Advanced Financial Accounting

An IFRS® Standards Approach, 3e

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Solutions Manual

Chapter 1

Risk Reporting

CHAPTER 1

CONCEPT QUESTIONS

Concept Question 1.1

This is an open-ended question and is specific to the financial institution selected by the student.

Concept Question 1.2

1. Historical simulation is more appropriate than the delta-normal method under the following conditions:

    (i) Future market conditions are an extension of the past as historical simulation is based on historical data.
    (ii) The distribution of returns is non-normal.
    (iii) The distribution has fat tails. The existence of fat tails pose a problem for parameter-based models since VAR is focused on the left tail of the distribution. A fat would mean that the normal distribution underestimate the proportion of outliers and in turn the true value at risk.
    (iv) When the portfolio includes nonlinear instruments such as options and mortgages. Options have asymmetric returns and these are not captured by the delta-normal method. On the other hand, historical simulation allows for nonlinearities.

2. Based on a 99% confidence level and assuming 250 daily observations, the firm would expect to incur losses greater than the VAR estimate for 2.5 days.

3. The firm might carry out stress testing using a worst-case scenario analysis approach. The approach involves the following steps:
    (i) Choose an appropriate short-term period to measure the worst case, for example, a week.
    (ii) Simulate a large number of times (thousands) various possible behaviour of the portfolio in the selected period.
    (iii) For each simulation create a distribution of worst outcomes by incorporating the worst value return for each simulation into a new distribution.
    (iv) After running all the simulations a distribution of worst case scenarios is created. The mean value of this distribution may be used as the worst case scenario.

Concept Question 1.3

Some of the insights are obtained from the article "Value at Risk" by T J Linsmeier and N D Pearson (Financial Analysts Journal, Mar/Apr 2000, 56,2). However, other readings relating to VaR will also be relevant.

1. Advantages of VaR as discussed in the article

    - The advantage of VaR is that it is a single quantitative and succinct measure of market risk for a portfolio. It summarizes the impact of complex risks in a single measure. It is a concise measure of risk.

    - It is a statistical measure and the risk of measurement error can be quantified, unlike descriptive data or opinion-based measures.

    - VaR is used to aggregate different risks in the same portfolio. It is a comprehensive measure of market risks.

    - The concept of VaR is not complex and can be understood by different audiences including senior management, regulators and investors.

    Limitations of VaR:

    - It is a measure of loss arising from "normal" market movements. It does not capture extreme market conditions (e.g. events that fall within 5 to 10 standard deviations from mean conditions – a recent example is the credit crisis of 2007).

    - The historical simulation is restricted by historical trends in market prices and does not capture new and abnormal situations well.

    - Assumed distributions (e.g. the delta-normal and Monte Carlo simulation) may not reflect real distributions of market factors.

    - The reliability of the VaR measure depends on the sample size (the larger the data set, the better the results), the horizon period (a short holding period, e.g. daily to generate a large sample size), assumptions concerning standard deviations and/or correlations.

    - Additional tests, such as stress testing are needed to determine losses outside of the normal range.

    - Source of risks are not evident from the summary measure. Loss of information results from the highly compressed measure.

2. This question tests the understanding of the information required by the three methodologies. The three methodologies are historical simulation, Delta-Normal and Monte Carlo Simulation.

- Historical simulation
  - The historical simulation requires the use of actual data from past periods. As a result, fewer assumptions need to be made about the statistical distributions of the market factors.
  - Works well when options are included in the portfolio.
  - Uses most realistic information but is limited by past trends – difficult to incorporate "what if" scenarios
  - Potentially misleading VaR if the past is not depictive of the future
  - Costly in terms of historical data set (although less costly in computational requirements)

- Delta-normal
  - No past data sets required
  - Assumes multivariate normal distribution
  - Only requires mean and standard deviations of simplified portfolios
  - Possible to include alternative assumptions about correlations and standard deviations
  - Normal distribution assumption is restrictive; not possible to accommodate alternative assumptions about distribution
  - Does not capture portfolio risks well if options are included
  - Less costly than historical simulation
  - Relatively easy to compute

- Monte-Carlo
  - No past data sets required; only hypothetical data sets using pseudo-random number generator
  - Requires a relationship between a portfolio value and a market factor
  - Assumed distribution need not be multivariate normal
  - Captures risks in portfolios that include options
  - Less costly in that historical data sets are not required of portfolio values and market factors; however, the relationship between a portfolio value and a market factor may require historical data.
  - More costly in terms of computational power

3. Combining different risk factors in one summary measure

   - Historical simulation:
     i. Use actual data of market risk factors for past N days
     ii. Determine the change in actual data from (i) above
     iii. Apply the daily historical rate of change of market factors from (ii) to current market factors to determine hypothetical portfolio profit or loss.

   - Delta-normal: If the portfolio has many risk factors, the standard deviation of changes in each risk factor σ, correlations ρ among the changes in risk factors must be determined and incorporated in the variance of the portfolio.

When the variance of the portfolio is computed, the VaR can be determined as follows, assuming a 95% confidence level:

VaR = Mean – 1.65 (Variance of the portfolio)

- Monte-Carlo simulation: Randomly generate hypothetical values of different market factors which are then used to calculate hypothetical marked-to-market portfolio values. These hypothetical portfolio values are subtracted from actual portfolio value to determine the hypothetical profit or loss.

4. Stress testing

   - Stress testing provides information on losses that exceed the VaR threshold. While VaR provides information on losses under normal market conditions, stress testing investigates the effects of market factors on a portfolio, under extreme market conditions, e.g. 5 to 10 standard deviations from the mean.

   - Stress testing also describes the test of VaR under conditions when the assumptions underlying the VaR are violated, for example, when the correlations between market factors are changed.

5. Differences between sensitivity analysis and VaR

   - Sensitivity analysis shows the impact on the value of a portfolio from a x% change in a market factor. It is simple and non-statistical. However unlike VaR, sensitivity analysis is not able to combine the effects of different risk factors on portfolio value. Hence, a risk manager may have to review several sensitivity analyses instead of one VaR that shows the aggregate impact of multiple risk factors on portfolio value.

   - As a result of its non-statistical nature, sensitivity analysis is not able to convey the frequency of the occurrence of the percentage change. VaR, on the other hand, is a statistical measure and provides a quantitative measure of the confidence level of the statistic.

Concept Question 1.4

This is an inference question. Students are to read the article to understand the methodology and determine the judgements and limitations involved in the Z-score.

1. Judgements involved in the Z-score

   - How should distressed firms be identified?
   - What ratios should be used to measure financial distress?
   - Why use financial ratios only and not other non-financial measures?
   - What is the sample size of distressed and healthy companies to be used to determine reliability?

- What statistical technique should be used?
- Should the Z-score be specific to particular industries?

2. Limitations of the Z-score

   - The choice of financial ratios is subjective and intuitive, and not supported by robust theories
   - There may be other non-financial measures that are associated with financial distress that are not included in the Z-score
   - The Z-score is sample- and time-specific
   - The measure is subject to statistical limitations such as Type 1 and Type 2 measurement errors

Concept Question 1.5

1. Importance of related party transactions disclosure

   Related party transactions form part of the normal business process. Many companies operate their businesses through complex group structures and acquire interests in other entities for commercial and investment purposes. Control and significant influence is exercised by companies in a wide range of situations. These relationships affect the financial position and results of a company and can lead to transactions that would not normally be undertaken. Similarly those transactions may be priced at a level which is unacceptable to unrelated parties.

   It is possible that even where no transactions occur between related parties, the operating results and financial position can be affected. Decisions by a subsidiary can be heavily influenced by the holding company even though there may be no intercompany transactions. The disclosure of the related party relationship is still important as a subsidiary may obtain custom, receive favourable credit ratings, and benefit from a superior management team simply by being a part of a well respected group.

   The assumption in financial statements is that transactions are carried out at an arm's length basis and that the entity has independent discretionary power over its transactions. Where related party transactions and relationships exist, this assumption may not be justified. Transactions can be agreed upon terms substantially different from those with unrelated parties. For example, the leasing of equipment between group companies may be at a nominal rent.
   These relationships and transactions lead to the danger that financial statements may have been distorted or manipulated favourably or unfavourably.

2. Beta, Delta and Kappa are all related parties of Alpha because Beta and Delta are under the common control of Alpha and Alpha is deemed to have significant influence over Kappa (by virtue of the 30% interest).

Beta and Delta are also related parties to each other. Beta and Delta are not necessarily related parties of Kappa.

Phi is a related party of Beta as the director controls Phi and is an independent director of Beta (an independent director is deemed to be a member of the key management personnel under IAS 24).

Concept Question 1.6

Considerations are based on paragraphs 5, 8 and 9 of IFRS 8. The consumer, enterprise, digital and corporate segments should generate revenues and incur expenses which are reviewed by the chief operating decision maker for resource allocation and discrete financial information should be available.

The company should also consider the nature of business activities of each segment, the existence of managers responsible for each segment and how the financial information of each segment is reported to the board of directors. The segment managers discuss regularly with the chief operating decision maker the results of the segment.

Concept Question 1.7

The loans granted by entity P to entity T is not a related party transaction because entity T is not an associate of a person who has control over entity P i.e. not an associate of entity Z.

The rest of transactions are related party transactions to be disclosed under IFRS 8.

PROBLEMS

Problem 1.1

(1) PL Banking Corporation faces interest risk on both its variable rate assets and variable rate liabilities and on its fixed rate assets.

A change in interest rate will affect cashflows on its variable rate assets and liabilities. A change in interest rate will also affect fixed rate assets if these are carried at fair values. (Fixed rate liabilities are usually carried at cost and so will not be affected by interest rate changes).

(2) Sensitivity analysis

Note: While sensitivity analysis can be performed for both cash flows and fair value changes, there is not enough information to do a sensitivity analysis for fair value changes. So the computations are for cash flow changes and apply to variable rate assets and liabilities.

	Maturing 20x1	Maturing in 20x2	Maturing in 20x3	Total
Variable rate assets	990,000	480,000	250,000	1,720,000
Variable rate liabilities	-300,000	-680,000	0	-980,000
	690,000	-200,000	250,000	740,000
50 bp increase	3,450	-1,000	1,250	3,700
100 bp increase	6,900	-2,000	2,500	7,400

A disclosure on sensitivity analysis will appear as follows:

A 50 basis points increase in interest rate will increase earnings by $3.7 million.
A 100 basis points increase in interest rate will increase earnings by $7.4 million.

Note: one basis point means 1/100 of a percent. So 50 basis points is equal to half a percentage point.

Problem 1.2

(1) Note the following assumptions for this question.
1) The portfolio is a two-asset portfolio (comprising bonds and equities).
2) The returns on the portfolio are normally distributed.
3) The covariance of returns on the bond and equity is zero.

If returns are normally distributed, we need only to know the expected value of the returns and the standard deviation of the returns to calculate the value at risk.

Long-term investments

		Weight	Expected annual return	Expected portfolio return
Bonds	$ 51,522	13.24%	5.5%	0.73%
Equities	337,514	86.76%	13.8%	11.97%
	$389,036	100.00%		12.70%

Formula for variance of portfolio: (W_1^2 x Variance of bond) + (W_2^2 x Variance of equity) + $2W_1W_2$ x Covariance of bond and equity return

Where W_1 is the weightage of bonds in the portfolio
W_2 is the weightage of equity in the portfolio

Variance of portfolio: $0.1324^2 \times 0.02 + 0.8676^2 \times 0.05 + 2 \times 0.1324 \times 0.8676 \times 0$
$= 0.03798$
Standard deviation = Square root of Variance

Std deviation of portfolio = $\sqrt{0.03798}$

	=	0.1949 (or 19.49%)

The 5% tail on the left is:

95% confidence level	=	0.1949 x 1.65 (from the mean)
	=	0.3216
Value at risk of portfolio	=	Expected return – 1.65 std deviation
	=	0.127 – 0.3216
	=	-0.1946 (-19.46%)

At 95% confidence level, the long-term investments portfolio's maximum loss is -$75,712 [19.46% x $389,066] over a time horizon of 1 year.

Short-term investments

		weightage	Monthly Return	Expected portfolio return
Bonds	$225,637	76.31%	0.2%	0.15%
Equities	70,033	23.69%	1.0%	0.24%
	$295,670	100.00%		0.39%

Note: Assume monthly return is 1/12 of annual return.

Variance of portfolio: 0.7631^2 x 0.005 + 0.2369^2 x 0.025 + 2x 0.7631 x 0.2369 x 0
= 0.004315

(Note: Assume that the variance of expected return is the same for one month and for one year.)

Std deviation of portfolio	=	0.06569 (or 6.57%)
95% confidence level	=	0.06569 x 1.65
	=	0.10838
Value at risk of portfolio	=	0.0039 – 0.10838
	=	-0.1045 (-10.45%)

At 95% confidence level, the short-term investments portfolio's maximum loss is -$30,898 [10.45% x $295,670] over a time horizon of 1 month.

99% confidence level	=	0.06568 x 2.33	=	0.153
VAR (99%)	=	0.0039 – 0.153	=	-0.1491

At 99% confidence level, the short-term investments portfolio's maximum loss is -$44,084 [14.91% x $295,670] over a time horizon of 1 month.

Managed funds

		Weightage	Half-yearly Return	Expected portfolio return
Bonds	$242,766	67.44%	2.4%	1.62%
Equities	117,210	32.56%	7.6%	2.47%
	$359,976	100.00%		4.09%

Note: Assume half-yearly return is half of annual return.

Variance of portfolio: 0.6744^2 x 0.03 + 0.3256^2 x 0.04 + 2x 0.6744 x 0.3256 x 0
= 0.017885

(Note: Assume that the variance of expected return is the same for 6 months and for one year.)

Std deviation of portfolio = 0.1337

95% confidence level = 0.1337 x 1.65
= 0.2206

Value at risk of portfolio = 0.0409 – 0.2206
= -0.1797 (-17.97%)

At 95% confidence level, the externally managed portfolio's maximum loss is -$64,688 [17.97% x $359,976] over a time horizon of 6 months.

99% confidence level = 0.1337 x 2.33 = 0.3115
VAR (99%) = 0.0409 – 0.3115 = -0.2706

At 99% confidence level, the short-term investments portfolio's maximum loss is -$97,410 [27.06% x $359,976] over a time horizon of 6 months.

(2) Long-term investments portfolio with covariance of 0.02

Variance of portfolio: 0.1324^2 x 0.02 + 0.8676^2 x 0.05 + 2 x 0.1324 x 0.8676 x 0.02
= 0.042577

Std deviation of portfolio = 0.2063 (or 20.63%)

95% confidence level = 0.2063 x 1.65
= 0.3404

Value at risk of portfolio = 0.127 – 0.3404
= -0.2134 (-21.34%)

At 95% confidence level, the long-term investments portfolio's maximum loss is -$83,027 [-21.34% x $389,066] over a time horizon of 1 year.

99% confidence level = 0.2063 x 2.33 = 0.4807

VAR (99%) = 0.127 – 0.4807 = -0.3537

At 99% confidence level, the long-term investments portfolio's maximum loss is -$137,613,000 [35.37% x $389,066,000] over a time horizon of 1 year.

Short-term investments with covariance of 0.01

Variance of portfolio: 0.7631^2 x 0.005 + 0.2369^2 x 0.025 + 2 x 0.7631 x 0.2369 x 0.01
= 0.00793

(Note: Assume that the variance of expected return is the same for one month and for one year.)

Std deviation of portfolio = 0.089 (or 8.9%)

95% confidence level = 0.089 x 1.65
= 0.1469

Value at risk of portfolio = 0.0039 – 0.1469
= -0.143 (-14.3%)

At 95% confidence level, the short-term investments portfolio's maximum loss is -$42,281 [14.3% x $295,670] over a time horizon of 1 month.

99% confidence level = 0.089 x 2.33 = 0.2074
VAR (99%) = 0.0039 – 0.2074 = -0.2035

At 99% confidence level, the short-term investments portfolio's maximum loss is -$60,169 [20.35% x $295,670] over a time horizon of 1 month.

Managed funds with covariance of 0.03

Variance of portfolio: 0.6744^2 x 0.03 + 0.3256^2 x 0.04 + 2x 0.6744 x 0.3256 x 0.03
= 0.03106

(Note: Assume that the variance of expected return is the same for 6 months and for one year.)

Std deviation of portfolio = 0.1762

95% confidence level = 0.1762 x 1.65
= 0.2907

Value at risk of portfolio = 0.0409 – 0.2907
= -0.2498 (-24.98%)

At 95% confidence level, the externally managed portfolio's maximum loss is -$89,922 [24.98% x $359,976] over a time horizon of 6 months.

99% confidence level = 0.1762 x 2.33 = 0.4105
VAR (99%) = 0.0409 – 0.4105 = -0.3696

At 99% confidence level, the short-term investments portfolio's maximum loss is -$133,047 [36.96% x $359,976] over a time horizon of 6 months.

The objective of this exercise is to demonstrate the effect of covariance between two assets on portfolio risk The greater the covariance (prices of two assets moving in the same direction), the greater the VAR.

VAR of a portfolio depends on variances, covariances and the number of assets. Lower portfolio risk can be achieved through low correlations or a large number of assets.

Problem 1.3

Since the information given pertains only to business segments, there should be at least 4 reportable segments: Logistics, warehousing, engineering and manufacturing. Each of these segments pass the 10% test for sales, profit and segmental assets.

Consultancy may be excluded since it failed the 10% test (for sales and assets). In terms of profit, if we take the absolute profit/loss figures then it would also not pass the 10% test.

(b) Segment reporting by Business Segments provide information on the relative importance of the reportable segments in terms of sales, profitability, growth rate and risk. If trend information is available, it would provide indications of relative volatility of sales and profit of the reportable segments.

Geographical segments provide indirect information on certain types of risk, for example, political risk, regulatory risk, economic risk.