



Institute
and Faculty
of Actuaries

EXAMINERS' REPORT

SP9 – Enterprise and Risk Management Specialist Principles

September 2022

Introduction

The Examiners' Report is written by the Chief 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.

Sarah Hutchinson
Chair of the Board of Examiners
December 2022

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

The aim of the Enterprise Risk Management (ERM) subject is to instil in successful candidates the key principles underlying the implementation and application of ERM within an organisation, including governance and process, as well as quantitative methods of risk measurement and modelling. The candidate should gain the ability to apply the knowledge and understanding of ERM practices to any type of organisation.

The SP9 examination generally requires bullet-point or short form essay style answers, together with concise mathematical applications. The answers given below are just one possible set of acceptable answers.

Candidates who give well-reasoned and relevant points, not presented in the marking schedule, are awarded marks for doing so.

B. Comments on *candidate performance in this diet of the examination*

Well prepared candidates, who were able to apply their knowledge of the core reading to the specific scenarios given in the questions, were successful in this diet. Candidates who were able to draw upon on a wide range of risk types, and who were able to demonstrate how ERM can be applied in the day-to-day governance of companies scored well.

Many candidates did not appear to plan their answers, and therefore were unable to benefit from question parts that built upon and developed ideas linked to each other.

Questions that required idea generation, application of mathematical techniques, and in-depth discussion or expansion of points were not answered well by unsuccessful candidates.

C. Pass Mark

The Pass Mark for this exam was 55
140 presented themselves and 55 passed.

Solutions for Subject SP9 – September 2022

Q1

(i)

Dominant CEO risk: the risk that key decisions might not be sufficiently challenged by those within Company X	[1/2]
Key person risk: the risk of significant reliance on an individual within Company X	[1/2]
Agency risk: the risk of misalignment of stakeholder interests, in particular the risk That the management of Company X does not act in the best interests of other stakeholders	[1/2]
Liquidity risk: the risk the Company X has insufficient liquid assets to meet obligations as they fall due	[1/2]
Model/parameter risk: the risk that Company X uses inappropriate models or assumptions	[1/2]
Expense risk: the risk that initial set-up expenses might cause Company X to under-perform	[1/2]
Strategic risk: There is a risk that Company X makes poor strategic decisions	[1/2]
Reputational risk: The risk that Company X garners a poor reputation in the marketplace	[1/2]
Operational risks: Any sensible, suitably described operational risks	[1/2]
Execution risk: the risk that Company X may fail to hire suitable staff, establish suitable processes or be offered its preferred business to write	[1/2]
[Marks available 5, maximum 3]	

(ii)

Dominant CEO risk/key person risk/agency risk: As it is a new organisation, the leaders of Company X have an unusually high level of influence over the direction of the company	[1/2]
As a founder of the Company, The Founder has a very high level of influence over the direction of the company	[1/2]
Since The Founder holds multiple senior leadership roles (Chair, CEO and Chief Actuary), they have an unusually high level of influence over the direction of the company	[1/2]
There is a risk that The Founder acts in their own interests (e.g. job security, remuneration) rather than in the best interests of the key stakeholders of Company X	[1/2]
Company X is particularly exposed given the degree of reliance on The Founder's knowledge and expertise, and the number of key roles held by The Founder	[1/2]
If The Founder was to leave Company X (e.g. due to illness, retirement, resigning), there would be a large loss of intellectual property and general disruption	[1/2]
<i>(maximum 2 marks from this section)</i>	

Liquidity risk:

Company X may find it harder than other GI companies to raise further capital quickly	[1/2]
or it may be more costly to do so	[1/2]
since it will be less stable/secure /well-established	[1/2]
<i>(maximum 1 mark from this section)</i>	

Model / parameter risk:

Company X is particularly exposed since it is a new company and hence is likely to lack its own historic data for setting assumptions	[1/2]
and may also lack expertise	[1/2]

hence it may set inaccurate premiums and/or provisions [1/2]
(maximum 1 mark from this section)

Expense risk:

There is a material expense 'overhang' in establishing a new business [1/2]

Hiring staff [1/2]

Establishing premises/systems [1/2]

Product development/marketing [1/2]

Regulatory compliance [1/2]

Particularly as new business takes time to earn through onto the balance sheet. [1/2]

Encouraging staff into a new business with no track record may require Company X to pay above-market rates [1/2]

Establishing robust regulatory processes in a short time frame may require additional consultancy spend until in-house processes are established [1/2]

In order to win new business, Company X may have to compete on price, which limits the company's ability to increase its top line to reduce its expense ratio [1/2]

(maximum 2 marks from this section)

Strategic risk

Compared to a well-established firm, Company X has no established strategy with a track record [1/2]

There is a risk of the strategy being poorly executed due to a lack of experienced staff [1/2]

Company X will need to seek competitive advantage, which makes it more likely to take on an unusual strategy [1/2]

(maximum 1 mark from this section)

Reputational risk:

Company X does not yet have its own reputation for underwriting and claims payment. [1/2]

Brokers and clients will do business with Company X based largely on The Founder's existing reputation [1/2]

Any indication that this existing reputation will not be replicated at Company X may make clients wary of doing business with the company [1/2]

There is a risk that a scandal associated with The Founder adversely affects the Reputation of Company X, leading to loss of business [1/2]

(maximum 1 mark from this section)

Operational risks

Compared to a well-established firm, Company X has:

No book of existing business to renew [1/2]

No (or few) existing systems [1/2]

No (or few) existing employees [1/2]

No (or few) existing processes [1/2]

Limited existing governance structures and controls [1/2]

(1/2 mark for any sensible, explained example of operational risk)

(maximum 2 marks from this section)

[Marks available 16½, maximum 6]

(iii)

Dominant CEO risk/key person risk/agency risk:

Split the roles of CEO, Chief Actuary and Chair of the Board between different individuals	[1/2]
Ensure diversity / range of backgrounds, skills and experience on the Board	[1/2]
Staff training (e.g. on speaking up / providing challenge)	[1/2]
Succession planning	[1/2]
Documentation of decisions and processes by The Founder.	[1/2]
Appoint a board of predominantly independent non-executive directors	[1/2]
Establish a culture of reasonable challenge amongst staff	[1/2]
<i>(maximum 1½ marks from this section)</i>	

Residual risks:

Individuals appointed to key roles may not be fully independent	[1/2]
Especially if they are previous colleagues of The Founder	[1/2]
Culture may take time to establish	[1/2]
Can be mitigated through clear communications with staff at all levels	[1/2]
Seeking advice / help to hire experienced senior individuals from consultants	[1/2]
Robust recruitment processes to attract 'strong' candidates	[1/2]
<i>(maximum 1 mark from this section)</i>	

Liquidity risk:

Ensure contingent funding in place, e.g. with banks	[1/2]
Use reinsurance to limit exposure to risk of large claims	[1/2]
Tight internal controls on expense spend	[1/2]
<i>(maximum 1½ marks from this section)</i>	

Residual risks:

The costs of arranging contingent funding may be prohibitive	[1/2]
Reinsurance cedes upside as well as downside risk to the reinsurer	[1/2]
Reinsurer may default on obligations	[1/2]

Mitigate by:

Thorough research into contingent funding / listings.	[1/2]
Seek external expertise.	[1/2]
<i>(maximum 1 mark from this section)</i>	

Model / parameter risk:

Seek external sources of data, e.g. reinsurer, industry data	[1/2]
Add (contingency) margins to the assumptions	[1/2]
Sensitivity test to assess the extent of the model / parameter risk	[1/2]
Hold a separate reserve for model / parameter risk	[1/2]
<i>(maximum 1½ marks from this section)</i>	

Residual risks:

External sources of data not relevant to Company X's business	[1/2]
They relate to different target markets, products, underwriting, distribution	[1/2]
Adding margins may conflict with need to keep premiums competitive	[1/2]
Mitigate by making suitable adjustments to the external data	[1/2]
Seek external expertise with regards to setting premiums / provisions	[1/2]
Regularly monitor experience, so can respond quickly to new data / competitive pressures	[1/2]

(maximum 1 mark from this section)

Expense risk:

- Establish clear and realistic expense targets for the company [½]
- And ensure that these are clearly communicated throughout the business [½]
- Write short-tailed business that earns through the financial statements quickly [½]
- Use automation and technology to minimise salary costs [½]
- Offer remote or hybrid working to minimise fixed property costs [½]
- Use outsourcing partnerships to reduce overall headcount and salary costs [½]
- Increase the proportion of remuneration which is performance-based, to allow expenses to mirror the fortunes of the company [½]

(maximum 1½ marks from this section)

Residual risks:

- Expense risk: done poorly, most of these actions could increase overall expenses [½]
- Remote working and outsourcing may result in reduced control over the work being done [½]
- This can be managed through suitable SLAs / HR processes [½]
- Outsourcing risk: lack of control over outsourcing partners [½]
- Can be mitigated by suitable Service Level Agreements (legal documentation etc) [½]

(maximum 1 mark from this section)

Strategic risk:

- Ensure suitable challenge of the strategy at Board level [½]
- Get consultants to review and challenge the overall strategy [½]
- For profitability [½]
- And achievability [½]
- Compare strategy to peers [½]
- Carry out historical 'as-if' analysis: how would this strategy have performed historically? [½]

(maximum 1½ marks from this section)

Residual risks:

- Strategic risk remains material [½]
- Execution risk of not being able to carry out the strategy [½]
- This can be managed in the same ways as 'execution risk' above [½]

(maximum 1 mark from this section)

Reputational risk:

- Ensure external comms are suitably reviewed before release [½]
- Establish clear expectations of outwards-facing functions [½]
- Underwriting and claims [½]
- Produce company-specific statements on key governance principles [½]
- ESG, corporate governance etc [½]

(maximum 1½ marks from this section)

Residual risks:

- Reputational risk remains material [½]
- Strategic risks: public statements can limit future strategic manoeuvrability [½]
- These can be managed by engaging with key stakeholders early [½]
- As well as engaging with communication professionals [½]

(maximum 1 mark from this section)

Operational risks:

Establish suitable governance structures	[1/2]
Internal Audit function, Risk function	[1/2]
Outsource key functions	[1/2]
Regulatory reporting [or other suitable example]	[1/2]
Recruit experienced market participants	[1/2]
Hire experienced staff	[1/2]
Establish a culture of improvement	[1/2]

(maximum 1½ marks from this section)

Residual risks:

Operational risk remains material	[1/2]
Expense risk due to establishing second and third lines of defence	[1/2]
Execution risk: additional governance structures can slow decision-making	[1/2]
These can be mitigated by ensuring that robust processes and systems are part of day-to-day expectations.	[1/2]
Embedding the risk function within first-line teams' responsibilities can reduce overall risk costs.	[1/2]

(maximum 1 mark from this section)

[Marks available 36½, maximum 6]

(iv)

Independent Chair is in line with ERM best practice	[1/2]
Separate Chief Actuary and CEO roles is in line with ERM best practice	[1/2]
CRO is on the board is in line with ERM best practice	[1/2]
Risk committee is in line with ERM best practice	[1/2]
Having a risk 'expert' on the risk subcommittee is in line with ERM best practice	[1/2]
CRO chairs risk committee is in line with ERM best practice	[1/2]
Risk committee comprises mostly NEDs is in line with ERM best practice	[1/2]
Four NEDs on the risk subcommittee could seem disproportionately given total headcount of company is <50? (Award half mark for any sensible comment on number of NEDs)	[1/2]
Compensation linked to company performance is in line with ERM best practice	[1/2]
But this could be delayed to allow time for true performance to emerge	[1/2]
Especially as the company intends to write long-tailed business	[1/2]
It would be better if linked to a risk-adjusted measure of performance, e.g. RAROC	[1/2]
So as to discourage excessive risk taking	[1/2]
A mid- to long-term measure of performance would be better than linking annual performance	[1/2]
A bonus in the form of shares (rather than cash) would help better align senior management interests with those of shareholders	[1/2]
Embedded risk team makes sense for a small, new company (i.e. not having a large, centralised risk team is proportionate)	[1/2]
But this should be reviewed as the company matures	[1/2]
One employee in the CRF is reasonable for a company of this size	[1/2]
Dual reporting lines to the CRO and CEO is good	[1/2]
To ensure risk issues are considered in all decision-making	[1/2]
Though this may slow down decision-making	[1/2]

And introduce potential conflicts between obligations to the CEO and CRO [1/2]
 [Marks available 11, Maximum 5]

(v)
 Mean = $200 - 50 = 150$ [1/2]

$$Var(A + B) = Var(A) + Var(B) + 2\rho\sqrt{Var(A)Var(B)}$$
 [1/2]
 So Variance = $50^2 + 10^2 - 2 * 50% * 50 * 10$ [1/2]
 So Variance = 2100 [1/2]
 $Var[X] = E^2[X](\exp(\sigma^2) - 1)$, so $\sigma = \sqrt{\ln(Var[X]/E^2[X]) + 1}$ [1/2]
 $E[X] = \exp(\mu + 0.5 * \sigma^2)$, so $\mu = \ln(E[X]) - 0.5 * \sigma^2$ [1/2]
 Mu = 4.966, Sigma = 0.299 [1/2]

[Marks available 3½, maximum 3]

(vi)
 Expected profit = $250 - 25 - 200 + 50 = 75$ [1/2]
 So Company X makes a loss if the distribution from part v is at least 75 greater than the mean, i.e. = 225. [1/2]
 If $X = \text{LogNormal}(4.966, 0.299)$ then $P(X \leq 225)$ is 93% [1/2]
 So the probability of making a loss is 7% [1/2]

(vii)
 The model is very simple [1/2]
 It is sensible to model claims as a stochastic variable, since it is likely to be the most significant and uncertain assumption. [1/2]
 It has just two variables, whereas the business is likely to be able to split into multiple profit centres [1/2]
 The use of a lognormal distribution for the combined claims and investment income variable is unlikely to be a good fit [1/2]
 In particular empirical evidence suggests that the (log of) investment income has a 'leptokurtic' distribution (fatter tails and thinner peaks than a normal distribution). [1/2]
 A lognormal distribution takes positive values only, whereas net claims – investment income has the potential to be negative [1/2]
 One lognormal distribution for claims isn't very informative, and a frequency/severity distribution might provide more insight [1/2]
 And the ability to back test against large loss experience [1/2]
 And future ability to apply non-proportional reinsurance effectively [1/2]
 Premium and expenses are assumed to be deterministic, but in fact are highly uncertain [1/2]
 And consideration should also have been given to modelling them stochastically [1/2]
 In particular, claims expenses are likely to vary, to some extent, in line with claim amounts [1/2]
 And net premiums linked to net claims depending on the nature of any reinsurance arrangement [1/2]
 Net premium and net claims are modelled directly, rather than modelling gross figures and applying ceded reinsurance [1/2]
 This could be very material if the company buys significant amounts of excess of loss reinsurance [1/2]
 Does not include any allowance for reserve risk [1/2]
 Or RI credit risk or operational risk [1/2]
 It may be inappropriate to use a measure of 'linear' correlation [1/2]
 Since the correlation between net claims and investment income may vary in the

extremes of the distribution	[½]
Additionally, Pearson's rho only fully defines the relationship between the two variables when the marginal distributions are jointly elliptical (e.g. multivariate normal)	[½]
Which is unlikely to be the case for net claims and investment income	[½]
It may be more appropriate to model net claims and investment income separately	[½]
With a copula to model the dependency structure	[½]
The calibration of the model should be subjected to sensitivity / scenario tests	[½]
The rationale for the choice of model and the calibration should be documented	[½]
Some parts of the model calibration look strange:	[½]
Investment income of \$50m on an asset base of \$250m is a 20% return, which seems very high	[½]
Especially since the distribution is relatively stable (SD=10)	[½]
Which means the probability of making an investment loss is close to zero	[½]
The expense ratio is 10% of NEP, which is very low	[½]
Especially for a new company with set up expenses	[½]
The CoV of net claims (25%) is only slightly higher than that of the investment income (20%), we would expect most of the P&L volatility to come from underwriting risk.	[½]
Though being long-tailed business, potentially little of the risk will emerge in the next P&L	[½]
The -50% correlation coefficient between claims and investment income seems very large	[½]
Unless the investments are in very specific products	[½]
Or the policies written are heavily affected by economic factors (e.g. mortgage indemnity insurance)	[½]
A simple model makes understanding and communication of the results much easier.	[½]
A simple model is reasonable given that Company X has essentially no data of its own	[½]
	[Marks available 19, maximum 5]

(viii)

Any copula can be recommended, so long as the recommendation covers:	
How the copula would be applied	[½]
What the real-world relationship between the variables might look like	[½]
The resulting impact on tail dependence	[½]
A conclusion that is consistent with that selection of tail dependence	[½]

*(e.g. to apply a negative linear correlation, we would apply a dependency between 'Investment income' and '-Claims' (i.e. the negative of the claims distribution)
For liability business, large economic downswings tend to result in an increase in claims.
So we would expect lower tail dependence to apply between investment income and negative claims.
Therefore we recommend a Clayton copula.*

*For a Gumbel copula, the same reasoning would apply, but between negative investment income and positive claims, resulting in upper tail dependence.
For a t-copula, we would argue that extreme economic events (positive or negative) would result in extreme claims outcomes (again, positive or negative)
For a Gaussian or Frank copula, we would argue that the relationship between claims and economic variables is symmetrical)*

(ix)

The Chief Actuary's comment to not include liquidity risk in the P&L model is reasonable	[1/2]
The current P&L model is very high-level and does not include several risks (e.g. reserve risk, operational risk) which are likely to be more material than liquidity risk	[1/2]
So focussing on these other risks first would be reasonable.	[1/2]
Depending on the current investment strategy.	[1/2]
Especially since General Insurance companies tend to be very cash-accretive, so Liquidity is less of a concern	[1/2]
And claims in long-tailed liability business tend to emerge over a long period of time, so that sudden unexpected demands for cash are unlikely	[1/2]
The Chief Actuary's model uses a one-year time horizon	[1/2]
So is unlikely to have the short-term detailed cashflows required to model liquidity risk	[1/2]
Liquidity risk is extremely hard to model accurately	[1/2]
And can be better understood and managed through sensible scenario modelling	[1/2]
However, insolvencies often arise through a lack of liquidity rather than a lack of profitability, so liquidity risk should be taken seriously	[1/2]
Depending on the purpose of the Chief Actuary's model (it may not be a solvency model)	[1/2]
Although it may be appropriate to ignore liquidity risk in the P&L model, it should not be ignored completely	[1/2]
It should be modelled outside the scope of this model	[1/2]
And reserve or liquidity risk capital held against it	[1/2]

[Marks available 7½, Maximum 3]

(x)

Monitoring liquidity risk:	
Company X could monitor liquidity risk via various KRIs such as:	[1/2]
Current ratio / quick ratio	[1/2]
Liquidity coverage ratio (aka BASEL) = high quality liquid assets / total net cash outflow over 30 days	[1/2]
Duration, convexity, as indicators of the matching of asset and liabilities.	[1/2]

(maximum 1 mark from this section)

Company X should also monitor:

The level of its cash reserves.	[1/2]
Its ability to raise additional capital and the likely cost of capital	[1/2]
The fungibility of its capital	[1/2]
Past liquidity incidents and losses, so as to learn from these.	[1/2]
The results of the scenario modelling	[1/2]
Company X should produce a 'cash budget' for the next year say, to be able to forecast months where outflow is likely to exceed inflow	[1/2]
The results of the monitoring should be reported regularly (e.g. weekly, monthly) to the Board, e.g. via a dashboard	[1/2]

Managing liquidity risk:

SMEs should try to understand what might cause liquidity stresses from the 'demand' side (i.e. sudden cash outflows required)	[1/2]
Claim payments need to be made earlier than expected requiring sudden sale of corporate bonds	[1/2]

A catastrophic claim	[½]
A fine	[½]
A reputational incident that triggers lots of withdrawals	[½]
<i>(maximum 1 mark from this section)</i>	
As well as the 'supply' side (i.e. sudden difficulty in generating cash)	[½]
Lower new business volumes than expected, and so lower premium income	[½]
Difficulty making timely reinsurance recoveries	[½]
Difficulty raising additional capital	[½]
<i>(maximum 1 mark from this section)</i>	
Use scenario testing	[½]
The process should begin with an assessment of the Board's appetite for liquidity risk	[½]
Gather insights from SMEs	[½]
Internal and external to Company X (i.e. include consultants if needed)	[½]
SMEs should be encouraged to try to think 'outside the box'	[½]
SMEs should try to understand what might cause liquidity stresses from the 'demand' side (i.e. sudden cash outflows required)	[½]
As well as the 'supply' side (i.e. sudden difficulty in generating cash)	[½]
And should consider carefully the relationships between variables	[½]
The CRF should then derive a set of scenarios	[½]
Which are plausible	[½]
And relate to the Board's liquidity risk appetite	[½]
The CRF should build a detailed cashflow model (or models) with suitably short time steps	[½]
Liquidity issues may require timesteps as short as one week or less	[½]
This model should include all cashflows from its assets and liabilities	[½]
Asset cashflows include coupon payments, dividends, reinsurance recoveries and premium payments	[½]
Liability cashflows include claims payments, reinsurance premium payments and expenses	[½]
This model should be run using assumptions that relate to each of the defined scenarios and over different ultimate time horizons	[½]
It may be beneficial to run multiple versions of each scenario, e.g. a mild, moderate and extreme version	[½]
For each scenario, and each version of that scenario, the different assumptions should be consistent with one another	[½]
If interest rates increase then mortgage defaults should also increase	[½]
For each model run, the total net cashflows at each point in time should be considered	[½]
Where these are negative, the net outwards cashflow should be compared to the available liquid funds to ensure coverage	[½]
The company can pre-arrange contingent liquidity sources if needed	[½]
With the liquidity available through these sources calibrated to the outputs of the model Company X could raise further (liquid) capital by	[½]
Issuing debt	[½]
Securitising some business.	[½]
Although these introduce gearing	[½]
Company X should ensure that its asset and liability cashflows are as closely matched as possible	[½]
Company X could switch from corporate bonds to more liquid government bonds	[½]

Although this would reduce the expected return [1/2]
 [Marks available 25, maximum 8]

(xi)
 Analysis (including identification of risks) [1/2]
 Quantification [1/2]
 Management [1/2]
 Monitoring [1/2]
 Modification [1/2]
 In a cycle, showing each stage linking to the next (i.e. a continuous, repeating process) [1/2]
 Emerging risks [1/2]
 External events and influences [1/2]
 [Marks available 4, Maximum 3]

(xii)
 RMCC establishes a clear process by which risks can be systematically identified [1/2]
 And compared to actual experience [1/2]
 And regularly reviewed [1/2]
 The analysis step of the RMCC includes identification of existing risks [1/2]
 These should be stored in the risk register [1/2]
 The monitoring step of the RMCC compares actual experience to the company's expectations [1/2]
 This should highlight any areas where actual risk events have not been captured within the RMCC / risk register [1/2]
 This should include near-miss events as well as actual experienced losses [1/2]
 The modification step allows for any learnings from these actual events to be updated within the RMCC [1/2]
 In addition, the RMCC explicitly considers emerging risks [1/2]
 A good emerging risk identification process should ensure that risks which have not yet crystallised can still be captured [1/2]
 [Marks available 5½, Maximum 5]

(xiii)
 Probabilistic:
 Provides insight into the likelihood of specific events occurring [1/2]
 Thus communicating that risk events cannot be avoided with a 100% probability [1/2]
 Probabilistic statements may be harder to understand / interpret by some [1/2]
 And harder to monitor against [1/2]
 There is subjectivity around the choice of the 15% probability. [1/2]
 And no information as to how this has been determined [1/2]
 Uses the existing P&L model, so time and cost savings [1/2]
 And will already be familiar / understood by the Board [1/2]
 However, the model is subject to the same limitations of the model as discussed in part (vii) [1/2]
 Not all risks reflected in the model [1/2]
 Though these likelihoods can be very uncertain [1/2]
 Especially in the extreme tails [1/2]
 Provides no insight into the details of the event [1/2]
 In the example given, what causes the loss is unknown [1/2]
 Is consistent with key regulatory regimes (e.g. Solvency II) [1/2]

And key rating agency models	[½]
So is likely to be able to be benchmarked and compared to peers more easily	[½]
The Chief Actuary's model may not have been designed with these statements in mind	[½]
So may lack the detail required to monitor against these statements	[½]
Or may not be suitably calibrated at the required return periods	[½]
The Chief Actuary's model already allows for the interactions between some variables	[½]
If the Chief Actuary's model is in use within the business, it should reflect SME expectations	[½]
And further exposing senior management to the output from that model will inform the relevant feedback loops	[½]
Further improving the model	[½]
Where a risk appetite has been breached, it can be hard to identify specific actions which would remediate the breach	[½]
Deterministic:	
Deterministic statements may be easier to understand	[½]
However, it may require new models / indicators / processes to be built for the Purposes of monitoring	[½]
There is subjectivity over choice of scenario	[½]
Chief Actuary biased by historical events, their own experience / knowledge	[½]
Provides no insight into the likelihood of the scenario occurring	[½]
Which allows the company to focus on the real-world risks being faced	[½]
Creation of the scenarios will involve input from SMEs around the business	[½]
Which will generate meaningful insight in its own right	[½]
Scenarios can be designed to reflect the risks inherent in the business, not the risks which are capable of being modelled in the Chief Actuary's model	[½]
There is no guarantee that the scenarios will be comprehensive	[½]
The company may miss important risks	[½]
For the company to have a stable risk appetite, the scenarios will have to be broadly fixed over time	[½]
Which may encourage individuals to 'game' the scenarios rather than managing the risks effectively	[½]
This could be mitigated by having 'core' scenarios along with a small number of 'other' scenarios that change more frequently	[½]
Where an appetite is breached, it is relatively clear which action(s) would result in a remediation of that breach	[½]

[Marks available 20, maximum 12]

[Total 63]

Candidates who planned their answers to parts (i), (ii) and (iii) together tended to score well and were able to produce a coherent response covering risk identification, exposure, mitigation and management.

In part (iv) candidates needed to be able to apply their understanding of ERM best practice carefully to the given management and remuneration structure. Candidates who provided a 'one-sided' comparison tended to perform less well.

Parts (v), (vi), (vii) and (viii) required mathematical manipulation and understanding of copula aggregation, and these question parts were well answered by successful candidates.

Parts (ix) and (x) were not well answered in general, with many candidates struggling to identify why there might be challenges in modelling liquidity risk and failing to identify suitable liquidity monitoring and management tools.

Parts (xi) and (xii) were reasonably answered by many candidates.

Some candidates failed to provide a balanced discussion of both advantages and disadvantages for part (xiii).

Q2

(i)

There is no one definition of ERM, but common features include:	[½]
A holistic approach	[½]
Managing the risks of an entire organisation together is superior to individual risk management of individual areas	[½]
We need to consider upside risk as well as downside	[½]
Where possible, risks should be quantified	[½]
Such that they can be monitored and managed effectively	[½]
Though unquantifiable risks should also be considered in the same framework	[½]
Once risks have been identified and measured, appropriate responses should be taken	[½]
Consistency of taxonomy, assessment and reporting of risks across the organisation	[½]
ERM is dynamic, i.e. an ongoing process not a one-off exercise	[½]
ERM is integrated into business processes	[½]
And strategic decisions	[½]
ERM is co-ordinated by the CRO and the CRF	[½]

[Marks available 6½, Maximum 3]

(ii)

Reduced earnings volatility	[½]
Easier to capitalise on emerging opportunities	[½]
Favourable perception from credit rating agencies	[½]
Better management information	[½]
Leading to better decision-making	[½]
Better transparency over the risk profile of the business	[½]
Clearer communication on risk issues (due to common taxonomy)	[½]
More efficient capital management	[½]
Improved shareholder returns	[½]
Fewer unexpected downside surprises	[½]
Improved compliance with regulatory requirements	[½]
Improved efficiency of operations	[½]
And facilitates the sharing of risk information within Company Y	[½]
Especially as it is a large company, where it could be easy for risks to fall between the cracks	[½]
Improved confidence in the ability of the organisation to meet its goals	[½]

[Marks available 7½, Maximum 5]

(iii)	
Mortality risk	[½]
The risk that mortality amongst policyholders is higher than expected	[½]
Longevity risk	[½]
The risk that mortality amongst policyholders is lower than expected	[½]
FX risk/Currency risk	[½]
The risk of profit or loss arising from movements in exchange rates	[½]
Credit risk	[½]
The risk of debtors being unwilling or unable to make payments in a timely fashion	[½]
Market risk	[½]
The risk of profit or loss arising from movements in the investment markets, or associated economic variables	[½]
(Funding) liquidity risk	[½]
The risk of insufficient (cash) funds to meet liabilities as they fall due	[½]
Catastrophe risk	[½]
The risk that a single event causes unexpectedly large losses, e.g. a pandemic	[½]
Underwriting risk	[½]
The risk of inappropriate selection or acceptance of risks	[½]
Exposure risk	[½]
The risk that business volumes are greater than expected, leading to a higher than expected capital strain	[½]
The risk that business volumes are less than expected, and that fixed expenses are not covered by premiums, resulting in a loss	[½]

[Marks available 9½, Maximum 5]

(iv)	
Likely brings these economic blocs closer together	[½]
Which would reduce FX rate volatility	[½]
Should improve prosperity within individual countries	[½]
Which in turn typically improves mortality rates	[½]
Free movement of people should reduce discrepancies between different countries	[½]
Though might encourage policyholders to arbitrage if different rating models are used in different countries	[½]
Reduces barriers to entry, opening up potential new competition within these countries	[½]
Likely to open up new distribution channels within these countries as well	[½]
Opens up further cross-selling opportunities	[½]
Movement of capital may allow local subsidiaries to operate with much lower solvency margins	[½]
With excess capital held at group level and distributed as needed	[½]
Company Y may face increased competition from life insurers in other countries	[½]
Resulting in reduced sales volumes	[½]
And/or more competitive pricing	[½]
And reduced profit margins	[½]
There may be a wider range of investment opportunities available to Company Y	[½]
Resulting in greater diversification	[½]
And hence reduced market/credit risk	[½]
There may be fewer problems with overseas investments	[½]
Easier to repatriate funds	[½]

Information more easily available	[½]
Greater fungibility (ability to transfer capital between Country Z and other countries)	[½]
Resulting in reduced liquidity risk	[½]
Over time, regulation may become more homogenous	[½]
Resulting in reduced regulatory / compliance risk	[½]
Company Y's target market will expand	[½]
Potentially resulting in greater (geographical, socio-economic) diversification	[½]
And hence reduced overall portfolio risk	[½]
Possible taxation benefits	[½]
Removal of withholding taxes	[½]
Reduced risk of political instability, as countries working more closely together	[½]
Increased freedom of movement of citizens could result in increased risk of spreading of diseases (pandemics)	[½]
Resulting in increased catastrophe risk	[½]

[Marks available 16½, maximum 6]

(v)(a)

Selling the physical assets	[½]
This would convert the asset to cash at today's prices	[½]
Short-sell REITs / property funds.	[½]
If property prices drop, so do the values of property funds	[½]
Sell property futures	[½]
Or buy property put options	[½]
Based on an index of commercial property	[½]
Having a short position means that falls in the direct property prices are offset by gains on the derivatives	[½]
Buy interest rate hedges	[½]
A swap	[½]
An FRA	[½]
A swaption	[½]
A cap	[½]
If interest rates rise, an interest rate hedge (e.g. swap) would mitigate the impact of this	[½]

[Marks available 7, Maximum 3]

(b)

Selling assets can take a long time	[½]
By which point the market may have already moved	[½]
It can also involve significant costs and fees	[½]
And is not easily undone if market conditions improve again	[½]
Short-selling indirect investments	[½]
Can be done quickly	[½]
Though it incurs borrowing fees	[½]
And there can be a basis risk: the fund chosen moves differently to the company's own assets	[½]
Market expectations of property prices may already be baked into the fund value	[½]
Futures are exchange-traded, meaning that there is no counterparty risk to Company Y	[½]
However margin payments may be required at an inopportune time (liquidity risk)	[½]
Futures hedge against upside risk (rises in property prices) as well as falls	[½]
Options involve Company Y paying an option premium at outset, which reduces potential gains	[½]

Basis risk again with both futures and options, i.e. that the property index underlying the hedge does not move in the same way as the direct property owned by Company Y because it is based on a different mix of properties	[1/2]
Or because contracts need to be rolled forward on uncertain terms (roll risk) to cover the full two-year period	[1/2]
Hedging interest rates can be done quickly and easily, using standard approaches.	[1/2]
At relatively low cost	[1/2]
Has significant basis risk: interest rate movements are not the proximate cause of property price movements, so the two may not be fully related	[1/2]
Operational risk in that the nature of the hedge is not fully understood	[1/2]
And errors made in terms of the nature of the hedge/number of contracts entered into	[1/2]
	[Marks available 10½, Maximum 5]

(vi)

Pensions diversify well with life insurance	[1/2]
Since pensions (once converted to annuities) make payments out until death, whereas life insurance receives payments until death	[1/2]
Separately capitalised subsidiaries are an inefficient way to set this up	[1/2]
The risks are best managed holistically, rather than in isolation	[1/2]
To take advantage of the diversification benefits between the lines of business	[1/2]
Use of same distribution channels is efficient	[1/2]
As these will be established channels, with minimal setup or marginal costs	[1/2]
People likely to think about pensions and life insurance at the same time	[1/2]
Which creates cross-selling opportunities	[1/2]
And further supports using the same distribution channels	[1/2]
Having separately capitalised subsidiaries may be useful for coping with different regulatory/operational regimes in each country	[1/2]
Having separately capitalised subsidiaries means cannot benefit from economies of scale	[1/2]
Consideration will need to be given as to how to allocate the capital, including any diversification benefit, between the subsidiaries	[1/2]
	[Marks available 6½, maximum 5]

(vii)

Inflation risk.	[1/2]
If inflation in a country is high, the company may incur significant losses to support the guarantee	[1/2]
This could be mitigated by investing in inflation-linked securities (for bonds) or real assets (e.g. property, equities)	[1/2]
Hedging using derivative contracts, e.g. buying put options on an inflation index, or an inflation swap	[1/2]
Putting a 'cap' on the inflation, e.g. inflation capped at X%	[1/2]
Moral hazard risk	[1/2]
Since the investment downside is effectively capped, there is no longer a downside to picking a high-risk fund	[1/2]
This could be mitigated by applying the benefits to a multi-year return	[1/2]
So that we would need sub-inflation returns over, say, 3 years, to benefit from the guarantee	[1/2]
Arbitrage risk	[1/2]

Customers may open multiple pensions in multiple jurisdictions to benefit from this guarantee	[½]
This could be mitigated by limiting the guarantee to one product per customer	[½]
Exposure risk (business volumes) – risk that new business volumes are higher than expected as a result of the attractiveness of the guarantee	[½]
Resulting in a higher capital strain than expected (especially due to the cost of the guarantee)	[½]
Mitigate by monitoring sales volumes / limiting sales if they exceed a certain point	[½]
There is a risk that customers switch funds more often than expected, leading to higher than expected admin costs	[½]
Mitigate by limiting the number of (free) permitted fund switches	[½]
Operational risk – that there is a lack of expertise to model the guarantee, resulting in incorrect pricing	[½]
Mitigate by using external expertise	[½]
Reputational risk – the guarantee should largely have a positive impact on Company Y's reputation.	[½]
But there is a risk if Company Y fails to meet it	[½]

[Marks available 10½, maximum 5]

[Total 37]

Parts (i), (ii) and (iii) were well answered by many candidates.

Many candidates did not consider using their answer to part (iii) to help generate ideas for part (iv), and therefore struggled to score highly.

Part (v) was generally well answered, with successful candidates demonstrating a good depth of understanding of the practical implications of implementing different hedging strategies.

Parts (vi) and (vii) were well-answered overall.

[Paper Total 100]

END OF EXAMINERS' REPORT



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