied creditworthiness or risk of default from credit default swap (CDS) spreads
- Look for any historic default events and reasons why
- Look at government bond yields
- Look at the state of the government's finances – receipts (e.g. from taxation) vs government expenditure
- Look at exchange rate history as a proxy for financial strength
- Evaluate the stability of existing government or fiscal policies
- Evaluate the stability of economy / economic cycle...
- ... by assessing key drivers of GDP ... which affects tax receipts (and so government cashflow)
- Check the extent of other borrowings
- Look at longer term borrowing trends
- Consider any off-balance sheet financing
- Consider balance and quality of state assets
- Consider history of capital restrictions (esp if bondholder is foreign) – i.e. whether the government will permit the coupon or redemption proceeds to be remitted back to the investor's home country
- Consider political stability

[½ per point unless otherwise stated]

[Max 3]

*This was a relatively straightforward credit question and was well answered.*

(v)

- Purchase a CDS
- Require collateral...
- ... possibly with ring-fencing / first lien on certain state assets
- Enter into a total return swap with a financial institution which takes on the credit risk in return for a pre-agreed set of cashflows
- Use credit spread options
- Short a relevant government bond (where possible)
- Use an FX hedge (if investor's base currency differs from the bond's currency) or simply go short the currency on the assumption the currency will weaken if there is a domestic payment crisis
- Use an interest rate hedge, especially where the country's central bank is not very independent of the government.
- Seek to change the bond term, in particular try to make it puttable

[½ each]

[Max 2]

*This was less well answered.*

*Candidates needed to explain how the sovereign risk (i.e. credit risk of the government) would be mitigated.*

(vi)

- Interest rate risk
  - price will fall as rates rise
  - may be small, e.g. if a floating coupon relative to LIBOR; greater if fixed coupon and/or callable
  - greater if not matched with liabilities
- Market risk
  - risk of unexpected inflation
  - reinvestment risk
- 'Physical' risk
  - risk of more natural disasters resulting in higher than expected aid payments
- Product, operational and technology risk
  - new product, so may have some operational teething issues
  - e.g. legal wording may not cover all potential issues (*any sensible example*)
  - e.g. poorly defined scope of aid payment
  - unable to obtain reliable prices / valuation difficulties
  - e.g. valuation system may not be able to cope with deductions for payouts (*any sensible example*)
  - Lack of suitable hedging instruments
  - Costs – carrying out any due diligence or monitoring the aid payments will be complex
- Foreign exchange risk
  - depends on functional currency used by the holder vs currency of bond
- Liquidity risk
  - likely to be an issue given it is a new type of bond
  - depends on size of this and any follow-up issues...
  - ... and popularity of issues
  - ... and whether listed / where listed / level of market-marker interest
- Compliance risk
  - it may not be admissible for investment by the holder / the rules may change in relation to its admissibility
  - need to ensure that confirm with the reporting requirements etc., which may be ambiguous or untested.
  - risk capital requirements may increase
- Prepayment risk
  - if the bond has a callable feature, it may be repaid unexpectedly early
- Mismatching risk
  - bond's payout is sufficiently unique to be unlikely to match any liability

[½ mark for identifying relevant risk area and  
½ for each sub-bullet point]

[Max 5]

*This is a fairly standard SA5 question and with many points available was well answered.*

(vii)

Interest rate risk

- hedge using interest rate swap
- match as closely as possible to liabilities
- review and reset principal hedges (as redemption proceeds reduce following an aid payment)

Market risk

- hedge using inflation swap
- use swaptions or other instruments to fixing future interest rates
- limit exposure to the bond

Physical risk

- diversify across other regions or risk sources (e.g. buy cat bonds covering other areas)
- diversify across other asset classes
- purchase catastrophe insurance (not clear this will be available as investor will have only a weak insurable interest)
- sell related catastrophe bonds

Credit risk

- CDS or other credit hedge for counterparties
- Trade listed derivatives rather than OTC

Product, operational and technology risk

- careful legal due diligence of bond terms
- plan for systems compatibility + testing
- clear operational procedures
- staff training
- engage experts for pricing
- fraud insurance

Foreign exchange risk

- hedge through FX forward

Liquidity risk

- decide on max allocation size given liquidity budget/stress testing etc.
- assess market size and potential for future market development

Compliance risk

- use a compliance consultant / hire expertise
- implementation of relevant compliance procedures / reporting



- active monitoring of changes to regulations

Prepayment risk

- prepayment likely to occur when rates fall so have appropriate interest rate swaps or put options available

Mismatching risk

- try to find matching liabilities - probably impossible
- limit exposure

[½ mark per bullet point]

[Max 4]

*This was less well answered, suggesting students were able to identify risks but then struggled to apply that knowledge into providing practical ways of managing them.*

(viii)

- Controlling the hazard itself or the rate at which its impact/energy is released
- Protecting persons or property from the impact/energy that is released
- Mitigating the effects of the impact/energy on persons or property

[1 each]

[Max 3]

*A bookwork question that was well answered by most.*

(ix) Controlling the hazard itself:

- Use of fire resistant storage
- Separation of heat/fire sources from fireworks
- Ban on smoking and other fire-related work practices (e.g. welding) in the factory
- Ensure building materials used in factory construction comply with safety standards
- Limiting the amount of fireworks that can be stored there
- Limiting the types of fireworks that can be manufactured (esp limiting the more explosive or volatile ones)
- Install fire suppression systems
- *Any other relevant examples*

Protecting persons/property from the hazard:

- Building the factory a long way from other buildings
- Siting the factory in a sparsely populated area
- Building a barrier (e.g. high wall, appropriate roof) between factory and other buildings
- Ensure staff wear protective gear or handle products using appropriate tools/machines

- Appropriate staff training
- Install fire suppression systems
- *Any other relevant examples*

Mitigating the effects of the hazard:

- Using fireproof materials in the construction of residential/other buildings
- Fire-breaks around property perimeter
- Prevent building of at-risk properties (e.g. houses) nearby
- Ensuring robust construction of residential/other buildings
- Having access to nearby water supplies for putting out fires
- Local specialist training in first aid treatment of burns
- Using insurance to limit the financial consequences
- *Any other relevant examples*

*This was well answered, with many points available (including others not listed above).  
Some points could be made under either heading and students were given credit appropriately.*

[½ mark per bullet point, max 1 mark per area]  
[Max 3]

(x)

- Changes in market interest rates
- Balance of supply vs demand
- Ability to access alternative sources of capital
- Reinsurer solvency...
- ... particularly after a major loss event
- [Also: the reinsurance cycle]
- Actuarial modelling / use of experience
- Changes in incidence of disasters...
- Population growth or changes in population concentration (urbanisation)  
change nature of risk exposure
- Increase in number of market participants
- Change in government / regulatory policy / law.
- Relative attractiveness of other asset classes
- Change in liquidity.

[½ per point]  
[Max 3]

*This was satisfactorily answered.  
The question was concerned with new issues (rather than yields on existing issues, although the two are connected).*

(xi)

- A major catastrophe will likely have led to (large) payouts made by affected reinsurers and hence also by affected ILSs
- This will cause the value of those affected ILSs in issue to drop sharply
- There is no immediate impact on future ILSs or other ILSs which are not financially affected by this catastrophe...
- ... however if investors have recently suffered a large loss, they tend to assume that large losses are more likely in future
- ... which may cause them to want to reduce their holding of other ILS securities or not want to invest into new ones
- ... effectively operating a "stop-loss" philosophy
- However, pension funds are likely to have invested for diversification reasons
- ... and tend to invest into an asset class on a long-term rather than short-term basis.
- This will not change as a result of a single big loss, so the comment is unlikely to be the case in general.
- ... as long as the pension funds understood the risk of the losses they could be exposed to.
- Therefore the comment may be inaccurate
- Also they would usually have several comparable bonds to spread the risk.
- Allocation to ILS is likely to be small, hence overall impact likely to be minor.
- Many pension funds may actually see such an event as a good opportunity to rebalance / top-up...
- ... particularly to take advantage of any rise in premium/coupon following a big loss.
- In practice smaller pension fund may take very long to make a decision therefore won't react as quickly as implied

[½ per point]

[Max 3]

*This was poorly answered.*

*Some straightforward marks were available such as identifying the price of affected ILS securities would fall sharply after a catastrophe – but only those with direct exposure; other ILS would trade at normal levels.*

(xii)

- ILS prices may decline at the same time as conventional bonds due to the interest rate increase; on relative basis there may be no gain or loss (so no reason to sell) [½]
- If the premium/coupon is linked to LIBOR then the returns from an ILS may increase in line with interest rates, hence on a relative basis may not become less attractive
- The diversification benefit from not being correlated to markets remains [½]
- And given the small size of ILS investment relative to traditional assets... [½]

- ... trading costs are likely to be higher [½]
  - ... making a pension fund less likely to sell. [½]
  - If the pension fund's liabilities have reduced more than their assets as a result of the interest rate move (i.e. mismatched by duration), the fund may now want to sell its interest-sensitive assets to "lock in" any gains [1]
- [Max 2]

*This was also poorly answered.*

*Many students failed to recognise that the price of ILS securities would also fall in line with a general fall in bond prices; therefore suggestions to 'sell the ILS to reinvest at higher rates' would be unlikely to work since less cash would be raised from selling the ILS which would offset the higher interest rate earned on subsequent reinvestment.*

(xiii)

- The manager earns higher fees when returns are high...
- ... and still earns something even if he/she incurs losses.
- Hence it may result in a higher overall fee.
- This asymmetry represents a free option to the manager. [1]
- In line with standard option pricing formulae (e.g. Black-Scholes), the value of the option is higher when volatility is higher, i.e. the more risky the fund is run, the higher the volatility of returns and hence the higher the value of the option. [1]
- The low annual fee may attract investors who don't see/recognise the value of the option
- The performance fee does not have a very demanding threshold (simply investing in cash would generate positive absolute returns)
- The fee structure may be commonplace in that industry segment [½ per point, unless otherwise specified.]

[Max 2]

*This was also poorly answered.*

*Recognising that the structure gave the manager an option and then applying simple option pricing concepts (like no downside risk, higher value from higher volatility) would have given students many of the marks.*

(xiv)

- May create some alignment of interest to have fees linked to performance (since the manager earns more fees at the same time as the fund has delivered higher returns)
- The performance share may also discourage raising excess assets in the fund as this may adversely impact on performance
- The total fee payable is likely to be lower (compared to a higher annual management fee only) when the fund is performing poorly

However:

- There is no benchmark in this fee arrangement...
- ... which is likely to result in fees being payable even if returns are simply generated by market beta
- i.e. performance share is based substantially on the absolute performance of the *asset class*, rather than active decisions made by the manager
- There should also be a high watermark of some kind to ensure that previous losses are first made up before the fee becomes payable again
- The value of an option [as per xiii] increases as the underlying volatility increases
- ... which may cause the manager to run the fund at a higher risk level than otherwise
- ... which the investor may not find attractive
- The period over which the performance is measured may be very short – hence the investor may pay out in early years if performance is good but never recoup this later on
- Fees payable will be more volatile

[½ per point]  
[Max 2]

*A follow-on to (xiii) and answered similarly.*

(xv)

- Disaster plan provides management with a planned course of action to guide it in disaster or emergency situations
- ... when normal operating procedures, the chain of command and communications links may be interrupted.
- Establishment of an emergency team to act before, during and after the hurricane
- Priorities for the use of resources available at the time of the hurricane and thereafter
- The duties of the emergency co-ordinator
- The steps that are to be taken should the hurricane event occur
- Creation/location of alternative headquarters
- Creation/location of data processing facilities (if this is normally done at headquarters)
- Emergency communications facilities
- Processes in place for the protection of records
- Public relations and news control
- Emergency medical care
- Hurricane warning systems
- Evacuation procedures for the headquarters building
- Restoration procedures
- Management succession (i.e. who will lead the company during or after the crisis if the existing leadership is unable to continue)

[½ per point]

[Max 4]

*A substantial bookwork question which was well answered.*

[Total 53]

**Q2** (i)

- Volatility on its own does not say very much about the distribution of outcomes
- ... in particular volatility says very little about tail risks
- Volatility can vary in the medium term...
- ... which could lead to situations where customer risk appetites based on the level volatility are changing more often than expected
- Need to determine a sensible period over which to measure volatility...
- ... e.g. daily would be too frequent
- ... and different clients will have different time horizons over which they measure risk/volatility
- Future volatility will not necessarily be the same as historical volatility
- ... due to random fluctuations or structural market changes
- If the historical observation period is too short, the results will not be credible
- ... or contain exceptional recent items (which could be excessively high or unusually low recent volatility)
- But if it is too long, the results will be less relevant
- The amount the client can lose is not explicit
- No confidence level can be applied
- The volatility measure within a fund needs to take into consideration the correlation between all assets...
- ... and these may be difficult to determine
- ... and may vary over time
- The client may not appreciate or understand what volatility means or how to interpret it

[½ per point]

[Max 3]

*This was satisfactorily answered.*

*Most students recognised that volatility was one-dimensional and there would be various computational assumptions needed which may be unsuitable.*

(ii)

- VaR only gives an amount that could be lost for a particular confidence level...
- ... and over a specified time period.
- The actual amount that can be lost in the case where a loss happens is not quantified. [1]
- Often calculated on a simplified basis using the normal distribution which may not be appropriate or may underestimate risk

- Any return distribution chosen will be sensitive to inputs / assumptions made
- It will not be easy to determine an appropriate time period over which VaR is calculated, especially when considering the entire client base (who are likely to have different investment timeframes).
- Similarly, it may be difficult to decide on a confidence level which is suitable for all clients...
- ... particularly clients with very different levels of risk appetite.
- VaR may be difficult to explain to customers

[½ per point]  
[Max 2]

*This was well answered.*

(iii)

- Tail/Conditional VaR
- i.e. the probability weighted loss in the tail past a certain percentile (confidence level)
- or the expected value of losses, given that they have exceeded a specified percentile point.

*This was satisfactorily answered.  
Other suggestions – for example stress testing – would score similarly provided they were explained to a similar level.*

[½ for the measure, ½ for the description]  
[Max 1]

(iv)

- The asset returns simulated will require assumptions for the distribution that the relevant asset returns follow. If these are determined by a 3<sup>rd</sup> party the assumptions may differ from what the company would use had it made its own projections [1]
- ... and hence differ from similar assumptions the company's staff may be communicating to customers elsewhere
- The implied volatility and return within these distributions may not be the same as those used to optimise the SAA portfolios.
- However, the third party may set them independently and so they may differ.
- The third party may fail to meet its obligations under the contract (including going out of business)
- The company does not have direct control over the service provided by the third party.
- ... for example in relation to the speed of model updates
- The level of service provided may not meet expected standards.

- Errors made by the third party would damage the company's own reputation.
- There may be delays in providing the information to the company.
- Company staff may not understand (or be told) limitations of the model used
- The arrangement does not allow expertise to develop within the company itself, making it dependent on the 3<sup>rd</sup> party.
- The 3<sup>rd</sup> party may misappropriate the company's trade secrets
- The 3<sup>rd</sup> party may mishandle customer data
- The company will be obliged to use scenarios/models selected and produced by the 3<sup>rd</sup> party with little ability to customise or amend (for example if trying to do a what-if analysis with a client)
- The 3<sup>rd</sup> party's service may be[come] expensive

[½ mark per point]

[Max 3]

*This was satisfactorily answered.*

*Most students understood the relationship would be commercial/arms-length with the company potentially unable to control many of the assumptions or outputs from the simulations.*

(v)

- Nil rate band: this is the amount which is exempt from (i.e. charged zero) IHT.
- At May 2016, the nil rate band was the first £325,000 of a deceased person's estate
- An additional nil rate band applies from April 2017...
- ... when a residence is passed on death to a direct descendant.
- Potentially exempt transfers are transfers of wealth via a lifetime gift...
- ... where there is no immediate IHT liability.
- For example, when the donor dies more than seven years after making the gift.
- Rate of tax depends on the interval between the gift and the date of death

[½ per point]

[Max 2]

*This was a bookwork question but in an area not regularly asked.*

*Marks were accordingly modest.*

(vi)

- When the policyholder dies, IHT will become due
- The total IHT payable will be a function of the deceased's assets
- If there is insufficient cash in the deceased's estate, assets would need to be sold, including potentially the family home
- The life insurance policy would pay out on death



- The insurance proceeds can be used to pay the IHT liability instead in this case...
  - ... thus avoiding a need to sell the family home to settle the bill, if the IHT liability is larger than the money available to the policyholder's dependants
  - However, the payout from the life insurance would become part of the estate / would increase the estate ...
  - ... and hence the IHT liability would also increase
  - ... although the premiums paid before death to the insurance company would reduce the total assets
  - The adviser is not correct to state that the tax itself will reduce – this will depend on how the proceeds of the policy compare to any premiums paid
- [½ per point]  
[Max 2]

*This was a follow-on application question to (v) and was poorly answered.*

*Not many students appreciated that the policy would provide cash flow on death (possibly to meet an IHT liability) but at the same time would itself add to the estate, and be subject to IHT.*

(vii)

- The Government wants to incentivise investment into VCTs.
- Allow small companies (i.e. the types of companies which deal with VCTs) greater access to capital market investors, which might otherwise be difficult. [1]
- Additional expected “compensation” (in the form of lower tax) for investors to offset potentially higher costs
- ... and / or greater risk of failure ...
- ... and / or potentially greater volatility of returns
- ... and / or greater illiquidity of investment
- ... when backing small companies.
- Want to attract different types of investors, e.g. higher tax band wealthy individuals to the sector.
- May provide returns in different forms hence the different incentives are needed to keep them attractive (e.g. returns may be mainly in the form of capital gains instead of regular dividends).

[½ per point, unless otherwise stated]  
[Max 2]

*A tax and capital raising application question for small companies which was not very well answered.*

*Recognising – and stating – that VCTs would be investing in small companies with a higher chance of failure would have scored useful points.*

(viii)

- The shares analysed are only those traded on the LSE
- i.e. are for only established (and so relatively low risk) companies.
- There is a survival bias: the shares trading will be the ones which have not failed, hence the observed volatility of their returns will be lower. [1]
- ... and there is a market bias: can only remain as qualifying VCT investment for 5 years after listing
- The return on VCT shares may be intentionally smoothed by the trust's managers to reduce volatility.
- Some of the VCTs may have a (large) proportion of their assets be invested in low volatility assets (such as cash) before they are invested into small companies, which will dampen the trust's return volatility during this period.
- The observation period may have been very short
- The analysis may have been performed during a period of particularly stable market conditions.
- Small scale, niche market which may trade infrequently

[½ per point, unless otherwise stated]

[Max 3]

*Students tended to repeat similar points for this question, which limited their ability to score marks.*

(ix)

- A more suitable measure / longer period volatility analysis would be expected to show that VCTs exhibit higher volatility. [1]
- VCTs will inherently include companies with a high chance of (complete) failure, with resulting 'lumpy' performance
- Particularly those VCTs which do not trade on the LSE
- ...and those which are in different (higher risk) sectors
- ...or which are at relatively early stages of maturity as a business.
- Unlisted VCTs may be difficult to trade for a retail client
- VCTs may be deemed to be complicated assets
- ... and so are not suitable for low risk investors
- ... or those who are unlikely to have a significant level of investment knowledge.

[½ mark per point, unless otherwise stated]

[Max 2]

*Answers were better for this question.*

[Total 20]

**Q3** (i)

- Through its book of annuities, without the swap the company is exposed to payment of cash flows to annuitants based on a variable, or floating, mortality experience. [½]
- The swap will be designed to replace these floating cash flows with fixed / pre-agreed cash flows. [½]
- The insurer will need to find a suitable swap counterparty (another insurer, reinsurer or a bank)
- The transaction is likely to be customised to the insurer's book and traded over-the-counter
- The fixed mortality experience would be agreed between the insurer and the counterparty... [½]
- ... and likely be determined using an expected/agreed mortality basis applied to the annuity portfolio [½]
- The floating mortality experience would be based on actual mortality experience within the portfolio [1]
- In practice, only the net difference is likely to be exchanged between the parties. [½]
- The life insurance company is likely to need to pay an upfront premium
- ... to compensate the counterparty for taking over the risk. [½]
- Collateral/margins may be required [½]

[Max 3]

*This was an application question using interest rate swap concepts which many students were able to translate to longevity and marks were satisfactory.*

(ii)

The standard formula for calculating the SCR under Solvency II identifies several categories of functional risks and groups them into modules (broad headings according to common characteristics of the business underwritten). Students answers may contain a mixture of functional risk categories or risk modules and are expected to select 4 items which apply to the annuity business and which would be affected by the swap.

Risk modules which are likely to be affected:

- |                  |     |
|------------------|-----|
| Operational risk | [½] |
| Life risk        | [½] |
| Default risk     | [½] |

Functional categories which are likely to be affected:

- |                |     |
|----------------|-----|
| Longevity risk | [½] |
| Mortality risk | [½] |
| Expense risk   | [½] |

[Max 2]

*This question was not as clearly worded as it could have been and students were given the benefit of a wider range of accepted solutions. Accordingly, the marks were high for most students, provided points made were sufficiently unique.*

(iii)

Operational risk

- The swap will result in additional operational complexity, around valuations, cash flow management and capital computations.
- Operational risk may be increased if the swap is not properly administered, leading to incorrect payments or balance sheet issues

Life risk

- The annuity portfolio includes substantial longevity and mortality risks depending on the remaining lifespan of annuitants.
- Life risk may be reduced (possibly eliminated) by the swap depending on how completely actual annuity cashflows are exchanged for fixed cashflows.

Default risk

- The swap counterparty could default on its obligations to the insurer.
- Default risk will be increased, given that the life office expects to be owed money at some point by the counterparty.

Longevity risk

- As for life risk

Mortality risk

- As for life risk

Expense risk

- The swap will require time and effort to monitor and administer (e.g. collateral or netting payments).
- Expense risk will increase due to the extra costs involved in administering the swap.

[1 mark per explanation]  
[Max 4]

*A follow-on from (iii).  
Note that the question did not specifically ask for the impact on the SCR so a wider range of answers was acceptable.  
Answers were generally good.*

(iv)

- A risk adjusted performance measure that could be used is the return on risk-adjusted capital (RORAC). [½]
  - This is defined as (Revenues – Costs – “Expected” Losses) / Risk-Adjusted Capital. [1]
  - Where Expected Losses are the anticipated ordinary trading losses from the business. [½]
  - The risk-adjusted capital could simply be the Solvency II Solvency Capital Requirement... [½]
  - ... or it could be based on an internal economic capital assessment. [½]
  - The swap is likely to result in a lower capital backing the business, i.e. a smaller denominator in the RORAC formula
  - The measure can be compared with and without the longevity swap in place. [1]
  - If the measure increases with the longevity swap in place, it would be deemed to be good value for money. [½]
- [Max 3]

*Students found this difficult – a key insight was to compare the level of capital before vs after. The swap was designed to manage the capital, rather than particularly influence profitability.*

(v)

- The regulator will be concerned that attempts to remove risk from the balance sheet result in genuine risk transfer. [1]
  - In particular, the counterparty risk needs to be appropriately recognised in the revised capital calculation (or mitigated through collateralisation). [1]
  - The regulator may be concerned that a restructure of the balance sheet intended to optimise capital is being done simply to obtain an arbitrage through the solvency rules. [1]
- [Max 2]

*This was a relatively standard question which was not very well answered.*

(vi)

- Although the amount of capital required is felt to be very high, the profits from the line of business may also be high, resulting in a high RORAC (i.e. the high capital is justified because the business generates relatively higher profits) [½]
- Therefore the company may be giving up more in terms of profitable business than it gains from an improved capital computation [½]
- The SCR may have been calculated too conservatively [½]
- E.g. the assumptions used to determine the market/credit risk of the swap, e.g. the default risk, may have been set too prudently – i.e. the swap may have been unattractively priced. [½]

- The best estimate of the investment return may not have been capitalised up-front.... [½]
  - ...Hence the return on capital of the line of business may be currently understated. [½]
  - If the insurer is currently using the standard formula, it could consider building, and applying for use of, an internal model... [½]
  - ... if it feels that the level of risk attached to the business is not properly recognised by the standard formula. [½]
  - Releasing the capital to invest in other projects may not result in the same level of return. [½]
  - The risks within the annuity portfolio may diversify well against other risks on the insurer's balance sheet ... [½]
  - ... By removing the risk from the balance sheet the insurer may find that the amount of SCR required by other lines of business may increase. [½]
  - Any overhead expenses will now need to be spread over the remaining policy lines reducing the profitability on those lines of business. [½]
  - The sale could trigger tax issues for the company as profits are crystallised. [½]
  - The company is unlikely to get the full economic value through the sale of the business as any buyer will want to make a profit as well. [½]
  - In particular, a buyer may have differing views themselves over the longevity basis underpinning the annuities and the quality of the assets backing the block of business. [½]
  - Assets may be managed on the insurer's behalf and those arrangements could have costs triggered if the assets need to be moved to another party. [½]
  - There will be costs attached to the sale such as legal, brokers, redundancy, systems). [½]
  - The market for (closed book) annuity portfolios may be depressed - i.e. the insurer won't get a fair price for the business if sold [½]
  - The insurer would reduce or lose the ability to cross-sell further products to the customers sold. [½]
- [Max 5]

*This was relatively poorly answered.  
Not all students read that that annuity book is closed - i.e. it is not a core business, and unlikely to be seeing new growth.  
Also, the sale of the book would include the annuity liabilities and the corresponding assets (bonds probably).*

(vii)

- The buyer may be unable to accurately assess the nature of the liabilities... [1]
- Particularly if the annuities are underwritten [½]
- Or have unusual features such as complex guarantees [½]
- Or are written on unusual lives [½]
- The buyer will need to form its own basis... [½]

- ... which would be difficult without access to the experience of the book. [½]
- The assets transferred may have unusual or unacceptable features. [½]
- ... For example, they may include bonds with optionality, substandard credits or include excessive exposures to e.g. individual sectors [½]
- corporate bonds may have optional call dates attached to them that mean they might be a poor match in some circumstances. [½]
- The matching of the assets to the liabilities might not be sufficiently granular. [½]
- This could lead to the need to restructure the asset portfolio, incurring additional costs. [½]
- There may be problems with transferring the staff from the insurer that administer the business or in recruiting new staff. [½]
- If the staff don't come across then there could be a loss of expertise. [½]
- There may be redundancy costs if all of the staff are not needed following the completion of the transfer. [½]
- Additionally, there will be the need to take on the seller's administration system or transfer the business onto the buyer's own system, which generate risks. [½]
- For example, the seller's system could be heavily manual / the buyer's system may need adapting to handle this business and all of its features. (any example) [½]
- There may be issues with data records, for example incomplete data [½]
- There may be existing contractual arrangements, for example around the management of the assets, that need to be transferred. [½]
- There may be financial obligations, such as reinsurance treaties, attached to the line of business. [½]
- The seller may be reluctant to disclose too much detail about its business to a competitor (who would be the likely buyer) [½]

[Max 5]

*This was poorly answered.*

*The question was focused on the due diligence – i.e., the analysis and discovery of information about the target by the acquirer, rather than the merits of the transaction.*

(viii)

- The buyer may be able to get a greater diversification benefit itself against the business on its balance sheet. [1]
- The buyer may be able to take advantage of regulatory arbitrage by transferring the business to a balance sheet where the capital requirements are not as high. [1]
- The buyer may be able to take advantage of tax benefits on its balance sheet. [1]
- The buyer may put a higher market value on the assets for risk-based capital purposes than the seller. [1]
- .. for example because the buyer has the tools to individually assess credit risk of particular securities [½]

- The buyer may have other assets it can use to hypothecate against the annuities that result in a higher yield being used for discounting the liabilities. [1]
  - The buyer may gain greater relative economies of scale (and expense efficiencies) from the purchase than were lost by the seller. [1]
  - The buyer is using a more favourable valuation basis. (Weren't really looking for this but need to award) [½]
- [Max 3]

*This was reasonably well answered.*

[Total 27]

## **END OF EXAMINERS' REPORT**