

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

17 April 2024 (am)

Subject SP9 – Enterprise Risk Management Specialist Principles

Time allowed: Three hours and twenty minutes

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator.

If you encounter any issues during the examination please contact the Assessment Team on T. 0044 (0) 1865 268 873.

1 In 2013, a small animal shelter charity was established in Country A by three individuals. The shelter provides housing, food and veterinarian care to abandoned domestic pets while also attempting to rehome the pets, either in Country A or overseas. The shelter has one salaried employee; the rest of the tasks are undertaken by volunteers.

The charity's board consists of its three founding members who hold the roles of Chairman, Treasurer and Secretary, respectively. None of the board members has experience or expertise in financial or risk management. However the Secretary, whose area of expertise is information technology, built the charity's technological infrastructure.

Following an attempted break-in, the charity no longer undertakes any cash transactions. Donations can be made directly following a link to the charity's website or via direct debit. All transactions, including applications for new volunteers and for animal adoption, are processed electronically. No paper documents are stored by the charity.

The shelter also uses its website and social media to promote its cause and to engage with the public.

(i) Describe the key risks to which the charity is exposed. [8]

The charity has recently purchased pet insurance, which covers veterinary costs in respect of the animals housed by the shelter.

(ii) Explain the key benefits to the charity of purchasing pet insurance. [4]

Sam, an enthusiastic volunteer at the charity, has recently qualified as an actuary. The board has instructed Sam to review the price of the pet insurance purchased.

(iii) Describe the steps that Sam may take in calibrating and using a model to carry out the board's instruction to review the price of the pet insurance. [6]

The charity is dependent on donations by the public to cover its expenses. The charity maintains a small reserve fund, of which 30% is comprised of government bonds (both domestic bonds issued by Country A's government and issued by overseas governments), 20% is invested in equities and 50% in current accounts and short-term notice accounts. The asset allocation was made based on the advice of one of the volunteers.

The board has asked Sam to review the risks that the charity is exposed to, including the investment risk in the fund.

(iv) Assess the appropriateness of the charity's investment strategy. [3]

- (v) (a) Suggest quantitative metrics that Sam may use to measure the charity's investment risk.
- (b) Suggest approaches that Sam may use to monitor and control the charity's investment risk. [4]
- (vi) Discuss the likely impact on the charity of a default of both domestic and overseas bonds. [3]

Sam has identified that a key risk to the charity is operational risk, and wishes to set up an appropriate model to simulate these losses.

There were five operational losses over the 10-year period since the charity was established: \$50,000, \$46,000, \$3,700, \$1,500 and \$10,380.

- (vii) Recommend, with reasons, a suitable frequency distribution for the historical operational loss incidents. [2]
- (viii) Discuss the advantages and disadvantages of using historical loss data to calibrate the frequency and severity distributions for a loss simulation model. [6]

Sam is considering the use of external data and scenario testing to help calibrate the frequency and severity distributions for the simulation model.

- (ix) (a) Explain how Sam may use external data and scenario testing for this purpose.
- (b) Describe the issues that Sam may encounter using external data and scenario testing.
- (c) Describe the methods by which the issues identified in part (ix)(b) could be mitigated. [12]

The board believe that simulation methods to model and manage operational risk are excessively complicated for the charity's purpose. They have instead accepted the use of a risk register to help monitor and manage the risks faced by the charity.

- (x) (a) Explain what a risk register is and how it is used.
- (b) Describe the approach that the charity should use to set up the risk register.
- (c) Set up an example risk register containing one risk that would be considered by the charity. You should use 'low', 'medium' or 'high' as the indicators for 'impact' and for 'likelihood'. [10]

Recent economic events have caused a significant reduction in public donations, and a reduction in the value of the reserve fund. The charity is under significant financial pressure and may have to cease operations.

- (xi) Identify, with reasons, three stakeholders that would be impacted by the closure of the charity. [3]

The board has decided to issue a risk appetite statement on the charity's website to enhance public confidence in the charity.

- (xii) Suggest what could be included in the risk appetite statement. [2]
[Total 63]

2 Insurance company ABC is building an economic capital model, which it plans to use to calculate its economic capital.

- (i) Define ‘economic capital’ in the context of an insurance company. [2]
- (ii) Describe how ABC may use its economic capital model. [4]

ABC proposes to use the parameters set out below to calculate the economic capital requirement to withstand a 99.5% 1-year Value-at-Risk (VaR) scenario.

Insurance risk

- 10,000 properties insured, with an average premium received of \$500 per property.
- 90% of the claims are assumed to cost on average \$3,000; 9.5% cost on average \$12,500; and 0.5% cost on average \$450,000.
- The frequency of claims is assumed to be 5%.
- Aggregate claims cost distribution information:
 - The standard deviation of the distribution is assumed to be 30% of the mean aggregate claim cost.
 - The 99.5th percentile of the distribution is assumed to be 2.5 standard deviations away from the mean.

Market risk

| | <i>Market value</i> | <i>Risk charge (%)</i> |
|----------------------------|---------------------|------------------------|
| Equities | 1,500,000 | 30 |
| Government bonds | 500,000 | 2.5 |
| Corporate bonds – rating B | 1,000,000 | 20 |
| Real estate | 2,000,000 | 10 |
| Diversification benefit | | 10 |

Credit risk

| | <i>Market value</i> | <i>Risk charge (%)</i> |
|-----------------------------|---------------------|------------------------|
| Bank deposits – A rated | 2,000,000 | 2 |
| Bank deposits – B rated | 1,500,000 | 10 |
| Debtors within grace period | 1,250,000 | 15 |
| Debtors beyond grace period | 30,000 | 90 |
| Reinsurance recoveries | 562,500 | 2 |
| Diversification benefit | | 10 |

- (iii) (a) Calculate the 99.5th percentile of the cost of claims distribution to show that insurance risk capital calculated using ABC's economic capital model is \$2,301,563.
- (b) Show that market risk capital calculated using ABC's economic capital model is \$776,250.
- (c) Calculate ABC's credit risk capital using its economic capital model. [10]

ABC assumes that insurance risk, market risk and credit risk are not fully correlated and applies a reduction to capital of 20% to allow for diversification benefits.

ABC calculates operational risk by applying a risk capital charge of 2.5% on net premiums, and a risk capital charge of 2% on its loss reserves of \$3.25 million. Operational risk is assumed to be fully correlated with all other risks.

- (iv) Calculate ABC's aggregated economic capital requirement. [3]

One of ABC's board members suggests that insurance risk, market risk, credit risk and operational risk are independent risks.

- (v) Calculate the new economic capital requirement based on the board member's suggestion, and assuming a normal approximation for capital aggregation. [2]
- (vi) Suggest two ways ABC could reduce its capital requirement. [2]
- (vii) Suggest reasons why ABC may hold additional capital, more than required to withstand the 99.5% 1-year VaR scenario. [4]

ABC has identified an investment opportunity. It relates to a single property consisting of five floors as follows:

- The ground floor is rented by a retail store.
- Two floors are rented by the government.
- One floor is rented by a company to which ABC outsources its policy administration.
- One floor is currently vacant.

The current market value of the property is \$3 million. A valuation undertaken 2 years ago gave a market value of \$3.5 million. The asking price for the property is \$2.8 million.

- (viii) Discuss the risks and other relevant factors that ABC should consider when assessing the suitability of this investment. [10]
- [Total 37]

END OF PAPER