

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2017

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
December 2017

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.
3. Candidates are awarded marks for all reasonable answers including different but still reasonable numerical solutions.
4. Candidates’ answers are made up of a series of points. For example, a point can be stating a valid type of risk and then another point for describing the type of risk, if so asked. The available marks give a general guide to the level of detail students’ answers are expected to cover.
5. Where a question sets out a specific scenario, candidates are expected to tailor their solutions to the circumstances described. Offering a more general (“standardised”) solution in a case like that would score fewer marks.

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.
2. Some students missed out on marks by presenting solutions in unreadable handwriting.

C. Pass Mark

The Pass Mark for this exam was 60

Solutions

Q1

(i)

- Forward guidance describes the Bank's approach of informing the market of a likely path of future interest rates or policy [½]
 - Forward guidance aims to provide some predictability about the path of interest rates, so that market participants can plan or anticipate movements in advance [½]
 - This is expected to reduce market volatility by reducing the level of unexpected interest rate changes [½]
 - However it may also unduly constrain the Bank as guidance, once issued, can be difficult to overturn and still maintain credibility. [½]
 - Under the 2013 guidance, the Bank will not raise interest rates above 0.5% or cut back on the quantitative easing programme until unemployment in the UK has fallen below 7%. [1]
 - The February 2014 further guidance covered the setting of monetary policy once this unemployment threshold has been reached: [½]
 - The MPC sets policy to achieve the 2% inflation target, and, subject to that, to support the Government's economic policies, including those for growth and employment. [1]
 - Despite the sharp fall in unemployment, there remains scope to absorb spare capacity further before raising Bank Rate. [½]
 - When Bank Rate does begin to rise, the appropriate path so as to eliminate slack over the next two to three years and keep inflation close to the target is expected to be gradual. [1]
 - The actual path of Bank Rate over the next few years will, however, depend on economic developments. [½]
 - Even when the economy has returned to normal levels of capacity and inflation is close to the target, the appropriate level of Bank Rate is likely to be materially below the 5% level set on average by the Committee prior to the financial crisis. [½]
 - The MPC intends to maintain the stock of purchased assets at least until the first rise in Bank Rate. [½]
 - Monetary policy may have a role to play in mitigating risks to financial stability, but only as a last line of defence if those risks cannot be contained by the substantial range of policy actions available to the Financial Policy Committee and other regulatory authorities. [½]
- [Marks available 8, maximum 4]

This was relatively straightforward bookwork with some mild application but many candidates were unfamiliar with the topic. Even well-prepared candidates scored comparatively low marks.

(ii)

- If this interest rate rise was unexpected, then markets may react negatively and may cause asset prices to fall.... [½]
- ... or lead to increased volatility in (equity, currency and bond) markets [½]
- People are likely to be less inclined to spend following such losses. [½]
- There may be pressure on the property markets... [½]
- ... as mortgages that are linked to the bank rate become more expensive to service, reducing the spending power of consumers. [½]
- Companies and consumers may face higher interest rate charges, which may put pressure on their future solvency or disposable income [½]
- and they may need to look at cutting costs and put off future spend on projects, items bought on credit, etc. [½]
- As a consequence, is likely to be negative overall in terms of putting downward pressure on growth... [½]
- ...particularly if the economy's growth was fragile... [½]
- ... and hence put upward pressure on unemployment... [½]
- ... putting further pressure on spending and putting yet more pressure on growth (negative spiral)... [½]
- ... and increasing the risk a of recession. [½]
- Government expenditure on e.g. welfare payments may increase if unemployment increases [½]
- More broadly interest rate rises are likely to lead to a devaluing of the economy as people and corporates would look to save more and reduce debt levels, which again would have a negative impact on growth. [1]
- Savers may benefit from earning higher interest on their savings [½]
- If this interest rate rise was unexpected, then markets may react negatively and may cause losses.... [½]
- ... or increased volatility in (equity, currency and bond) markets. [½]
- Pension funds/life insurance companies – which are not likely to be fully hedged - may benefit from seeing the value of their liabilities fall by more than the value of their assets [½]
- Higher interest rates may cause GBP to appreciate against other currencies... [½]
- ..., making the UK less competitive in terms of exports... [½]
- ... and putting pressure on the UK's balance of payments etc. [½]
- Increasing rates too quickly when growth is still fragile, may lead to lower inflation... [½]
- ... and in an extreme to deflation - which would be likely to put further downward pressure on spending and growth. [½]
- Higher interest rates on money market, bond and other instruments may attract foreign fund flows that are chasing higher yields [½]
- This may be positive from a stability point in the short-term, [½]
- ... but is likely to have less benefit in the long term (as the money is likely to leave just as quickly once rates go back down). [½]
- In order to stimulate growth in the economy, the government may introduce measures to try to increase consumer spending [½]
- such as increased government spending (e.g. infrastructure projects) [½]
- ... or lowering taxes (e.g. VAT) [½]

- ... or provide help with mortgage and housing schemes etc. [½]
 - This will however depend on the government's willingness to take on more debt... [½]
 - ...which while simulative in the short term could put pressure on the economy in the long term. [½]
 - Importantly there may be a concern that it would be difficult to reverse the impact of the sudden rate rise [½]
 - ... as traditional tools available to the Bank of England would be less effective when rates are still at low levels relative to history [½]
 - ... and the impact of quantitative easing may be muted following the series of easings in recent years. [½]
 - A quick rise in interest rates is likely to improve banks' lending margins... [½]
 - ... end hence their willingness to make new loans [½]
- [Marks available 19, maximum 8]

*A wide-ranging higher-order question but with many marks available.
Most candidates scored well.*

(iii)

- Prolonged period of low interest rates – provide low returns on cash balances and potentially other risk premiums also being low as a result etc.
- Lack of sustained or predictable market trends – may be difficult to predict beneficial trades
- Low levels of market volatility – active managers can't generate much active returns if prices don't move much (e.g. as shown by the impact of QE in recent years).
- Lack of divergence in markets – if markets globally are highly correlated it reduces the opportunity set for the manager
- Lack of market liquidity – making it difficult to trade in and out of positions
- Market pricing not driven by fundamentals – difficult to predict market moves when markets are driven by short-term noise, spikes in market volatility and technical factors (e.g. a central bank intervening in currency markets creating flows not driven by market fundamentals)
- Large unexpected market moves caused by sudden and important global events (e.g. political unrest, misleading guidance or unexpected policy error from central banks, supply shock in commodities etc.) – can generate unexpected losses
- Lack of available risk capital or financing – so cannot employ leverage
- Too much capital being run on the same strategy chasing the same market trades – thus eroding market anomalies quickly (e.g. crowded trades).
- Markets which are highly efficient – where mispricings *in general* are few, presenting few opportunities for the hedge fund
- Increased or high levels of trading costs or taxation – which reduce the net return from any trades

[Up to 1 mark for each example: ½ mark for the market condition, ½ mark for a valid supporting reason, maximum 3]

Another wide-ranging higher-order question where most candidates likewise did well.

(iv)

- Options introduce one-sided payoffs into the portfolio
- Options are more flexible tools than futures and forwards for managing risk and exposures.
- Some types of risk exposure are contingent on some event, but there is uncertainty around the amount of protection needed. In these cases, options are best suited to constructing a hedge.
- The hedge fund manager may be interested in insuring against the prospect of losses arising from an exposure and wants to retain the prospect for gains. Options are the natural device for purchasing such insurance.
- For example, the hedge fund manager may be concerned that a fall in market prices will reduce the value of his portfolio below some minimum required level.
- The use of trading strategies using two or more options can introduce an element of speculation, in addition to hedging.
- The use of options may allow the manager to directly express a view on an asset's volatility, rather than just the change in underlying asset price.
- It allows more complex trades (digital options, double touch options etc.).
- It may also be seen as more capital efficient to buy options...
- ... given the loss is restricted to the size of the premium paid...
- ... and there is no need to post ongoing margin or deal with margin calls etc. (unless it is a short option)
- The market value of the option in terms of portfolio valuation is likely to be very different to a futures/forward contract...
- ... which may give the manager flexibility to get round portfolio exposure or risk limits.
- Trading a broader range of instruments means there is a greater probability of finding inefficiencies or anomalies...
- ... as different market participants would participate in each market.
- The liquidity of the option markets may be better
- There may be a broader range of contract lengths (i.e. time period to expiry) available in the options market.
- The tax treatment of gains and losses may be better for options than forwards/futures
- Selling (covered) options can be used to enhance income for the fund
- *Other credible answers possible.*

[½ mark per point]

[Marks available: 10, maximum 5]

A surprisingly tricky question. Even well-prepared candidates

struggled to identify benefits beyond the one-sided payoff.

(v)

- The hedge fund could short synthetic equity exposure to the country
 - For example by using derivatives [½]
 - ... or global depository receipts [½]
 - ... or OTC swaps that pay out on the EM country's market losses [½]
- Where available, the hedge fund could short the equity of the EM country's companies that are listed on exchanges outside of the EM country.
- The hedge fund could short investment trusts, REITs, corporate credits or other assets that are linked to the EM country but which are domiciled outside of the EM country.
- The fund could short commodities required by the EM country [these should weaken as demand for commodities falls faster, because the emerging country has a large manufacturing industry and demand would weaken]
- The fund could short the currencies of commodity producing countries (e.g. Australian dollar)
[these should weaken as demand for commodities falls faster, because the emerging country has a large manufacturing industry and demand would weaken]
- The hedge fund could short the equity markets of countries with strong trade links to this EM country (e.g. their neighbours).
- The hedge fund could short forwards on the currency of the country [in anticipation that rates will be cut (to boost growth) leading to a fall in the value of the currency.]
- The hedge fund could short the currencies of countries who are themselves likely to have to cut interest rates
[to help offset the downward pressure on growth where the growth was driven by EM country's demand].
- The hedge fund could short the interest rates / bond markets of those same countries who are likely to have to cut interest rates
[to help offset the downward pressure on growth where the growth was driven from EM country's demand].
- The hedge fund could short specific companies or sectors of the global equity market that are sensitive to this EM country's growth
- ... or which generate a large part of revenue from this EM country (luxury goods, autos, etc.).
- The hedge fund could have a long position in volatility in various markets [this may be profitable if the market has not been fully expecting the slowdown and volatility spikes up].
- The hedge fund could enter into a swap to receive e.g. UK LIBOR and pay LIBOR of the EM country in anticipation of that country having to reduce rates to re-stimulate its economy.
- *Other credible answers possible, for example for any short position described, a put option on the same asset or security would also be acceptable.*

[1 mark per point unless stated]
[Marks available: 13.5, maximum 5]

Candidate responses were middle-to-weak for this question.

(vi)

- Monetary policy:
 - Risk for the hedge fund is that if interest rates are moved up more than what is currently priced in... [½]
 - ... then its holding of UK Government bonds' (and probably equities also) market value will go down. [½]
- Fiscal policy:
 - Risk for the manager is that increases in tax... [½]
 - ... may prove to be a drag on UK economic growth and as such impact company profits... [½]
 - ... which is likely to negatively impact company share prices and the manager is likely to see losses in his UK equity investment. [½]
 - Conversely if taxes were cut too aggressively,... [½]
 - ... the market (including rating agencies) may feel that the Government may not get sufficient income to pay its debt commitments, which will negatively impact bond holdings. [½]
 - Higher taxes may also affect the funds after tax returns directly [½]
- National debt management policy:
 - There is a risk of an imbalance in the supply and demand of national debt... [½]
 - ... which may create pricing anomalies [½]
 - e.g. Government increasing its issue of long term debt / reducing its buyback activities would mean that long term investors such as pension funds will have much lower demand relative to the supply of these bonds, reducing prices [½]
 - a significant increase in issued debt could also affect the UK's credit rating [½]
- Exchange rate policy:
 - Several of the actions above could impact the global market's perception of the UK and as a result the value of its currency. [½]
 - Any action that would reduce yield (cutting interest rates), increase inflation, and reduce economic growth is likely to lead to a weakening of GBP vs other currencies, all else being equal, which will be a bad result for the hedge fund manager. [1]
- Prices and incomes policy:
 - Action that would result in higher inflation than currently being priced in by the market... [½]
 - ... could lead to a weakening of the hedge fund manager's GBP currency position and its UK equity position. [½]
- *Other valid points are around regulation, particularly around the banking sector and foreign investment etc.*

[Marks available: 8.5, maximum 5]

Candidates who knew the main areas of policy did rather better than those who could not recall them and made "educated guesses".

[Total 30]

Q2

- (i) (a)
- The company will seek to hedge exposure to currency movements... [½]
 - ... where it buys products or pays wages in currencies other than its reporting currency... [½]
 - ... to avoid a material reduction in profits in terms of its own currency (*or increases in costs or negative share price impact*) [½]
 - The company may also want to hedge (insure against) business risk like reduced revenue or profits [½]
 - ... due to fewer customers travelling through its airport [½]
 - The company's shareholders may want to it to hedge its exposure [½]
 - ... for example because they have similar exposures elsewhere and need to reduce their aggregate risk [½]
- (b)
- Entering into futures contracts (where they exist) on items it needs to procure [½]
 - Entering into currency hedges, e.g. currency forwards or swaps / sell currency upside to provide downside protection. [½]
 - Stockpiling physical goods [½]
 - Options could be considered [½]
 - Sell short or buy put options on the shares of other UK airport companies [½]
 - Seek to diversify into non-EU/non-UK markets [½]
- [Marks available: 6.5, maximum 2]

A relatively easy application/higher-order question with good marks from most candidates.

- (ii) The information required would be:
- The contract or asset name
 - The expiry date or contract term
 - The strike price
 - Whether the option is a put or a call
 - The number of contracts that should be traded
 - Whether the trade is closing out or opening a position
 - Any limits on the price that the investor is prepared to deal at

- Settlement details, like bank accounts
- The desired marketplace (such as OTC or exchange)
- Type of order (e.g. market vs limit)
- Style of option - American or European

[½ mark per point]

[Marks available: 5.5, maximum 3]

A relatively easy knowledge question. Some candidates suggested “collateral” which is incorrect as that is specified by the broker to the client.

(iii)

- A private sector contractor funds the asset required to provide a service required by a public sector body [½]
- There is no need for public expenditure at the beginning of the project, only payments once the service is delivered [½]
- There is a good and sustained competitive process for awarding contracts, in order to ensure that the public gets a good deal [½]
- There is encouragement of creativity and innovation to reduce costs and/or to provide an asset better able to deliver a scheme's ongoing requirements [½]
- Payment is made for services rather than assets, as an incentive to get on with the job and ensure fitness for purpose [½]
- There is creation of a single private sector contact point to simplify contract management and problem resolution [½]
- There is transfer to the private sector of those risks which it can manage better [½]
- The transaction needs to represent value for money for the public sector [½]

[Marks available: 4, maximum 2]

Another fairly straightforward question answered well by nearly all candidates.

(iv)

- Project finance is debt supported by a project, not by the project's sponsoring companies. [½]
- Project finance could be used to develop, test and manufacture the machinery [1]
- The project would be set up as a separate company, reducing the company's risk exposure. [1]
- That company would have the baggage handling company and the government [½]

- A series of contracts would be entered into that outline the service required and the payments to be made. [½]
- The Government may provide guarantees... [½]
- ... that the baggage handling system will be used in this airport for a period of time. [½]
- As a result of the contracts and / or guarantees being provided, the company formed can raise finance either through bank debt... [1]
- ... or some other privately placed or public debt. [½]
- The shareholders will be entitled to a fair return, so the cost of capital must be allowed for through charges. [½]
- However, the charge is not easily measured and may lead to disputes which would need to be resolved. [½]

[Marks available: 7, maximum 3]

This question combined aspects of PPP with project finance with some fairly standard issues and was generally well answered.

(v) *Any three of the following:*

Process Risk

- A new process is being developed and this could fail
- E.g. insufficient controls may be put in place around the automation.
- There is also the risk that the contract cannot be fulfilled as stated.
- Risk that parts or subcontractors don't deliver promised goods of correct quality on time

People Risk

- There is a risk of human error
- In particular, the development of the new system will rely on software that is prone to this.
- The company may lack the skills that it needs to be able to engineer its solution
- People may be injured during manufacture or operation
- There may be a staff resource deficiency
- There is a risk of dishonesty or fraud as the project develops

System Risk

- There is a risk of systems or IT failure/error
- There is the risk of unauthorised access to key systems involved in the development of the new system
- The infrastructure supporting the software may not be kept up to date
- The models used to control the automated handling system may be flawed
- The handling system may prove to be susceptible to hacking/security breaches

Event Risk

- There could be a single event that jeopardises the project.

- For example, in the development of the new terminal, a failure by another developer could lead to destruction of the company's development (*any relevant example*)

Business Risk

- There is a risk of incurring a loss through a strategic error - demand for the product was wholly overestimated

[½ mark for naming the risk, ½ mark per bullet point, max 1 per risk area; where more than one option given, the three highest scoring as used]
[Maximum 3]

A question covering common risks which was answered well by most candidates.

(vi) *Any three of the following:*

- There will be an option to make follow-on investments. [½]
- If the project is a success, then there may be an opportunity to increase the investment in this project [½]
- ... or to become more involved with the running of other facilities at the airport. [½]
- These are both contingent on the original investment being made in the first place. [½]

- There will be an option to abandon the project. [½]
- This will allow committed assets to be put to a different use... [½]
- ... or to prevent spend on certain assets... [½]
- ... or simply to write off the assets... [½]
- ... although there are likely to be penalties involved in withdrawing from the project. [½]

- There will be an option to wait. [½]
- This option allows the delay of making important decisions... [½]
- ... whilst further information is gathered. [½]
- E.g. might defer the decision to abandon the project or, if investments are being made in a series, to defer the decision to continue to invest in the project. [½]

- There may be an option to vary the production method. [½]
- For example, if new techniques become available that are more cost effective, to adapt the method to fit within remaining budgets. [1]
- There may also be an option to alter the end output of the project. [½]
- For example, by delivering only a baggage tagging system or only a software component. [½]

[Max 1 per embedded option; where more than one option given, the three highest scoring as used]
[Maximum 3]

A question covering common options which was answered well by most candidates.

(vii)

- The net present value method involves discounting all the expected cash flows from the project at a suitable discount rate and adding them to obtain a net present value [1]
 - This is an innovative new method of baggage handling, so NPV techniques can be difficult to apply because the uncertainties involved with the project are very high. [½]
 - In theory this can be dealt with through a high risk discount rate. [½]
 - ... but that approach (a high discount rate) may unfairly penalise all types of new innovation, such as this project, simply because of the uncertainty. [½]
 - The aggregate risk can be broken down and a different discount rate applied to each risk. [½]
 - However, establishing the right level of discount rates can be subjective. [½]
 - Using historical betas (or other historical information) is inappropriate to the new method. [½]
 - It will be difficult to accurately forecast the project's cash flows given the newness of the technology (e.g. likely to encounter teething issues when constructing prototypes and early installations) [1]
 - With innovations, another problem with NPV is that there is a short-term economic premium involved in being able to use the new process, but this premium will disappear after a period of time. [1]
 - The interaction of the new technology with other aspects of the infrastructure may also generate additional costs that need to be accounted for when considering the profitability. These project interactions may be complex to model. [½]
 - The embedded options may also be difficult to value. [½]
- [Marks available 7, maximum 4]

Most candidates knew what net present value is, but most struggled to apply these ideas to the specific situation of a new, innovative business idea.

(viii)

- One or more arranger bank will be appointed to organise the facility. [½]
 - After the deal has been arranged, an agent bank will organise the transfer of funds to the company... [½]
 - ... and collect the interest and any repayments [½]
- [Marks available 1.5, maximum 1]

An easy question with nearly all candidates scoring full marks.

(ix)

- A syndicated loan facility allows the company to increase its network of bank relationships, and this may be something that the company wants to pursue. [1]
- The company may be able to get a better borrowing rate through the syndicated facility... [½]
- The company's existing [lead] bank may be willing to act as arranger for the syndicate, making the process relatively quick and simple. [½]
- ... or there may be more capacity in the market. [½]
- The company may be able to get more appropriate terms or more flexible arrangements with a loan negotiated directly with a bank, instead of more standard terms likely to be required in the debt markets. [1]
- Going to the debt markets would require the company to disclose financial information to the market, which it may wish to avoid. [½]
- The company may feel that it already has too much bond debt on its balance sheet. [½]
- With a syndicated facility, the bank takes the role of screening the borrower, whereas to raise corporate debt the company needs to pay for a rating and undergo the work necessary to provide the information for that itself. [1]
- Public debt creates operational work for the company in reporting, servicing and redeeming that debt. [½]

[Marks available: 6, maximum 2]

Another relatively easy question with most candidates scoring near full marks.

[Total 23]

Q3

- (i) A very low capital requirement would be consistent with the low loss assumption. [½]

The loss assumption is based on the shortfall of the accumulated loan over the value of the house at the sale date (shortly after date of death) [½]

The low loss assumption may be appropriate due to the combination of:

- the low LTV... [½]
- ...the low interest rate used to increase the loan size... [½]
- ... relative to likely average house price inflation each year... [½]
- ... or equivalently a large % fall in house prices must happen before the homeowner's equity is exhausted [½]
- ... and the relatively short expected duration given the high minimum age [½]

Regulators may consider residential property to be considered good collateral so the regulatory capital required against the book is reduced. [½]

[Marks available: 4, maximum 2]

In theory a straightforward question – low capital requirements corresponding to low risk of loss on the portfolio – but several students struggled to make or explain this connection.

- (ii) Meeting regulatory capital requirements is extremely important for any financial services company. [½]

However, it is unlikely to be the case that the company should *only* be considering regulatory capital. [½]

The company may also wish to consider the *economic* capital required for these products [1]

- ... if regulatory capital requirements are heavily prescribed...
- ... and are not consistent with the level of risk embedded in these products based on an internal risk assessment...
- ... and so would not give a good indication of the costs for different risk management options / allow robust risk monitoring ...
- Economic capital may be preferable to be used for capital allocation...
- ... and to allow the calculation of diversified capital on an internal basis (which will help to give a more holistic view of the different risks that the firm takes).

[½ per bullet point]

The company will consider its available capital – whether internal funds are available or new funds need to be raised. [½]

... and if new funds are raised, from where and at what cost? [½]

... including the potential need to raise additional funds in future to support this block of business (e.g. due to liquidity strains later on in the product life). [½]

The company will consider alternate uses for any capital (i.e. other products it sells which may be more profitable or attractive) [1]

The company's risk appetite may have various limits, which are usually linked to the level of risk the company is willing to accept as defined by various capital measures which may not be related to regulatory capital. [½]

There may be rating agency capital implications, i.e. rating agencies expecting a certain level of capital in order to maintain a particular rating level. [½]

This could be due to concentration risk or the reduced ability to pay short term commitments due to the liquidity strain these products place on the company. [½]

[Marks available: 8.5, maximum 4]

Candidates who recognised there are other ways of calculating capital – notably economic capital – scored better. Overall the question scored below average marks.

- (iii) The statement that the capital requirements are expected to be similar for the new ERM product is not appropriate. [½]

In particular, the loss assumption for the new ERMs would be expected to be significantly higher than the current value of approximately 2%. [1]

This is because of the following factors:

- Where the initial LTVs or LTV after initiation of the contract is the same as or higher than 100% we would expect that the loss assumption would be, at a minimum, equal to the stress on a property investment (i.e. if a loan is repaid when the LTV is 100% then the collateral is the essentially the asset which is owned).
- The rate of increase on the loans is such that the LTV (of any level) is likely to stay flat or increase which means that the longer these loans are outstanding the more likely the LTV is going to be 100% or greater. As stated above this leads to a loss assumption which is significantly higher than 2%.
- The ability to take out additional loan amounts at any point in time without restriction will also increase the LTV and hence the exposure to losses will be greater than 2%.
- The lack of an age restriction means that young homeowners can borrow money and they are more likely to have their loan LTV becoming 100% or more over time.

[1 for each explanation of how the different elements imply a higher expected loss assumption]

If the correct assessment is made, it would be expected that the new ERMs will have a stress closer to at least that of property values, which is likely to be significantly higher than 2%. [½]

The guarantee remains in place, but will be much more expensive to provide when needed. [½]

[Marks available: 6.5, maximum 4]

A follow-on question from (ii) investigating the impact of changes to the product parameters. Paradoxically this was better answered than (ii) by most candidates.

(iv) Both produce a number of simulations using a probability measure... [½]

For the real-world model this is based on realistic expectations... [½]

... and hence the probabilities associated with the scenarios are based on real world expectations. [½]

... although these real world probabilities – say, taken from market prices - may include an element of subjective market expectations [½]

For the risk-neutral model, an artificial probability measure is used, in which the value of future uncertain cashflows is the same regardless of investor risk preferences (under certain assumed conditions). [1]

[Alternatively: ... under which all investments are expected to generate returns equal to the risk-free rate.]

[Marks available: 3, maximum 2]

A fairly specific question on a narrow subject area which most candidates found difficult.

(v) The ERM embedded option comes into-the-money when property prices are low... [1]

... which is the same as the value of a put option (rather than a call option)... [½]

... and the option should have property as the underlying asset class. [½]

Traded options will likely be priced using a risk-neutral so would by definition be in a market consistent framework. [½]

Traded property-related put options may only available on an index. [½]

An index may give a better spread across the full portfolio (i.e. be more representative). [½]

Assuming the market is complete, a hedging strategy for this embedded option can therefore be constructed using property index puts, i.e. the embedded option can be replicated using property index puts. [½]

Calibrating the risk-neutral model using the current prices of traded property index puts will hence mean that the modelled scenarios are constructed such that these options are priced in accordance with market prices... [½]
... and so are market consistent, as required. [½]

[Marks available: 5, maximum 2]

Another difficult question with commensurately low scores. Candidates who realised that the ERM product would come 'into the money' (i.e. create a loss for the seller) in line with property prices had an advantage.

- (vi) The option market size is small, which may mean that there are limited options to choose from for calibration.

Liquidity may be poor, such that quoted prices are unreliable or bid-offer spreads are unhelpfully large

It is unlikely that standardised, listed options exist which match exactly the guarantees or other embedded options in the company's product.

There will be basis between the movement in the individual or collective assets linked to the company's products and any index underlying the options.

In particular, property indices might be available for commercial property only, not residential property.

Options may only available for fixed strikes, and not for a continuous range of possible strikes.

It may be difficult to determine an appropriate option strike price at outset.

.. and in any event it is likely to be far out the money, making available options even fewer

Options of a suitable term may not be available in the market.

It will be difficult to determine the term to exercise if these depend on external factors, for example on the mortality of the homeowners...

... and potentially other subjective factors like future customer choice

The repayment guarantee is path-dependent, i.e. the path of interest rates or asset prices affects whether the guarantee exists or not...

... and these are unlikely to be replicated in the market.

[½ mark each]

[Marks available: 6.5, maximum 2]

This was answered better than the previous two sub-questions. Typical issues like lack of liquidity, fair pricing or basis risk were identified by several candidates.

(vii) The Black-Scholes formula is difficult to use for the new product since there is no fixed “strike” (the loan value varies) and so is unlikely to be very accurate.

The Black-Scholes formula contains many simplifying assumptions which are unlikely to hold in practice.

e.g. constant volatility (*or any other example*)

The bank may have used different input assumptions for the option parameters....

[1]

... including a more prudent risk (or volatility) assessment

... or different assumptions for property price growth, typical customer LTVs etc.

The assumptions used by either side may not be market consistent.

The bank could have used a simulation modelling methodology which accurately allowed for features such as additional loan amounts.

The bank would have included a profit margin in its quote.

The bank would want to recoup the expenses of developing this likely one-off OTC derivative.

Banks have differing capital requirements and capital costs which may make it significantly more expensive to take on the new ERM product exposure.

The bank may not wish to transact this business (i.e. it is deliberately making an unattractive price).

The market for this type of hedging may be very uncompetitive.

[1]

There may be some risks which the bank is unfamiliar in modelling (e.g. mortality risk) so it may model such risks conservatively.

The bank may be using imperfect hedges which leave it exposed to various risks which it will charge the company conservatively to bear on its behalf.

Either calculation may contain errors

Different tax treatments or assumptions may be made by the bank compared to the calculation.

[½ for each unless shown]

[Marks available: 9, maximum 4]

A relatively straightforward question which was nevertheless not well answered by most candidates.

(viii)

- The product design can be changed
- E.g. the company may consider introducing a maximum LTV
- ... Or setting a minimum age for the products.
- ... Or removing the guarantee
- ... Or remove the loan increase function
- The company could restructure the assets via an SPV and create a senior and junior tranche where the senior tranche is sold to investors and the junior tranche is retained. [1]
- The company could reinsure its liability exposure.
- The company could purchase standardised derivatives to partially hedge the embedded option
- e.g. house price index floors.
- Sell the portfolio while retaining some economic stake (e.g. equity tranche or a marketing fee)

[½ for each bullet unless otherwise stated]

[Marks available: 5.5, maximum 3]

Most candidates realised the product design could be changed but were less able to specify exactly how. Most candidates also realised that spinning the product off into some kind of SPV would work.

Q4

(i)

- the low interest rate environment means the company is likely to be able to borrow at low rates
- so the company could issue new debt at these low rates
- ... and use the proceeds to replace more expensive equity (as measured by the cost of providing dividends)
- ,, and allowing for the tax benefit of interest
- thus reducing costs...
- ... while retaining the same overall level of capital
- the interest rates may be abnormally low and so the director is making the most of the opportunity before they increase again
- the FD may believe the equity is (substantially) underpriced, allowing NAV per share to increase following the buyback
- ... but internal resources are insufficient to make said buyback
- it may be a tax inversion deal (i.e. a way of returning capital to shareholders without using dividends)
- it may be driven by (some) shareholders who want to strengthen control over the company by buying back dissenting shareholders
- shareholders may prefer a more highly geared enterprise (i.e. adjust the risk profile of capital structure)

[½ per point]

[Marks available: 6, maximum 2]

Most candidates appreciated this proposal was aimed at reducing the cost of capital. Marks were correspondingly high.

(ii)

- $WACC = \left(\frac{\text{Debt}}{\text{Debt} + \text{Equity}} \right) \times r_{\text{debt}} \times (1 - \text{corp tax rate}) + \left(\frac{\text{Equity}}{\text{Debt} + \text{Equity}} \right) \times r_{\text{equity}}$

[1]

- r_{debt} is likely to be lower than r_{equity} . (else wouldn't make the transaction)
- ... although this depends on the level of debt (i.e. distress cost increases as level rises above a certain level)
- Interest is tax deductible, as indicated by the (1-tax rate) term
- following the transaction debt has increased and equity has fallen...
- ... so under the above assumptions, the WACC will reduce
- Other well-reasoned conclusions are also acceptable, for example that there is no impact as postulated by Modigliani-Miller, and would score comparable marks

[½ per point unless otherwise stated]

[Marks available: 4, maximum 3]

Most candidates recognised the cost of debt would be lower than equity (more so once the tax shield was allowed for). Candidates who said "it makes no difference" and adequately argued following e.g. the M-M

proposition that capital structure does not affect firm value scored similar marks.

(iii)

- Higher debt implies higher financial commitments
- ... increasing probability and possible magnitude of future financial distress [1]
- There may not be sufficient market demand/capacity for such a high level of new debt
- The company may have insufficient future cashflow to pay required coupons / redemptions
- ... whereas equity dividends could have been suspended
- Covenants in existing debt may prevent issuing this level of debt
- Regulatory issues – swapping equity for debt may cause adverse implications for capital calculations
- Eventually the level of debt may be so high that the price of issuing further new debt will increase (distress premium)
- ... however the company's WACC is not affected by this if the bonds were issued in one go at the outset (but future debt raises are affected)
- The credit rating may deteriorate
- Customer reaction may be negative to a highly geared insurance company
- Equity investors may require a higher rate of return going forward to compensate for higher risk, so equity prices may fall – shareholders may become unhappy
- Also future equity dividends may be negatively affected
- Equity prices may be very high (due in part to low interest rates causing discounted dividends being greater) so the buyback may be poor value for money
- Regulatory tiering issues might arise – company is replacing Tier 1 capital (equity) with higher tier, less loss-absorbent debt

[½ per point unless otherwise stated]

[Marks available: 8, maximum 3]

The question was broader than simply examining financial distress – candidates who only explored this aspect had fewer options for scoring marks.

(iv)

- Prohibition on the issue of further senior debt unless the ratio of senior debt to the value of net book assets is within a specified limit.
- Prohibition on issuing any further debt if the level of gearing is too high.
- Prohibition on issuing further secured debt without giving equal treatment to existing unsecured bonds.
- Restrictions on the amount of dividends that the company may pay.
- Restrictions on disposals of assets by the company.
- Restrictions on the nature of business of the company.

- Minimum levels of asset or interest coverage ratios.

[½ mark each]

[Marks available: 3.5, maximum 2]

An easy knowledge question with high marks for nearly all candidates.

(v)

- If interest rates are negative, then it will not be possible for the company to invest the premiums so as to guarantee return of premiums in the event of death
- ... without taking on risk to capital
- ... because investing in risk-free debt securities would incur a cost
- The severity of the problem will depend on the term over which interest rates are negative compared with the likely term of the insurance policy until a claim is made. [1]
- If rates are only negative for the (very) short term the company may be able to invest later premiums and accumulations and generate enough income to have the necessary sums available for claims
- Liabilities will be increased due to the need to use a negative discount rate
- However, if the assets held are (risk-free) bonds, then their value will increase correspondingly
- The overall impact on solvency depends on the extent to which assets and liabilities are matched by duration
- The company may have to take on market risk / credit risk etc. in order to meet its expected claims outgo...
- ... which is likely to adversely impact on its capital adequacy situation
- The profitability of the portfolio of business is likely to be adversely affected
- Particularly for new business
- There could be anti-selection of new business from sick lives who recognise they can earn a (zero) return on their premiums which is higher than the (negative) return they could earn if they put those premiums into their bank
- Customers generally may see the product as poor value for money leading to lower sales

[½ mark per point unless otherwise stated]

[Marks available: 7.5, maximum 4]

One of the most poorly answered questions on the paper. The initial premise was relatively simple – that a negative interest rate would make it impossible to offer a fixed guarantee without incurring risk to the balance sheet – however few candidates were able to expand on this. Accordingly, marks were low for this question.

(vi)

- Take on market risk / (lengthen portfolio duration, invest in equities)
- Take on credit risk / invest in corporate bonds
- Take on liquidity risk
- Stop writing this type of business
- (Temporarily) suspend the return of premiums feature
- Reduce the fixed benefit
- Increase premiums for new business
- Hedge against further falls (note it's too late to hedge against the fall that has already happened)

[1 mark per point]

[Marks available: 8, maximum 4]

A follow-on question to (v) with similarly poor answers. Some suggested reinsurance which would not work – reinsurers would have the same negative interest rate problem and adjust their premiums accordingly; also setting aside capital doesn't help - that that would shift the burden onto a different part of the company without reducing it, and may have cost implications if that capital is now tied up. Marks were low for this question.

(vii)

- Credit risk: the issuers of high yield bonds will be of lower credit quality than lower yield bonds, and so there is a higher chance of default or credit spread widening.
- Mismatching/term/interest rate risk: longer duration bonds will likely not provide redemption proceeds at the necessary times to match expected outgo, so there is the risk of having to sell the bonds at a time when yields are high (prices are low).
- (or alternatively a mismatching gap is introduced between rate-sensitive and rate-insensitive assets and liabilities)
- (or alternatively longer-dated assets may be more volatile than corresponding liabilities, causing balance sheet volatility)
- Liquidity risk: the alternative bonds are likely to be less liquid compared with investment grade bonds or may not provide the coupons needed to make payments due.
- Regulatory risk: the alternative portfolio may create regulatory stress and require capital from elsewhere to be allocated against this book of business

[1 mark each]

[Marks available: 6, maximum 3]

Another relatively straightforward scenario – the company taking on investment risk to meet guaranteed outgo – with most candidates appreciating the issues and scoring reasonable marks.

(viii) Credit risk:

- Need to measure [volatility of] the credit exposure itself...
- ... and the [volatility of] the default experience.
- Could be measured using weighted average credit rating across the portfolio

Mismatching/term/interest rate risk:

- Could be measured using a mismatching gap (i.e. duration difference)
- Often divided into 'rate sensitive' and 'rate insensitive' assets/liabilities
- Depending on when they will reprice (before or after a selected cutoff)

Liquidity risk:

- Measure the level of “net liquid assets” or the “liquidity gap”, i.e. the difference between the level of liquid assets and volatile liabilities...
- ... where a six-month remaining maturity criterion is often adopted in classifying assets and liabilities
- Or measure using the concept of liquidity duration....
- ... or liquidity risk elasticity (LRE), where the impacts of changes in market conditions are considered

Any:

- Could be measured using a VaR model.

[½ mark each]

[Marks available: 5.5, maximum 3]

A follow-on questions to (vii) but candidates needed to read the question which was about measuring not managing. Marks were generally good for this question.

[Total 24]

END OF EXAMINERS' REPORT