

# Risk Management

Fifth Edition

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'It has been cited that the sociopolitical upheavals of our time result to a large extent from the disintegration of human communities – this book is dedicated to the most important of communities: our families.'



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# Foreword

What is risk management? It would be instructive for every reader of this new edition of the textbook to write down the answer to this question now and again at the end of the course. The question is often asked of candidates for jobs in risk management as well as in finance and operational management.

Risk management is a process that is based on a set of principles. Various organisations have set out their principles of risk management, such as the Committee of Sponsoring Organizations (COSO) in 2004 (updated in a June 2016 edition), and ISO in their revised 31000 standard in 2009. National organisations such as FERMA, the associations of Risk Management, AIRMIC in the UK, and RIMS in the US, to cite just a few, have all drawn up guidelines for working within these principles. As Chris Lajtha, a former global risk manager and consultant puts it, 'risk taking is the lifeblood of the company. It must be done knowingly, carefully, and efficiently. This requires a framework and a methodology which is provided by the risk management process: identification, assessment, control, financing and communication.'

Yet the process is unnecessarily narrowed by the very definition of risk itself. It is often misunderstood. In its most basic form, as discussed in this book, it is a way of assessing deviation from the expected. And, since it is too often looked at in the negative light of loss, damage or injury, the responses to risk tend to be avoidance, reduction, or something to be endured. Many risk management policy statements talk about the goal of risk management being to protect against, eliminate or reduce this kind of harm.

Publicly quoted companies are required to publish statements about their risk profiles and risk management practices. But few begin with the statement that the company is in business to take risks, and that the risk management process is designed to support assumption of risk – which should include risks taken in expectation of reward.

When risk management principles include ways of looking at new ventures, products, or projects, then it becomes much easier to 'sell' the benefits of risk management to seasoned operations managers who, in a period of informational and procedural overload, often view new business support initiatives (such as risk management) as either additional costly compliance impositions or passing management fads. Where risk and reward principles are embedded in ERM initiatives it is possible to reveal operational benefits of the risk management process, which means, simply, better management.

The other question that is worth addressing is what is the measure, or metric of 'good' risk management? The common measure is to show a reduction in losses, or lost time, or claims, together with a reduction in insurance spend. Those, plus the cost of the risk management department, are the elements of the cost of risk, sometimes referred to as the 'global' cost of risk. This measure, often shown on a timescale of a number of years, is complicated by the change of operations, change of management and even the presence of a captive insurance company. A better measure of 'good' risk management includes some reference to how successfully the process is applied at various levels of an organisation, since the underlying principles are applied differently at different levels. But who should judge that?

Some organisations have tried risk committees, some have called them 'risk juries' to agree on the annual, or periodic setting of the standards for the risk management metric. As for the addition of reward into the measure of 'good' risk management by such methods, it remains to be further defined in terms of the expanded definition of risk as deviation from expectations.

It is too obvious to start with saying that the board of a large company is somehow responsible for risk management. Board members, from the audit committee on down need guidance as to what kind of reporting on risk management from management is really important, as compared to what is merely compliance.

Management needs guidance on how to assess risk management efforts by those reporting to them – including legal, finance, human resources, and reputational management. And at operations level, where annual budgets and annual bonuses matter, guidance as to how to demonstrate that risk management – of negative as well as reward risks – is needed.

Readers of this text and its course materials will be better equipped to provide this guidance and have a better answer to the initial question, 'What is Risk Management?'

*Risk management – what can you do  
To make them listen to you?  
Who should get prizes  
For avoiding surprises?  
Read this text, and you will know who!*

### **Hugh Rosenbaum**

Internationally renowned consultant who has spent his career promoting the 'value-added' of risk taking, of risk management including captive insurance programs - as well as the value of playing the bassoon, which he says involves some of the highest risks he takes these days.

# About the authors

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## PART I

# Fundamental principles

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- Chapter 1 Concept of risk
- Chapter 2 Principles of management applied to managing risk
- Chapter 3 Decision-making under conditions of risk and uncertainty
- Chapter 4 Corporate governance and enterprise risk management
- Chapter 5 Operational risk management

## CHAPTER 1

# Concept of risk

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## 1.1 Introduction

This book starts by describing the context of risk with Chapter 1 providing a definition to allow us to understand what managing risk means. The chapter outlines the elements of risk, the condition of uncertainty and its relationship with risk. Risk is then defined. The classifications of risk and the concepts of peril and hazard are also considered. Finally, psychological influences on risk are explained.

## 1.2 Elements of risk

Risk management is concerned with managing possible future consequences or outcomes. This suggests that risk has a number of elements.

### Outcomes

The first element is outcomes which can be either positive (favourable) or negative (unfavourable).

Negative outcomes manifest in five different forms. Firstly, negative outcomes can be damage to property. Secondly, consequential losses can arise from the damage to property. Thus, if a factory is destroyed, the owner will not only face the cost of repairing or replacing the factory, but will also face a loss of the income that it would have earned had it not been destroyed. Thirdly, there could be employees killed or injured in a fire. Fourthly, there could be legal liability claims against the owner. In the case of the factory fire, for example, a fireman sent to fight the fire could be injured and decide to sue the owner. Finally, the losses can be purely financial in nature, i.e. losses unrelated to damage to property. Thus, employees may go on strike, resulting in a loss. All forms of losses are usually expressed in financial (monetary) terms. The extent of the damage to the factory can be expressed as the amount of money required to repair the factory, amounts paid to injured employees or other people as the amount of compensation they receive, and so on. The outcomes are, however, not all monetary in nature. Thus, the owner of the factory may face criminal charges arising out of the fire, and the possibility of criminal prosecutions will be regarded

as much a risk as the financial loss. Non-monetary outcomes are difficult to quantify, since they are not expressed in a common currency, and thus the tendency is to concentrate on outcomes expressed in financial terms. Drawing a distinction between the different types of losses is important since insurance makes the distinction.

Positive outcomes are usually expressed in monetary values, e.g. an investor will purchase shares with the view to earning a profit. The profit is a positive outcome. Profits are usually expressed as a rate of return.

Outcomes can occur anywhere within an enterprise, and hence risk management is not confined to any particular part of the organisation, but should extend throughout the organisation, hence the term enterprise-wide risk management. Traditionally, risk management was fragmented, concentrating more on certain types of outcomes, i.e. insurable outcomes.

Since risk management is concerned with the future, outcomes may be anticipatory rather than actual. For example, buildings may be designed to resist an earthquake, not because an earthquake has taken place, but because it may take place. Past outcomes can be recorded and measured, e.g. the cost of individual motor vehicle losses can be recorded. This suggests that risk management requires that data be collected and analysed.

## Events

Outcomes can usually be traced to a specific time and place. This implies that risk involves a second element, an event. Thus a fire is an event that can be determined with reference to a time and place. Positive outcomes, on the other hand, may not be traced to a specific event. Company profits are earned over a period of time. The discovery of a valuable idea by a research and development department can be regarded as a valuable event. However realising the profits from this discovery may only take place years later. The profits will accrue over a period of time and are not confined to an event per se.

Events can also be recorded. Thus, the number of motor accidents or industrial accidents can be recorded. Again, since events can be recorded, this suggests that the data can be subjected to statistical analysis.

## Sources

The cause of outcomes can often be traced to specific sources. This suggests that risk involves a third element, the source of the loss. Thus, a fire may be the cause of damage to a building, resulting in a financial loss. The source of the loss is also often called by some as the peril. Thus, it can be said a factory is exposed to the peril of fire.

## Environmental factors

It may be anticipated that two projects could produce similar outcomes. This does not mean that, from a risk perspective, these are the same. For example, two factories, each requiring a similar capital investment, would both be exposed to a loss due to fire. If one manufactures steel products and the other manufactures wood products, the probability of a fire is different. Fire is more likely in a factory that works with wood, since wood burns more easily. The probability and standard deviation of the outcomes of these two may differ. It will be said that seen in terms of the peril of fire, the one factory is more hazardous than the other. A hazard is thus an environmental factor which increases the

probability of loss. If it rains or if there is snow and ice on the roads it is said driving is more hazardous. Hazardous factors are not only physical, there are also the moral hazard factors, well known to the insurance market (Rowell & Connelly, 2012; Pearson, 2002).

### 1.3 Definitions of risk

Having gained an idea of the elements involved in risk, the next point is to discuss definitions of risk. Risk often has a contextual meaning and thus no single definition covers all possible meanings, in all differing circumstances. Furthermore, different disciplines assign different meanings to the word 'risk'. The context in which risk can be viewed is so diverse that no single definition is sufficient to cover all possible meanings. This gives rise to interpretations and definitions suited only to specific areas of study or disciplines. Hence, in an actuarial context, risk has a statistical interpretation; while in the world of insurance, the term 'risk' may be used to describe the subject of the policy (the property or liability that is insured) or the peril insured under the contract.

Contemporary finance theory makes extensive use of the notion of risk, but is not overly concerned with semantics, and the technical usage of the term 'uncertainty' has, to a degree, been limited. It is not surprising to find that varying definitions of risk exist.

- Pfeffer, for example, defines risk as a combination of hazards measured by probability (Pfeffer, 1956).
- Denenberg et al. define risk as uncertainty of loss, where the term 'risk' is implicitly understood as uncertainty of financial loss and where the definition denies that the degree of uncertainty needs be measurable or the probability of loss determinable (Denenberg et al., 1974).
- Greene and Serbein qualify the existence of many usages of the term 'risk', and there is therefore no single definition that is universally employed. Nevertheless, it is stated that the term is understood to mean mainly the uncertainty of the occurrence of economic loss (Greene & Serbein, 1983).
- Athearn and Pritchett define risk simply as a condition in which loss or losses are possible. Risk (pure), they state, involves only the possibilities of loss or no loss (Athearn & Pritchett, 1984).
- As the result of the work of Frank Knight, in economic theory risk has a specific meaning. It describes those situations where the probability and outcomes can be determined. If either the outcome or probability or both cannot be determined, uncertainty is involved (Knight, 1921).

In specifying the definitions cited above, authors have been careful to qualify that interpretation depends to some extent on the particular orientation of the discussion of risk. Notwithstanding such qualifications, the evidence suggests a non-uniformity rather than disagreement concerning the fundamental tenets of risk in the context of pure risk management and insurance.

With the emergence and growing importance of risk management as a systematised discipline, it becomes necessary to provide a more rigorous definition of risk by enlarging on the early concepts and, by so doing, adding clarity to the more contemporary definitions and interpretations. The following definition is proposed:



### Definition

Risk is defined as the variation of the actual outcome from the expected outcome. If this definition is accepted, then the standard deviation is an appropriate measure of risk. Risk therefore implies the presence of uncertainty.

The definition of risk as the deviation of an actual outcome from the expected result or outcome implies the following:

- Uncertainty surrounds the outcome of the event. The decision maker is uncertain about the outcome, but predicts an expected outcome. The actual outcome may deviate from the expected outcome. If the outcome were certain, there would be no uncertainty, there would be no deviation from the expected result and therefore no risk.
- The extent of the uncertainty between the actual outcome and the expected outcome determines the level of risk. The greater the possible deviation between the expected and actual outcomes, the greater the risk.

In a sense, the above definition links risk and uncertainty. Uncertainty prevails because outcomes of situations are not known in advance. Consequently, such situations display risk. To the extent that associated probabilities are assigned (objectively or subjectively) to possible outcomes, risk can be mathematically described. Where situations dictate that associated probabilities cannot be assigned (objectively or subjectively), risk cannot be quantified, and thus, from a risk management point of view, whether one regards these situations as uncertain as opposed to risky becomes immaterial. The degree of uncertainty surrounding the event determines the extent of the risk.

This distinction seems to be somewhat ignored in the definitions given earlier. The tendency in these definitions is towards the negative financial consequences associated with the event, which, although such consequences must be seen as an important consideration, somewhat blurs the question of whether uncertainty, and hence risk, is present. For example, it is maintained that insurers carry risk, since they are involved in funding the financial loss that is the consequence of an insured event. In the extreme, it could be argued that, given a sufficiently large number of exposure units, the insurer's risk is diversified and thus the aggregate loss is known with some degree of certainty and thus, notwithstanding the financial loss implied, there exists little or no risk to the insurance company. The variability surrounding the expected aggregate loss is small under these conditions and therefore the risk is limited – the insurer theoretically carries little risk and is merely a diversification mechanism, funding the financial consequences of the insured events.<sup>1</sup>

Obviously, from the viewpoints of the individual insureds, uncertainty, and hence risk, does exist; each exposure viewed independently displays considerable variability in outcome. The act of insuring has the effect of pooling the exposures, and as the number of exposures pooled increases, so the variability in the aggregate outcome diminishes.

1 Under these conditions, the insurer theoretically faces only the liquidity or solvency risk. However, systematic risk may be inherent. For example, in the life insurance industry, the effect of acquired immune deficiency syndrome (AIDS) has been to increase insurers' risk, (possibly in the shorter term). The overall uncertainty surrounding the event of death (in the books of the insurer) has increased.

It is contended that the degree of risk is solely dependent upon the variability rather than upon the probability value surrounding an event or its outcome. Such an interpretation refutes the viewpoint of those who consider risk in terms of probability of occurrence and who often measure risk on a scale with certainty of occurrence at one end and certainty of non-occurrence at the other end. The assumption that risk exists in varying degrees between these extremes, and that risk is thus greatest where the probability of occurrence or non-occurrence is equal, does not fit with the basic tenet that risk refers to the degree of uncertainty or variability about the occurrence, and not to the degree of probability that it will occur.

From a risk management perspective, uncertainty exists concerning:

- whether the event or occurrence will take place, and
- if it does, what the outcome (financial) of the event will be.<sup>2</sup>

The definition, for example, that risk is uncertainty about loss, is indicative of the orientation towards insurance, rather than towards risk management: i.e. it is one that concerns itself more with the financial treatment of the consequences of the event than with the business of managing risk. Managing risk implies not only the financial provision for the consequences of an event, but the effort to:

- reduce or minimise the likelihood of the loss-producing event occurring
- reduce or minimise the adverse effects (mostly financial) once the event has occurred.

Taking cognisance of the points made above, the following expanded definition is proposed:

#### Definition

Risk is defined as a deviation from the expected value. It implies the presence of uncertainty. There may be uncertainty as to the occurrence of an event producing a loss, and uncertainty as regards the outcome of the event. The degree of risk is interpreted with reference to the degree of variability and not with reference to the probability that it will display a particular outcome.<sup>3</sup> The standard deviation becomes a suitable measure of risk.

## 1.4 Basic risk classifications

Risks can be classified in several ways. Two divisions are discussed, basic classifications and managerial classifications. Basic classifications examine the more popular ways in which

2 Simplistically, the situation is analogous to that of throwing a die. The uncertainty not only concerns the *value* of the thrown die, but also whether the die *will be thrown at all*. There are instances, of course, where one is more concerned with how often the event will occur as opposed to whether it will occur. For example, in the case of a large motor fleet, the event, defined as an accident of a vehicle, is not uncertain. What is uncertain is how many vehicles will be damaged by accidents. If the national annual accident rate is, say, 13% and if the fleet comprises 200 vehicles, one could expect 26 vehicles to be damaged each year. The concern is not with the probability of a vehicle being involved in an accident — it is almost certain that an accident will take place. The concern in this instance concerns the number of accidents that will occur and about the outcome (annual costs) of such accidents.

3 Outcome in itself can assume various forms, e.g. criminal prosecution arising from an accident, emotional stress due to the loss of a limb, and many others. In this study, however, the concern is primarily about the financial outcomes of risk.

risks have been conceptually classified. Managerial classifications are those classifications made in practice to enable these particular risks to be managed.

Managing risk requires both the ability to quantify risk in order to facilitate decision-making under conditions of uncertainty and the recognition of the qualitative and often psychological aspects of risk. In this chapter, therefore, probability theory and its application to risk measurement is introduced, and for illustrative purposes, a relatively simple model for decision-making under risk conditions is proposed.

A central theme of this book is the integration of the activities that collectively represent the risk management process and discipline. The fundamental principles governing risk management, which are translated into a simple integrated model, are discussed in the next chapter. This model identifies the two underlying facets in the risk management process, namely:

- the practical or physical management or control of risk
- the financing of risk, where the insurance market is an important mechanism for financing the consequences of risk.

In line with this integrated approach, this chapter also considers the definition of risk from a financing perspective, particularly the question of risk as applicable to an insurer. Finally, in the more general context, particular aspects relevant to the formation of a market for treating risk are described.

## Risk and uncertainty

### Uncertainty

Uncertainty is the opposite of certainty. Certainty is the lack of doubt. It exists when a particular consequence can be unambiguously predicted to follow a given event. Examples of certainty are predictions from physical laws, such as the law of gravity or laws of motion in physics. The predictions of these laws correspond to the actual outcomes.

Uncertainty arises from a person's imperfect knowledge concerning future events. It exists in decision situations where the decision maker lacks complete knowledge, information or understanding about the decision and its possible consequences. The perceived level of uncertainty depends on information that an individual can use to evaluate the likelihood of outcomes and the individual's ability to evaluate this information. In other words, uncertainty is present in levels or degrees, as illustrated in Table 1.1.

Uncertainty is concerned with the following two elements:

- (i) uncertainty whether an event will occur, and
- (ii) if the event does occur, what will be the outcome of the event.

### Example

Uncertainty exists whether interest rates will change (decrease or increase) and also, if they do change, what the direction and the extent of the change will be.

Table 1.1 The certainty–uncertainty continuum

Level of uncertainty	Characteristics	Examples
None (certainty)	Outcomes can be predicted with precision	Physical laws, natural sciences
Level 1: Objective uncertainty	Outcomes are identified and probabilities are known	Games of chance, cards, dice
Level 2: Subjective uncertainty	Outcomes are identified, but probabilities are unknown	Fire, car accidents, investments
Level 3: Total uncertainty	Outcomes are not fully identified and probabilities are unknown	Space exploration, genetic research

Source: Adapted from (Williams, Smith & Young, 1998)

A high degree of uncertainty, as at Level 3, reflects a significant lack of understanding and knowledge of the situation, resulting in a low level of confidence and assurance. Where there is complete uncertainty, the prediction of possible outcomes is impossible.

Uncertainty, which is a condition that results from an inability to foresee future events, has been recognised as affecting all walks of life. The finite nature of our minds denies us the ability to foresee, and hence control, the many happenings that affect our lives and those of others. In interpreting the notion of uncertainty, Shackle offers the following (Shackle, 1961, p.109):

*The word uncertainty ... can convey either the mind's consciousness of ignorance and its consequent willingness to entertain an array of diverse hypotheses, or alternatively the mind's hesitant contact with any hypothesis which has not a complete case in its favour or has some partial case against it.*

While many statisticians and philosophers believe that there are laws that precipitate change, be it in attitudes, perceptions or the business environment, such laws and governing principles are too vast to be regarded as charted knowledge. In their efforts to understand or minimise uncertainty, people have attempted to determine causation, unfold patterns and give meaning to unexplained events, possibly in terms of a controlling power (Denenberg et al., 1974).

Despite such attempts and the aversion to yield to domination, humankind's situation will always be characterised by the presence of uncertainty.

## Risk

In a literal sense, the concepts of risk and uncertainty are regarded as interrelated. The perception is that uncertainty gives rise to risk. This is because where the outcomes of events are surrounded by uncertainty, risk will be present. Reference to uncertainty is made when considering events whose outcomes are predictable, even though such outcomes may be assigned objective associated probabilities. In such cases, the assigning of objective probabilities may be seen as being incongruent with the concept of uncertainty.

Willettt draws the following distinction between risk and uncertainty (Willet, 1901, p.8):

*My only reason for mentioning it here is to show why it seems necessary to define risk with reference to the degree of uncertainty about the occurrence of a loss, and not with reference to the degree of probability that it will occur. Risk in this sense is the objective correlative of the subjective uncertainty. It is the uncertainty considered as embodied in the course of events in the external world, of which subjective uncertainty is a more or less faithful interpretation.*

The distinction between risk and uncertainty then, is in the objective and subjective aspects of variability in the outcome of events.

The interpretation offered by Knight may also be seen to hinge on a similar objective-subjective distinction. Knight distinguished between measurable and immeasurable risk. More particularly, in the cases where possible outcomes and associated probabilities are known and therefore the spread of values can be mathematically measured, Knight defines such variability as risk. When the distribution of possible values and probabilities is not known, the situation is described as uncertain (Knight, 1921).

Thus, where so many uncertainties (technical, political and economic) surrounding a value exist, implying that the number be viewed as a random value, uncertainty is deemed to be present. However, this interpretation implies that in situations where objective probabilities surrounding outcomes cannot be assigned, but where subjectively one may impose a range on the possible magnitude of outcomes, then risk is present, but it cannot be measured very easily.

In distinguishing between uncertainty and risk in the definitions offered by Willett and Knight, attention should be focused more on the important similarities rather than on any differences that may be identified. The modern tendency is to interpret risk as the absence of certainty, where certainty represents the situation where there is only one possible outcome. Hence, a risky outcome is one that can assume a number of values, but the particular value is not known in advance.

## Perils and hazards

The terms 'risk' and 'peril' are often confused and used as if they mean the same thing. A peril has been defined as the cause of a loss (Mehr, 1986, p.27); it has also been defined as the source of loss (Denenberg et al., 1974). For reasons that will become evident when considering the definition of hazard, it is preferable to consider peril as the source of loss.

### Definition

Peril is defined as the source of loss.

Peril, therefore, is quite distinct from risk, which has been defined as the absence of certainty relative to both the occurrence of a loss-producing event and its outcome. Typical perils are fires, explosions, storms and earthquakes. These perils give rise to risk, but are not defined as risks themselves.

Thus, for example, a fire in a warehouse is the peril against which insurance may be purchased, while the oil drums stored on the warehouse floor represent a fundamental

loss-causing circumstance or situation. This definition coincides reasonably with that provided by Mehr, who states that behind the ostensible cause of loss (peril) is hazard – except that it claims to differentiate between risk as the source of loss and hazard as the fundamental loss-causing circumstance or agent (Mehr, 1986).<sup>4</sup>

#### Definition

Hazard relates to the circumstances surrounding the cause of loss.

Intuitively then, one situation in relation to another may be described as more hazardous if that situation is fundamentally considered more loss-causing; the term ‘hazardous’ should not be interpreted as describing the degree of risk, for the latter refers to the degree of uncertainty (variability).

A distinction can be drawn between physical and moral hazards.

#### Definition

The material or physical aspects in the circumstances surrounding the cause of loss are termed physical hazards; the personal aspects or characteristics are termed moral hazards.<sup>5</sup>

The preceding sections aimed at providing a definition and classification of risk and to distinguish between the risk-related concepts of peril and hazard. Any discussion of risk should, however, include both qualitative and quantitative aspects. The concern is to place risk and particularly the management of risk in an overall framework within which it can be understood and managed. Managing risk implies not only the qualitative understanding and perception of risk, but the application of developed quantitative techniques to arrive at some dimensional expression of the concept. Hence, the sections that follow aim to give an understanding of:

- the quantification of at least some aspects of risk through the use of quantitative techniques
- the psychology of risk and decision-making under pure risk conditions
- market considerations for the financial treatment of risk.

## Pure (or event) and speculative risks

A classification often used is that of pure and speculative risk. Pure risks are those risks that only have the possibility of a loss, e.g. the risk of destruction of a building due to

4 It has been stated that hazard represents a condition that increases the likelihood or chance of loss (Denenberg et al., 1974; Mehr, 1986). Paradoxically, when considering the definition of risk and in particular the interpretation of the degree of risk proposed in the previous section, hazard may imply (strictly) that uncertainty is reduced and hence risk is reduced. It is unlikely that, in defining hazard in such a way, the authors’ intentions have been to point to this ambivalence. As mentioned earlier, a literal sense has developed in the definition of risk, and this, it is contended, is also evidenced in the definitions of the risk-related concepts of peril and hazard.

5 In the literal sense, moral hazard refers to the possible existence of a dishonest tendency. Reference is also made to moral hazard (Mehr, 1986, p.28), where the intention is to refer to broader human characteristics of carelessness or indifference to loss. Objectively, the term should refer broadly to a behavioural characteristic (not necessarily unethical) concerning the level of effort devoted to loss-reducing activity. This aspect is further debated in Chapter 14.

fire. Speculative risks are those that have the possibility of either the profit or loss. Thus, entering into a profit-making venture entails a speculative risk.

## Insurable and non-insurable risks

Another important classification to the risk manager is the distinction between insurable and non-insurable risks. No completely satisfactory test has yet been formulated to determine if a particular risk is insurable or not. In theory, most pure risks should be insurable. But some risks can be pure and non-insurable. For example, the possible destruction of a building is a pure risk, and generally this risk is insurable, but the destruction of the building due to war is generally not. Usually, damage to property, consequential losses arising out of this property, injury to people, and liability claims from sudden and accidental events resulting in the abovementioned losses are insurable.

In reality, very few risks are insurable, which is surprising.

## Fundamental and particular risks

Fundamental risks arise from losses that are impersonal in origin and in consequence, and originate in the economic, political or social interdependency of society, although they may also arise from purely physical occurrences.

Particular risks are losses that have their origin in discrete events that are essentially personal in cause. Such risks would, for example, be fire damage to a building or the explosion of a pressure tank.

One may further categorise operational risks by distinguishing between fundamental and particular risks.

### Definition

Fundamental risks arise when many losses can be traced to a single source in origin and in consequence.

Fundamental risks affect large parts of society or even the world, rather than individuals. Thus, the risk of damage to assets due to wear and tear or corrosion is fundamental.<sup>6</sup>

Most fundamental risks such as, for example, war and recession originate in the economic, political or social interdependency of society, although they may also arise from purely physical occurrences, such as, for example, pollution, or even the Irish famine experienced during the nineteenth century, which was caused by the destruction of the potato crop. A further example is damage due to the nuclear accident that happened at Chernobyl. Fundamental risks are regarded as commercially uninsurable.

Particular risks give rise to losses that have their origin in discrete events, which are essentially personal in cause. Such risks would include the explosion of a boiler or fire damage to a building.

The distinction between fundamental and particular risks is not, however, definitive. The classification of risk as either fundamental or particular depends on judgement. For example, while it was previously readily accepted that unemployment was a particular

<sup>6</sup> Most exclusions from insurance policies referring to land-based risks relate to fundamental risks, e.g. war and nuclear exclusions.

risk (caused by a person's lack of ability or work ethic), it is more widely accepted today that in most cases unemployment is a result of the economic system – a responsibility of society rather than of the individual, and therefore a fundamental risk as opposed to a particular one.

One reason for determining whether a given risk is particular or fundamental is to establish whether commercial insurance may be appropriate, or in fact available, as a means of financing the consequences of such risk. Losses arising from fundamental risks cannot be prevented, particularly by an individual. Such losses are frequently catastrophic and therefore social insurance may need to be established in order to mitigate their effects, instead of commercial insurance.

Changes in attitudes, knowledge, technology and social conditions, and other factors, sometimes political in nature, make it difficult to determine whether the risk is fundamental or particular, and thus whether the cost of such risks should be borne by society or remain the responsibility of the individual. However, the relevance of such a classification or categorisation is real.<sup>7</sup>

## Systematic risk

This classification is used extensively in finance theory. Systematic risk is a market-related risk. For example, the case of changes in the value of the Rand [ZAR] against the US Dollar [USD]; this could impact the entire market and not only an individual equity. As a result of the change, there could be a market-wide impact and most of the values of shares could change. This would be regarded as a market-related risk. This should be contrasted to firm-specific risk. Risks associated with specific firms could be dealt with by holding a diversified portfolio. So, once again, as in the case of insurance, diversification plays a role. Firm-specific risk can be managed by holding a diversified risk, but not related market risk.

## Systemic risk: Global Financial Crisis 2008 and COVID 2020

Following the introduction of fundamental risk, we now introduce systemic risk, even though very often both terms are used inter-changeably. Systemic risk refers to the risk of a collapse of an entire system, such as the financial or even economic system – whereas in the case of fundamental risk, equity markets can be at risk, in the case of systemic risk, an entire system is at risk. In a financial context, it captures the risk of a cascading failure, or contagion, in the financial system, which is caused by close inter-links within the financial system. This could of course result in a severe economic downturn. Until recently, systemic failures were virtually inconceivable but in recent years two of these have occurred; the 2008 Global Financial Crisis and after that, the COVID pandemic.<sup>8</sup>

The financial crisis began in 2007 – mostly thought to be attributable to a crisis in the US subprime mortgage market. The consequences of the collapse in the US housing and

<sup>7</sup> It can be argued that the legal liability crisis (the increase in liability litigation and the consequent spiralling of the price of insurance and even the withdrawal of capacity) has arisen because risks such as personal injury, which used to be seen as particular risks, are now in fact treated as fundamental risks. As a logical consequence of classifying a risk as fundamental, the negligence system of delictual liability is inappropriate as a legal remedy. Viewed from a different perspective, judicial systems have tried to use private financing systems (insurance) to fund what the judiciary perceive as social responsibilities; hence the liability crisis.

<sup>8</sup> Readers are also directed to Chapter 12, sections 12.9 and 12.10



mortgage market led to declines in residential investment and were followed by reductions in household spending and, subsequently, business investment. This led to a liquidity and credit crunch that impacted all credit and financial markets. The crisis was made visible by the collapse of the US based Lehman Brothers and Bear Stearns investment banks. Although the crisis began in America, it quickly spread through the global financial system causing a banking crisis in other parts of the world and leading to economic recessions across Europe and the rest of the world. This sparked a response in the form of quantitative easing.

The second systemic risk was the COVID pandemic which started to appear in late 2019 and led to the first virtually world-wide lockdown. The impact of COVID on risk management presents a new and interesting set of challenges. COVID is a systemic risk – a risk which is pervasive and originates outside of the control of the business entity. Risk management is usually concerned with specific (or particular) risks, which are isolated in time and space. They are random, local, and essentially as such unique events. Generally, loss or damage due to fires, motor accidents and so on, are specific risks.

There is good reason as to why risk management usually focuses on specific risks since these can in some measure, be holistically managed by the enterprise. In the case of systemic risks, there is little that individual enterprise can do to manage the risk itself. Some of the consequences can be managed, but not the risk itself. Risk management has two main foci: risk control and risk financing. COVID, and thus systemic risks impact on both.

## Risk financing

The magnitude of funding falls outside what can be managed by most enterprises and thus the issue of public sector funding must be considered. The South African government also implemented a nationwide lockdown and provided significant funding largely via the Unemployment Insurance Fund (UIF) system. Both the national lockdown and state funding to those affected by the lockdown are unique. No announcement was made that such funding would be achieved via the Quantitative Easing mechanism. There can be little doubt that internally the South African Reserve Bank, which has a reputation of being up to date on what is happening within central bank thinking world-wide, discussed Quantitative Easing. Private sector firms retrenched staff – small firms closed down – unemployment increased massively. This illustrates the point that, systemic events/consequences, such as a national lockdown cannot be funded privately or internally. However, government funding to ameliorate the problem created in the private sector is new. Funding systemic risks generally fall outside of the scope of private risk management.<sup>9</sup>

## Public sector funding

A unique feature of these two systemic risk events is the extent to which funding was provided by governments. Before 1776 when the US declared independence from Britain, it was accepted the state had a very limited role, which was that of protecting its citizens. Funding was thus limited to this single role. At that time, 1776, Adam Smith identified that the state had a second function in respect of which it could spend money - the installation and maintenance of public works. By the time the US Constitution was adopted, after the War of Independence, these two functions were well-established and captured in the

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9 The issue of financial risk management with respect to COVID-19 is further discussed in section 12.10.

preamble of the US Constitution. The preamble incidentally was much of an afterthought, and not even discussed. Initially, government expenditure was modest and limited to the two recognised functions of the state. Today, government expenditure is no longer modest. The interwar period (1918–1939) saw the Great Depression. With this, came a slight change in the idea and role of government expenditure. Some argued expenditure was needed to stimulate the economy. Although the purpose of government expenditure had changed, the purpose of expenditure was being directed to stimulating the economy, the basic function of the government remained within the accepted framework of defence and public works. The stimulation expenditure was largely directed toward public works, including infrastructure. This could be called the ‘first wave of government expenditure’.

The 2008 crisis saw a fundamental shift in expenditure philosophy. Extensive expenditure was undertaken by Central Banks in terms of the Quantitative Easing programmes (QE). In terms of QE1, by March 2009, the Federal Reserve had acquired \$1.75 trillion in assets. In November 2010 QE2 was launched followed by QE3 in September 2012. QE3 became known as ‘QE3 to infinity’. By October 2014, the Fed had accumulated \$4.5 trillion in assets. This could be called the ‘second wave of government expenditure’. By the time COVID appeared, the idea of massive government expenditure via Central Banks seemed to have been the accepted norm in many quarters and so, because of COVID in 2020, the Fed added a further \$2 trillion to its balance sheet. The COVID expenditure was different to the 2008 expenditure and can therefore be called the ‘third wave of government expenditure’.

This new form of funding was not confined to the US. After a lag, the UK followed the QE path. By July 2012 the Bank of England asset purchases reached £375 bn in the second wave expenditure. And, as in the USA, the notion of massive Central Bank intervention seemed to have been accepted by many, so with Brexit and COVID by March 2020 the purchases totalled £645 bn. The increased expenditure becomes evident when government deficits are examined. The expenditure has not been funded through taxes but by deficit spending. This is achieved largely because of low interest rates.

## Private sector funding

When the magnitude of the funding involved is taken into consideration, it becomes clear that this funding falls completely outside of the scope of any individual private sector enterprise. These developments intersect with private funding mechanisms via insurance. Insurance is used to fund losses, and thus the obvious question which arises is ‘to what extent can insurance play a role?’ One of the obvious risks is the risk of business interruption which, as it so happens, *to an extent*, is an insurable risk. *To an extent*, because historically business interruption insurance was designed to cover a limited form of business interruption loss which arises as a consequence of physical damage to property. It was not designed as a general form of business interruption cover. The need for this limited cover became apparent when in the early 1800s the courts interpreted property damage policies not to include consequential losses or liability claims. This, then, gave birth to two new insurance policies: the business interruption policy and the legal liability policy.

It is not surprising that legislators, regulators and bureaucrats, spending in general trillions of dollars, would find the notion of insurance cover being somewhat restricted, to be a strange one. So, in the US, for example, litigation was launched to force insurers to pay

for business interruption losses incurred as a result of the pandemic. In the UK and other parts of the world, litigation was also launched but limited to insurers whose form of cover and extensions seemed to provide insurance against pandemic-type losses. In this regard, insurers were being held liable to make payment.

Going forward, considerable research will need to be undertaken to establish the extent of insurers', or other yet to be defined institutions', role in financing the effects of future pandemics. This research will of necessity be informed by two interlinking factors. As indicated above, insurance deals with specific and not systemic risks. These risks materialise as random loss or damage which occur at identifiable times and places. This brings the losses within the requirement of insurability. Insurance practice is informed by an adage: insurance is the payment of the losses of the few by the many. A pandemic, being systemic, exposes the system to the risk of government intervention, which occurs in the form of national lockdowns. Thus, for the first time in world history, the possibility of all enterprises experiencing business interruption at the same time became a reality. This risk cannot be covered by private sector insurance. The multi-trillion losses indicated above cannot be transferred from the government to the insurance market.

## Financial systemic assistance as a public good

This conclusion is endorsed by standard economic theory which recognises there are three kinds of goods: public goods, merit goods and private goods (Chapter 12). Private insurance is provided as a private good. If, on the other hand, *everyone* suffers a loss, then, if that is to be funded, it can only be funded as a *public good*. As already indicated the role of private insurance in covering losses arising out of a pandemic can only be more clearly set out by way of future research. An *agency* role may well develop between the government and insurance sectors, to manage the provision of the public good, as has been the case with financing, for example, the losses arising from terrorism.

## Risk control

The second focus of risk management is one of risk control – the practical measures which can be taken to deal with the risk. There are many lessons to be learnt from dealing with the pandemic on this front. Risk management no doubt can contribute. One of the key processes of risk management is contingency planning; so, when the pandemic has passed, it is necessary to develop contingency plans to deal with future systemic risks, not normally forming part of the scope of risk management.

## Risk management and governments

As indicated above, the focus of risk management is individual enterprises. The principles of risk management are however of general application and thus also can be applied by governments to manage systemic risks.

# 1.5 Strategic risks: Sustainability

Integral to a company's risk management is the identification of strategic risk, including sustainability risk. Businesses' sustainability is dependent upon ensuring that the four pillars of strategic planning, financial, environmental, social and human, are

appropriately addressed (King, 2009a). Mervyn King<sup>10</sup> asserts that ‘governance, strategy and sustainability’ are inseparable. The provisions of King III require companies to report on their sustainability practices and performance, making the issue of sustainability a governance criterion as well. One of the best practice formats identified by the South African Institute of Chartered Accountants and the International Federation of Accountants for sustainability reporting is the Global Reporting Initiative (GRI)<sup>11</sup>. Sustainability is no longer an optional extra, but an ‘essential component of doing business’, according to Ben Marx of the University of Johannesburg (James, 2009). One of the key consequences of incorporating sustainability reporting in the King Codes is that doing so integrates sustainability with financial reporting, making sustainability a key risk management concern. The 2006 Companies Act in the UK introduced the requirement for businesses to report on their social and environmental issues.

It is not difficult to understand why sustainability issues are of significant importance in risk management. Note the findings of Sir Nicholas Stern in the 2006 Stern Review that climate change will increase the frequency and severity of weather patterns such as hurricanes and floods, with severe consequences both for humans and the economy (Stern, 2006). Costs associated with this trend have been estimated by the Global Humanitarian Forum over the past five years at around \$230 billion in a single year, placing industries, businesses, infrastructure and properties at risk (Essop, 2009). The present threat to sustainability presented by climate change is likely to be exacerbated by the trend towards increasing harmful emissions by large developing countries such as China, India, Brazil and South Africa.

It is easy to lose sight of the importance of sustainability in the light of the global financial tsunami that in 2008/09 engulfed the world, but business and political leaders around the world are calling for a solution to the financial crisis that incorporates solutions to climate change. Joseph Stiglitz, who presided over discussions on reform of the international monetary and financial system, called on leaders to ensure that goals such as meeting the Millennium Development Goals and protecting the world against the threat of climate change must remain priorities and that ‘the immediate steps taken in response to the crisis ... should provide an opportunity to accelerate progress towards these goals’ (Stiglitz, 2009).

This presents a critical challenge to business as key drivers of development and contributors to emissions especially in developing countries not to go about their business as usual. Businesses in developing countries need to explore innovative solutions to sustainability risks and not simply pursue the same destructive paths towards industrial development that has resulted in the world we have today.

In December 2015, the United Nations Framework Convention on Climate Change (UNFCCC) was established in Paris. The plan, due to come into force in 2020, is notable in that all 196 representative countries agreed to abide by its targets on mitigating greenhouse

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10 King is chairman of the King Committee which produces the King Codes on corporate governance.

11 The GRI is a voluntary network of business, civil society, labour and professional institutions promoting transparency on sustainability issues through a reporting framework that outlines principles for organisations to use as a guiding mechanism for measuring and reporting on their economic, environmental and social performance. The latest version of the GRI is called G3. See <http://www.globalreporting.org> (retrieved 2009, 23 October).

gas emissions. The Convention has agreed to keep the rise in global temperature to 2°C above preindustrial levels which has the potential to substantially reduce the risks of climate change. In June 2017, the USA announced that it would withdraw from the agreement, to be made effective by November 2020, a move which has created uncertainty around the effectiveness of the agreement.

In his call to action, King reports numerous initiatives being undertaken by forward-thinking corporations both globally and in South Africa to address the problems caused by pollution and to reduce the amount of environmentally damaging greenhouse gases they produce. He tells of 'green' office buildings in Manhattan and Johannesburg, Sasol's clean development mechanisms and African Explosives and Highveld Steel & Vanadium participation in carbon offsetting (King, 2009b, pp.3–4). South Africa's JSE Securities Exchange has begun offering shares in carbon credit investments. King's book highlights the tremendous importance of large corporations as agents for change and identifies good corporate citizens as role models for how companies should be addressing their sustainability risks and responsibilities. King makes the case that addressing sustainability is not simply a matter of social responsibility; rather, the business case sees a link between sustainability and opportunity where sustainability is the basis for strategic and long-term thinking. 'Sustainable development makes a company more competitive, not less competitive' (King, 2009b). The costs of doing business are increasing as energy sources are depleted, and the higher costs of electricity and diesel will make production prohibitively expensive in time, forcing companies to rethink their strategic risks and ability to continue doing business as usual. The lack of key resources such as water will require strategic responses from industries reliant on water as a factor of production, such as Coca-Cola. The challenge for businesses in responding to sustainability risk is 'how to produce more with less' (King, 2009b).

## 1.6 Managerial risk classifications

Managerial classifications are made to assist in managing risks. A board of directors may decide to manage the risks facing the company, but how does it do this? One way would be to break the organisation into more manageable sections. So it could divide risks into two categories, future risks (strategic risks) and day-to-day risks (operational risks). The day-to-day risks could then be subdivided into risks facing each department of the company, such as the marketing department, engineering (technical), financial and treasury, and so on. It is clear that managerial classifications are arbitrary in nature and those discussed here are by no means all that are possible.

From a risk management perspective, the terms 'risk' and 'management' imply, in a sense, that only some risks inherent in corporate activity will concern this process. This class of risks has distinguishing characteristics that differentiate it from other forms of risks.

Doherty identifies four types affecting an organisation (Doherty, 1985, p.2). These are:

- marketing risk
- financial risk
- resource management risk
- environmental risk.

Greene and Serbein classify risks along quite similar lines, namely (Greene & Serbein, 1983):

- property and personnel
- finance
- personnel and production
- environment.

An organisation, in seeking to earn a profit for its owners, can be affected by the collective effect of these various risks. But the organisation is also exposed to, for example, the possibility of fire loss to its plant and equipment, to liability claims due to defective products, and to possible theft of assets and fraud by its personnel.

For the purposes of this discussion, risk in a corporate environment is subdivided into three categories on the macro level, namely:

- inherent business risks (end-economic risks) and incidental risks
- operational risks (including pure risks) and speculative risks.<sup>12</sup>

These categories are discussed in greater detail below.

## Inherent business risks and incidental risks

### Inherent risks

Inherent business risks include all the activities, decisions and events that impact on the operating profit of an organisation. These risks are also inherent to the main business of the organisation as reflected by the mission statement. They cause fluctuations in the operating profit of the company and eventually also in the earnings of the ordinary shareholder. Inherent business risks consist of two different types of risks.

The first results from variations affecting an individual company and is uncorrelated with the rest of the economy. This is referred to as specific risk or unsystematic risk (as opposed to systematic risk; see p.12). The second type of risk stems from occurrences that affect the economy as a whole. This is referred to as systematic risk or market risk (see p.12).

Specific business risk, or the volatility of operating income, can be segregated further into the following:

- **Sales variability**

Sales variability is measured by the standard deviation of sales over time and is dependent on consumer demand for the product. It is caused by market factors that affect the demand for a company's products such as product design, promotion, general income levels, price, and prices of competing and complementary products.

- **Operating leverage**

Operating leverage is dependent on the production function and specifically the mix of fixed and variable cost inputs that go into producing goods. It is measured by the percentage change in operating earnings divided by the percentage change in sales over a specific period of time.

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<sup>12</sup> Traditionally, the distinction has been made between pure and speculative risks, but as companies increasingly have adopted risk management programmes, the various other risks have been classified. A simple distinction between pure and speculative risk is thus inadequate. Non-speculative risks can be referred to as operational risks, and many of these are insurable. The term 'event risk' instead of 'pure risk' is also used in this text.

- Fixed costs are costs that remain the same regardless of the level of sales volumes.
- Variable costs vary directly in relation to sales volumes.

Operating cost volatility is dependent on the proportion of fixed costs to total costs. Fixed costs add to the volatility of total costs by not declining when sales are dropping, but also by not increasing when sales are picking up.

- **Resource risks**

Another factor that causes fluctuations in the operating profits of companies is resource risks. In the production process, the firm brings together a number of specific resources such as labour, material, capital and technology. Changes in the productivity of these resources bring about changes in the profits and therefore cause risk to shareholders.

- **Profit margin and turnover**

The profit margin and turnover of companies also affect the operating profit. Increases in competition that may result in lower profit margins and/or a smaller turnover, therefore causing risk to shareholders.

The management of systematic risk entails a repositioning on the risk-return curve. A specific company or an investor may position themselves on a risk-return curve to determine the level of systematic risk they are prepared to accept given the level of return. The required return increases with increasing levels of systematic or market risk.

## Incidental risks

Incidental risks are those risks that arise naturally from the activities of a business, but are incidental in the sense that they do not form part of the main business of the organisation, yet are necessary to ensure the continuation of the main business of the entity.

The principle subcategory of incidental risks is financial risk.

The risks involved in transactions in financial assets and those that may result from fluctuating financial claims (deposit liabilities) are referred to as financial risks. Businesses exposed to this type of risk must, therefore, manage not only their non-financial (operating risks) and physical assets, but must also manage their financial assets.

Financial risks can generally be subdivided into the following main headings:

- **Interest rate risk**

Interest rate risk refers to the changes to the net interest income that could arise owing to adverse variations in interest rates.

- **Liquidity risk**

Liquidity risk is the risk that operations cannot be funded and financial commitments cannot be met timeously and cost effectively. Liquidity risk results from both the difference between the size of assets and liability (the funding need) and the disproportion in their sizes.

- **Investment (capital) risk**

Capital risk refers to the possibility that investments may be adversely affected by losses stemming from risks to which they are exposed.

- **Credit risk**

Credit risk is the risk that a financial contract will not be concluded according to the original set of terms. It is the risk that a party to the contract will default.

- **Currency risk**

Currency (or foreign exchange) risk concerns the possible impact that changes in exchange rates may have on the foreign exchange holdings or the commitments payable in foreign currencies by business organisations.

These risks exist and arise indirectly from the business activities of the business.

## Operational risks

Operational risks refer to risks of a non-speculative nature that have no potential for showing a profit. Traditionally, many of these can be insured. A typical example would be the destruction of an asset by fire. If a fire occurs, a loss is incurred; if the fire does not occur, then no loss occurs. Pure risks are usually referred to as insurable losses, since the financial consequences of these losses may be transferred to an insurance company by insuring against these losses.

## 1.7 Psychological influences on risk

Attempting to understand human behaviour has for a long time preoccupied the minds of many in the discipline of Psychology. This has led to the development of a recognised area of study and subdisciplines or specialisations such as Social Psychology, Clinical Psychology, Psychology of Education and others.

Interest has been directed for some considerable time to the influence of risk on decision-making – more particularly on determining substitutes for risk and incorporating these in decision-making techniques, usually quantitative ones, so as to reflect the effects of uncertainty more accurately. Individuals' perception of risk and their capacity to absorb it are critical to the study of risk management and insurance. Situations of risk are perceived differently by each person, and such perceptions often depend on an individual's reaction to risk or are even dictated by a particular entity's attitude towards risk treatment. Put simply, one person's reaction towards risk, which could be described as aggressive, might be contrasted with another's, whose attitude is one of aversion to risk and who will purchase insurance merely not to tempt fate.

An individual's perception of and reaction to risk are influenced by many factors. Wealth (i.e. risk-bearing capacity), family background, previous experience, position or status, and geographical location are just a few of what seem to be an endless list of factors that influence risk-taking decisions. Not only have psychologists not identified all such factors, but the effects of those already identified on the kinds of decisions that are made under conditions of risk and uncertainty have not been satisfactorily quantified.

Research has shown that the attitudes towards risk are unstable, in that an individual's attitudes can change when they are being subjected or exposed to the attitudes of a group (Rim, 1964, pp.70–79). The implication that group decisions are less risky than individual ones may be inaccurate. This influence of group attitudes is particularly relevant when placed in the context of organisational behaviour towards risk and its overall profile. This often dictates what is an acceptable level of risk to be borne and hence what level of risk should be insured. It is likely that the perceptions and attitudes of those individuals responsible for



insurance are swayed to coincide with those portrayed by the group as a whole. Organisational culture or ethos, therefore, affects the specific area of risk perception and management.

Personal or group characteristics are not the only influences on reaction to risk. The type of risk (pure as opposed to speculative) also exerts an influence. Williams argues that speculative risk situations are frequently desirable and pure risk situations undesirable (Williams, 1966, p.579). Again, it is not uncommon for individuals or organisations to purchase insurance and thereby avoid risk while simultaneously accepting speculative risks – a decision that appears to be contradictory, since both situations may have the same objective probability of occurring.<sup>13</sup>

The importance of psychological influences on risk behaviour in economic decisions has increasingly been understood and is studied in the field of behavioural economics and finance.

## 1.8 Summary

The objective of this chapter has been to provide a general background to risk management by examining the central concepts of risk and uncertainty, and the definition and classification of risk. With regard to the latter, a degree of rigour was imposed, while explaining, from a risk management point of view, the two distinct elements of event and outcome, which are inherent in uncertainty.

The discussion has, of necessity, considered the question of risk quantification and decision-making under uncertain conditions, taking into account the financial mechanism of an insurance market to fund the possible financial outcomes resulting from risk.

Having reviewed what may be regarded as the key features of the area of uncertainty or risk, the chapter that follows focuses on decision-making under conditions of risk and uncertainty when the standard deviation is an appropriate measure of risk. Risk therefore implies the presence of uncertainty.

## References

- Athean, J.L., & Pritchett, S.T. (1984). *Risk and Insurance*. West.
- Denenberg, H.S., Eilers, R.D., Melone, J.J., & Zelten, R.A. (1974). *Risk and Insurance*. Prentice-Hall.
- Doherty, N.A. (1985). *Corporate Risk Management: A Financial Exposition*. McGraw-Hill.
- Essop, T. (2009). Survival of the Planet and Its People at Stake. *The Thinker*, 8.
- Friedman, M., & Savage, L.J. (1948). The Utility Analysis of Choices Involving Risk. *Journal of Political Econom*, 56(4), 279–304.
- Greene, M.R. & Serbein, O.N. (1983). *Risk Management – Text and Cases*. Reston.
- James, A. (2009). Increased Commitment despite the Recession. *Business Day*, October 23, 2009.
- King, M. (2009a). No Title. *Business Day*, 2009.
- . (2009b). *Transient Caretakers: Making Life on Earth Sustainable*. Pan-MacMillian.

13 A rational explanation for this has been offered by means of utility theory (Friedman and Savage, 1948, pp.279–304).

- Knight, F. H. (1921). *Risk, Uncertainty and Profit*. Houghtson Mifflin Company.
- Mehr, R.I. (1986). *Fundamentals of Insurance*. 2nd ed. Irwin.
- Pearson, R. (2002). Moral Hazard and the Assessment of Insurance Risk in Eighteenth-and Early-Nineteenth-Century Britain. *Business History Review*, 76(1), 1–35.
- Pfeffer, I. (1956). *Insurance and Economic Theory*. Irwin.
- Rim, Y. (1964). Personality and Group Decisions Involving Risk. *Psychological Record*, 14.
- Rowell, D., & Connelly, L.B. (2012). A History of the Term ‘Moral Hazard’. *Journal of Risk and Insurance*, 79 (4), 1051–75. <https://doi.org/10.2307/23354958>.
- Shackle, G.L.S. (1961). *Decision, Order and Time in Human Affairs*. Cambridge University Press.
- Stern, N. (2006). *Stern Review on the Economics of Climate Change*. British Government.
- Stiglitz, J.E. (2009). *Follow-up to the Implementation of the Outcome of the 2002 International Conference on Financing for Development and the Preparation of the 2008 Review Conference: Recommendations of the Commission of Experts of the President of the General Assembly on Re*. In *UN Doc. A/63/838 of 29 April*. UN General Assembly.
- Willet, A.H. (1901). *The Economic Theory of Risk and Insurance*. Pennsylvania University Press.
- Williams, C.A. (1966). Attitudes towards Speculative Risks as an Indicator of Attitudes towards Pure Risk. *Journal of Risk and Insurance*, 34.
- Williams, C.A., Smith, M.L. & Young, P.C. (1998). *Risk Management and Insurance*. 8th ed. McGraw-Hill.