Chapter 3: Risks in banking

Essential reading

Saunders, A. and M.M. Cornett *Financial Institutions Management: A Risk Management Approach*. (New York: McGraw Hill, 2006) Chapters 7, 10 and 14.

Further reading

Bessis, J. *Risk Management in Banking*. (Chichester: Wiley, 2002) Chapters 2, 4, 5, 6 and 7.

Matthews, K. and J. Thompson *The Economics of Banking*. (Chichester: Wiley, 2008) Chapter 13, sections 13.1, 13.2, 13.4 and 13.6.

Aims

This chapter aims to:

- define the various categories of risk faced by banks and illustrate their main characteristics
- demonstrate the need for appropriate risk management and risk measurement processes
- introduce the key issues arising in risk management and risk measurement, and identify commonly used techniques.

Learning objectives

After studying this chapter and having completed the essential reading and activities, you should be able to:

- describe and evaluate the variety and complexity of risks facing banks
- illustrate and discuss the need for effective risk management tools and systems
- explain the principles of risk measurement
- explain how to evaluate the risk of a given position using the Value at Risk methodology.

Introduction

Taking risks can almost be said to be the business of bank management. Financial institutions that are run on the principle of avoiding all risks will be stagnant and will not adequately service the legitimate credit needs of the community. On the other hand, a bank that takes excessive risks is likely to run into difficulty. Banking risks can be defined and classified in many ways and it is possible to draw up a long list of the types of risks to which banks are exposed. In this chapter we will examine six main types of risk:

- Credit risk is the risk that a counterparty to a financial transaction ('the borrower') will fail to comply with its obligations to service debt, or that the counterparty will deteriorate in its credit standing. Credit risk will also be investigated in detail as a separate topic in Chapter 4.
- Liquidity risk covers all risks that are associated with a bank finding itself unable to meet its commitments on time, or only being able to do so by recourse to emergency borrowing.

- Interest rate risk relates to risk of loss incurred due to changes in market rates, for example, through reduced interest margins on outstanding loans or reduction in the capital values of marketable assets. Liquidity risk and interest rate risk will be examined in detail in Chapter 5 in the context of balance sheet management.
- Market risk relates to risk of loss associated with adverse deviations in the value of the trading portfolio.
- Country risk is associated with the risks of incurring financial losses resulting from the inability and/or unwillingness of borrowers within a country to meet their obligations.
- Solvency risk relates to the risk of having insufficient capital to cover losses generated by all types of risks.

We will also investigate the nature of operational risk, the risk management process and aspects of risk measurement. You should recall the nature of foreign exchange risks and contingent risks, which were covered in some detail in the prerequisite **24 Principles of banking and finance** (or its predecessor **94 Principles of banking**). For an overview of the central role played by risks and risk management in banking, see Bessis (2002) pp.ix–xvii.

Types of risk

Many banking risks arise from the common cause of mismatching. If banks had perfectly matched assets and liabilities (i.e. identical maturities, interest rate conditions and currencies), then the only risk faced by a bank would be credit risk. This sort of matching, however, would be virtually impossible, and in any event would severely limit the banks' profit opportunities. Mismatching is an essential feature of banking business. As soon as maturities on assets exceed those of liabilities then liquidity risk arises. When interest rate terms on items on either side of the balance sheet differ, then interest rate risk arises. Sovereign risk appears if the international nature of each side of the balance sheet is not country-matched. Many of these risks are interrelated.

Credit risk

Credit risk is the most obvious risk in banking, and possibly the most important in terms of potential losses. The default of a small number of key customers could generate very large losses and in an extreme case could lead to a bank becoming insolvent. This risk relates to the possibility that loans will not be paid or that investments will deteriorate in quality or go into default with consequent loss to the bank. Credit risk is not confined to the risk that borrowers are unable to pay; it also includes the risk of payments being delayed, which can also cause problems for the bank. Capital markets react to a deterioration in a company's credit standing through higher interest rates on its debt issues, a decline in its share price, and/or a downgrading of the assessment of its debt quality.

As a result of these risks, bankers must exercise discretion in maintaining a sensible distribution of liquidity in assets, and also conduct a proper evaluation of the default risks associated with borrowers. In general, protection against credit risks involves maintaining high credit standards, appropriate diversification, good knowledge of the borrower's affairs and accurate monitoring and collection procedures.

In general, credit risk management for loans involves three main principles:

- selection
- limitation
- diversification.

First of all, selection means banks have to choose carefully those to whom they will lend money. The processing of credit applications is conducted by credit officers or credit committees, and a bank's delegation rules specify responsibility for credit decisions. Limitation refers to the way that banks set credit limits at various levels. Limit systems clearly establish maximum amounts that can be lent to specific individuals or groups. Loans are also classified by size and limitations are put on the proportion of large loans to total lending. Banks also have to observe maximum risk assets to total assets (see Chapter 2), and should hold a minimum proportion of assets, such as cash and government securities, whose credit risk is negligible. Credit management has to be diversified. Banks must spread their business over different types of borrower, different economic sectors and geographical regions, in order to avoid excessive concentration of credit risk problems. Large banks therefore have an advantage in this respect.

The long-standing existence of the above procedures within banks is insufficient to address all credit risk problems. For example, the amount of a potential loss is uncertain since outstanding balances at the time of default are not known in advance. The size of the commitment is not sufficient to measure the risk, since there are both quantity and quality dimensions to consider. These are among the issues inherent in credit risk measurement and management which are examined in detail in Chapter 4.[1]

[1] *Although beyond the scope of the syllabus and not covered in this subject guide, portfolio credit risk is a further important aspect of credit risk. If you are interested in exploring this area, refer to Bessis (2002) Chapter 14.*

Liquidity risk

Another ever-present risk in banking is the likelihood that customer demand for funds will require the sale or forced collection of assets at a loss. Banks require liquidity for four major reasons:

- as a cushion to replace net outflows of funds
- in order to compensate for the non-receipt of expected inflows of funds
- as a source of funds when contingent liabilities fall due
- as a source of funds to undertake new transactions when desirable.

Liquidity risk relates to the eventuality that banks cannot fulfil one or more of these needs. Banks must ensure that they have a satisfactory mix of various assets or liabilities to fulfil their liquidity needs. The choice among the variety of sources of liquidity should depend on several factors, including:

- purpose of liquidity needed
- access to liquidity markets
- management strategy
- costs and characteristics of the various liquidity sources
- interest rate forecasts.

Seasonal liquidity requirements tend to be repetitive in extent, duration and timing. Forecasts of seasonal needs are usually based on past experience. Because seasonal requirements are generally predictable, only moderate risk is associated with the use of bought-in forms of liquidity to cover seasonal liquidity requirements. On the other hand, liquidity requirements relating to cyclical needs are much more unpredictable. Bought-in funds to provide liquidity needs during booming economic cycles tend to be costly. Credit demands are high during such periods and liability

sources tend to become expensive. They may be limited by the money market's lack of confidence in a bank's ability to repay its obligations and the market may be restricted to only the larger operators. Large banks with broad access to money market sources have few problems during such periods, whereas smaller banks tend to rely on their (less costly) non-bought-in liquid asset holdings.

The longer-term liquidity needs of banks are more complex than the aforementioned seasonal and cyclical requirements. If loan growth exceeds deposit growth, banks must budget for longer-term liquidity. Such net growth can be financed by selling liquid assets or purchasing funds. The major problem with fulfilling such longer-term liquidity demands is that the supply of saleable assets and the amount of borrowing permissible are limited. In addition, a bank should always limit its use of bought-in liquidity, so as to have enough 'borrowing capacity' if future unpredictable liquidity needs occur.

Liquidity risk is often an inevitable outcome of banking operations. Since a bank typically collects deposits which are short term in nature and lends long term, the gap between maturities leads to liquidity risk and a cost of liquidity. The bank's liquidity situation can be captured by the time profiles of the projected sources and uses of funds, and banks should manage liquidity gaps within acceptable limits. This aspect is covered in detail in Chapter 5.

Interest rate risk

Interest rate risk relates to the exposure of banks' profits to interest rate changes which affect assets and liabilities in different ways. Banks are exposed to interest rate risk because they operate with unmatched balance sheets. If bankers believe strongly that interest rates are going to move in a certain direction in the future, they have a strong incentive to position the bank accordingly: when an interest rate rise is expected, they will make assets more interest-sensitive relative to liabilities, and do the opposite when a fall is expected. Assets and liabilities can obviously be mixed to increase or decrease exposures, and techniques such as interest-margin variance analysis (IMVA)[2] are used to evaluate current and project future exposures.

[2] *See Chapter 5 of this subject guide.*

The impact of interest rate changes in the macro economy on the risk exposure of banks is a matter of significant concern to both bankers and regulators. For example, a monetary environment that produces marked interest rate volatility may threaten banking stability. Because banks engage in maturity transformation, unexpected and significant market rate changes may lead to an unacceptable number of banks and other financial institutions encountering difficulties, or even failing. Full awareness of such costs is needed in order to evaluate policy alternatives. At the same time, management needs to understand and manage its own exposure to interest rate risk.

With bank costs and revenues both being increasingly related to market interest rates, the net effects of interest rate changes on bank profits are becoming increasingly difficult to measure. Another important dimension of bank interest rate risk concerns other changes in the bank balance sheet that may be associated with the interest rate cycle. For example, a bank faced with significant profit variance related to market interest rate changes may alter its balance sheet volume and mix of earning assets in order to help stabilise earnings. Although some such volume and mix effects may be initiated by the bank itself, other factors may be external and uncontrollable in a deregulated banking environment. Faced with

this complex set of relationships, the concept of interest rate risk and its measurement is becoming ever more sophisticated.

Banks use the concept of matching to minimise their interest rate exposure. This requires the classification of assets and liabilities according to their interest rates. The aim of such matching is to show how each side of the bank's balance sheet is related to particular rates of interest, and how it is exposed to changes in market rates. There can never be perfect matching, because of three factors:

- Some risk is unavoidable (some interest rates are fixed or quasi-fixed, such as rates on cheque accounts and savings accounts, and these may be considered to be structurally mismatched with respect to variable interest rates on assets).
- Some interest rate risks have to be accepted to accommodate clients.
- There can be no certainty that the banks' borrowing costs in all cases will move in step with market rates.

The interest rate gap (see Chapter 5 of this subject guide for details) links variations in interest margin to variations in interest rates, and is a standard measure of a bank's exposure to interest rate risk.

Market risk

This relates to the risk of loss associated with adverse deviations in the value of the trading portfolio, which arises through fluctuations in, for example, interest rates, equity prices, foreign exchange rates or commodity prices. It arises where banks hold financial instruments on the trading book, or where banks hold equity as some form of collateral.[3] Many large banks have dramatically increased the size and activity of their trading portfolios, resulting in greater exposure to market risk.

[3] *In some countries (e.g. Germany and Japan), banks hold equity as part of their overall investment strategy.*

Bessis (2002) defines market risk more narrowly as the risk of loss during the time required to effect a transaction (liquidation period). This risk has two components, relating to volatility and liquidity. First, even though the liquidation period is relatively short, deviations can be large in a volatile market. Secondly, for instruments traded in markets with a low volume of transactions, it may be difficult to sell without suffering large discounts. Beyond the liquidation period, the risk is of a deficiency in monitoring the market portfolio, which Bessis (2002, pp.18–19) defines as an operational risk (see later in this chapter), rather than a pure market risk.

Regulators are increasingly focusing on requiring banks to measure their market risk using an internally generated risk measurement model. The industry standard for dealing with market risk on the trading book is the Value-at-Risk (VaR) model (pioneered by JP Morgan's Riskmetrics™). This model is used to calculate a VaR-based capital charge.[4] The aim of VaR is to calculate the likely loss a bank might experience on its whole trading book. The validity of a bank's estimated VaR is assessed by backtesting, whereby actual daily trading gains or losses are compared to the estimated VaR over a particular period. Concerns would arise if actual results were frequently worse than the estimated VaR. A bank may measure its specific risk through a valid internal model or by the 'standardised approach'. The latter uses a risk-weighting process developed by the Basle Committee on Banking Supervision.[5] Some banks supplement the VaR estimate with stress tests, which estimate losses under extreme adverse market events.[6]

[4] *Saunders and Cornett (2006) p.259 explicitly link market risk and VaR.*

[5] *Bessis (2002) pp.34–39 covers the rationale for market risk calculations under the Basle I Accord. You should clearly differentiate between the capital requirements for market risk and the capital requirements for credit risk, as discussed in detail in Chapter 2 of this guide.*

[6] *See Saunders and Cornett (2006).*

- Definition: the Value at Risk of a portfolio is defined as the maximum loss on a portfolio occurring within a given length of time with a given small probability.

VaR is currently the most popular tool for risk evaluation.[7] To fix your ideas, consider Figure 3.1 below. Here we plot the probability distribution of the change in the value of a given portfolio. Assuming the portfolio to be well diversified, this distribution should reflect aggregate or market risk only. A bank official wishes to know what the maximum fall is in the value of the institution's portfolio that occurs no more than five per cent of the time. We assume the distribution which is plotted is the distribution of six monthly portfolio returns.

[7] *After studying this section, you should read Bessis (2002) Chapter 7. This reading is also relevant to the discussion of Earnings at Risk (EaR) and economic capital later in this chapter.*

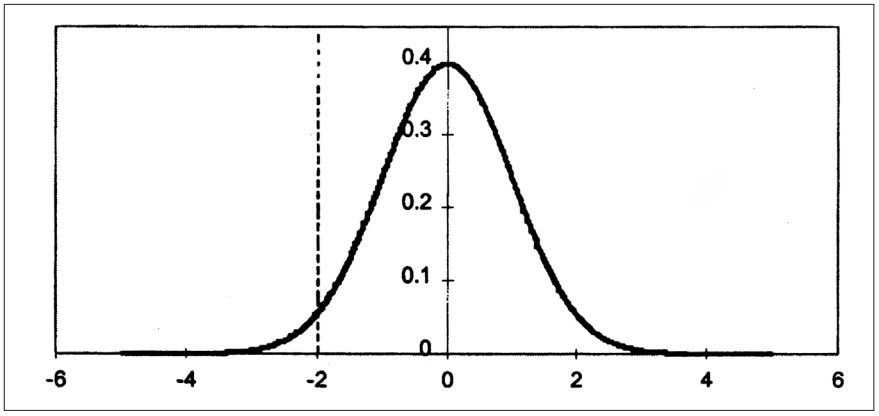

Figure 3.1: Calculation of VaR.

The fact that the official is interested in losses which occur very infrequently implies that we should concentrate on the left tail of the distribution. Further, we note that the official specified losses occurring no more frequently than five per cent of the time. Hence, the VaR of the portfolio is defined as the return which has precisely five per cent of the probability mass to its left. In Figure 3.1, the VaR is shown to be a loss of two per cent of the portfolio's value.

Practically, what we have calculated is the worst event that is likely to happen under unexceptional market conditions. There are, however, two parameters which are user-defined. The first is the horizon over which portfolio returns are calculated. In the above example, the horizon was six months. Clearly, increasing this horizon will increase the probability of a disastrous (or fantastic) return. Hence, the VaR of the portfolio will become larger in absolute terms; in terms of the previous example it may increase to three per cent. The second parameter is the percentage specified by the bank official. If he had originally desired a calculation based on losses occurring no more than one per cent of the time, it is obvious that the VaR would again increase in absolute terms. Hence our perceptions of portfolio risk are greatly affected by these two parameters.

The final issue we should think about when discussing VaR is the accuracy of our VaR estimate. Essentially what we are doing when calculating a VaR is constructing a given quantile from an empirical distribution of returns. The key problem is that the quantile that we are interested in is composed of the very extreme events and, as such, is likely to be the least accurately estimated. For our purposes, however, you need only note that there are difficulties in attaining good VaR estimates.

Large commercial banks, investment banks, insurance companies and mutual funds have all developed market risk models (referred to as internal models of market risk). Three major approaches have been followed:

- RiskMetrics (or the variance/covariance approach)
- historic or back simulation
- Monte Carlo simulation.

Activity

Now read Matthews and Thompson (2008) Section 13.4 and Saunders and Cornett (2006) pp.261–74.

Compare and contrast the relative merits of RiskMetrics, historic simulation and Monte Carlo simulation for developing internal models for market risk.

Country risk[8]

Another type of risk that is important in international banking is country risk.[9] Country risk refers to the ability and willingness of borrowers within a country to meet their obligations. It is thus a credit risk on obligations advanced across borders. Assessment of country risk relies on the analysis of economic, social and political variables that relate to the particular country in question. Although the economic factors can be measured objectively, the social and political variables will often involve subjective judgments.

Country risk can be categorised under two headings. The first sub-category of country risk is sovereign risk, which refers to both the risk of default by a sovereign government on its foreign currency obligations, and the risk that direct or indirect actions by the sovereign government may affect the ability of other entities in that country to use their available funds to meet foreign currency debt obligations. In the former case, sovereign risk addresses the credit risk of national governments, but not the specific default risks of other debt issuers. Here, credit risk relates to two key aspects: economic risk, which addresses the government's ability to repay its obligations on time, and political risk, which addresses its willingness to repay debt. In practice, these risks are related, since a government that is unwilling to repay debt is often pursuing economic policies that weaken its ability to do so.

Many banks have their own unique country-risk assessment system. An effective system aims to signal potential problems before they occur, enabling banks to minimise their exposure to countries with low or decreasing ratings.[10] There are also other organisations that offer country risk assessments, and Table 3.1 illustrates one particular rating system.

Country	Political risk	Financial risk	Economic risk	Composite
Japan	81.0	48.0	38.0	83.5
Malaysia	67.0	42.0	43.0	76.0
Singapore	86.0	45.5	50.0	90.8
UK	89.0	36.0	42.0	83.5
USA	90.0	36.0	42.0	84.0

Table 3.1: Country risk ratings, September 2000.

Source: Table created using data from International Country Risk Guide. www.icrgonline.com

Note: Under this particular rating system, political risk is rated out of 100, whereas financial risk and economic risk are both rated out of 50. The composite country risk rating is equal to the sum of the three constituent risks divided by 2. The higher the score, the lower the perceived risk.

The other sub-category of country risk is transfer risk. This refers to the risk that the sovereign government will be unable to secure foreign exchange to service its foreign currency debt, and also to the likelihood that the sovereign government may constrain or prohibit non-sovereign issuers' access to foreign exchange. The latter would prevent the issuer from meeting its foreign obligations in a timely manner. Figure 3.2 illustrates the linkages among these different elements of risk.

[8] You may find several different definitions of country risk and sovereign risk in the literature. Here, we follow the definitions used by international credit rating agencies (see also Figure 3.2).

[9] You should note the distinction between country risk and foreign exchange (currency) risk, which you covered in the prerequisite unit **24 Principles of banking and finance** *or its predecessor* **94 Principles of banking**. *However, managing foreign exchange risk is addressed in Chapter 8 of this subject guide.*

[10] For full details on implementing sovereign risk analysis, see Saunders and Cornett (2006).

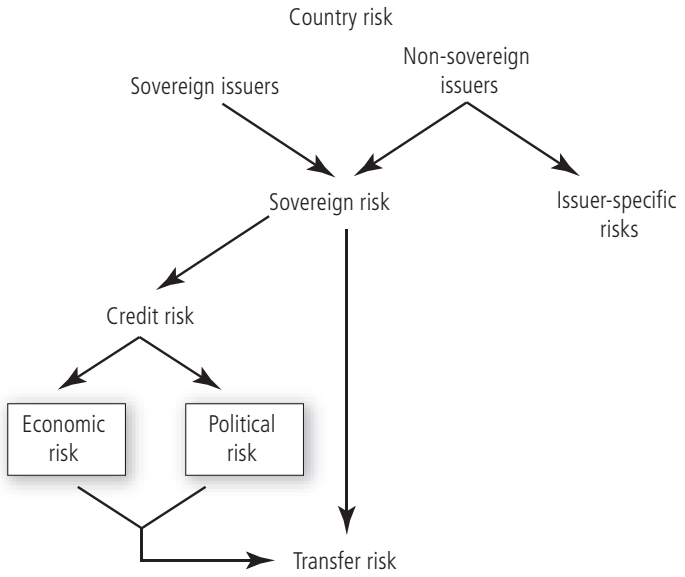

Figure 3.2: Rating agency definition of country risk.

Solvency risk

This relates to the risk of having insufficient capital to cover losses generated by all types of risks, and is thus effectively the risk of default of the bank. From a regulatory viewpoint, the issue of adequate capital is critically important for the stability of the banking system. The regulatory approach to ensuring sufficient capital to minimise banks' solvency risk was discussed in detail in Chapter 2.

To address solvency risk, it is necessary to define the level of capital which is appropriate for given levels of overall risk. The key principles involved can be summarised as follows:

- Risks generate potential losses.
- The ultimate protection for such losses is capital.
- Capital should be adjusted to the level required to ensure capability to absorb the potential losses generated by all risks.

To implement the latter, all risks should be quantified in terms of potential losses, and a measure of aggregate potential losses should be derived from the potential losses of all component risks.

Activity

Read Saunders and Cornett (2006) Chapter 7 and Bessis (2002) Chapter 2.

Now answer the questions on pp.175–77 of Saunders and Cornett (2006).

Operational aspects of risk

Operational risk

Operational risk arises from shortcomings or deficiencies at either a technical level (i.e. in a bank's information systems or risk measures) or at an organisational level (i.e. in a bank's internal reporting, monitoring and control systems). Technical operational risks arise in a multitude of forms (such as errors in recording transactions, deficiencies in information systems or the absence of adequate tools for measuring risks). According to Bessis (2002, p.48), the Basle Committee adopts a standard industry definition of operational risk as 'the risk of direct or indirect loss resulting

from inadequate or failed internal processes, people and systems or from external events'. Chapter 2 explained how the Basle II Accord incorporates measurement of operational risk.

Activity

Now read Saunders and Cornett (2006) Chapter 14, Bessis (2002) pp.20–21 and Matthews and Thompson (2008) section 13.6 for further details on operational risk. For an illustration of the origin and supervision of risks within banking operations, you should read Bessis (2002) Chapter 5.

Summarise the nature of operational risks faced by financial institutions.

A key requirement in managing operational risk at the organisational level is to ensure separation of the risk takers from the risk controllers. This was a fundamental flaw within Barings Bank, which was infamously exploited by one of its derivatives traders and which resulted in the collapse of the bank (see the Mini-case below). Risk takers have an incentive to take on additional risk in order to generate business and profitability, and thus risk should be controlled by a separate unit of the bank. A further important principle is to formulate business rules which create incentives for employees to disclose risks rather than conceal them.

Mini-case

On 26 February 1995 Barings Bank collapsed as a result of £860m of losses accumulated by Nick Leeson, a Singapore trader. Leeson had been successful in the low-risk arbitrage of Nikkei stock index futures between the Osaka and Singapore exchanges. During 1994 and through to the collapse, he took ever larger risks as he attempted to surpass past performance. In January and February 1995, he was effectively making a massive bet that the Japanese stock market would rise. Instead it fell by 13.5 per cent in those two months. Barings lost money in standardised exchange-traded Nikkei stock index futures for which there is an active secondary market, public pricing, efficient clearing, margining systems and daily mark-to-market.

Internal risk management systems are intended to contain individuals such as Leeson, but management failure and the pressure for profits caused Barings' system to be bypassed. Management gave Leeson so much free rein that he both traded and managed back-office operations. Barings appeared to violate many well-known rules of risk management:

- Keep risk management and control independent of trading.
- Be sure top management understands and supervises derivatives trading.
- Establish information systems for reporting positions and risk.

The risk management process

Risk management is both a set of tools and techniques, and a process that is required to optimise risk–return trade-offs. The aim of the process is to measure risks in order to monitor and control them. There are four stages that are usually followed in risk management.

- Identify the areas where risk can arise.
- Measure the degree of risk: this could range from evaluating an individual customer risk to reviewing the risks inherent in a particular sector or industry.
- Balance risk and return trade-offs, and determine prudent levels of total risk exposure by individual, firm, country or business activity, within the agreed level of overall risk.
- Establish appropriate monitoring and control procedures within the bank.

The outcomes of this process have several important functions, including implementation of strategy, development of competitive advantages, ensuring capital adequacy and solvency, aiding decision-making, reporting and control of risks, and management of portfolios of transactions.

Activity

Now read Bessis (2002) Chapter 4 to gain insights into the functions described above.

What are the key advantages for banks arising from effective risk management processes?

The risk management process can be viewed from both top-down and bottom-up perspectives. On a top-down basis, target earnings and risk limits are translated into signals to business units, and then to managers dealing with customers. On a bottom-up basis, monitoring and reporting of risks rises from the transaction level through to aggregate risks. This process facilitates the diversification of risks and aims to ensure consistency with available capital. Bessis (2002) Figure 4.1 presents this structure as a pyramid of risks.

Risk measurement

Recent years have witnessed considerable advances in the quantitative techniques applied to risk management within banks. Quantitative measures of risk are vital for controlling risks and setting limits. Bessis (2002) Chapter 6 classifies the most commonly used quantitative risk measures into the following three categories:

- sensitivity of target variables (e.g. earnings or interest margin) to changes in market parameters (e.g. an interest rate change)
- volatility of target variables, which captures deviations around their mean (both upside and downside)
- downside risk, which focuses on adverse deviations only. This type of measure is expressed as a worst-case value of a target variable and the probability of it occurring.

These different measures address different dimensions of risk. The first category is the simplest measure and the third is the most elaborate. The third category integrates the previous two. Quantification of risks is increasingly achieved through the use of Value at Risk (VaR) and Earnings at Risk (EaR) techniques which belong to the third category above. We will discuss EaR in greater detail below. An illustration of the use of the VaR technique appears earlier in this chapter.

Activity

Now read Bessis (2002) Chapter 6.

Explain the differences between the three categories of commonly used quantitative risk measures.

Economic capital

Economic capital or 'risk-based capital' represents the capital necessary to absorb potential unexpected losses at a preset confidence level. This confidence level reflects the bank's appetite for risk and by definition is also the probability that the loss exceeds the capital, thus triggering bank insolvency. Economic capital is a quantitative assessment of potential losses for the entire portfolio of a bank, and generally differs from regulatory capital (discussed in Chapter 2 of this subject guide) or available capital, in that it measures actual risks.

Regulatory capital is not an effective estimate of economic capital because of (a) the divergence between the actual risks and the forfeits inherent in the calculation of regulatory capital and (b) the additive approach to regulatory capital, which ignores diversification effects. Instead, economic capital is typically defined using the Value at Risk (VaR) methodology (which was discussed above). For the purposes of producing simple estimates of economic capital, 'Earnings at Risk' (EaR) is a practical version of VaR. EaR is not equal to VaR but shares the same underlying principles.

EaR uses the observed volatility (standard deviation) of earnings values as the basis for calculating potential losses, and thus for estimating the amount of capital capable of absorbing such potential losses. In simple terms, EaR implies that the wider the distribution of the time series of a bank's earnings, the higher the risk of the bank. Several measures of earnings can be used, including accounting earnings, interest margins and cash flows. After earnings distributions are obtained, EaR uses loss volatility as the unit for measuring capital (following the same principles as VaR). EaR can be applied to any sub-portfolio as well as to the bank's entire portfolio. However, due to diversification effects, the sum of earnings volatilities across sub-portfolios should exceed the loss volatility of the entire portfolio.

One of the main drawbacks of EaR is that it does not relate the adverse deviations of earnings to the underlying risks, because EaR aggregates the effects of all risks. In contrast, VaR captures risks at their source, and requires the linking of losses to each risk. This is critical from the risk management perspective, because relating risk measures to the sources of risk is a prerequisite for risk management, which aims to control risk before rather than after the loss materialises. Thus, EaR must be viewed as a rather crude additional tool for risk management, rather than as a replacement for the more comprehensive (and sophisticated) alternatives.

EaR will be based on a higher tolerance level than VaR, due to the essential need to maintain the solvency of the bank. The EaR at a given tolerance level is identical to the value of potential loss at the same tolerance level. For instance, if EaR equals 100 at a 1 per cent tolerance level, this means that losses will not exceed 100 in at least 99 per cent of all cases. The associated tolerance level is identical to the default probability of the bank, since if losses exceed 100, then the bank defaults. The lower the tolerance level, or default probability, the higher the EaR for a given level of risks.

Activity

To gain further understanding of the VaR and EaR measures, you should read Bessis (2002) Chapter 7.

Explain the benefits and limitations of VaR and EaR measures.

A reminder of your learning outcomes

After studying this chapter and having completed the essential reading and activities, you should be able to:

- describe and evaluate the variety and complexity of risks facing banks
- illustrate and discuss the need for effective risk management tools and systems
- explain the principles of risk measurement
- explain how to evaluate the risk of a given position using the Value at Risk methodology.

Sample examination questions

1. Critically assess the different risks facing banks, and discuss your views on the relative importance of these different risks.
2. a. Analyse the process through which banks manage the multitude of risks facing them.

   b. Critically review the possible approaches to risk measurement within banks.