Financial Risk Management

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Financial Risk Management

Sources of Financial Risk and Risk Assessment

Peter Moles

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Introduction

This elective course covers one of the core functions of finance, namely risk management.* A large part of the role of finance, the actions of the financial specialist and the operations of the financial department within firms, are devoted to handling, controlling, and profiting from risk. This text sets out to show why and how firms manage their financial risks.

For most kinds of activity, risk is unavoidable as long as the outcome is uncertain. Therefore, taking on risk and handling it is a core management discipline. All major corporate decisions involve choices as to how much risk to take and how best to manage these risks. At its simplest, risk management involves procedures for becoming aware of risks, the methods used to analyse risks, assess their impact, and respond accordingly.

Financial risk management is the activity of monitoring financial risks and managing their impact. It is a sub-discipline of the wider task of managing risk and also a practical application of modern finance theories, models, and methods. The traditional role of finance within the firm has been in terms of reporting and control. The modern approach is to see the financial function as actively formulating policy and directly involved in the subsequent decisions. Financial risk management involves handling those business decisions resulting from financial exposures.

As a subject financial risk management draws on the disciplines of accountancy, economics, management science, decision theory, statistics, and psychology as well as the key principles and methodologies to be found in finance. Before starting, the student is expected to have some prior knowledge of the fundamentals of finance and, in particular, time value of money methods, and a basic understanding of statistical concepts. The level of knowledge required is that which it is necessary to have in order to successfully complete a course in finance.

* The other key functions are valuation and the optimisation of resources across time.

Arrangement of the Course

The modules that go to make up *Financial Risk Management* fall into the following topic areas:

	Topic area	*Modules*
One	**Introduction** The background and basics of risk management	1 and 2
Two	**The Markets** Sources of financial risk from interest rates, currencies, equities and commodities; the nature and structure of financial markets; the asset price generating process	3 to 7
Three	**Risk Assessment** The techniques used to assess, model, manage and control risks	8 to 11

The course starts with an overview of the financial risk management process and its historical development (Part I). A rationale for such activity is proposed based on current financial theories about firms and markets. It then proceeds to an examination of the principal financial risks that arise from interest rates, currencies, equities, and commodities markets (Part II).

The text next goes on to examine methods used to identify, measure and reduce these risks (Part III). In implementing risk management policies, firms seek to quantify the risks they face and the resultant impact on their profits or cash flows. Two separate approaches are covered: the use of quantitative models and qualitative scenario building, and the link between the two is discussed.

In presenting the text in this way, the aim is it provides a comprehensive and logical approach to what is a complex subject.

Approach and Key Concepts

Financial risk management is a holistic subject. The order in which the text is presented follows what may be called the standard risk management model. Whilst this is useful in developing a good understanding of how risk arises and how it is handled, it does have some disadvantages in that material on one subject (for instance, interest rate risk) is presented in modules that do not follow each other. As a result, we would encourage students to look at alternative ways to approach the text.

A basic premise of the text is that it is orientated at the industrial and commercial firm. If anything the typical firm is taken to be a manufacturer with cross-border transactions of various kinds. That said, some sections provide methods that are more suited to financial firms. On the whole the applicability of a technique to a particular type of firm will be self-evident.

As a course, it is largely technique based and emphasises the financial, scientific, or engineering approach to risk management. Whilst this is more appropriate to a course on managing financial risks, the student should be aware that there is an alternative, behaviourist approach to risk. In most cases, this

social science approach provides complementary insights into the sources and treatment of risk by individuals and organisations.

Also financial risk management uses many ideas that are central to finance. For instance, the ideas behind portfolio theory and the mean-variance framework – the use of an asset's expected return, the variance or dispersion is an appropriate measure of the asset's risk – are a key approach to assessing risk. It is the same methodology used in portfolio selection but applied to a different purpose. In risk management it is as if we were running the ideas of portfolio selection in reverse. Even so, optimising the risks in a firm is still an objective.

A key idea to understanding risk is the dispersion or the variance of return.* At its simplest the stochastic process that underlies future asset prices can be seen in the binomial model where for the next period, the asset price can take one of only two states: an increase or decrease. Extending this approach allows one to understand the price generating process for financial assets as well as how derivatives on these assets are priced.*

Once the text has been read and assimilated, one of the key approaches to assessing risk will become evident, namely the measurement of the position sensitivity to the risk factor (usually, the market factor). Sensitivity is a key concept in risk management. Knowing the degree of responsiveness to the source of risk (coupled to its impact) is essential in order to manage the risk. If one might use a medical analogy to help bring home the point. People have different tolerances to outside hazards: sunlight, alcohol, infections, pollutants, irritants, and so forth. Knowing how susceptible one is to chemical irritants is useful when determining the amount of exposure one may take – and the kinds of precautions that might be in order, for instance the need to wear rubber gloves.

To manage risk it is necessary to measure it – accurately. An advertising campaign run by the *Union Bank of Switzerland* (UBS) some time ago promoted their expertise in this area with the slogan: 'Master the detail – manage the risks'. A similar approach is used here. Much of the material presented in the course covers the different approaches used to master the detail of financial risk management. The text introduces ideas at an early stage – for instance much of the conceptual foundation for risk management is given in Module 1 (Introduction) – which are then taken apart and examined in detail in subsequent modules.

* This dispersion is often referred to as 'volatility' by market participants.

* These are the subject of *Derivatives*.

Assessment

As is customary with this programme, you will find self-test questions and cases at the end of each Module. The answers are given at the back. Also, provided are two pro-forma exams of the type it is necessary to pass in order to gain credit from this course. The exam assessment is based on the following criteria:

Section	*Number of questions*	*Marks obtainable per question*	*Total marks for the Section*
Multiple choice questions	30	2	60
Cases	3	40	120
			180

PART ONE

Introduction

Module 1	Introduction
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Module 1

Introduction

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Learning Objectives

This module introduces the sources of risk, together with the methods used to measure it. It starts by looking at the historical background before going on to define risk. It then examines the basic approaches used to identify, measure and reduce risks. Managing risk is a key activity for firms and a range of different

approaches is outlined. Firms may either seek to examine the totality of the risks they face in the aggregate, an approach known as 'top-down'; or build up their exposures from the individual risks, a procedure referred to as 'ground-up'. In practice, many firms use both methods.

The function of risk management is to control the effects of uncertain and generally adverse external developments (or events) on firms' activities and projects. Financial risk management is a more specific activity which seeks to limit the effects of changes in financial variables such as interest rates, currencies and commodity prices.

After reading this module you should be able to understand:

- what financial risk management is designed to achieve;
- the difference between uncertainty and risk;
- the multidimensionality of risk;
- how different attitudes to risk lead to different decisions as to what amount of risk is acceptable;
- the basic approaches used to manage risks;
- the basic nature of the financial risks facing the firm;
- the three key steps used in risk management: risk awareness, risk measurement and risk adjustment.

1.1 Introduction

My introduction to the dangers of **financial risk** arose in the early 1970s when I had occasion to travel to Germany and, in order to have money available, I was advised by my bank to take traveller's cheques. At the time, there was little choice of currency for these and I was persuaded to take US dollar-denominated ones on the grounds that they were the most negotiable. When I got to Germany, I found that each time I cashed my cheques I received fewer and fewer Deutschemarks for my dollars. I was a victim of adverse movements in the exchange rate. I had, unknowingly at the time, been exposed to currency risk. In reality I had taken on considerably more risk than I need have since not only was I exposed to movements in the Deutschemark against the US dollar, I had also exposed myself to the exchange rate risk between sterling and the dollar, a fact I discovered on my return to the UK when I sought to cash in my surplus cheques![*]

This module introduces the basic concepts of risk management and justification for this process. Managing risk is part of any organisation's strategic and operational activities and analysing risks is an important aspect of a manager's job. **Risk management** is the process of monitoring risks and taking steps to minimise their impact. **Financial risk management** is the task of monitoring **financial risks** and managing their impact. It is a sub-discipline of the wider function of risk management and an application of modern financial theory and practice. The traditional view of the financial function has been to see it in

[*] A more detailed discussion of this issue is given in Appendix to Module 1.

terms of financial reporting and control. The modern approach is to consider the financial function in terms of financial policy and financial decision making.

Risk is a constant of the human condition. Everything we do in our lives has a degree of risk attached to it. In living with risk, however, certain potentially high-risk exposures or potential events require us to take corrective action, for instance insuring our life, home and other possessions. In the terminology of risk management, we would be adjusting the risk, that is, reducing the risk to acceptable proportions by hedging, offsetting or possibly eliminating it, depending on the courses of action that were available. The reason we make such adjustment is that this risk is too great for an individual to bear. We may transfer part or all of the risk to those better able to accept it, either by sharing the risk via insurance (as with life assurance policies), or in some cases by finding others who have the opposite risk and agreeing with them to exchange positions.

For instance, a commodity producer who is concerned about investing in production may seek out a buyer and agree to a fixed price. The buyer has an equal incentive to buy the commodity forward, that is, in anticipation of its being needed. Taking such a step will eliminate the risk that the price may have risen of a rise in price before the buyer makes the purchase.* Alternatively, we may change our behaviour to reduce the risk. One (but not the only) reason that companies establish overseas manufacturing subsidiaries is to eliminate currency risk on exports.

Because certain types of risk are unacceptable, a market for exchanging or offsetting risks has developed. Nevertheless, **the risk management process involves choosing those risks to accept; not seeking to avoid all risks.** The latter is impossible.

1.1.1 Historical Background*

There is evidence of risk management activity going back to the dawn of time. There are indications of forward dealing taking place in India as early as 2000 BC; a forward market in grain is said to have existed in Rome and certainly by the Middle Ages risk sharing was widely used. Merchants spread their risks through collective ventures by pooling capital to finance trading expeditions, thus allowing them to diversify their investments. Agreements allowing parties with opposite risks to exchange positions were also becoming common practice. For instance, a forward market in currencies was well established in Antwerp by the close of the fifteenth century. The Antwerp exchange was the original model for Thomas Gresham's Bourse which was set up in 1571 in London, later to be known as the Royal Exchange. By the eighteenth century, in England, thriving risk exchange activity was taking place, with buyers and sellers being willing

* Of course, by buying forward, the buyer forgoes the opportunity to purchase the commodity at a lower price, were it to fall in the meantime. The decision to 'buy forward' – or to hedge – will depend on many factors: the consumer's tolerance of risk, expectations about future price changes, the supply outlook and how much prior price variability (generally known as volatility) there has been or is expected in the future.

* A good discussion of the history of risk management is to be found in Bernstein (1996).

to contract forward to eliminate price and delivery risk on basic commodities.* Since much of the uncertainty arose in relation to imported products, these markets were located at terminal points such as dockyards. The above evidence is testimony to the ongoing nature of the problem presented by risk in human affairs and the willingness of individuals to create arrangements to mitigate its worst effects.

In the nineteenth century, the development of modern risk management techniques took a step forward with the formation of organised terminal or futures exchanges to allow participants to exchange risks on a wide range of agricultural commodities. The United States, because of the economic importance of its large agricultural base, led the way with the establishment of commodity exchanges in New York and Chicago. Soon after, similar terminal exchanges were established in other major trading centres, such as London and Paris.

Financial risk management has always been implicit in the management of the firm. Its recent development as a major management responsibility, however, is the result of two major post-war developments. The first was the collapse of the Bretton Woods agreement following the decision by the United States on 15 August 1971 to stop exchanging dollars for gold at the fixed price of US$35 per oz. From that moment onward, foreign exchange markets became more volatile, a factor which directly affected interest rates and, indirectly, other assets such as commodities, many of which were traded in dollars.* The collapse of the fixed exchange rate system was shortly followed by the first oil shock when the price of oil quadrupled in winter 1973–4. These two events led directly to a demand for instruments to manage these risks.

The increased price uncertainty or volatility that has been seen since the early 1970s has been one of the main driving forces behind changes in financial risk management tools and techniques and the increased choice available to practitioners. Another development encompassed the fundamental changes that took place in the behaviour of economic variables from the mid-1960s. With the collapse of the Bretton Woods agreement, individual countries were able to pursue divergent economic policies, the impact of which was now transmitted through the free floating exchange rate. To combat inflation and to prevent excessive currency depreciation, countries needed to have a more aggressive approach to managing interest rates which, in some cases, were raised to unprecedented levels.

1.1.2 Increased Volatility in Foreign Exchange Rates

Figures 1.1 and 1.2 show changes in the exchange rate of sterling against the US dollar. Apart from the occasional currency devaluation, prior to the breakdown of the Bretton Woods agreement, there was relative stability month on month. After the agreement collapsed increased volatility is clearly evident. Before the collapse of managed exchange rates, exporters and importers could be relatively

* At the same time the life assurance industry, which provided payment against death, also became established.

* This was the time I experienced my lesson in the vagaries of currency movements, as detailed in the first paragraph of section 1.1.

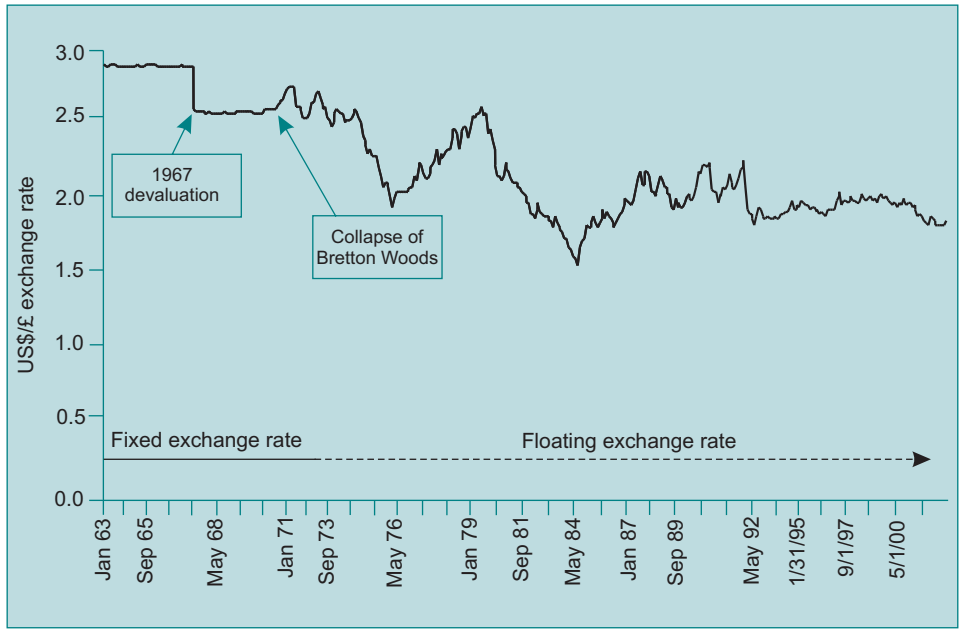

Figure 1.1 **Sterling–US dollar monthly changes in exchange rates**

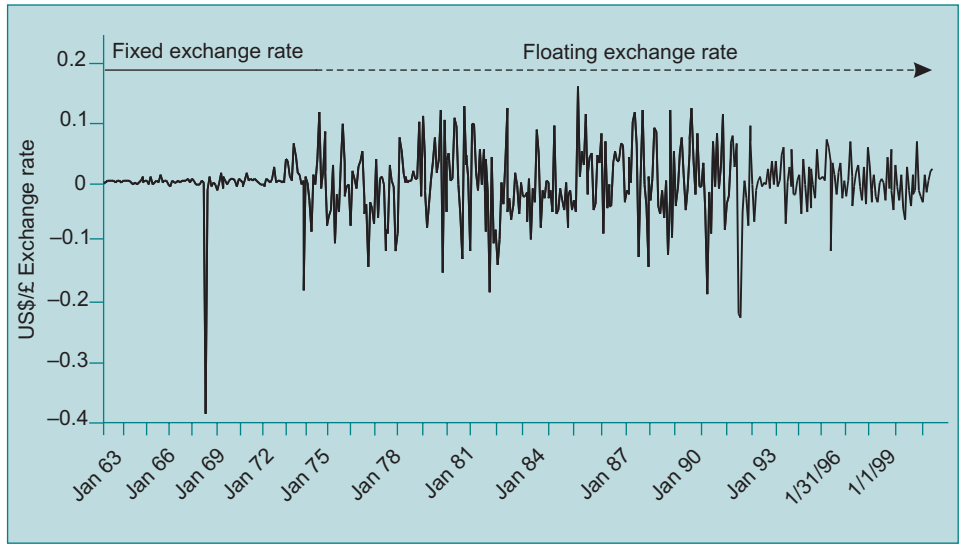

Figure 1.2 **Sterling–US dollar monthly volatility**

Note: The data show month by month first differences in exchange rates.

confident of the prices they would get or have to pay; afterwards, the rules had changed. With a free floating exchange rate, both parties had significant currency risk. Exporters sought to protect themselves by pricing in their domestic currency; importers sought to do the same. By accepting foreign currency prices, one or other party stood to suffer a potential loss if the exchange rate moved

significantly between the time when the agreement was reached and that when the payment was made.

Currency volatility also affects domestic producers and increases their risks. Medium- to long-term changes in exchange rates affecting a country's terms of trade can make foreign producers more competitive relative to domestic ones, thus allowing import penetration. The UK suffered such a change in the 1980s when the exploitation of North Sea oil lead to a significant increase in sterling's value. Many parts of British industry found it very difficult to compete with imports because of the overvaluation of the currency, and suffered long-term damage as a result.

The situation changed again in the late 1980s and the 1990s as the impact of the oil industry on sterling diminished (partly as a result of the dramatic decline in oil prices) and sterling fell to a more competitive level. But the 1990s have seen sterling continue to show short-term and longer-term swings in its external value. Sterling fell precipitately in 1992, having been introduced into the European Exchange Rate Mechanism at the uncomfortably high level of DM2.95 (*see* section, 'The Sterling Experience in the 1990s'). Since 1996, as result of the (undeclared) decision to defer participation in European Currency Union in 1999, this decline has been more than reversed (*see* Figures 1.3 and 1.4).

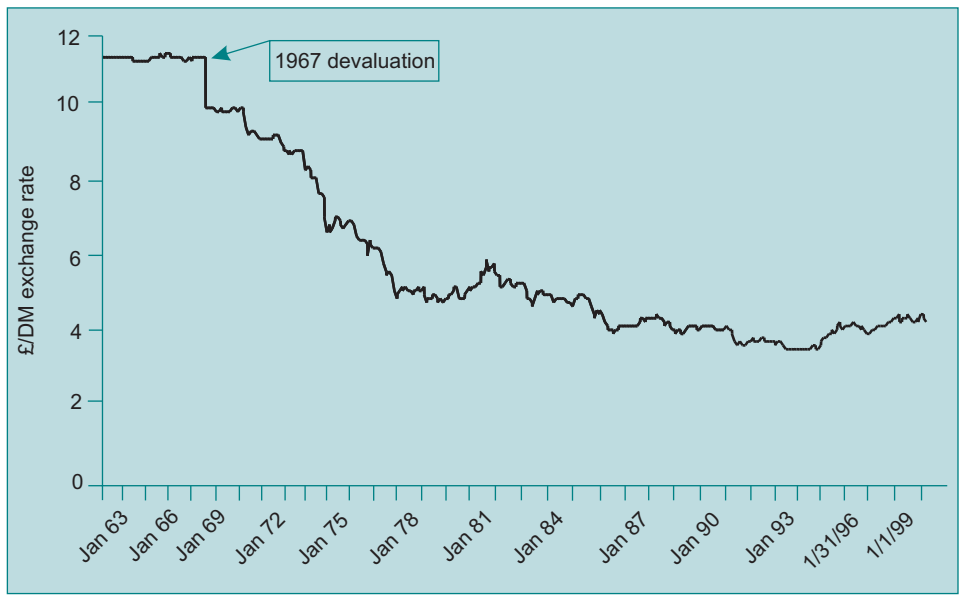

Figure 1.3 Deutschemark–sterling exchange rate

Note: The stronger Deutschemark has risen against the pound (sterling has fallen) with only a few short-term deviations against the trend (such as that in 1996/97).

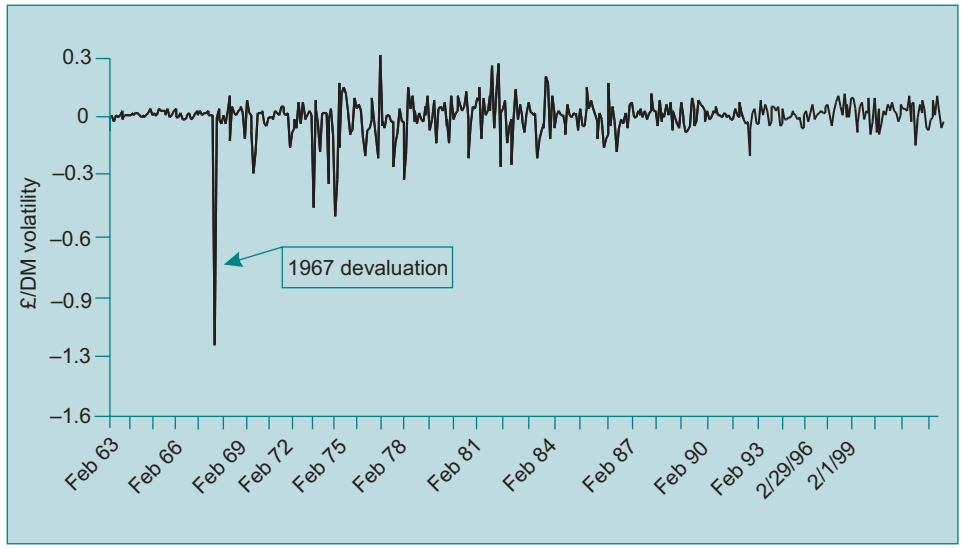

Figure 1.4 **Deutschemark–sterling volatility**

Note: The data show monthly first differences in the exchange rate.

The Sterling Experience in the 1990s

How the value of sterling has fared against other currencies demonstrates the complexities of managing financial risks. Sterling's value has a direct impact on the competitiveness and profitability of exporters and importers. As sterling falls relative to foreign currencies, exports become cheaper and foreign competitors are disadvantaged. At the same time, imports become more expensive and domestic suppliers become more competitive. If the currency appreciates, the opposite conditions hold: exporters are disadvantaged and importers improve their position.

Sterling's behaviour against a basket of currencies, as shown by the trade-weighted index prepared by the Bank of England, shows many of the problems firms face when seeking to manage financial risks. The price history for this index for the 1990s is shown in Figure 1.5. What is evident from the record is that sterling has seen periods of relative price stability, within a longer-term gentle depreciation against external currencies and also times of considerable instability. The time line can be roughly divided into periods of relative price stability and instability, as given below the graph. Notice too that there are two periods when sterling's external value has changed dramatically. The first was the point at which sterling left the Exchange Rate Mechanism (ERM), in September 1992, when within a day it fell 15 per cent. An equally dramatic, if longer, period has been the spectacular rise in sterling's value in 1996/97. From August 1996 to August 1997, the sterling index appreciated by 18.9 per cent – about 1.5 per cent per month! Against some currencies, notably the Deutschemark, the appreciation was even greater: sterling was up 26.2 per cent. Against the US dollar, the appreciation over this period was far less, just 1.5 per cent. This means that exporters to Europe have been badly hit; those to US dollar-linked currencies, less so.

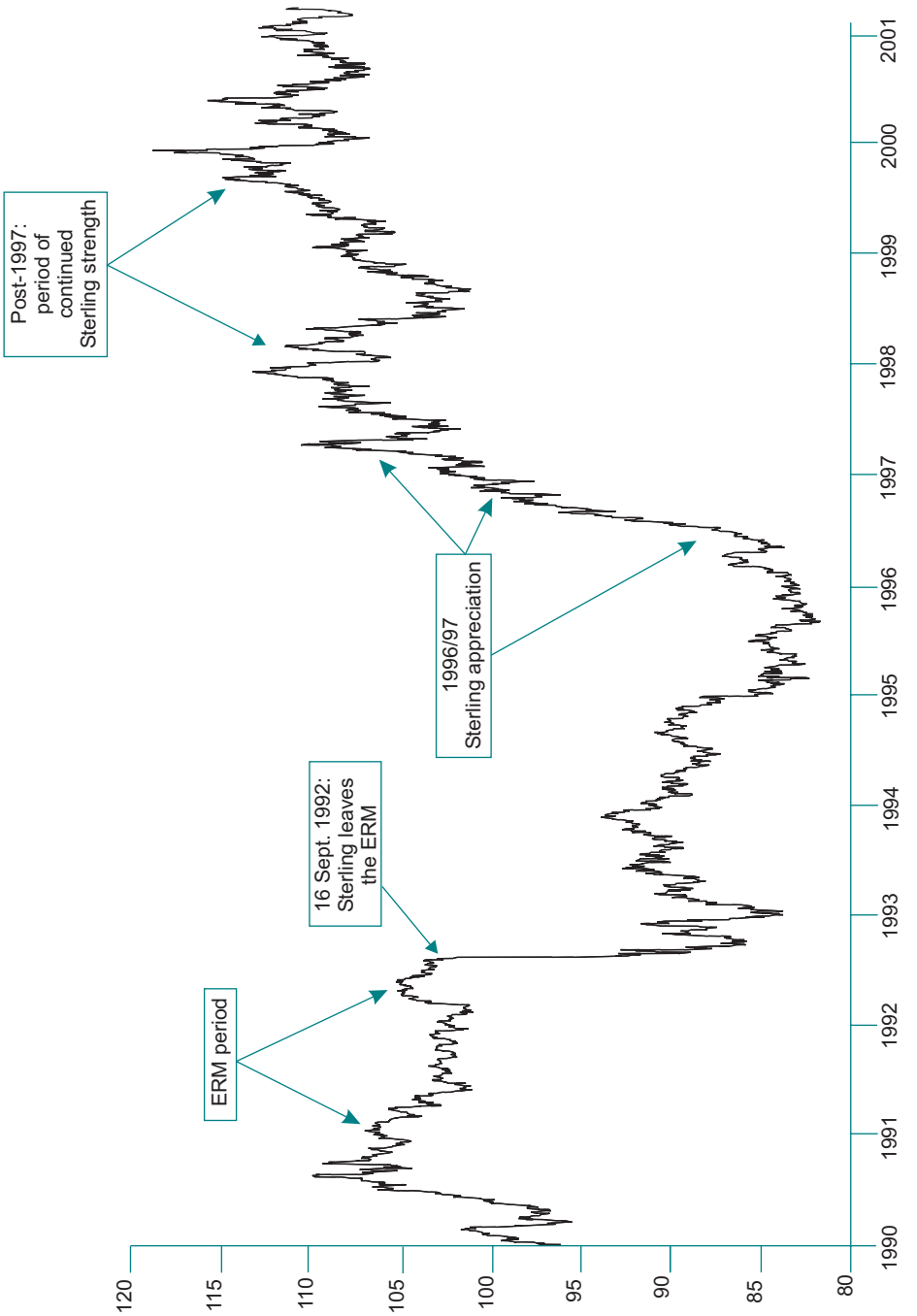

Figure 1.5 Sterling trade-weighted index from 1990 to 2001

Note too that in periods when sterling looks particularly unstable the price trend is somewhat less clear.

In seeking to manage these risks firms faced considerable difficulties. In the period 1996/97, the subject of some of the company reports that are part of this module, companies had to contend with not just a strengthening currency, but an appreciation within a very short time-span. Policies for adjusting prices had to be rapid. One problem, as the longer time series for sterling shows, is that there has been a general expectation that sterling could be expected to depreciate over time. The 1996/97 rise is against the trend, as it were, further complicating management's decision to revise prices and adapt to changing circumstances.

From 1998 to 2001, sterling has remained relatively overvalued compared to its mid-1990s position. This has been particularly true against the Deutschemark and, latterly following the move towards European Monetary Union (EMU), the new composite currency, the euro. Firms which may have expected sterling to spike in 1998 have therefore continued to be disappointed. Firms, particularly exporters, have had to adapt to the new strength of sterling. Firms which have differentiated products have generally faired better than those which produced commodities. One notable victim of the effects of an apparently overvalued sterling-euro exchange rate was Corus, the Anglo-Dutch steelmaker, created by the merger between British Steel and Hoogevens of the Netherlands. It found that it could no longer produce steel in competition with European producers and, as a result, has virtually ceased all UK production of base steels. Even the efficient producers, such as Nissan Motors which has the most productive factory in Europe in its Sunderland plant, have been severely penalised by sterling's high value against the euro. As a result, firms are beginning to make painful changes to their strategies, product mix and productive capacity and location as sterling's exchange rate remains stubbornly high against the currencies of their major markets and competitors.

To some extent, in the short run firms can mitigate the currency risk by undertaking hedging transactions on their future currency receivables and payables. But,
whatever short-term steps are taken, ultimately such wide currency swings will have an impact on corporate profitability and decision making.

1.1.3 *Increased Volatility in Interest Rates*

As with currencies, interest rate volatility also increased as a result of the ending of fixed exchange rates. At first, it was thought that countries would be able to pursue divergent economic policies based on domestic criteria, including monetary conditions and interest rates. However, rising inflation, partly caused by currency depreciation, meant that after some delay, interest rates too became more volatile. This is shown in Figure 1.6, which plots the short-term interest rates in the UK and Figure 1.7, which plots short-term interest rate volatility.

The increased risk had several effects. The fact that borrowing costs, lending rates, bond prices and yields were unpredictable meant that financial institutions were unwilling to enter into long-term fixed rate commitments. In response,

firms increased hurdle rates on investments, required faster payback and sought better ways to manage the risk.

Figure 1.6 Sterling short-term interest rates

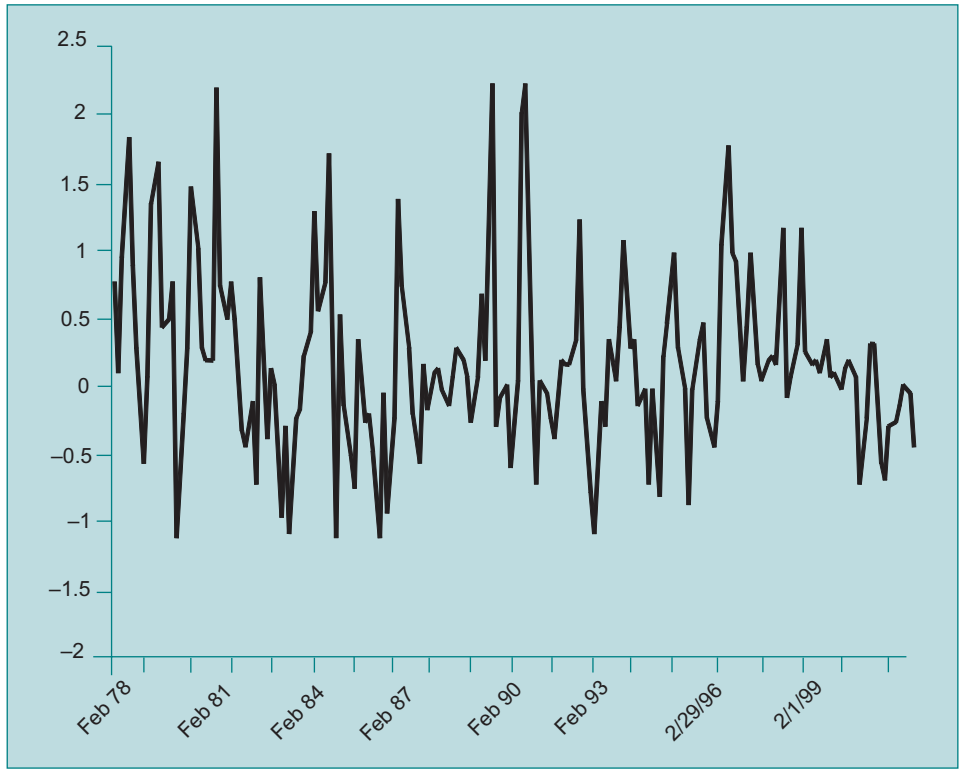

Figure 1.7 Sterling short-term interest rate volatility

1.1.4 Increased Volatility in Commodity Prices

The same increased volatility can be seen in commodity prices. The price of gold, following the US Treasury's decision to sever the link to the dollar, also changed dramatically, as can be seen in Figure 1.8. The volatility picture in Figure 1.9 is even more dramatic, as the price changes month by month suddenly become very significant.

Figure 1.8 **The behaviour of the gold price**

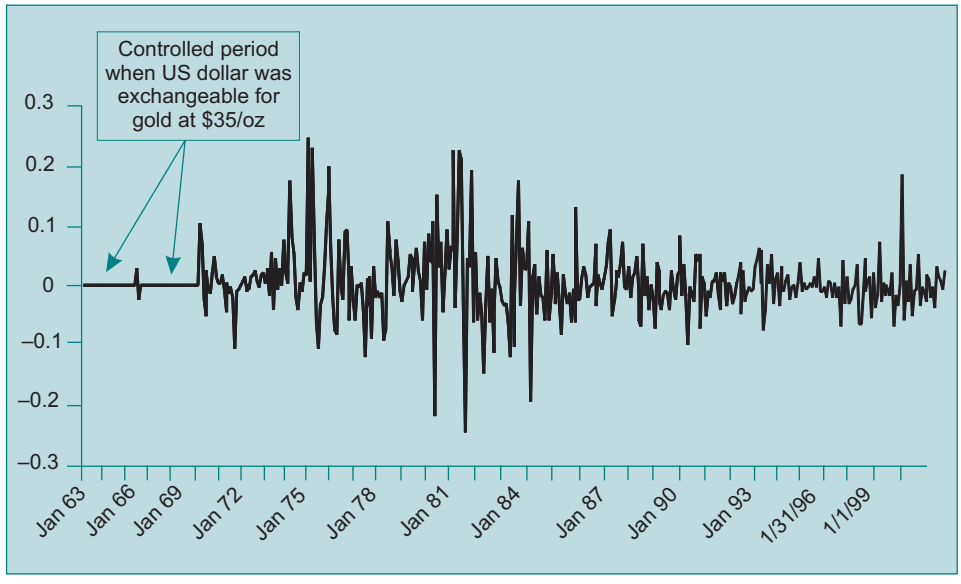

Figure 1.9 **Gold price volatility**

Since the 1970s there have been a number of 'oil shocks' when the crude oil price has risen dramatically and subsequently fallen again, as shown in Figures 1.10 and 1.11

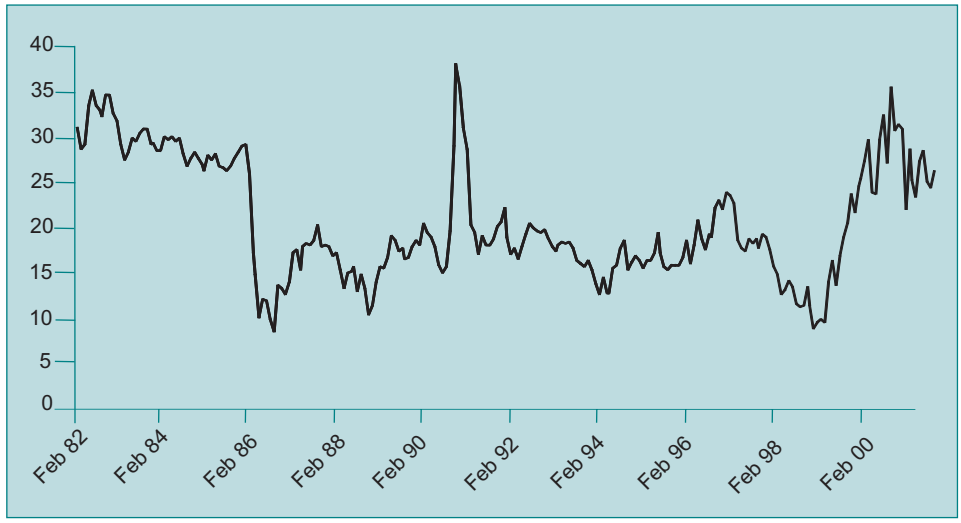

Figure 1.10 Crude oil price

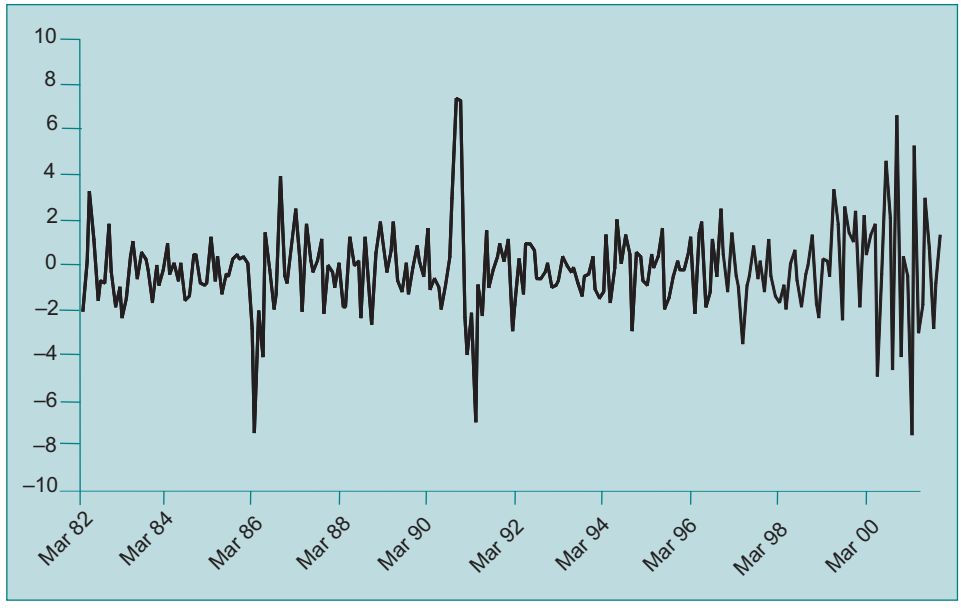

Figure 1.11 Crude oil volatility

1.1.5 Increased Availability of Financial Risk Management Products

Another technical development that was to lead to the modern approach to financial risk management was the introduction in the United States by the Chicago Board Options Exchange (CBOE) of exchange-traded **options** on common stocks (or ordinary shares as they are known in the UK). At the same time the Chicago Mercantile Exchange (CME) started trading **financial futures** contracts on both currencies and interest rates. While over-the-counter options and forward contracts had long existed, they had many disadvantages; exchange-traded instruments promised much greater liquidity, since the risk of default by one of the parties to a transaction was negligible. Because of the methods used to manage trading on these exchanges, these markets are open to all parties, with both firms and individuals able to transact. In addition exchanges, with their large number of competing bids and offers, established robust trading mechanisms. Equally, immediate price dissemination provides transparent and efficient pricing. Forwards and futures, as part of the risk management product set, are examined in detail in the *Derivatives* course text.

An unrelated, but equally important development, that was occurring at the same time, was the seminal work by Fisher Black and Myron Scholes (1972)* on providing a model for option pricing. Their work and that of others in this area has provided practitioners with accurate analytical models for pricing complex, probabilistic products. Options will be discussed in the *Derivatives* course text.

The combination of increased market volatility and the availability of financial instruments for hedging purposes (latterly called derivatives) has led to the development of modern financial risk management techniques. A related development has been the proliferation of new financial instruments, many incorporating one, or more than one, derivative, to alter the pattern of return offered. Some of these have been 'seven-day wonders'; others have created new possibilities for asset and liability managers. The process of building new financial instruments continues, although there is some evidence that the spurt in financial innovation that took place in the 1970s and particularly the 1980s has abated somewhat.*

Industrial and commercial firms have responded to the increased financial risks by seeking better methods to manage these new risks. At the same time, financial intermediaries have sought better ways of helping their clients to reduce or eliminate such risks. It is a dynamic and interactive process where participants' understanding of risk has led to the evolution of new, more specific, hedging methods. Increased technical expertise and experience allow financial

* See also Black and Scholes (1973). The Black–Scholes equation has been described as 'the theoretical workhorse of the financial industry'.

* A good review of the process is found in Miller (1991). He lists four factors that have increased financial innovation:

(i) the move towards floating exchange rates;

(ii) information technology and the developing power of the computer;

(iii) world economic growth; and

(iv) regulation and deregulation as contributory factors to the spurt of innovation in the last twenty years.

engineers to break risks down into constituent parts. Complex exposures can then be reassembled with the undesirable or unacceptable elements removed. For instance, airlines face a range of risks in their business: fuel prices, interest rates, currency movements, passenger load factors and political events. Some or all of these risks need to be managed; in response to the problem, financial intermediaries put together special hedge programmes, such as jet fuel swaps or currency swaps, to provide tailor-made solutions to these and other uncertainties.

1.1.6 New Developments in Technology

In the mid-1960s, International Business Machines (IBM) introduced its 360 series of computers, heralding increased computing power and greater ease of use. Many data-processing tasks which hitherto had to be handled by hand were now automated. In 2001, Microsoft along with computer manufacturers and other software firms celebrated the twenty-fifth anniversary of the introduction of the PC. New developments in information technology (IT) have occurred hand-in-hand with the need for more extensive risk management activity. Many of the developments in financial methodology are dependent on the availability of cheap and fast processing power. Pricing many kinds of derivatives requires the high-speed ability of computers to crunch the numbers. This applies to virtually all aspects of financial intermediaries ability to deliver risk management products. Even an established financial derivative like a foreign exchange forward contract cannot be managed without the support of IT systems. More exotic derivatives require computers to perform iterative simulation or optimisation in deriving a price or the instrument's risk characteristics. A side product to the availability of IT systems has been the collection of enormous quantitites of financial data with which to test the new instruments and develop quantified risk estimates for the sources of risk.

The Effects of Financial Risk

As we shall see, companies are vulnerable to changes in macroeconomic variables. The following examples show how changes in economic factors are affecting corporate performance.*

- **TT Group in trouble because of the strength of sterling**
  The TT Group, a diversified engineering company, issued a profit warning in the summer of 1999 where it blamed the strength of the pound against the euro as the major contributing factor. For the six month period to June 1998 the group had profits of £31 million while the profit forecast indicated the company would have profits of just £20 million for the same trading period in 1999. The full year 1998 pre-tax profits, before exceptional items, was £63.1 million on sales of £620 million.
- **Rio Tinto profits affected by falling metals prices**
  In February 1999 Rio Tinto, the Anglo-Australian diversified mining group in announcing its 1998 financial results indicated that its 1999 results were

* A fuller discussion of the issue of why firms, their managers and investors might be concerned about these effects is deferred to Module 2.

likely to be badly affected by the continued weakness in the prices of most metals. Its 1998 group revenues were £5.56 billion as compared to £5.76 billion in 1997 while pre-tax profits dropped to £910 million from £1.27 billion – a drop of 28 per cent.

- **Allied Irish Banks suffers from low interest rates**

  The 1998 profitability of Allied Irish Banks (AIB) were adversely squeezed, despite a 42 per cent increase in pre-tax profits to Irish punts 826 million, up from I£718 million in 1997, as a result of low interest rates squeezing its net interest margin (the net difference between the rate at which it lends and borrows funds). This fell by 33 basis points (a basis point is one hundreth of a per cent) to 3.33 per cent in 1998. AIB further indicated that, as a result of the introduction of a common interest rate in countries participating in European Monetary Union, a further reduction in margin was to be expected in 1999.

- **Paterson Zochonis suffers from deteriorating credits**

  Paterson Zochonis, the household products group, announced that its first half profits to November 30, 1998 were down to £11.4 million from £14.8 million in the same period the previous year whilst turnover rose by 4.5 per cent to £187.5 million (£179.3 million). The company blamed the fall in profits on difficulties in obtaining payment from eastern European countries and especially Russia.

This example indicates how active risk management can help it to overcome the problems of economic factors:

- **Risk Management benefits Placer Dome**

  The Canadian mining company, and North America's third largest gold producer, reported that its third quarter 1999 results rose by 21 per cent, to US$17 million, despite the weaknesses in the gold price. Its hedging programme had allowed the group to sell gold at an average price of US$338 per ounce, US$79 an ounce more than the average London market price.

  The company indicated that its hedging of its gold product added US$65 million to revenues in the third quarter and US$160 million for the first nine months of 1999. The marked-to-market, that is realisable value, of the company's hedges was US$350 million. Placer Dome stated that half of its production was hedged for the next year. The group estimated it would produce 3 million ounces in 1999. Its hedging strategy would allow it to sell 35 per cent of its gold output at prices of at least US$400 per ounce until the year 2005. The price of gold in London at the end of October 1999 was around US$300.

- **Yen appreciation hits Victor Company of Japan (JVC)**

  JVC, the consumer electronic products manufacturer, reported a net loss of Y4.37bn (US$41.3m) in the half-year to end September, 1999 on sales of Y332.5bn, down some 9 per cent on the previous year. The company indicated that this was due to the strength of the yen coupled to weak domestic demand. As a result of difficult trading conditions, the company

also indicated that its full-year results ending in March would need to be revised downward, given the current strength of the yen and intense competition in the audio-visual market.

1.2 What Is Risk?

1.2.1 Definitions of Risk and Risk Management

A single definition of risk will not serve all risk management purposes. Risk management is carried out in diverse areas such as transport, health and safety, finance, and insurance. In mathematics, there is no single definition for the idea of a number; a similar situation arises in risk management when it comes to defining what risk and risk management are. Each of the disciplines above makes use of the idea of risk in the context of its particular objectives. So for transport, risk is taken to be an accident or damage; for health: illness, injury or loss of life.

The term risk originates from the Italian, *riskare* which means 'to dare'. The dictionary definition either defines risk as a noun, when it has the conotation of danger, hazard, the chance of loss, an enterprise which can lead to profit or loss, the amount of a loss (hence the 'sum at risk'), a gamble or a bet. When used as a verb, risk means to expose oneself to the potential for loss, to make a bet or a wager, to gamble, to undertake an uncertain enterprise or venture. Both uses imply that there is the possibility of gains as well as losses.

There is also a psychological meaning to risk, it is that state of uncertainty or doubt in the face of a situation with beneficial and adverse consequences (gains and losses).

A simple definition of risk which includes the meanings above is:

> 'The chance (or probability) of a deviation from an anticipated outcome.'

The implications of this definition are:

1. We can attach **probabilities** to risks. Therefore it can be measured, estimated or calculated in some way. Risk can therefore be quantified and expressed as a parameter, number or value.

   Risk is concerned not just with the extent or probabilities of potential losses, but to **deviations from the expected outcome**. It is the extent to which the actual result may deviate from that which is expected that makes a situation risky.
2. **Risk is a function of objectives**. It is the consequences of the actual result deviating from the expected result that leads to risk. Without an objective or intended outcome, there is only uncertainty. A rider to this is that risk only arises where the deviation from the objective matters, that is it affects individuals or firms financially, or entails some other adverse consequence.

Within the discipline of risk management, of which financial risk management froms a sub-element, the following additional concepts for risk are in use:

Possibility of a gain or loss

Where there is a possibility of a gain or loss, this is often referred to as a risk. Note that this usage does not necessarily attempt to quantify the degree of loss.

Probability of a gain or loss

This defines risk as the chance or probability of a gain or loss. In terms of risk theory, the probability of an event occurring takes a value that can range from zero to one. An event is impossible if it has a probability of zero; an event is certain if it has a probability of one. Risk will be greatest if the gain or loss making event has a probability of one; that is it is certain to occur. In practice, the probability of loss (ρ) will lie above zero and be less than one, i.e. $0 < \rho < 1.0$.

Cause of loss or peril

Peril is a term used in the insurance industry for the source of a risk. It is the cause of a loss. For instance, a fire, flood, explosion, accident, death, and so on are all perils. In finance, the more common term is **risk factor**.

Hazard

Another term common in insurance. It is a condition or action of the insured party that increases the likelihood or likely magnitude of a loss. There are three common types of hazards:

- *Physical hazard*: the condition of the insured property, person, or operations that has the effect of increasing the likelihood and/or severity of the loss.
- *Moral hazard*: a condition where the insured intentionally seeks to take advantage of insurance cover by either deliberately causing an accident or inflating the value of a loss.
- *Morale hazard*: actions taken by the insured party that increases the likelihood and/or severity of a loss. Moral hazard arises because the consequences of the action are borne by the insurer rather than the insured. For instance, car owners with fully comprehensive theft insurance are less likely to lock their cars when they leave them. Such persons are likely to own more expensive vehicles and experience higher theft rates than individuals who are not similarly insured.

(Note these last two concepts bring in the behavioural aspect of risk.)

Potential gain or loss

The exposure or potential for gain or loss is also referred to as a risk. Practitioners may use the term risk to refer to the values that are exposed to gains and losses. An example is the financial services industry's 'value-at-risk' metrics used to quantify the extend of an expected future loss within a given confidence limit.

Range and variability of outcomes

The actual range of potential outcomes, or a measure of that range (for instance, the variance of a particular set of outcomes), is used to define a particular risk. A more sophisticated approach may specify the the exact nature of the probability distribution (such as the normal or Gaussian

distribution). Finance professionals will often refer to markets as being highly volatile. The term volatility comes from the derivatives markets and is the standard deviation of continuously compounded returns. The intellectual foundation is the mean-variance approach derived from modern portfolio theory and option pricing.

Risk Management

Risk management is the identification, assessment, and decisions made regarding the treatment by an organisation (or an individual) regarding particular risks faced by the organisation (or the individual). It can be a formal process involving procedures, quantitative, and qualitiative assessments leading to review and minuted decision, or it can be informal.

The Three Dimensions of Risk Management

At the level of the economy, risk management makes use of basically two approaches to modifying the level of risk, either risk pooling (sharing) or risk transfer. At the aggregate level the total amount of risk in the economy cannot be reduced but its economic consequences can be modified through sharing its consequences or transferring the risk to another party better able to accept the consequences of the risk. With risk pooling, or risk sharing, the effects of risks are spread among all market participants. Insurance is an example where losses are shared among the pool of insured parties. Risk transfer involves reassigning the risk to another party for a fee. For instance, many industrial and commercial firms transfer their foreign exchange exposures to banks by buying forward foreign exchange contracts. The bank then manages the resultant risks.

In addition, while the process of financial risk management activities may seem complex and this often serves to mask the inherent benefits from undertaking the process, this same apparent complexity also hides the fact that the risk management process has three generic approaches, namely hedging, diversification, and insurance.

Hedging leads to the elimination of risk through its sale in the market, either through cash or spot market transactions or through a transaction, such as a forward, future or swap, that represents an agreement to sell the risk in the future. For instance, the UK-domiciled exporter being paid in euros when the goods are delivered at some date in the future can hedge this exchange rate risk by entering into a forward exchange agreement (with a bank) to sell the euros it will receive at a fixed price and receive a known amount of sterling rather than leave the result to unknown fluctuations in the exchange rate.

Diversification reduces risk by combining less than perfectly correlated risks into portfolios. For instance, while individual borrowers from a bank each represent a significant element of credit risk, for the depositors at the average bank there are virtually no concerns about credit risk.*

* This is to simplify. Of course depositors may be concerned about the financial stability of a bank given other factors such as the competence of its management, lending policy and the level of defaults. Past experience shows that banks can – and do – fail. It is for this and other public policy reasons that banks are regulated and in some countries deposit insurance is provided. But banks thrived prior to regulation.

Insurance involves paying a fee to limit risk in exchange for a premium. For an example, one has only to consider the benefits to be derived from paying a fixed premium to protect against property damage or loss or life assurance in the traditional insurance contract. In doing so, the insurer, usually an insurance company takes on the risk of unknown future losses.

Figure 1.12 illustrates how the relationship between risk modification (through risk pooling and risk transfer) and the generic risk management approaches might work. Any risk management transaction can be mapped onto this template.

	Risk pooling	Risk transfer
Hedging	Risks are not pooled as such, but transactions undertaken which have the economic effect of selling (or transferring) the risk	Risks are exchanged (transferred) from one party to another
Diversification	Risks are placed into portfolios and the aggregated risk is less than the sum of the individual risks	No risks are transferred: risk reduction is obtained through portfolio effects
Insurance	Assumed risks, as in the case of insurance, may be pooled at the aggregate level and hence risk taker may get benefits of diversification	Risks are sold (transferred) from the buyer to the seller. Seller assumes all future uncertainty about value

Figure 1.12 Relationship between risk processes and generic risk management approaches

All definitions of risk share two common factors: the **indeterminacy of the outcome** and the **chance of loss**. That the result is not a foregone conclusion is implicit in any concept of risk: the outcome must be in question. For a risk to exist, there must be at least two possible outcomes. If we were to know for sure that a loss was the result, there would be no risk; we would avoid the situation or accept the consequences. For instance, when we buy a new car, we know that the value of the car will depreciate with age and use: here the outcome is (more or less) certain and there is no risk. The other element of risk is that at least one outcome is undesirable. This is a loss in the sense that something of value is lost or that the gain in value is less than what it was possible to achieve. That is, an asset whose return – or appreciation in value – is less than an alternative would result in an opportunity loss.

Bryan Wynne (1992)* proposes a four-level stratification:

* In Ansell and Wharton (eds) (1992).

1 **risk**, where probabilities are known;
2 **uncertainty**, where the main parameters are known, but quantification is suspect;
3 **indeterminacy**, where the causation or risk interactions are unknown.
4 **ignorance**, where we don't know what we don't know. This refers to the risks that have, so far, escaped detection or have not manifested themselves.

We can define risk as the set of outcomes for a given decision to the occurrence of which outcomes we may assign a probability. Uncertainty implies that it is not possible to quantify the extent of the hazard. It follows, therefore, that with risk, the outcome is unknown but we can somehow define the boundaries of the possible set of outcomes. Risk can be quantified, whereas uncertainty cannot.

To be able to assess risks involves breaking the overall risk down into its component parts. The basic risk paradigm, based on Mccrimmon and Wehrung (1986), is a **decision problem** where there is a choice between only two outcomes: a certain outcome (often the status quo) and an uncertain outcome which is the result of two possible events each of which has a certain chance or probability of occurring, one result giving a profit, the other a loss. This basic risk paradigm is shown in Figure 1.13. The financial equivalents to this risk model are the Sharpe–Lintner Capital Asset Pricing Model (CAPM) in Sharpe (1964) and Lintner (1965) and Ross's Arbitrage Pricing Theory (APT) in Ross (1976).

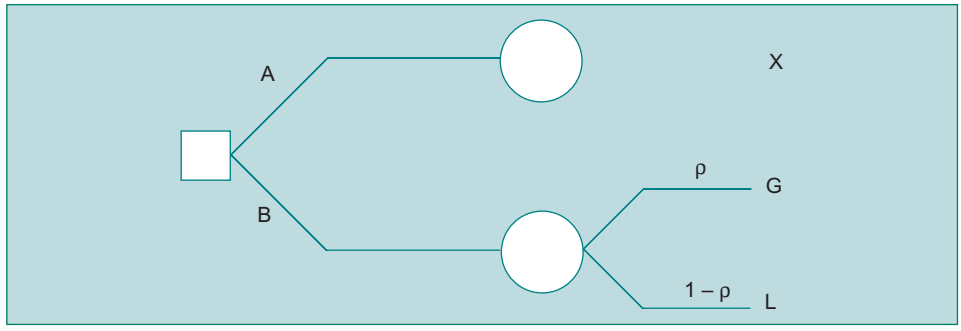

Figure 1.13 Basic risk paradigm

Source: Frank Wharton (1992) 'Risk Management: Basic Concepts and General Principles' in Ansell, J. and Wharton, F. (eds) (1992) *Risk: Analysis, Assessment and Management*, Chichester: John Wiley & Sons.

We face the problem of deciding whether to take on a particular risk. This requires us to calculate the benefits of bearing the risk, which in turn entails balancing the possibility of a gain against the possibility of a loss. It also requires us to establish our attitude to the possibility of a loss if the risky course of action is decided upon. Resolving the problem is a complicated task that often depends on the situation, its context and the knowledge and attitudes of the person or group making the decision. This is because the risk capacity of individuals and groups varies enormously.

In order to resolve the decision problem, the evaluation often takes the form of some **cost-benefit** or **risk-reward analysis**. To do this would require an estimate of the probability (ρ), which forms one part of the resolution to the problem.

However, these probabilities are not sufficient in themselves and have to be integrated into the overall analysis to allow a decision to be made. The **expected value** or **certainty equivalent** approach, as proposed by **decision theory**, can be used to derive a probabilistically weighted average value for the risky course of action. In the case of the risk paradigm above, course of action B would have an expected value (EV) of:

$$\text{EV(B)} = \rho \cdot G + (1 - \rho) \cdot L$$

A more general outcome with n mutually exclusive possibilities would be:

$$\text{E(V)} = \sum_{i=1}^{n} \rho_i v_i$$

where ρ_i is the probability or likelihood of the ith outcome and v_i is its value. Note that the various probabilities sum to unity (that is, all possible outcomes are catered for):

$$\sum_{i=1}^{n} \rho_i = 1.0$$

We can calculate the **dispersion** or **variability** of the range of outcomes as a measure of the risk we take. Again using the basic risk paradigm example, the **variance** in possible outcomes from taking the risk would be:

$$\text{VAR(B)} = \rho \cdot (G - E(V))^2 + (1 - \rho)(L - E(V))^2$$

A situation where there is greater deviation from the expected outcome has a higher risk than one where the deviation is smaller. We will look at how this deviation (or variance) can be defined and measured in Module 7.

Calculating Risk

To see how we might estimate risk, think of the situation when we are throwing 2 dice with the normal one through six on each of the faces. There are 36 possible combinations with values ranging from 2 (snake eyes or double one) through to double 6. The likelihood of any number on a given dice is 1/6. But a little thought will show that the likelihood of both dice giving a one, for instance is $1/6 \times 1/6$ or 1/36. So extreme values of two and twelve are unlikely. A number such as seven (which is also the expected outcome) has a much higher likelihood since a number of different combinations of values from dice can add up to seven: 1 + 6; 2 + 5; 4 + 3. The likelihood is in fact 6/36 or 1/6. For risk management purposes, we want to know the possible deviation from the expected outcome. We want to know the distribution of the outcomes. A histogram of the possible values of the two dice and their frequency is given in Figure 1.14.

In quantifying the risk, we can first calculate the expected value of the two dice. This is seven. Given this, we can now calculate the variance and standard deviation using the quantification formula above:

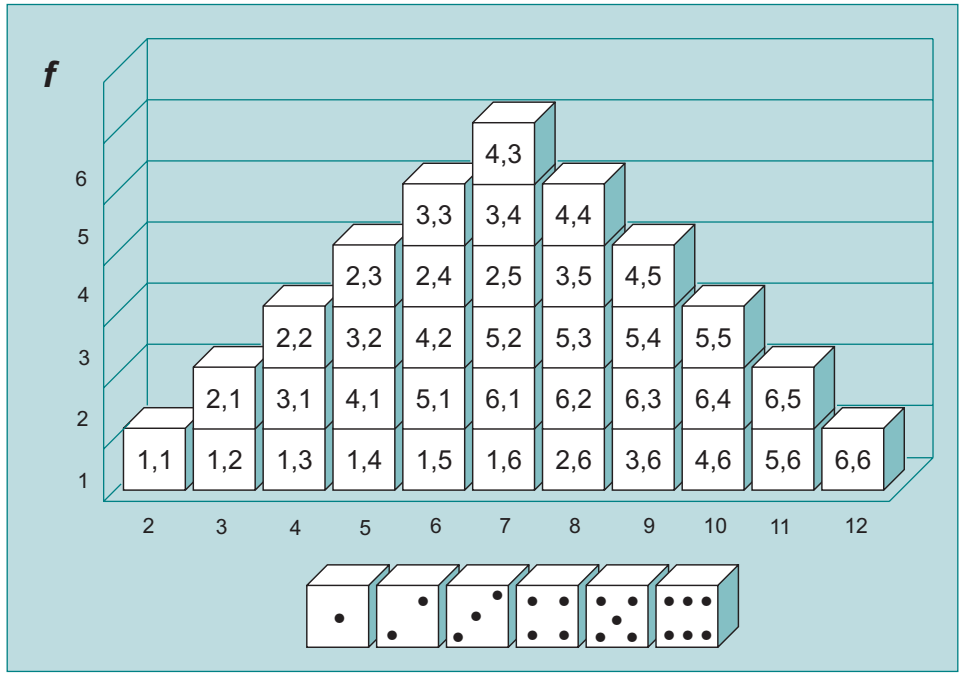

Figure 1.14 **Histogram of outcomes for two six-sided dice with faces with values of one through six**

$$\text{Variance} = \sum_{i=1}^{11} \rho_i (X_i - E(X))^2$$

This gives values for the variance and standard deviation for the two dice of 5.83 and 2.42 respectively.

Now let us look at another example of dice similar to the one above, except in this case the dice are what are known as average dice. These dice have values which are closer to the average of a normal dice (which is 3.5) and are numbered 2, 3, 3, 4, 4, and 5. The histogram of outcomes is given in Figure 1.15. A comparison of Figure 1.14 for the normal two dice outcomes and that of Figure 1.15 for two average dice outcomes shows that the spread of possible outcomes and their likelihood is very different. Whereas the normal two dice, the average value 7 is expected in 6/36 cases, in the average dice it occurs 10/36 cases. Also the likelihood of getting outcomes close to the average (namely six or eight) is much higher in the average dice case.

As with the normal dice, we can calculate the spread using the variance equation. This gives 1.83 for the average dice variance and 1.35 for its standard deviation.

What the two statistics do is provide us with a metric for measuring the relative riskiness of the two situations. A glance at the two histograms will immediately show there is a greater chance of significantly divergent outcomes for the normal dice. For instance, the probability of getting an outcome more than two values away from the mean (in either direction) for the two cases is:

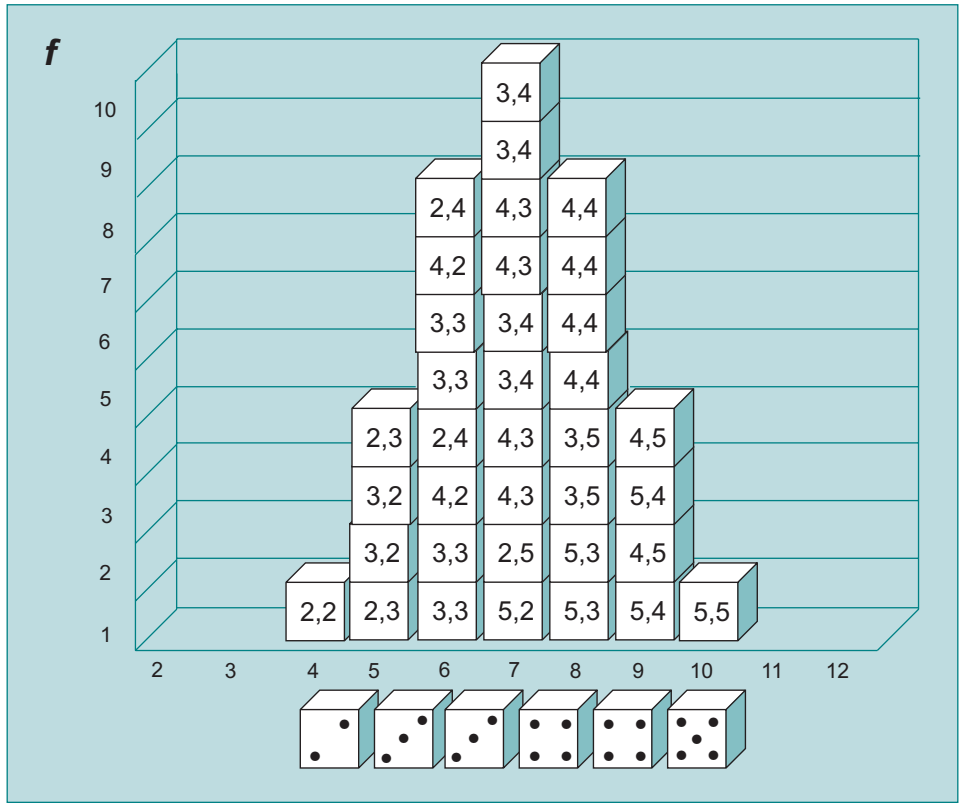

Figure 1.15 **Histogram of outcomes from two average dice with faces with values of 2, 3,3, 4,4, and 5**

Normal dice: 0.33

Average dice: 0.06

We can use the variance or standard deviation statistic therefore as an objective measure of risk for comparison purposes.

In practice we are more concerned with adverse than positive results (that is, we concentrate on the **downside** element of risk in any given situation). However, risk taking is as much about opportunity as it is about loss, although such risk taking is often equated with gambling or speculation. It is thus correct to consider **risk reward**, this being the trade-off between the risk being taken and the expectation of reward, as do many financial market practitioners, rather than purely focusing on risk elimination.

Risk is multidimensional. Any given situation may have a number of different risks, some of which may be related. Typically in financial markets we concentrate on **price risk**,* that is, the risk that prices may change; but other related risks exist, for instance, **liquidity risk**. Liquidity risk arises from the

* Which is also known as market risk.

problem that there may not be a willing buyer (or seller) on the other side of a given transaction at a price close to the previous recorded transaction within a reasonable time-frame.* Although price risk and liquidity risk are distinct, they may interact: there will be more price risk in an illiquid market since the time required to execute a transaction may be greater and the market price may shift significantly in the meantime.

We will use the term **risk factor** to describe any single particular risk. A given risk will thus be made up of one or more risk factors, the sum of which is the **total risk**. Given that risks are complex, some of these risk factors might actually be mutually offsetting. For instance, inflation and interest rates are highly correlated – that is, they tend to move together. Thus a combination of increases in both factors may not be the sum of the two risks in a given situation. An organisation, for instance, may be able to benefit from inflation by increasing prices which will, to some extent, counteract the effects of higher interest rates. Whether the combined risk is beneficial will depend on how the two factors interact. Module 9 looks at how we can integrate the different risk factors or exposures mathematically using portfolio theory.

One way of understanding the effects of a risk is to establish the **risk profile** of a given exposure. The risk profile is the sequence and direction of the payoffs that can be expected in the future, given the risk, as shown in Figure 1.16. It will also show us, as with a payoff diagram, the relationship between the risk and the gains and losses from the risk factor. The slope of this relationship shows the sensitivity of the position to the underlying risk – an idea we will return to frequently (*see* the slope in Figure 1.16). Equally, we can also determine how well the exposure correlates to the underlying risk factor.

We need to extend our analysis slightly. We may face risks, but in practice organisations manage their **exposures**. To understand the difference, we need to introduce the concept of **materiality**. There may be very great risks in certain circumstances, but if they are immaterial to the specific organisation, that is, insignificant economically, our attitude to such risks will be different from what it would be if they were likely to have a serious impact on the organisation. For instance, an organisation with a £100 million turnover and a foreign exchange transaction exposure of £100 000 is not likely actively to manage this risk since in the overall context of its business such a sum is not important. It hardly warrants much management time devoted to the problem. Managers will therefore weight risks by their materiality to derive a firm's **exposure** to a particular risk. The analysis in Table 1.1 illustrates the process of weighing risks to obtain exposures.

The organisation will want to manage the large exposure which has a 50 000 value at risk, but will devote only minimal time to the small exposure. To do otherwise is to misuse management time and effort. Material is, in this context of course, a relative term. Organisations should manage the absolute values at risk in relation to their overall objectives.

Thus material exposures, which we do want to manage, are the risk factors

* Note that, as with most financial terminology the term is somewhat imprecise. Liquidity risk has other meanings, like the ability of a company to meet maturing obligations from available (liquid) assets, or for a company to raise funds when required.

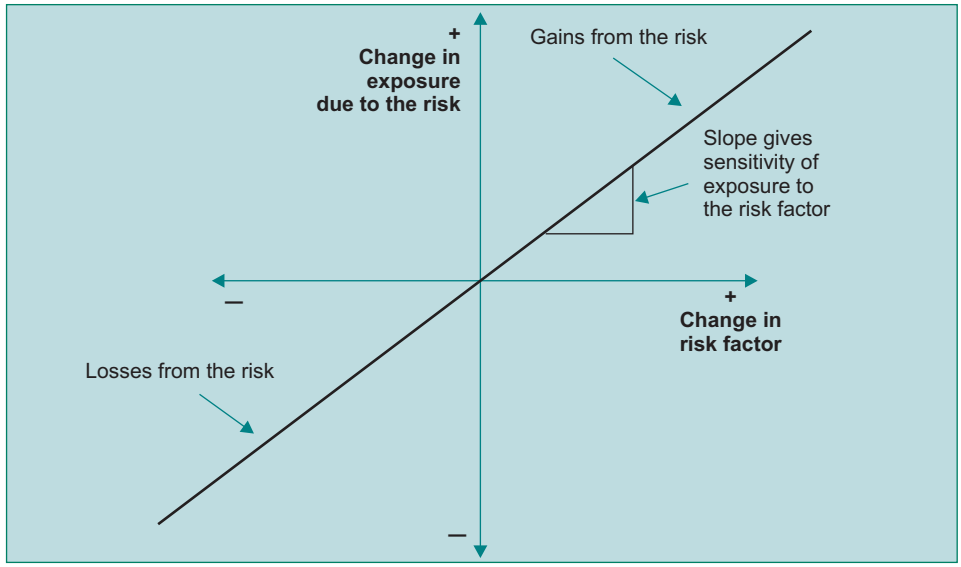

Figure 1.16 **Risk profile and sensitivity of an exposure to a risk factor**

Table 1.1 **Risk and exposure**

Potential degree of change in variable (risk)	*Amount of the variable exposed (total amount at risk)*	*Value at risk*
(i)	*(ii)*	*(i) × (ii)*
−5%	1 000 000	50 000
−5%	25 000	1 250

Note: Value at risk is a measure of the value loss or gain that arises from the potential change in the risk based on the exposed amount.

times the total amount at risk in relation to the whole. A further examination of Table 1.1 shows that, if the potential degree of change in the variable had been only 0.5 per cent, then the amount at risk would have been 5000. It is the combination of change in the risk factor and the amount of the exposure that creates materiality. Of course, we can argue about what is material in a given context. For an individual, the orders of magnitude are much smaller: 500 might be a large loss to an individual and consequently quite material.

One of the decisions to be made by a particular organisation is what constitutes materiality in the context of the business, given that any time devoted to managing such an exposure will involve a cost. Different organisations will arrive at different decisions in this regard depending on their **attitude to risk**. A key policy decision facing any organisation is on how great an exposure it is prepared to assume. Economists generally define individuals' and organisations' attitudes to risk as **risk averse, risk neutral or risk seeking (risk taking)**.

In determining the amount of risk being assumed, we may also be helped by the lack of correlation between the different types of risk. As with a portfolio, the benefits of diversification come to our rescue with bad and beneficial consequences cancelling each other out in most instances. The organisation's 'portfolio of risks' is likely to be, in the main, self hedging. However, an organisation's

risk manager would nevertheless want to check that this is the case. In the main, it is the excess of the risks in the portfolio that needs to be managed.

We must also distinguish between risk, which is manageable and uncertainty, which is not. Just to confuse matters, financial literature sometimes uses uncertainty to mean the same as risk! Risk is the impact of events the occurrence of which is predictable but the exact form of which is unpredictable. For example, with risk we can predict a range of potential outcomes within which the actual outcome will occur. Uncertainty is the impact of completely unpredictable events. In an uncertain situation, we cannot make forecasts about the range of outcomes. Although uncertainty is not amenable to quantifiable forecasts, it can be handled within a generalised risk management framework. Risk managers will seek to build in **flexibility, resilience** and **redundancy** within an organisation to cope with these events. Such forward planning involves qualitative forecasts, scenario building and other similar methods to ascertain the nature and scope of the impact of future, uncertain developments. An example of such planning is the requirement for US banks to have duplicated data processing facilities that can be brought on-line in the event of a disruption of the main installation. As a general precaution, organisations routinely prepare contingency plans for unpredictable events such as product tampering or contamination, or systems failure. Equally, at the macro level, situations like a war breaking out or civil strife are foreseeable, but impossible to predict.

The principal point is that, as we move from frequently occurring events to the less common ones, there is a gradual reduction in our ability to calculate accurately the chances of different events taking place. Since we largely base the future probability of such events on their past occurrences (and making any reasonable adjustments for the future), we need a database of such occurrences on which to build our analysis. We can rely on statistical assessment methods for events that occur very frequently but will need to use alternative methods for events that occur less frequently or potential discontinuities between the past and the future.

It may be argued that there is plenty of evidence that war, for instance, is a fairly common event. We are aware that such a risk exists, but due to the complexity and variability of the factors that are likely to lead to war's breaking out, we cannot predict such an event with any degree of confidence. It is inherently uncertain. On the other hand, we can predict with a great deal of confidence that about 3000 people will be killed in road accidents in the UK in the next 12 months. This is risk. That said, it is a remarkable fact that many low-frequency events are amenable to quantification through sophisticated statistical inference techniques, even if the estimate itself should be subject to considerable uncertainty. Examples of such calculations are the safety estimates for nuclear power stations. However, in analyses of these rare event, the process by which the result is achieved is often more informative than the numerical estimate. In addition, there is strong research evidence that people tend to disregard undesirable low-probability outcomes and, likewise, to overestimate desirable ones (as with gambling).

Analytic techniques which are useful for high-frequency events may not be suitable for examining rare occurrences. This is a point which will be taken up

later. Risk management does not, therefore, restrict itself to a single analytical approach; rather it makes use of a wide variety of techniques from finance, statistics and the management sciences. It would be wrong to see financial risk management as embodying one particular methodology although, as we will see, there is a logical approach to risk management which is widely used by risk managers whether in finance, industry, commerce or government.

1.2.2 The Risk Landscape

As previously stated, the risk landscape is multidimensional. Different management and administrative disciplines have to confront the problems of risk: health and safety, transportation, public policy, the environment, technology, science, firms and many other areas are involved. There are a number of different ways of laying out the different risks facing an organisation. One such way of looking at risks is shown in Figure 1.17.* Two important conclusions can be drawn from this approach.

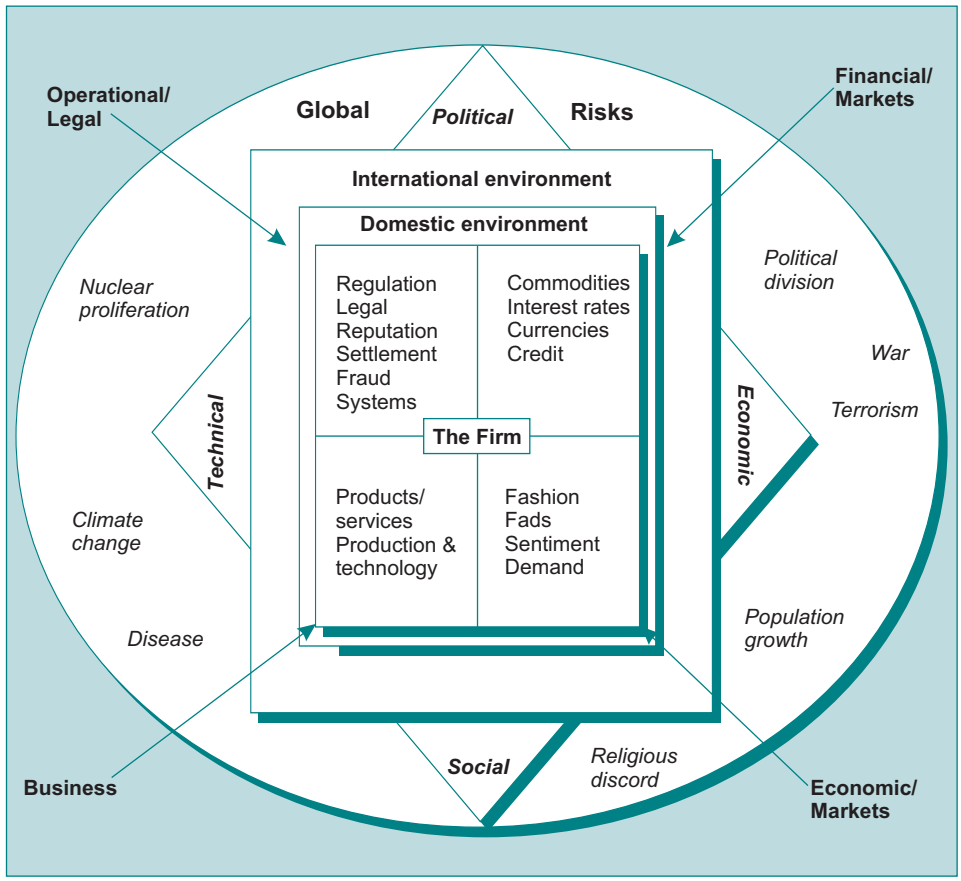

Figure 1.17 A topography of corporate risk

The first is that financial risk management is only one aspect of risk. Although this course concentrates on financial risk management, the approaches used to manage financial risk may be applied to other aspects of an organisation's activities. The second is that although the material covers the top right-hand quadrant, the other quadrants impact on financial risks. Ultimately, everything connects with everything else. The objective of risk management is to control

* Other modules will show other ways to categorise risks.

risks in such a way as to allow the effective operation of the organisation within its capabilities and resource constraints.

1.2.3 Risk Management

Organisations have no choice in managing risks. If an organisation has a sensitivity to a particular kind of risk due to the activities it pursues then changes in this risk factor will change the current and future cash flows of the organisation. Organisations have to choose what objectives to pursue in handling these exposures. The basic risk management premise is to have more of the good and less of the bad. The key management task is to balance the desirable objective of risk reduction with the costs of so doing. We will examine why organisations manage risks and what these risks are in detail in the next module. Typically, the organsation will want to be confident that changes in the external environment do not affect its objectives. As the next section indicates, the organisation is likely to have a multiple set of objectives that it will seek to pursue in handling its various exposures.

Objectives of Risk Management

In seeking to manage risk, individuals and organisations need to define some objective or a set of objectives in deciding how, when and what to do about risk. A common goal for firms is to increase shareholder value. That is, the object is to increase the value of the firm through increasing the present value of its future expected cash flows. In normal circumstances, in pursuing the goal of increased shareholder value, firms are likely to evaluate risk management decisions on the basis of two criteria: the **costs of reducing risk** and **setting risk levels at an acceptable level** – that is, in line with the particular firm's risk appetite or risk tolerance. In essence firms will be evaluating risk on the basis of cost-benefit criteria. The cost of risk management relates to the price to be paid for risk control, be it via insurance, management time, lost opportunities from hedging, and so forth. Firms will want to economise on these incidental expenses of being in business. In doing so, firms will want to arrive at an acceptable level of exposure in order to allow managers to focus on the core activity of value creation and not to be preoccupied by the nature, extend and consequences of the risks in the business to the exclusion of its value enhancing objective.

The situation is different once a major loss has occurred. At this point, the objectives of risk management change. The overriding objective becomes survival. In such a situation, the results of excessive risk are likely to significantly jeopardise the firm's survival. In such a situation, firms will be looking to creating a stable set of earnings and, where the loss has been a physical one, such as a fire or damage to plant and equipment, the ability to continue operations. Lastly, the firm will be concerned about its future growth prospects and development. The objectives of risk management are thus different, depending on the firm's development and recent history.

Hence, since the nature of the firm's objectives is changed by a major loss, to the possible detriment of its fundamental objective, avoiding the loss becomes in itself a desirable objective.

Of course, concerns such as satisfying externally imposed obligations, for example health and safety regulations, employment law, and so on, as well as meeting issues of good corporate citizenship, will be applicable both before and after any serious loss.

Summary of pre- and post-loss corporate objectives

Pre-loss Enhancing Shareholder Value	Post-loss Survival
Objective is achieved by:	Objective is achieved by:
• Cost-benefit analysis with emphasis on costs of reducing risks	• Maintaining earnings stability
• An acceptable level of worry and anxiety so as not to distract from core objective	• Restarting and maintaining operations
	• Continued future growth
Social responsibility Satisfying externally imposed obligations	

Enhancing shareholder value: a criterion for decisions about future courses of action that recognises the value-maximisation objective for the firm's managers;

Survival: the ability of the firm to continue in operation in spite of sustaining a loss;

Cost-benefit analysis: evaluative technique that seeks to balance the benefits of risk management against the costs;

Acceptable level of worry and anxiety: corporate attitudes to risk-taking such that the risks being accepted do not detract from the pursuit of the overall business objective;

Earnings stability: keeping earnings within acceptable bounds;

Maintaining operations: restoring normal operations with the minimum of delay after a loss;

Continued growth: ability to take advantage of growth opportunities;

Social responsibility: the firm will be a good citizen;

Satisfying externally imposed obligations: to comply with existing laws and regulations.

We may want to distinguish between two aspects of individual and corporate behaviour. The first is the idea of **speculation** the second is **hedging**. With speculation, risk is deliberately taken on with the direct intention of producing a gain. The change in value or impact of the risk will be beneficial. On the other hand, hedging (or buying insurance) is a defensive action aimed at protecting against the effects of uncertainty. Hedging involves giving up the 'upside' in

return for protection against the 'downside'. Insurance provides cover against potential adverse developments. While, as we will see in the next module, companies will want to choose the mix of risks they assume, firms which decide not to hedge are in effect speculating. In the face of risks, deferring a course of action is as much a 'decision' as buying insurance or putting on a hedge.

1.3 What Is Financial Risk?

There are several ways in which we may define financial risk. In understanding the impact of financial risk on the organisation, the nature of the cash flows or transactional exposures needs to be understood. The risk is both in the amount involved and its timing. The most obvious way to understand such risks is in terms of the impact of changes in the risk factors on the organisation's **accounting numbers**. Changes in the reported earnings will be indicative of the different outcomes experienced by the organisation. However, as mentioned earlier, financial risk will extend to **contingent exposures**, that is, expected future transactions. But there is a further, more general type of financial risk, known as **economic exposure**, that comes from the interaction between changes in macro economic variables and an organisation's overall competitive position.

1.3.1 The Nature of Cash Flows

We can define the nature of financial risk to cash flows in two ways: first, whether the amount of the cash flows is known and second, whether the timing is known. We therefore have four different types of cash flows, as shown in Figure 1.18.

Financial risks involve contractual or potential contracted payments where the cash flows either are known for certain or are conditional. The timing of these cash flows is also either certain or conditional. These lead to the four types of risk given in Figure 1.18.

Type 1 cash flows are contracted payments which it is known will have to be met in the future. Examples of such known cash flows include the fixed-rate term deposits made with a bank and the coupon and principal payments on a fixed-rate bond. Both the cash flows and their timing are known with certainty. The deposit will mature at a given date and both the amount deposited and the set interest thereon will be paid to the depositor. With a bond, the issuer will pay periodic coupon payments as defined by the bond terms on set dates. The holder knows in advance when these will take place.

Type 2 cash flows are contracted payments where the amount due is known but where the actual timing is undetermined. These include, for instance, the payments from debtors when credit is extended. The payment amount is known but the exact date on which payments will be received is not known for certain. Uncertainty about the payment date also applies to various types of conditional financial contracts, such as life insurance, where the payout is known – since it is contracted – but the timing is unknown, since it depends on an uncertain event, the death of the insured.

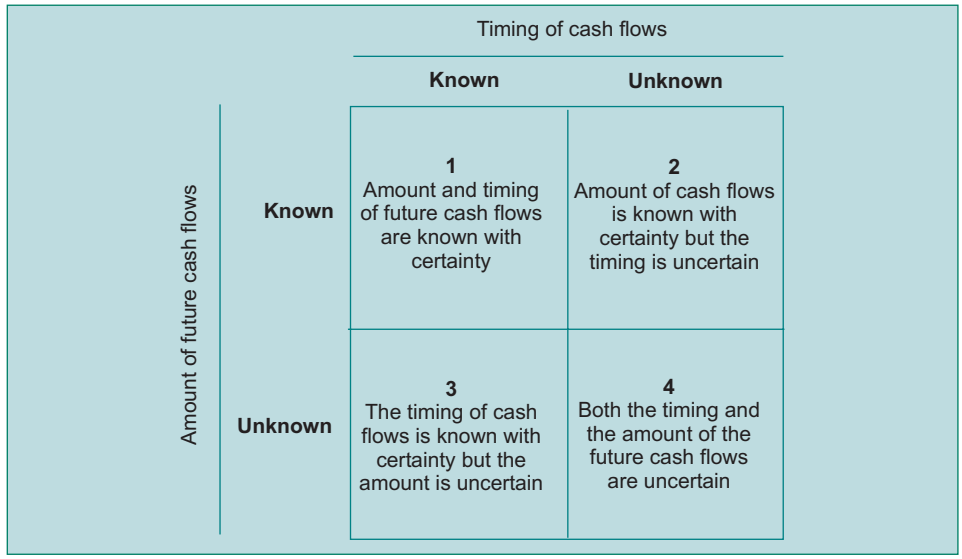

Figure 1.18 The nature of financial assets and liabilities (cash flows)

Note that indeterminate does not mean that estimation is not feasible. Estimation is possible, often with a fair degree of accuracy. When a large number of transactions are involved, the statistical properties of the event come into play and, in particular, the law of large numbers applies. As we will see in later sections, the risk manager will make use of data from past cases as a predictor for outcomes in the future.

Type 3 cash flows have fixed timing but unknown amounts. These can arise, for instance, when money is borrowed at a floating rate over a given period. In this case, the contracted interest payments are not known for certain since these will be set in line with future, unknown market conditions for each of the interest periods. For example, on a five-year bank loan which has the interest set every six months, the timing of the interest payments is known, but the amount will not be known until the actual interest rate is set in accordance with the terms of the borrowing. Note that once this happens, the cash flow then becomes a Type 1 cash flow.

Type 4 cash flows have neither fixed timing nor known amounts. These are typically various contingent contracts or obligations where the cash flow only crystallises when a specific event occurs. These include many types of insurance contract which require payments if a loss is incurred by the insured party and where the extent of the loss only becomes known when the event happens. Type 4 cash flows also include situations such as tenders for contracts, where the future cash flows are conditional on success in the bidding process.

The different nature of these cash flows is captured in most organisations through internal management information, often of an accounting nature or transactional nature.

1.3.2 Accounting Definition

Various risks will affect an organisation's reported accounting numbers. The most common type of exposure is **transaction exposure** which is based on **contracted transactions**. This is most evident in terms of foreign exchange rate risk where the value of **payables** and **receivables** in a foreign currency will vary directly with changes in the foreign exchange rate. There is, therefore, a **risk of an actual cash loss** if the position is not managed or completely hedged.

The second kind of accounting exposure arises from the **translation** of foreign currency items into the reporting currency (and hence it is also known as accounting exposure). Although no cash transactions arise, since the organisation is merely consolidating different sets of accounting numbers, changes in the rate used to convert currencies between one reporting date and another will create bookkeeping losses or gains. The translation problem arises because of two different effects. Accounting numbers are a combination of historic and current activities and one view holds that it is the inherent contradictions within accounting conventions that create the problem.

1.3.3 Contingent Exposures

Contingent exposures are those created by expected, but not yet contracted, transactions. Typically an organisation will have some expectation of sales to be made or costs to be incurred in the future on its recurring business. Although these revenues and expenses are not yet binding, there is a high probability that some or all of the anticipated cash flows will materialise. If such cash flows are denominated in a foreign currency or sensitive to changes in commodity prices or interest rates, then the value or magnitude of such expected cash flows may change in line with changes in these risk factors. A typical example would be an organisation bidding for a project or contract in a foreign currency where the value will fluctuate in line with changes in currency rates, adding a large undesirable element of unpredictability to the profitability of the contract.

1.3.4 Economic or Competitive Exposure

Economic or competitive exposure arises from changes in foreign exchange rates, interest rates and commodity prices which have an impact on the organisation's profitability. It can be seen as the extent to which an unexpected change in a risk factor changes the value of the organisation's future expected cash flows and ultimately its profitability. The change in expected cash flows depends on the effect of changes in the variables affecting future sales volumes, prices and costs and hence competitiveness. It has second-, third- and higher-order effects since not only will an organisation be looking at how changes in the risk factors affect its suppliers and competitors, but also the effects on suppliers to the organisation's competitors and their competitors; and so on.

Codelco Savaged by Poor Copper Price

First half 1999 profits at Codelco, the world's largest copper producer, were nearly halved to US$122m as a result of poor prices. Over the first half of the

year, the copper price had averaged US$66.47/pound, one of the lowest in the 20th Century. The state-owned mining concern which accounts for 15 per cent of world output, producing some 725 000 tonnes of fine copper annually, had first half sales of $1.27bn, down 7 per cent in value, even though sales volumes had risen by 5.5 per cent over the same six month period in the previous year.

The situation would have been even worse had not managers at Codelco embarked on a radical cost-cutting plan that involved job cuts and pay freezes at the concern's five mines. As a result, direct production costs had been paired from 44.3 cents/pound down to 41.3 cents/pound.

1.4 Steps to Risk Identification

Risk management, financial or otherwise, follows a logical process. At its simplest it involves three steps: an **awareness** of the risks being taken by the firm, organisation or individual; **measurement** of the risks to determine their **impact and materiality**; and **risk adjustment** through the adoption of policies or a course of action to manage or reduce the risks.

1.4.1 Risk Awareness

It is not obvious how we may become aware of risks. Some risks will be well known since they have long been identified; other risks will emerge as a result of changing conditions. Management may have a prior awareness or there may be a specific experience of certain risks. Other methods of becoming aware of risks include standard analytic methods such as fault tracing; the use of experts (for instance Delphic forecasting), scenario building (via an investigation of Murphy's law: that is, what can go wrong will), brainstorming and so forth. Careful examination of accidents that happen to others is also useful in creating an awareness.

Being aware of risks is an ongoing discovery exercise that needs to be repeated at frequent intervals to capture changed conditions. As human beings we also have the problem that we may not either perceive the risk or be able to assess its significance due to our interpreting data through our own 'world view'. In addition, different financial markets have varying degrees of efficiency, market transparency and development. Dominic Casserley (1993) suggests three levels of risk awareness.*

1 **Risks that are unknown and unmeasurable** (that is, they have not manifested themselves or have not been perceived). An example would be the effect of changes in the mergers and acquisitions market brought about by the availability of junk bond finance in the USA in the late 1980s and the new risk that a large US corporation could be subject to a leveraged buy-out, thus affecting the quality of the organisation's outstanding debt. What had prevented many large companies from being acquired was the lack of large amounts of financing of a speculative nature. The development

* This draws on the approach of Dominic Casserley (1993).

of a speculative funding market in the 1980s, dubbed 'junk bonds', allowed small but aggressive firms, to make large bids, principally financed by debt, a process known as a 'leveraged buyout'. Obviously, the buying firm would prefer not to seek to refinance existing bonds issued by the acquired firm. However, the new debt issued to finance the takeover meant that the old debt lost its previous high credit rating, since the amount of equity or risk capital committed to the balance sheet was now significantly reduced (in some cases to less than 10 per cent of the total). As a result, the danger of having the credit standing of existing, good-quality bonds downgraded by such a leveraged buyout created a new, hitherto unforeseen hazard for bond investors, dubbed 'event risk'. The key event which eventually alerted the market to such a risk was the takeover of RJR Nabisco Inc., a company hitherto assumed to be bid proof, by the buyout specialist firm of Kohlberg, Kravis and Roberts (KKR) in 1988.

2 **Risks that are known, but still unmeasurable** (where, although the risk is known, there are insufficient data on which to base an evaluation of the likely consequences or to quantify the exposure). The Less Developed Country (LDC) debt crisis began in August 1982 when Mexico announced it could no longer service its US$100 billion of foreign debt. Brazil and Argentina quickly made similar announcements and within 12 months about 50 LDC countries were in negotiation with their creditors about rescheduling their debts. However, it was not until 1987 when Citicorp, one of the most prominent lenders to rescheduling nations, announced a major provision against lending losses that creditors began to quantify their exposures.

3 **Risks that are both known and measurable**. (In such cases, there are many observations on which to build a statistical model in order to predict future behaviour.) This is the situation with which risk management typically has to deal, when organisations seek to measure their exposure to the principal financial risk factors.

1.4.2 Risk Measurement

Risk measurement transforms that which is difficult to measure to quantifiable risks. The principal task initially is to **model risk** in order to measure its impact. Once the extent of the exposure has been determined, decisions about the appropriate course of action can be made. Typically, the procedure is to evaluate these risks using a cost-benefit approach (or, alternatively, the risk-reward trade-off) according to predetermined criteria. In principle the decision will depend on the costs and benefits involved. There will be a trade-off between the benefits of risk reduction and the costs to be incurred. Normally the risks are contingent, while the costs involve actual cash outlays (for instance, insurance against damage to property). Also, many risk-reducing measures may involve opportunity costs. In practice, organisations will also have different views about the level and types of risk that are acceptable. Consequently, there is no hard and fast rule governing any particular course of action. Indeed, one aspect of risk measurement involves determining the organisation's own risk taking approach.

1.4.3 Risk Adjustment

Risk adjustment involves changing the nature of the risk from an undesirable level to an acceptable one. Three different approaches exist. The first involves **insurance**, where the risk is transferred to another party better able to accept the risk. Many kinds of standard risk can be insured at a price (known as a premium). The problem is that as the risk to be insured becomes more specific to a particular organisation, insurers have the same problem as the insured! They will have the same difficulty quantifying the risk and the price of such insurance will rise to reflect this uncertainty.

The second approach uses **hedging**. This is the principle of offsetting one risk with an opposite position in the same or similar risk. If the hedge works, the two risks should be self cancelling. A decision can be made about how much of the total risk is to be hedged.

Organisations can undertake two different kinds of hedging. There is operational hedging (which shares some of the characteristics of the third approach discussed below) which involves the firm in changing sources of supply, the location of manufacturing and so on in order to reduce the impact of economic factors. The firm will also seek to match inflows and outflows in foreign currencies so as to become self hedging.

The alternative is via financial hedging, which uses both on-balance sheet and off-balance sheet instruments. Organisations using foreign currency-denominated borrowings, for instance, seek to eliminate foreign exchange rate risk by using foreign currency income to service the foreign currency loan. The great expansion in off-balance sheet methods (or derivatives) to manage financial risk has greatly increased the organisation's scope for such financial engineering.

The third approach involves accepting the risk, but reducing some of the more undesirable aspects by **changing behaviour**. This typically involves strategic decisions by organisations which seek to minimise undesirable risks. For instance, in certain areas of the world, there is considerable country and political risk. To cope with such a position, firms might form consortia, to spread the risks, or joint ventures with local firms better able to understand local conditions. Another alternative involves breaking down and separating the component risks in any given situation and only assuming the acceptable risks. Such 'cherry picking' of risks is typically seen in certain kinds of capital or venture-type projects where the different parties connected with the undertaking accept different parts of the overall risks involved.

Although the above suggests a sequential approach, risk analysis and management is in fact a dynamic situation as the perception of risks evolves over time. As with so many management tasks, risk assessment has to be kept under constant review as circumstances change. In addition, as organisations become more familiar with different risks, they are better able to assess these and to handle the consequences.

The Step-By-Step Risk Management Process

The risk management literature often adopts a stages model from the project management and decision theory literature. A typical set of steps is given below:

1 Identify the source of the risk exposure.
2 Quantify and/or assess the exposure.
3 Assess the impact of the exposure on the firm's business and financial strategy. Determine the degree of risk-adjustment required against predetermined criteria. This often takes the form of a benefit–cost analysis.
4 Assess the firm's capabilities, competencies and/or capacity to undertake its own hedging and insurance programme.
5 Select the appropriate risk management product and mix. This will typically include both operational hedging and the use of external risk management products such as insurance contracts, derivatives, and risk pooling.
6 Keep the risk management process under review.

In their discussion of how financial risk exposure can be applied in practice, Bauman, Saratore, and Liddle (1994) also provide a logical series of steps, together with the required analysis, policy formulation and operational procedures that are required in order to properly manage and control the ongoing risks in the firm. This generic model with its five steps is shown in Figure 1.19. In their approach, the formulation and execution of the risk management strategy is deemed to be simultaneously taking places at different levels within the firm, within different functions and business units, and also over time.

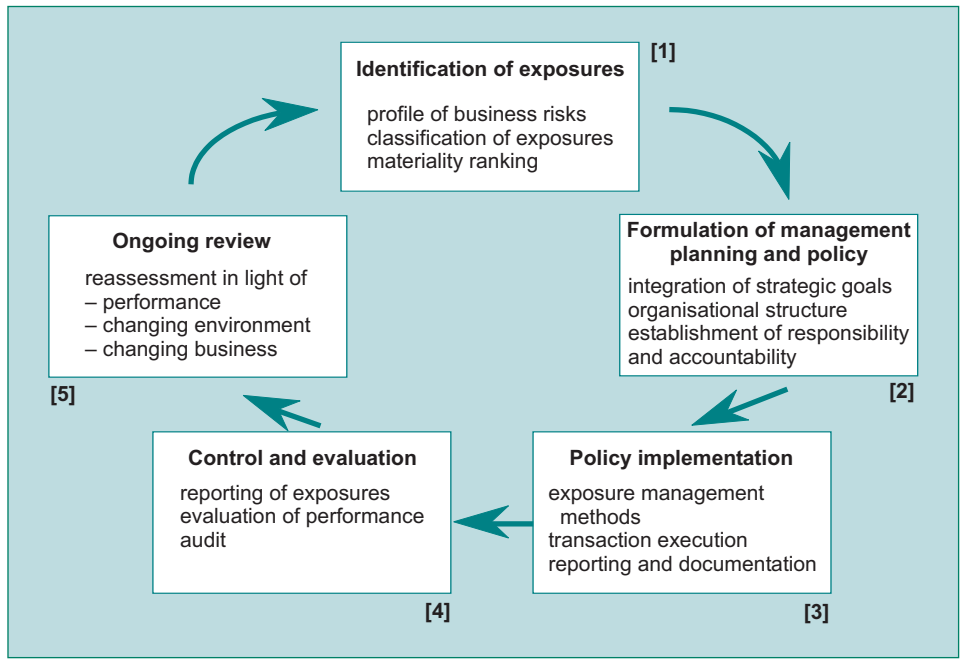

Figure 1.19 The stages in strategic risk management

The dynamic element leads to a continual process of review and modification. In Figure 1.19, the identification of exposures [1] leads to the formulation of an appropriate managerial response [2]. This is then implemented at the business unit and functional levels with the appropriate set of controls and evaluation

criteria [3] to determine the policy's effectiveness [4]. The results of the implementation stage are then reviewed in the light of the firm's overall corporate performance [5], changes in strategic objectives, and the changing business environment, which in turn restarts the evaluation process, leading to changes in policy [1]. The process is continuous as, in step 6 in our decision approach, the risks are kept under constant review. This is because the nature of the firm changes over time as do the risks it faces.

The risk management process is, therefore, a continual adjustment of the firm's exposures in the light of changing conditions, the firm's own capacity to operate its hedging and insurance programme, and the benefit-cost trade-offs involved.

1.5 Top-Down and Building-Block Approaches to Risk Management

The senior management of an organisation will view the risk-management process by looking at the overall risk from all sources. It is their responsibility to put in place a policy that will govern how much risk is acceptable. Within an organisation, this will be translated into a hierarchy of risk limits. A commonly accepted criterion is for firms to seek to 'maximise shareholder value'. This would suggest concentrating on the impact of risk on a firm's **market value** or **equity value**.*

Senior management may also decide on the overall exposures and the anticipated movements in the risk factors. For instance, concerns about the likely direction of changes in interest rates and their impact on profitability may lead to decisions about the type and maturity of debt in the balance sheet. However, because senior management may experience difficulties in reacting to changes within an appropriate timescale, such decisions are normally delegated to a specialist committee or individual. For instance, a common approach in banks is to delegate decisions about the right level of sensitivity to interest rates and choices about funding to an Asset Liability Management Committees (ALMAC). Given the objectives of a particular firm, senior management will have to decide to what level to delegate responsibility.

There are three distinct approaches that can be adopted; these will be discussed in the later modules on the techniques for modelling and measuring risk. They can be termed an **equity–value approach**, an **asset–liability approach** and a transactional or **cash flow approach**. The different methods provide different insights and require differing amounts of information about the firm.

1.5.1 Equity Value

It is a tenet of finance that liquid capital markets are information efficient, that is, the price of financial instruments reflects known facts about the issuer. The market price of a security is a reflection of the consensus view on the worth of the asset. As new information arrives, market participants revise their assessment

* This section draws on the insights from Smith *et al.* (1995) and Rawls and Smithson (1990).

on the basis of the new information and act accordingly. This will cause prices to move, that is, to reflect the impact of the new information. We can use this fact (even without being certain about the degree of market efficiency – a subject still very much debated by financial economists) to measure the effects of changes to equity values from our risk factors using standard statistical techniques (in this case multiple regression). The greater the price movement (or sensitivity) for a given change in the risk factor, the greater the market's estimate of the firm's exposure to the particular risk. Of course, such estimates are historical since they measure the impact after the fact.

1.5.2 Asset–Liability Management

Organisations have access to information that is, not generally available to outsiders. This can be used for assessing their financial risks. The degree of sophistication used in measuring exposure in this way will depend on the availability, quality and cost of suitable data. The traditional approach is to focus on the accounting numbers through the budgeting and reporting process, although for risk management purposes this type of information may not be sufficiently timely, detailed or accurate to give exact measurements.

Accounting methods have tended to involve scenario-building or maturity-gap and funding-gap type analyses based on accounting entries. Maturity- and funding-gap methods break up future assets and liabilities into discrete time intervals (for instance, by quarter years) and the mismatch between receipts and payments is used to determine the net amount of risk in any single period. This method is relatively simple to apply since it is often easier for firms to collect information on their assets and liabilities, which only change relatively slowly over time, than to have accurate forecasts of their future transactions or cash flows. Various measures of risk, for instance payback measures and so forth, can then be applied to the result to determine the firm's sensitivity to changes in risk factors.

1.5.3 Transactions and the Cash Flow Approach

The standard textbook finance approach focuses on changes to cash flows as the key sensitivity measure. A transactions-based approach usually starts at the level of the single transaction, building up individual exposures and netting the differences where applicable in order to build an overall (net) position to be managed, from the ground up. This is often done in large organisations, for instance in foreign exchange management, through factoring arrangements between subsidiaries in different countries. The different currency exposures are pooled and only the net residual difference has to be hedged. Using this method to manage contingent and economic risks has the disadvantage that it requires knowledge of the future cash flows from the business. In most instances, this will be impossible to determine since such cash flows will not be known with certainty. Organisations could find themselves overhedging their risks.

1.6 Conclusion

This module has introduced the concept of risk as an unavoidable consequence of human activity. The increased risks facing firms from changes in economic variables has meant a greater focus on risk management activities.

Risk can be variously defined, no two definitions being identical. Generally, we can define risk as the variability of future outcomes. This variability is in some way measurable, rather than being pure uncertainty, where measurement is not possible, or is inaccurate. Financial risk is that part of a wider risk-management process concerned with managing changes in, among other areas, the business, social, economic, political, technological and legal environment.

Corporate risk management is a natural response to an uncertain future. These risks can be measured in different ways, using accounting information, future cash flows, contingent and economic exposures. The risk-management process is simple to define and it follows a series of simple steps which involve the firm in: (a) becoming aware of the risks; (b) measuring the risks; and (c) adjusting the risk, if necessary.

There are a number of different approaches that can be used to measure risk, either taking an equity view or building up the relevant exposures from the basic unit level. Risk can also be related to the asset and liability obligations of the organisation. In practice, organisations tend to use a combination of methods depending on the quality and timeliness of the information available.

Multiple Choice Questions

1.1 Risk is:

I the natural consequence of change in the world.

II the interaction of unpredictable events upon one another.

III the interaction of events upon one another that we can anticipate, but not predict.

IV the unexpected.

Which of the following is correct?

A I and II.

B I and III.

C II and III.

D III and IV.

1.2 For a firm, risk management is the responsibility of which of the following:

A The managing director.

B The financial function of the firm.

C The firm's advisers.

D The firm as a whole.

1.3 Which of the following is correct? The task for risk management is to:

A eliminate all risks.

B reduce risks to an acceptable level.

C eliminate unacceptable risks.

D monitor risks and take action as required.

1.4 Which of the following is correct? A key factor in the modern development and practice of risk is:

A the breakdown of the Bretton Woods agreement.

B the development of financial markets where risks can be exchanged.

C an increasingly uncertain future.

D all of A, B and C.

1.5 What effect does a change in the external value of the currency have on exporters?

A It increases the price of their products and services in foreign terms.

B It decreases the price of their products and services in foreign terms.

C Neither A nor B.

D No effect.

1.6 Which of the following are the consequences of significant swings in interest rates?

A On average, the cost of borrowing has been higher.

B Lenders have refused to make long-term fixed lending commitments.

C Savers have benefited from higher interest rates.

D Volatility has increased.

1.7 Firms react to uncertainty about future interest rates by which of the following?

A They increase the required rate of return, or hurdle rates, on investments.

B They shorten the payback period.

C They devote more resources to managing interest-rate risk.

D All of A, B and C.

1.8 The introduction by exchanges in the early 1970s, such as the Chicago Mercantile Exchange (CME), of financial instruments to manage risk addressed the following issues:

I Problems of liquidity with over-the-counter (OTC) contracts.

II The need for new instruments to manage financial risks.

III The need to open the market in financial risk-management products to all users.

IV A requirement to trade risk-management products on an exchange.

Which of the following is correct?

A I and III.

B I and II.

C II and IV.

D II and III.

1.9 The financial engineer seeks to help firms to manage their risk by which of the following methods?

A Selling the user a forward, future, swap or option.

B Designing new securities for sale to investors.

C Splitting risks into their constituent parts.

D Designing special hedge programmes.

1.10 Which of the following is correct? A fair definition of 'risk' is:

A a situation where we are likely to be disappointed by an uncertain outcome.

B an unexpected or unintended outcome.

C a measure of the deviation from an anticipated or expected result.

D all of A, B and C.

1.11 Which of the following is correct? The difference between risk and uncertainty is that:

A there is no difference and the two terms are used interchangeably for the same thing.

B one can measure risks but only establish conditions of uncertainty.

C uncertainty is a product of the human condition while risk is our perception of man-made and natural hazards.

D risk is objective in that it measures the range of outcomes in a given situation whereas uncertainty is the problem of the decision maker's inability to choose a course of action.

1.12 Which of the following is correct? The difference between uncertainty and indeterminacy is that:

A with an uncertain outcome the main parameters are known but not measurable, whereas with indeterminacy the causation is unknown.

B uncertainty is another term for risk whereas indeterminacy means that causal factors are unknown.

C uncertainty is another term for risk whereas indeterminacy means that the range of the outcomes is unknown.

D with an uncertain outcome, the risk taker knows the direction but not the magnitude of the outcomes, whereas with indeterminacy the direction is unknown but not the magnitude.

1.13 Which of the following is correct? A cost-benefit approach to risk proposes that:

A the benefit of not analysing risk is measured against the cost of risk analysis before a decision is made whether to assume the risk.

B the benefit of analysing risk is measured against the cost of risk analysis before a decision is made whether to assume the risk.

C the benefits of not assuming the risk are weighed against the potential losses according to predetermined criteria before a decision is made whether to assume the risk.

D the benefits of assuming the risk are weighed against the potential losses according to predetermined criteria before a decision is made whether to assume the risk.

1.14 In analysing risk, the decision maker is often more concerned with the capacity for losses or the downside than potential gains. Which of the following explains this phenomenon?

A Individuals and firms are risk averse and feel losses more than possible gains from assuming risks.

B Methodologies for analysing risks are better suited to measuring losses than potential gains.

C Losses arise before gains in any given situation.

D All of A, B and C.

1.15 Which of the following is correct? Price risk is:

A the risk that the market price of an asset, security, etc. will change over time.

B the risk that the price required to be paid by buyers will change over time.

C the risk that the price required to be paid by sellers will change over time.

D all of A, B and C.

1.16 Which of the following is correct? Liquidity risk is:

A the risk that market trading will be interrupted by the breakdown of market systems, such as computer malfunction, power failures and other parts of the mechanics of trading.

B the difficulty a seller has in finding a buyer.

C the problem of market price movements between a decision to buy or sell and being able to carry out the transaction.

D problems companies have in buying and selling currencies of some Central African states.

1.17 Which of the following is correct? The risk profile is defined as:

A the total risk of a given situation, that is, the sum of all the individual component risks.

B the analysis of a given situation by risk types, so that each risk is then categorised, the total of these being known as the risk profile.

C the amount of a particular risk in a given situation. Thus it is the individual element of the total risk.

D the sequence and payoffs from a given risk in a situation.

1.18 Exposure is:

I the risk times the amount at risk.

II the value at risk.

III the sum of all the individual risks.

IV the sensitivity times the amount at risk.

The correct definition includes which of the following?

A I and II.

B I and III.

C II and III.

D II and IV.

1.19 Which of the following is correct? Speculation is:

A taking actions designed to make a profit from reducing risks.

B taking actions designed to make a profit from increased risks.

C structured risk-management actions designed to benefit from reducing risks.

D structured risk-management actions designed to benefit from increasing risks.

1.20 We can adjust risk in which of the following ways? We can:

A sell the risk to another party.

B enter into transactions which have the opposite risk to the current risk.

C follow policies which seek to take risks into account.

D do all of A, B and C.

1.21 Transaction exposure arises from which of the following?

A Companies undertaking purchases and sales of products and services for immediate payment.

B Companies reporting purchases and sales in their accounting books and ledgers.

C Companies reporting purchases and sales in their profit and loss and balance sheet.

D Companies undertaking to buy and sell products and services for later payment.

1.22 Which of the following is correct? Contingent exposures arise from:

A non-contractual agreements that cannot be enforced in law.

B various expected but not guaranteed future receipts and payments.

C any bids or tenders where the company is not sure it will get the business.

D all of A, B and C.

1.23 We can say the following about 'economic exposure':

I It arises from changes in the balance sheet and profit and loss account in a company.

II It is the result of management decisions about the nature and type of business activities pursued by the firm.

III It arises from changes in exchange rates, interest rates and commodity prices.

IV It is the result of management decisions about the nature and type of business activities pursued by competing firms.

Which of the following is correct?

A I, II and III.

B I, II and IV.

C I, III and IV.

D II, III and IV.

1.24 Which of the following is correct? The insurance approach to risk management involves:

A transferring a risk to another party better able to accept the risk.

B entering into transactions which have offsetting characteristics to the risk.

C changing the nature of a firm's operations to reduce the risk.

D all of A, B and C.

1.25 Which of the following is correct? Operational hedging is the term given to:

A how a risk manager carries out his duties.

B transactions using off-balance sheet instruments, such as forwards, futures, swaps and options.

C transactions that change the firm's balance sheet, such as foreign currency debt.

D how the financial function within a firm reports its risk-management transactions.

1.26 Firms seek to manage the risks by looking at the risks in the:

I assets.

II liabilities.

III balance sheet.

IV profit and loss account.

V cash flows.

Which of the following is correct?

A I and II.

B III and IV.

C IV and V.

D All of I, II, III, IV and V.

1.27 The risk-management process follows a series of logical steps to arrive at a result. These involve initially identifying the risks facing the firm. Which of the following represents the major difficulty that arises in this identification process?

A There are insufficient data for the analysis.

B Risks are ignored because they are seen as unimportant.

C There is no consensus over which risks are to be included.

D Some factors are included which are not risks.

1.28 There are many dimensions to risk. A firm will seek to manage some or all of these and the most appropriate combination of methods will be to:

I manage each risk separately.

II manage the sum of all the risks.

III manage those risks which are considered important.

IV manage those risks which exceed a given exposure.

Which of the following is correct?

A I and III.

B I and IV.
C II and III.
D II and IV.

Case Study 1.1: Attitudes to Risk

A family reunion has brought together three generations of the family. At this gathering are the grandparents, the parents and their children. It is a cold winter's day and, after lunch, they decide to go for a walk. As they progress along they find that the route they wish to take is thickly covered by ice from a broken water pipe.

Consider the attitudes that the different members of this family might have towards the idea of crossing the ice.

Appendix to Module 1: What Risks Are we Taking?

The story in the section 1.1 about converting sterling into US dollar travellers' cheques raises some issues about whether, in doing so, more risk has been assumed than is necessary. Reviewers of this module described the example as 'flawed'. They took the view that there was cross-rate parity, that is, that the risk of a DM/£ fluctuation equals the combined risk of a US$/£ fluctuation plus a DM/US$ fluctuation. They also made the point that the DM/US$ risk may be higher than the DM/£ risk. Once you have exchanged pounds for dollars, you will no longer have any US$/£ risk, unless of course you have some money left over in dollars which you want to take back and reconvert to sterling.

In the earlier analysis, the decision to buy dollars for use in Germany may have been motivated by a view that the dollar was likely to appreciate against the Deutschemark in the immediate future (although at the time this was not the case).

As a transaction, buying US dollar traveller's cheques is equivalent to a two-leg transaction in foreign exchange. In making this transaction, I may have expected the DM to depreciate relative to the dollar. I therefore sold pounds for dollars. In terms of what is happening, the future relationship of the three currencies and their exchange rates can be expressed as follows.

$$\text{FV}(\text{DM}/£) = \frac{\text{FV}(\text{DM}/\$)}{\text{FV}(\$/£)}$$

where FV is future value of the money, expressed as the ratio of the two currencies.

This synthetic position will be profitable if:

- both sterling and the US dollar appreciate relative to the DM, but the US dollar appreciates more; or
- sterling and the US dollar depreciate relative to the DM, but sterling depreciates more; or
- sterling depreciates against the DM, but the US dollar appreciates.

If the opposite result occurs, the transaction will lead to losses.

As a transaction, this trade will make most sense if the prognosis is that the dollar will appreciate relative to the DM, while sterling loses ground relative to the DM. I now have to forecast not just the DM/£ exchange rate, but also the DM/US$ rate. If my ability to forecast currency movements is 50:50, then adding another currency leg requires success on two fronts!

Although, as the reviewers consider, I may have eliminated my sterling currency risk, instead of just the DM/£ cross, the denomination of my traveller's cheques in US dollars does increase the potential for risk, especially as my base currency was sterling – and not the dollar.

What do you think?

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