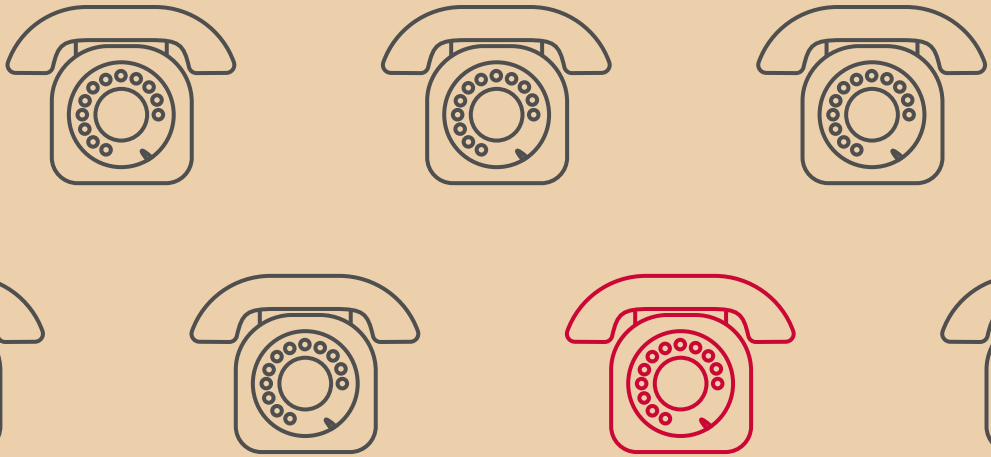
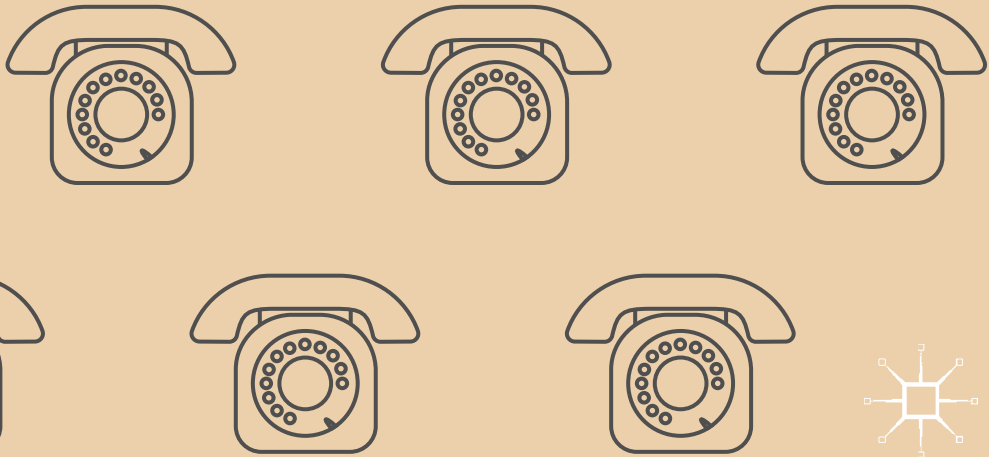


# REDEFINING RISK & RETURN

## The Economic Red Phone Explained

**Jesper Lyng Jensen**

Co-author: Susanne Sublett



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Jesper Lyng Jensen • Susanne Sublett

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## The Economic Red Phone Explained

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*It is extremely advantageous to be able to bring a number of investigations under the formula of a single problem. For in this manner, we not only facilitate our own labour, inasmuch as we define it clearly to ourselves, but also make it easier for others to decide whether we have done justice to our undertaking.*

***Emmanuel Kant**, 1781, **Critique of Pure Reason***

# Preface

The journey from experiment to book has taken nine years. It has been an interesting journey, and it has been a privilege to receive the assistance of a great many fantastic people in the process.

Claus Due Ponsaing and Jens B. A. Winther have been invaluable partners in the work of writing this book and the scientific publications. I owe both of you my deepest gratitude.

Special thanks go to Niels Thygesen and Mogens Lykketoft for having admirably furthered the work of writing this book. You have opened many doors, participated in discussions, and frequently given your professional input.

Many people have contributed to the writing of this book. During the five years I have taken to write the book, friends, family, and people from my network have helped with proofreading, commented on the contents, or put me in touch with people who were able to help in different ways, and I would like to thank them all. I should like to thank in particular Susanne Sublett, Gitte Harbo Vanderhaegen, Thomas Iversen, Sune Kliborg Lynge, Mettelene Jellinggaard, and Christian Wichers.

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Finally, I should like to thank my family, Dorte, Asger, and Amanda, for being so patient with me and for believing in me over the years when I have worked on the book and the research during my spare time.

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# 1

# Introduction

The purpose of this book is to change our usual description of risk and uncertainty.

The purpose is not to change what we feel about risk and uncertainty. Nor is it about taking a specific approach to risk and uncertainty, or a political angle or a societal observation. The purpose is literally to change one of the most "set in stone" definitions of risk theory. The book will argue that the current definition of "Risk = Probability × Consequence" is simply too crude a description to justify the enormous theoretical apparatus that has been based on it. We need a better risk description that captures more nuances of the way risk actually behaves.

It is possible to change the definition of risk because the origin of our risk definition is in philosophy, and this book takes a different approach to defining risk that is not philosophical in nature. Rather, the book uses a purely economic argumentation and perspective to challenge the classical risk definition. From an economic perspective, it makes more sense if we modify the definition of risk to Risk = (Probability × Consequence) + Structure.

The work on which this book is based was published in an international peer-reviewed journal. The reason I still found it necessary to write



J. Lyng Jensen, S. Sublett, *Redefining Risk & Return*,
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the book was because the work potentially has a colossal impact on the way we perceive the concepts of risk and uncertainty today.

Risk and uncertainty are intertwined in everything that happens in society and basically express the fact that the future is uncertain. They tell us that something else may happen in the future than what we expect and want.

To people, the present is admittedly important, but the future perhaps even more so. The future covers the rest of our lives and the work we will experience, but it is also a matter of the world we pass on to future generations.

If we seek to change our description of risk and uncertainty, this means that the basis on which we currently make many decisions in an attempt to create a better future is wrong. This is because contemporary decision making is based on an incorrect description of risk and uncertainty.

Consequently, politicians, businesses, individuals and other risk owners systematically make decisions today on the wrong basis because they do not have the knowledge presented in this book. Therefore these decisions will not lead to the best possible future economically, but to a suboptimal future.

Because this book deals primarily with economic theory, "suboptimal future" in this context means a future with lower average economic growth than could have been achieved by using the same resources but allocating them differently.

Therefore, the above statement concerning wrong decisions only applies to decisions made largely on an economic basis: i.e., decisions aimed at achieving growth and economic optimisation.

In order to change the description of risk, it is useless to point the finger at current literature or try to find errors and deficiencies in major works published by some of the world's greatest thinkers. Their work is fantastic and has, incidentally, been analysed through and through by numerous experts from different fields, such as economy, social science, philosophy, and other related fields.

Thus, this book is not an attempt to challenge the existing literature but to contribute to it. We maintain the role of "Risk = Probability × Consequence", but we add a structural component to the cost description because this is significant and fundamental and has been missing.

Adding a cost factor, thereby making risk more expensive than it is today, should simply not be possible, as the definition of Risk = Probability × Consequences is so easily observed being played out in real life, such as when playing dice for money and in many other similar situations, and the amount of economic theory that is directly or indirectly based on this definition of risk is enormous.

So, this book is on an impossible mission, right from the start. If this book is successful, it means that all the world's professors and other experts in economics, philosophy, and social science have not spotted a fundamental cost associated with risk or have described it in ways that do not allow for generalisation at the most fundamental level possible. By failing to include the cost component in our fundamental description of risk, much of our work in investment analyses, societal models, definitions of freedom, and many more areas could potentially be based on a wrong understanding of the dynamics of risk cost.

So, to recap, the mission of this book is impossible—or, more precisely perhaps, it is extremely unlikely to succeed.

In this light, the most natural response would be to give up and not write the book at all. Nonetheless, I have chosen to do so. I have written a book that aims to change the description of the nature of risk—hopefully forever.

Whether this is going to be a mission accomplished is up to the reader. Having read this book, readers, I believe, will at least be able to form an opinion.

The book has been structured so as to initially offer a brief, simple description of its contribution to economic risk theory. This is not very difficult to grasp or understand. And to convince the reader, the new theory should fit into economic theory as a missing piece of a complex puzzle. But not only that, it should also fit with the reader's personal understanding of how risk works and how it affects us. To change something in our fundamental description of risk, the new theory has to be convincing and intuitively correct and not something that alienates the concept of risk.

Additionally it must be possible to see that the interfaces to existing works and to the real world in which we live are credible. We want this

piece of the puzzle to contribute something new, but not contradict significant, well-proven connections.

That is why the book will take the reader on a journey through the theoretical universe of economics, focusing in particular on our understanding of the theory and its contribution to seeing risk as part of the description of the value of capital and insurance. It will be demonstrated that the theory contributes to and extends our understanding of how risk should be included in the assessment of investment calculations. In the process, examples from the real world will be used to show that the consequences of the theory are related to reality and significant to our understanding of how fundamental societal elements, such as health insurance, form part of the national economy.

The book will also address the interfaces between new economic risk theory, macroeconomics, and understanding society. This will enable the theory to be validated against the effects observed during financial crises, which surprised many. This includes the observation that the rich get richer and the poor get poorer during financial crises.

What we also see in the interfaces is that two persistent economic paradoxes suddenly begin to make sense. The paradoxes are not paradoxical any more. We find that people and enterprises actually behave the way they were supposed to according to the new risk theory, and the paradoxes stop being paradoxes. Furthermore, we are talking about two paradoxes for which probably nobody would have expected to find a simultaneous explanation.

To recap, the reader should see this book as a description of a missing piece to the puzzle and as a description of the pieces already in place—pieces that are adjacent to the newly discovered piece. This also means that the book does not describe all the details or nuances of the existing puzzle, but merely relates to the pieces immediately adjacent to the previously missing piece of the puzzle (Fig. 1.1).

The concept behind the structure of the book has been to say that there is no simple message or punch line that will change the description of risk and uncertainty overnight. The change is too fundamental for that to happen. On the other hand, the sum of a convincing, easy-to-grasp theory and the concurrence of existing problems and observations will hopefully generate the momentum that will transform our view of the

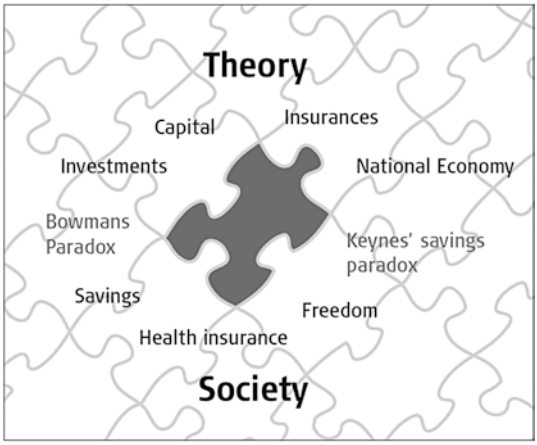


**Fig. 1.1** The book "Redefining Risk & Return" contributes to the description of economic risk, demonstrating how the theory fits in with a number of interfaces of the existing regimen of theories and with society. Accordingly, the book should be seen as an argument to support our claim that we have actually found an important, previously missing piece in our understanding of how risk is included in decisions to optimize conditions for social economic growth

world. Such a transformation will permit us to create a better society with higher growth.

This improved description of risk and uncertainty will make politicians and enterprises take different decisions. The people will impose new demands on politicians and will administer their own finances differently. This will all lead to higher economic growth in society.

Perhaps the impact from these decisions will be small. Perhaps it will be great. We will not know until many years down the road.

It is important to stress that the mission of the book is not political or ideological; the book is not intended to reflect a specific sociological approach. The only purpose of the book is to demonstrate the existence of a factor that hampers growth in society and that has not been elucidated or recognized as a fundamental consequence of risk until now. Furthermore, the book will give examples to explain some of the tools available to individuals and to society when it comes to handling this cost factor—tools that we will be able to use to increase growth in society.

The book should thus be seen as a step towards an economically more advanced society and an economically more complete society with fewer economic paradoxes, fewer inexplicable economic consequences of risk, and higher economic growth.

The first step towards a better description of economic risk is to ask one simple question:

## What Is the Financing Cost of Suddenly Running Out of Capital?

On the face of it, this is a trivial question. We are all, economists as well as non-economists, quite accustomed to considering financing cost when we want to make an acquisition, whether it is a new car, a caravan, or a company we wish to acquire, but for which we do not have all the money required. In this situation, we will scrutinise the financing opportunities available, and if we find financing at a reasonable cost, we will make our acquisition. If financing is not available at a reasonable cost, we will simply not make the acquisition. The ability to walk away from the situation is what separates a normal acquisition from a situation where we suddenly run out of capital. In this situation, walking away is not an option because the cost has already materialized. So the logic of assessing the financing cost and walking away if the available financing cost is not attractive enough cannot be applied in this situation. Instead, we need a new logic that allows us to look at what financing cost scenarios exist when the bill has to be paid and financing opportunities may be prohibitively expensive or not available at all.

This book will describe the logic of the cost of running out of capital and through this description conclude that we need to revise our classical risk model in order to understand the true nature of the cost of risk and uncertainty.

To write this book, it was necessary to test risk in Monte Carlo simulations. If you are not familiar with Monte Carlo simulations, you may well want to read the following chapter, entitled *How to read a Monte Carlo*

*simulation graph,* before you start on the book. If you are already familiar with Monte Carlo simulations, you may want to skip the next chapter.

In this book the masculine pronoun (*he*) has been used rather than the correct systematic reference to both genders. In the absence of a pronoun for both genders, this approach has been used to facilitate the book's readability, and no discrimination is intended by this choice.

The book also states "I" when referring to the primary author of the book, rather than stating the collaboration of the authors. In reality I have benefitted from a fantastic collaboration with Susanne Sublett in the writing of this book, and I am forever grateful for our many discussions and the contributions to the book provided by Susanne.

# 2

# How to Read a Monte Carlo Simulation Graph

This book includes graphical representations of Monte Carlo simulations, also known as Monte Carlo simulation graphs.

A Monte Carlo simulation is a practical test of risk. Unlike a calculation, the simulation only describes the nature of risk elements. This is also known as an empirical description or test.

A Monte Carlo simulation is warranted because it provides a different approach to the description of risk than statistical or average value-based assessments of risk.

In the statistical and average value description of risk, risk behaves nicely because there is an underlying assumption that we are endlessly repeating an experiment.

If, for example, we take a look at an investor who will be able to make an investment with a 10% probability of generating an extra expense of DKK 200,000, we can calculate the investor's financial risk as Risk = Probability × Consequence, which is why Risk = 10% × DKK 200,000. The risk is thus calculated to be DKK 20,000. Mathematically, this means that sometimes—nine times out of ten—the risk owner will lose DKK 0, while sometimes—once out of ten times—he will lose DKK 200,000.



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When we calculate the risk described above, we assume that the investment will be endlessly repeated. In this situation, it is correct that the average value of the risk is DKK 20,000 each time the investment is made.

In the specific calculation above, it must, however, be borne in mind that the calculated value gives no understanding whatsoever of the situation that a risk owner may land in if the risk owner makes only one investment. Conversely, in this situation the calculation gives a result that is outright misleading. If only one investment is made, the result may be a cost of DKK 0 or a cost of DKK 200,000. The specific investment whose value is calculated in the example can never actually generate a cost of DKK 20,000, which is the result of the calculation of the size of the financial risk.

It is thus possible to calculate the value of risk, but this calculation does not generate a fair view of what can actually happen to a risk owner in the case of few investments.

If you want to demonstrate what can actually happen to a risk owner, you may want to carry out a Monte Carlo simulation. In a Monte Carlo simulation, you carry out the experiment constituted by the risk investigated. Naturally, for this purpose you need to be able to generate random numbers; to this end, a die can be used, or as is more often the case in financial simulation, the suitable function in a spreadsheet can be utilized.

In the example with a risk of 10% that a cost of DKK 200,000 will arise, you could take a ten-sided die (Fig. 2.1) and decide that if you roll it and get a "1", it means that the cost of DKK 200,000 has been realized, while if you get anything but "1", it means that a cost of DKK 0 has been realized.

You may now roll the die as many times as you like; each time you have rolled it, you can tick off the cost generated by the experiment. In practice, you should roll the die many times to make sure that the experiment generates a correct picture of the risk you wish to clarify. Because a high number of simulations are required and because the


**Fig. 2.1** Graphical representation of a ten-sided die

risk picture to be simulated is often complicated, Excel is preferable to a die.

When you have rolled the die a number of times—e.g., 100 times—you can produce a graph showing how often the experiment resulted in a given value. Such a graph is depicted in Fig. 2.2

On the X-axis for the graph in Fig. 2.2, you state the value in DKK in suitable intervals. The more intervals you decide to have, the more detailed a picture you will get of the risk effect you are simulating. On the Y-axis, there is no reproduction of numbers. This is because the Y-axis shows the frequency of a given value in the experiment. This also means that the frequency is merely a number decided by the number of simulations made. If I made 100 simulations, the Y-axis in Fig. 2.2 could never exceed 100. However, if I made 10,000 simulations, the Y-axis would go to a place between 0 and 10,000, depending on how many results land in the category with the highest number of results. Thus the real and absolute numbers on the Y-axis do not describe the risk simulated, but simply show a number chosen by the person making the simulation. As regards the chosen number of simulations, it must be high so as to avoid having the graph show too few randomized

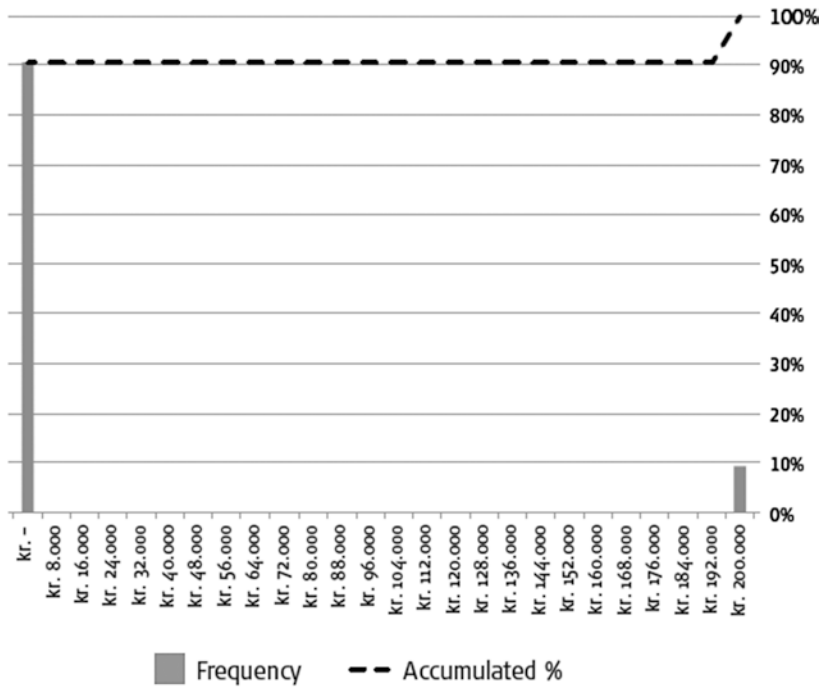


**Fig. 2.2** This graph shows the result of a Monte Carlo simulation of a 10% risk of a DKK 200,000 cost. The graph has two gray frequency columns. As can be seen, one is much taller than the other. The tall column is at the 0 point on the X-axis, while the short column is at the interval on the X-axis that goes from DKK 192,000 to DKK 200,000. The *dotted graph* is the accumulated probability graph. The *dotted line* is generated by taking the observations at a given value on the X-axis and dividing this figure by the number of all observations, while multiplying it by 100 to get the result as a percentage

results. There are ways to estimate the required number of simulations, but these are beyond the scope of this introduction to Monte Carlo simulations.

The interesting point about a Monte Carlo simulation graph is thus not the absolute number of observations, but the specific observations that are made in the experiment as well as the relative breakdown of these observations.

The relative—or percentage—breakdown may for any frequency category be designated as the number of observations "n" divided by the number of trials "N" as a percentage. This can also be written as n/N × 100.

In Monte Carlo simulations, accumulated frequency is often used to reproduce the result of the simulation. For any frequency category, the accumulated frequency can be calculated as the sum of all the observations made that have a value equal to or lower than the given frequency category "∑n" divided by the number of experiments "N" in percent. This can also be written as ∑n/N×100. The axis for the accumulated frequency is shown on the right-hand side of the graph, while the graph itself of the accumulated frequency is shown as a dotted line in the graph.

A Monte Carlo simulation is thus used to reproduce knowledge about the risk as an experiment, and it gives us a visual presentation of what can actually happen if you are exposed to the risk.

There is no value calculation in a Monte Carlo simulation. There is no assessment of whether it is financially advantageous to take a given risk. The simulation simply offers a graphical presentation of the breakdown of the consequences of assuming a given risk.

In a very simple experiment, a Monte Carlo simulation offers only a limited contribution to our understanding of risk.

However, in more complex contexts, the simulation may provide a good overview. Table 2.1 lists the risk situations applicable to a fictitious

**Table 2.1** A risk description of the future of a fictitious risk owner. The future is described as the next twelve months. It is assumed that all risks in the risk owner's life are included in the table

| A risk owner's risks over the next twelve months | | |
|---|---|---|
| Risk | Probability (%) | Consequence |
| Car breaks down | 5 | DKK 10,000 |
| Unplanned visit to dentist | 10 | DKK 6,000 |
| Frost damage to summer cottage | 20 | DKK 15,000 |
| Replacement of lawn mower | 50 | DKK 3,000 |
| Lack of income from secondary employment | 25 | DKK 50,000 |
| Sudden interest hike | 25 | DKK 25,000 |
| Deductible on one insurance | 5 | DKK 5,000 |
| Theft | 3 | DKK 5,000 |

risk owner, a person who is not insured against everything and who has quite some risk. Let us assume that the risk owner has a reserve capital of DKK 50,000.

When you do a Monte Carlo simulation, you get a relatively easily accessible representation of a complex risk situation. For example, the graph allows you to read that the risk owner concerned has roughly a 75% chance of having enough reserve capital for the next twelve months. This can be read at the point on the graph where the dotted line, which describes the accumulated frequency of the observations, crosses the vertical line, which marks the limit of the risk owner's reserve capital (Fig. 2.3).

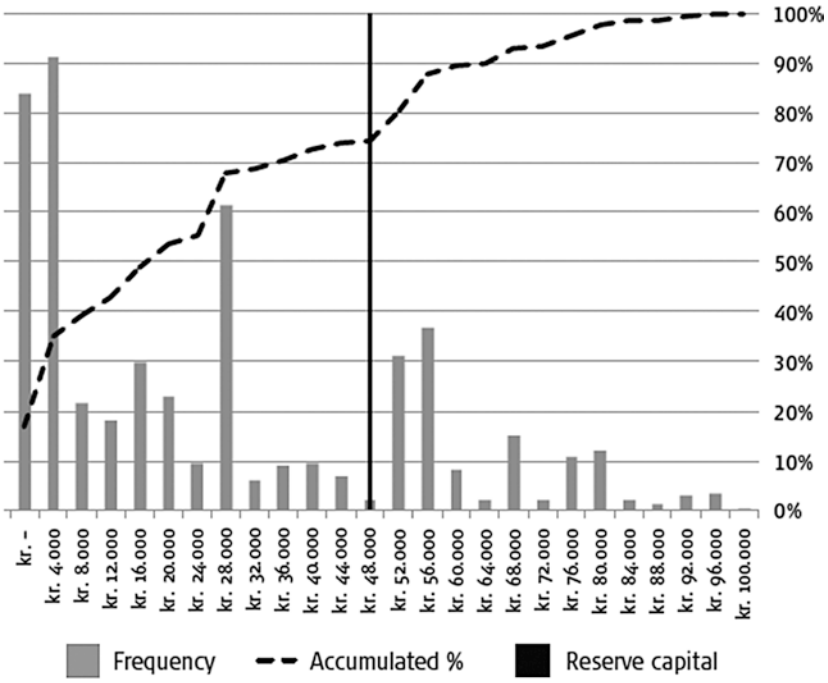


**Fig. 2.3** A Monte Carlo simulation of a risk owner's risk situation as described in Table 2.1 A total of 5,000 simulations were made. The graph shows the result of these simulations in the form of the sum of observations in each cost category. The risk owner's reserve capital is marked with a *black vertical line* in the graph. The *dotted line* is the accumulated frequency of the observations made in the conducted Monte Carlo simulation

# 3

# Introduction to the Cost of Running Out of Capital

The cost of running out of capital is a big, complicated question. Running out of capital is defined here as a situation of not having enough available funds to draw on but still having financial obligations towards others. In other words, we have not necessarily run out of assets in the form of long-term investments and other assets of value, but we have no more cash, so we have run out of capital.

It would probably surprise many people to know that economists find it difficult to predict and describe the costs of running out of capital. This is interesting because it is a constantly recurring event in our society.

It is often unforeseen events that cause us to run out of capital. Sudden, unforeseen expenses may hit us or expected income may not materialize. When such a situation occurs unexpectedly, it is a result of risk or uncertainty. Running out of capital as a result of high, unforeseen costs may hit private individuals as well as enterprises in the private and public sectors. When the situation occurs, it places the victim in a highly unpleasant situation that may be difficult to get out of. Without money, ongoing investments and long-term growth initiatives will stop—be it in households, enterprises, or other players in society.



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The purpose of this book is to point out that it is possible to describe the cost of running out of capital in the form of a simple, general mechanism; this will allow us to better integrate costs into our deliberations concerning the future. This also involves including cost more correctly when investments are being considered.

## A Risk Owner and a Structure

In this book, a person, enterprise, state, or other entity in society that owns or is exposed to risk or uncertainty will be called a *risk owner*. It would probably have been more correct to talk about a risk and uncertainty owner, but risk owner has been chosen for convenience.

By using the term risk owner we wish to emphasize a specific property of risk, namely the property of exposing people to specific effects of risk, such as sudden cost. When observing a risk effect from a third-party perspective, it is tempting to simply describe the singular risk event that could happen, such as a car crash. Such an event can be well-described in terms of the financial consequences of repairs and the potential safety concern of the driver and passengers. But in reality the consequences may be suffered by completely different agents of society. The cost of repairs may be the concern of an insurance company, and as regards the safety concern of the driver and the passengers, this might be different for different occupants, because it may not be equally dangerous to be in a front seat or a back seat. When we use the term risk owner, we emphasize that what we are looking at is the individual, whether a person or a company, exposed to the effects of risk. This is because this is the exposure that we own, not any additional consequence of risk that may adversely affect other risk owners. So the risk owner is to be understood as an objective analytical filter for how we describe the effects of risk.

To proceed with this book we need to define an additional term—the structure. A *structure* is basically an objective description of an entity's capital and long-term investments. An entity in this aspect is also a risk owner, so the structure is exposed to risk, as characterised by the risk owner's view on risks. A structure is thus an objective description of capital and long-term investments, while the risk owner is the person who

owns or administers the structure, and who is capable of making decisions regarding the exposure to risk of the structure concerned.

It is important to note the frequent occurrence of the word "objective" in the description of the risk owner and the structure. In the past 20–30 years, subjective risk and behavioural economics have exploded in popularity, and much effort has gone into describing this area. Behavioural economics and subject risk are best understood as a person's attitude towards a certain risk or economic proposition. Researchers in this area may be economists, but are as often philosophers and psychologists. In this book we wish to put a distance between the theory presented here and the work on subjective risk and behavioural economics because what we want to describe is a real cost effect and a direct consequence of risk, not a consequence of a certain behaviour or attitude towards risk.

The combination of a risk owner and a structure will help us achieve this. A risk owner and a structure in this way become a micro universe, where everything is under the direct control of the risk owner. But it is also a micro universe that is completely isolated from the market place. Inside a structure a market makes no sense, as the risk owner would only be able to trade with himself. So any market would have to be located between structures, and the structures can then trade goods and services with other structures in this market.

The absence of a market does not mean that there is no economic activity in a structure. Long-term investments are typically matured internally in structures, until such time as the investments start having a recognisable value and thus become relevant for the market. Structures are the nursing ground for investment, and no matter whether we are looking at the structure of a company where the risk owner is the CEO, we are looking at a department in that same company where the risk owner is the manager, or we are looking at that same manager's private economy, where the manager is the risk owner of his own private structure, the structures play a crucial role in maturing investments in an environment that is more or less segregated from the marketplace and thus the market economy.

Not all activities are easily understood in terms of structures and marketplaces. One case in point is education. An education can be a market product that I buy on the marketplace by selecting a private school

or other education provider. But once the investment has started, it becomes an internal long-term investment within the structure, which has to be matured within the structure during the completion of the education, and only when the education is completed does it provide a market value for the structure in the shape of job opportunities. Another example is the writing of this book by the authors. While working on the book and potentially using resources acquired in the marketplace, such as graphics design, proofreading, and advice on writing a book, the book in the shape of an uncompleted manuscript itself has no value. Only upon completing the manuscript to a state at which a publishing company can evaluate it does it start to assume a marketplace value.

Before this book starts analysing the costs of a situation in which a risk owner runs out of capital, it is necessary to review definitions of risk and uncertainty.

# 4

# Risk and Uncertainty

## The Concept of Risk

Defining and understanding risk and uncertainty is a relatively complex affair, which in itself may be an obstacle to passing on new knowledge of the cost of risk, which is the primary purpose of this book.

It is thus relevant to provide a brief review of risk concepts and definitions. It is important to note that this will not be a complete review because such a review would require an entire book of its own. The review provided here merely addresses the essentials.

Regarding the word "Risk", there is some uncertainty as to its origin, but most sources state that the word comes from the Italian word *risicare*, which means "to dare", or to try something that may be uncertain.

Historically speaking, risk is an old concept. We have examples of 4500-year-old board games containing deliberate elements of randomness through the presence of early types of dice and such board games can well be seen as an expression of risk. One of the most beautiful examples of such games is The Royal Game of Ur, which dates back to 2600 BC and which can be seen at the British Museum in London. During the



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ages, the concept of risk has developed both philosophically and objectively, and today the literature concerning risk is comprehensive.

Risk is a broad concept used in many different contexts. Risk is a concept we often use, each with our own subjective understanding of its meaning. If you ask a broad range of people to define the concept, you are thus likely to get many different definitions of the same concept.

A major reason why risk as a concept is so difficult to define is that risk always describes unexpected events in the *future*. As we know, the future is hard to predict and hard to relate to.

In our attempt to predict the future, we may, of course, use our knowledge of historical, unexpected events; on the other hand, we have no guarantee that the future will be like the past. Actually, the opposite is often the case—tomorrow always tends to be different from today. Our historical knowledge of risk thus gives us no complete picture of any unexpected events in the future.

## The Description of Risk and Uncertainty

In the world of science and economics, vague concepts are difficult to use. They need to be more specific to make it possible to work with risk in practice.

Different ways of dividing risk and uncertainty exist in literature: ontological uncertainty, epistemological uncertainty, aleatory uncertainty and idiosyncratic risk are all examples of subdivisions of the content of risk. A complete review of all these definitions is not required in order to be able to understand this book.

The set of definitions required to understand this book is the one where risk and uncertainty are two complementary concepts that jointly cover all unexpected events in the future.

In this context, uncertainty is an all-encompassing expression covering future, unexpected events that we cannot even formulate today. This basic uncertainty was defined by Frank Knight in 1921 in his main work Risk, Uncertainty & Profit (Knight 1921), where uncertainty was defined as "When we simply don't know".

Uncertainty is most easily described as events that we have no basis for describing—or lack significant preconditions for describing—as risk. For example, what is the risk of a military coup in a given country 20 years from now? The answer is that we have no idea, and that any attempt to predict and describe any choice would have such a frail basis of knowledge that such predictions really make no sense. There is thus a fundamental uncertainty.

**Uncertainty = When we have no knowledge or lack significant knowledge of the risk description**

Where uncertainty is defined as events that cannot be described because of lack of knowledge, risk can be defined as unexpected events that can to some extent be described. Unlike uncertainty, risk exists in situations where something unexpected may happen, but where this unexpected event can be described, stating probability and consequence for the risk owner (Lynggaard 2011; Edwards et al. 2007).

**Risk = Probability × Consequence**

In this way, risk becomes the orderly part of an unknown future. Risk is the part we can extract from the uncertain world and describe in more detail. The formula for risk is more universally accepted and can be found in basic textbooks on risk—be they books on financial risk or books on risk management. Risk is the practical tool for understanding that is the easiest to use if we want to relate to any unexpected and possibly unwanted events that may occur in the future.

The most important message to take away from this section is that we live in a world of risk and uncertainty, and whenever something unexpected happens, it will be a function of either risk or uncertainty (Fig. 4.1). If a meteor lands on top of our car, this event will be a result of the uncertainty surrounding us. If we get a ticket for speeding, it is a result of a predictable, describable event that has occurred, and we would name it a risk event.

Throughout the rest of this book, the terms *risk* and *uncertainty* will be used with their respective meanings as described in this section. This is also known as the Knightian risk definition, named after Frank Knight. Consequently, risk covers future, unexpected events that can be described in the form of probability and consequence and that can thus be the subject of calculations, while uncertainty covers all the other unexpected events, which may occur, but which cannot be described here and now.


**Fig. 4.1** If you consider uncertainty to be an absolute concept, comprising all unexpected future events, risk is the part that can be separated from the concept of uncertainty and described as Risk = Probability × Consequence. The ratio between risk and uncertainty is not constant but depends on the situation described

There are alternative approaches to defining risk and uncertainty, and all definition sets have their own strengths and weaknesses. But for all practical purposes it makes no difference for the new theory presented in this book what theoretical definition set of risk and uncertainty we use, as the risk theory described will be equally relevant for all definition sets of risk and uncertainty. It is merely important to have a risk and uncertainty definition to which we can add the new risk theory.

Both risk and uncertainty are relevant to discuss when it comes to a situation in which a risk owner has run out of capital, because both risk and uncertainty are able to generate this situation by resulting in significant, unexpected extra expenses for a risk owner.

The unexpected events that materialize are called risk events, no matter if they come from the fundamental uncertainty of the world in which the risk owner lives or they are the result of a specific, describable risk that the risk owner has taken. The reason for not differentiating between events caused by a risk owner undertaking a specific risk and events that can rightly be said to be caused by the fact that we live in an uncertain world is that events, as they occur, are not associated with risk or uncertainty. They have materialized, and once they have materialized, we can see what

caused them. That is why they are called risk events. The costs that come in the wake of risk events will thus also be called risk costs, no matter if they stem from risk or uncertainty.

The risk events are called unexpected and unpredictable because before they occurred it was not certain that they were going to occur. Rent is thus not a risk event, because it is expected and predictable and can thus become part of my budget.

In addition to the above definitions of risk and uncertainty, it is relevant to mention that uncertainty can also be used in the meaning of a spread. Even if the risk of a car accident can be described in terms of a probability and an average cost, it is often relevant to point out that the average cost covers a range of possible outcomes, from a small dent in the car to a very extensive event with major damage to materials and injuries to people. Such a spread or distribution is often referred as the "uncertainty" of the consequence. But this is not the definition of uncertainty used in this book. In this book uncertainty refers to the fundamental state of "Simply not knowing".

## Correlated Risks

A problem in risk management is that risks tend to be correlated and not truly independent events. In this book, when we do Monte Carlo simulations, risks are presented as discrete events that can occur completely independently of one another. In real life the situation is often different. If I am taken ill, I may be at risk for losing my job, or you could say that if I am ill for an extended period of time, this increases the probability of me getting fired. So the risk of becoming ill increases the probability of another risk. In this book, I knowingly ignore this mechanism for two reasons. The first is that, while mapping risk interdependencies may provide some improved insight into risk exposure, it comes at a cost of a much more complicated risk description, which takes longer time to prepare and which consequently is much more difficult to model in a Monte Carlo simulation, while at the same time only offering a small increase in accuracy. Secondly, the point I wish to make can be easily made without complicating the cases and scenario with this additional level of realism to the risk description. However, it is important to keep this mechanism in mind, as it does play a very important role in some risk environments.

## How Do We Process Risk?

As mentioned, risk is defined as Risk = Probability × Consequence.

Because the rest of the book will contain examples of how to process risk, it is relevant to offer a brief explanation of how this is done in the following.

To some extent, everybody spends time and energy on describing, relating to, and processing risk. The most obvious purpose of processing risk is to be able to eliminate or reduce the risk concerned.

A risk can be eliminated or reduced by removing or reducing the probability of an event occurring and/or by reducing or removing the consequence of the risk event. Here, knowledge and accumulation of experience play a vital role.

We know from various studies that the use of safety belts increases our chances of surviving a car crash. It thus seems sensible to spend five seconds on fastening the seat belt before we start the engine and go on our ride. We know that by putting on the safety belt, we reduce our risk of being injured in a traffic accident. We do not process probability, but only the possible consequence of an accident. With a safety belt, the consequences will be mitigated compared to not using the safety belt.

The probability of having an accident can also be reduced—e.g., by paying attention to road conditions and by using technical improvements, such as winter tyres in winter. Such measures help reduce the probability of an accident occurring.

When it comes to the risk of getting involved in a traffic accident, we can thus process this risk by reducing probability and/or consequence—i.e., the two factors that make up risk.

Another opportunity we have, when risks have been identified, is to avoid them completely by simply not carrying out the activity associated with risks, or carrying out the activity in a different way in order to eliminate the risk. If we fear traveling to Paris on vacation due to recent terrorist attacks, we can change the destination to one that is more secure, and the specific risk of a terrorist attack in Paris will be eliminated, even if it is likely to be substituted by new risks, though hopefully more benign, associated with the new destination for the vacation.

Generally speaking, our everyday lives are full of risks, both big and small. We can accept these risks, try to reduce them by influencing one or both of the factors that make up risk, or try to eliminate the risks. However, it is not always up to us to decide what we do. Society also has an interest in reducing risk for its citizens because the risk preparedness of individual citizens may cost society dearly. The government thus tries to regulate our choice of the risks we as individuals can, want, and have to take. This happens through legislation and/or education and information campaigns.

Laws and regulations may govern risk directly, as in the Road Traffic Act, or they may try to nudge behaviour, as is the case when the government puts large warnings on tobacco and alcohol.

Education and information campaigns only serve to inform us of the risks we take. Education and information campaigns serve the purpose of giving us the information we need in order to make informed decisions as to whether we wish to take risks—e.g., the risk of an unhealthy lifestyle or speeding on the road.

## People, Risk, and Uncertainty

People tend to expose themselves to risk, but are also exposed to or influenced by risk and uncertainty from their surroundings. William G. T. Shedd, an American theologian, said, "A ship is safe in harbour, but that's not what ships are for". The same basic problem is true of people. Where we are safe is not necessarily where we thrive.

Some risks and elements of uncertainty are a consequence of living on this planet—i.e., natural disasters, illness, etc. Other risks are a product of people's own choices, such as investments, personal safety, etc. Others again constitute a complex combination of personal choices and choices made by others.

Consequently, we sometimes have to relate to our own specific situation of risk and uncertainty. We must assess our risk situation and examine whether there is anything we ourselves can do to mitigate our personal risk—if we are worried about the situation, that is.

All people work with their risk situation to some extent, their knowledge and understanding permitting. If they choose to accept their risk situation, their risk situation is said to lie within the boundaries of their risk appetite.

*Risk appetite* is defined as the scope of risk to which you are prepared to expose yourself in pursuit of goals, no matter whether you are a person or an organisation. Typically, risk appetite is measured against the different consequence categories such as health, finance, and reputation, and the risk appetite can be different within the separate categories. As an example, a person can be very risk willing with respect to health risk effects but at the same time be very risk averse towards financial risk exposure.

Risk appetite is a behaviour-conditioned element, not an exact, financial element. It is subjective and it varies from one person to the next. In subjective risk, you do not necessarily become any wiser about the nature of the risk to which you are exposed, but an insight can be gained into the reaction of decision makers when facing such risks.

Contrary to subjective risk, objective risk can be described in such a way that, as a risk owner, you are able understand the nature of the risk you face. The description is often based on experience, facts, and knowledge. An investment analysis or business case is an example of an objective risk analysis.

The decision-making process for the handling of identified risks often consists of both an objective component, which is the actual understanding of the risks, and a subjective element, which is our attitude to the risks concerned.

One example of people's subjective attitude to risk would be the purchase of a lotto coupon.

If we take a large group of people, all of whom are fully knowledgeable of their chance of winning, some will want to purchase a lotto coupon anyway. The buyers have found that the chances of winning are extremely small and that the "investment" in a lotto coupon will likely be lost. Still, these persons choose to purchase a lotto coupon. Instead of only basing their decision on factual information, these persons allow subjective elements, such as personal optimism and the dream of winning, to influence their decision.

Our subjective attitude to risk thus plays a role when it comes to choosing between whether or not to buy a lotto coupon. Our choices involving risk are not based on an objective analysis only.

One of the factors that play a role in our subjective assessment of risk is the consequence that such risk may have for us. In regard to the lotto coupon, the fact that most of us can afford to buy a lotto coupon and to lose the amount without this having any consequence worth mentioning for our financial situation plays an important role to our subjective assessment.

However, when we deal with significant risks of importance to our future, objectivity and analysis should have more weight in our decision-making process because this will provide the most rational basis for making decisions. For example, few people can be bothered to calculate the precise financial risk of a lotto coupon because the risk is so low in the sense that the possible negative consequence is so small and has no space among the possible, unexpected, unwanted events in a risk owner's life. If, however, you invest a large amount in shares, it is a good idea to spend some time clarifying the risk involved in this investment, including the possible negative consequences if the investment does not generate the return expected by the risk owner, but a loss instead.

There is an important connection between subjective risk perception and objective risk description. Objective risk description may influence a risk owner, while subjective risk perception will not change the objective description, all other things being equal (Fig. 4.2).

The way objective risk can influence the subjective attitude towards a risk can be illustrated with the lotto coupon example. Statistically, the chance of winning on a lotto coupon is always the same, no matter if we know about the statistical chance of winning or not, whereas knowledge of the statistical chance of winning may influence our decision to buy a lotto coupon or not buy it. If, for instance, I encounter a person in a kiosk who is in the process of buying lotto coupons for large amount of money, I can make a calculation for that person illustrating what the chances of winning are and what the probability of losing all the money is. Such a calculation may or may not influence the person buying the lotto coupons. On the other hand, the fact that a person thinks he has a high probability of winning in a lottery does not in any way change the


**Fig. 4.2** The relation between subjective risk and objective risk in a decision-making process. The objective risk description may influence the risk owner's subjective perception of risk, but the subjective risk description cannot influence the objective risk description

actual probability of winning. Our own personal attitude to risk may thus be influenced if we are presented with an objective analysis of the facts of an investment, not the other way round.

This means that the more knowledge we have of the financial consequences associated with a given risk, the better we will be able to assess whether we are prepared to take this risk, and the better we will be able to assess whether a given risk may land us in a situation in which we may run out of capital.

It is in the interaction of subjective risk and objective risk that we find the reason why it is so important to amend the objective description of risk if at all possible. If we can make a more precise objective description of the cost of risk, we may expect this to have a positive effect on decision makers facing risks. Those decision makers who are able to understand this new cost component of risk will be able to deviate from the current paradigm of subjective risk and change their behaviour to one that is more optimized than what is possible today.

# 5

# The Cost of Running Out of Capital

This book deals with the cost of suddenly running out of capital. If such a situation occurs, it is normally because one or several risk events have materialized.

## Experiments and the Limitations of Literature

The situation in which a risk owner runs out of capital is complex. Not surprisingly, economists have found it difficult to describe this situation in general terms and in a way that allows us to understand the cost and to integrate it in our fundamental description of risk.

Had it not been for the financial experiment carried out in 2008 at Copenhagen Business School (CBS) (Jensen et al. 2012), it would probably have taken even longer for such a generalization to become available.

However, in 2006 the writer of this book started an experiment by agreement with Professor Finn Valentin and Associate Professor Sof Thrane, using the risk economy simulation device called "Risky Business". Risky Business is a high-risk simulator describing conditions in the global pharmaceutical industry. I will not go into detail about this simulation



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in this book because the simulation device and the experiment have been described in the international peer-reviewed journal *Risk Management* (Jensen et al. 2012), to which those interested in the technical details are hereby referred.

Risky Business was originally designed on the recognition that analytical tools available for describing situations of huge economic risk only provided limited guidance for decision makers. Risky Business was thus intended as a case study in which the applicability of known analytical tools could be tested in a real-life relevant environment. Originally, the study performed at CBS was actually a huge disappointment. The experiment came out negative. Only later, when I developed a new hypothesis in the course of that summer and asked Claus Due Ponsaing to develop a computer model of the simulation for comparison with the data generated at CBS, did it become apparent that the combined data packages illustrated a value loss that could not be accounted for by means of existing economic risk theory.

An interesting point about the experiment was that we used a close-to-reality, albeit simplified, simulation to bring about a situation in which risk owners lost value and where the loss of value was attributable with absolute certainty to the interaction between a sudden need for capital and the risk owner's prospects of procuring financing to meet this sudden need for capital in a free market.

This was the first time an experiment was able to document that financial value may disappear completely when a risk owner is faced with a large, unpredicted expense. Furthermore, the value that was lost was higher than the direct risk cost we had programmed into the simulation experiment using the formula of Risk = Probability × Consequence. The capital need thus resulted in an additional loss.

The most important observations from the experiment were that the extra cost—or extra loss—did not form part of the risk owner's risk calculation of risk and that it was a cost which was conditional upon the failure of the capital market to function perfectly when significant, unexpected events occurred.

The experiment thus showed specifically that the risk owner's cost was high when the risk owner experienced a high need for capital while the

surrounding world was not adequately prepared to negotiate with the risk owner.

This was an interesting experience because what the situation described is a commonly known situation. It was also interesting because the theoretical apparatus surrounding economic risk theory is extremely comprehensive but still does not contain any reference to the existence of this extra cost as a fundamental, generalisable, and direct consequence of risk.

As an example, in insurance theory (Dionne and Harrington 1992), no description states that insurance protects a risk owner against extra loss in a situation of a high and sudden capital need, where the risk owner is unable to procure this capital through negotiations with the surrounding world. This is remarkable because the very purpose of insurance is to protect a risk owner against situations involving large, unexpected extra costs. Had such generalized cost of risk been recognized, it would for certain be expected that one could find a reference to this risk cost in insurance theory.

As regards the cost of running out of capital, it is possible, however, to find references to this situation in literature on capital.

The situation in which a person negotiates with the market to procure financing for investment is well-known. This is basically what banks live from; it is part of the basis of their existence. It is also a situation that is quite different from the situation of suddenly running out of capital, because you can walk away from an investment if you do not like the price tag on the available financing opportunities. But you cannot walk away from a sudden financing need that has materialized.

It is well-known in literature that a sudden, significant need for capital is a poor negotiating position. In 1994, Froot (Froot et al. 1994) wrote an article in Harvard Business Review dealing with the price of resources when we are hit by what he calls "a shock to the capital", such as a large unexpected expense. Here, he explains that this situation is different for the risk owner because it gives him a worse negotiating position and may thus make things expensive for the risk owner—expensive in the sense that a loan may come with a very high interest rate.

Froot concluded that the price of capital may become particularly high if you are affected by risk. However, Froot's article does not address the cost of a situation in which the capital is not procured.

Another theoretical area of relevance to the situation in which a risk owner runs out of capital is the area of "financial distress". In a financial distress situation, it is recognized that financial pressure may put a company at risk of bankruptcy. A bankruptcy situation is often accompanied by a great many extra costs, such as legal assistance, loss of inventories, production loss, loss of assets in the form of goodwill, patents, etc. This list is by no means exhaustive. In such a situation, it is recognized that good connections to the capital market may reduce the cost of a sudden lack of capital (Hoshi et al. 1990).

However, financial distress analysis is an investigative discipline that analyzes companies experiencing financial distress, such as a threat of bankruptcy, so this is not a generalisable method for calculating or predicting the extra costs resulting from the sudden lack of capital because the lack of capital does not always lead to a threat of bankruptcy. This means that many other, more frequent, situations in which unexpected, significant needs for capital do not lead to a threat of bankruptcy are not included in the analysis of financial distress. Furthermore, the work is limited to companies and does not cover the financial situation of private individuals.

What all the existing works on financial distress and shocks to capital and other specific fields in literature on capital have in common is that it is not possible to put these works into a specific, generalized, economic theory, as they are based on historic observations in specific and limited environments.

Furthermore, the cost of running out of capital is not explained in economic literature on diversification. In this book, I have chosen not to go into detail on the cost of running out of capital as addressed in diversification literature because I would like to focus on insurance and capital as risk tools. This is because, in my view, the need to integrate the generalized cost of running out of capital is greatest in theories dealing with insurance and capital.

This book describes basic, generalisable risk theory, which can be used to describe how and when extra costs associated with a risk event occur. The book addresses these points because the generalized theory allows for understanding and insight, which we cannot achieve by analysing specific environments, and we may use this insight to develop a better, objective

understanding of the possible situation in which a risk owner is exposed to risk.

## The Red Phone

In the preceding sections, we looked at the concept of risk and how it can be described as either risk or uncertainty. This is a distinction that allows us to establish criteria for the description of the risk component. It has also been explained how the generalized cost of running out of capital is inconsistently and inadequately represented in important fields of economic literature, such as insurance theory and the theory of capital and financing.

There are likely to be many reasons why, so far, we have failed to generalize and systematically approach the cost of running out of capital. The most significant reason, though, may well be found in the delimitation introduced by the definition of risk. If Risk = Probability × Consequence, this definition does not include any aspects relating to a risk owner's specific capital situation. A risk owner's capital does not form part of the assessment of consequences, which is why the possible cost of running out of capital is not naturally reflected in a calculation of the economic consequences of risk for a risk owner.

If we do not have a correct description of the consequence of risk and are unable to systematically include the cost of running out of capital in our risk description, it is likely that risk owners will display suboptimized risk behaviour. The risk behaviour becomes suboptimized because in the situations where this additional cost is essential, the objective analysis will make the world seem less dangerous and worrying than it actually is, objectively speaking.

The core to understanding the cost of running out of capital and thus to including this factor in the description of risk lies in finding a generalisable, characteristic feature of the cost—one we can describe and predict.

For this purpose, we need a red phone. The image of the red phone has been borrowed from the Soviet/US hot line used during the Cold War in the 1970s and 1980s. The red phone was a secure line of communication that could be used for immediate contact between the heads of state

of the two nations. Normally, this would be used to avoid a situation in which the assets of the nations were in danger of a destructive process such as war. In a war, significant assets are invariably lost—be they cultural heritage items, infrastructure, manufacturing facilities, know-how, or other economic or societal assets.

The situation in which you suddenly run out of resources as a consequence of risk closely resembles the situations in which the heads of state occasionally found themselves during the Cold War. There is a sudden need to contact someone to secure one's assets and, if the outcome of these contacts is negative, the destruction of one's assets is imminent because timely negotiation was not possible.

Thus, the red phone symbolises a risk owner's only possible action if he is acutely short on capital, which is to call everyone who comes to mind in an attempt to secure the necessary capital. And the risk owner is willing to pay!

The risk owner may call the bank, the mortgage credit institute, his family, or anyone else who might have the necessary capital available. All potential, external sources of financing of the risk cost are symbolized by the red phone.

The risk owner calls because he is in a threatening, unpleasant situation. Remembering back to the definition of risk owners and structures in Chap. 3 of the book, this situation is possible because the risk owner's structure is defined as being segregated from the general market. And in the segregated structure, the risk owner is in complete control of resources and the use of these resources and answers to no one with respect to decisions and investments made. Also, in such a structure, assets do not always have any easily recognisable market value.

An example of such a situation is a risk owner who has completed two years of a long-cycle study programme, such as 3D graphic design. However, he suddenly receives an enormous unexpected expense. It does not really matter if this expense is a sum extorted by a biker gang, an unexpected extra tax to be paid to the Inland Revenue, or an investment for borrowed money that went wrong, and so on and so forth. At this time, it does not matter much whether the event came about because of uncertainty or whether a risk event has occurred.

The interesting point is the situation as it plays out after the expense materializes. The risk owner may have to discontinue his study programme if he cannot secure the money that will allow him to pay the extra expense and complete his programme. As mentioned above, the educational programme is not the source of the unexpected expense, but still it is his education that is threatened. The threat to his education is thus not a logical consequence of the risk event that has occurred but a result of the fact that, in this situation, the risk owner does not have the capital required to cover the consequence of the risk event that has occurred.

In the above example, the loss of his education is a personal financial loss to the risk owner. The risk owner has invested two years of his time plus financial resources to obtain knowledge in his field of study. The risk owner's knowledge cannot be converted into value in the market and is irreversibly lost. This means that in addition to the direct cost associated with the risk event, the risk owner also risks losing two years of value creation if nobody accommodates him on the red phone and provides the capital required to finance his risk costs. The red phone thus represents a situation that could develop in two different directions: The call could be answered and capital procured from others at a given price, or the call is unanswered and significant assets of the risk owner's could deteriorate in value, resulting in the risk owner incurring a significant additional loss. In this case the education, being a long-term investment, is caught within the structure of the risk owner, and does indeed not have any market value, as one cannot sell knowledge acquired; only when completed does his education attain an easily recognisable market value.

The red phone is essential to the understanding of the cost to which a risk owner may be exposed when a large, sudden expense arises that exceeds the risk owner's reserve capital.

The red phone is essential because the situation in which a risk owner runs out of capital is not only attributable to risk. It might also have been caused by uncertainty in whichever form or shape (Fig. 5.1).

Accordingly, we are also unable to obtain any information about the cost associated with the red phone by looking at risk or uncertainty in isolation because it is only the unique situation in which a risk owner

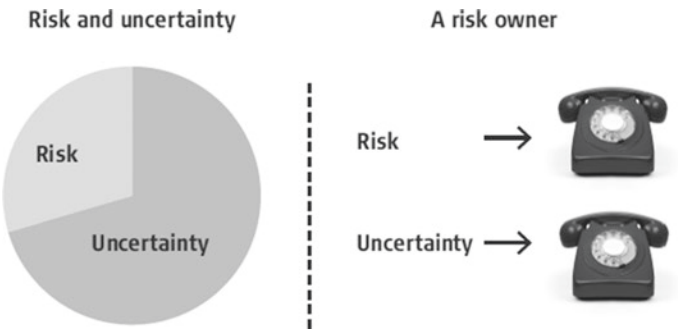


**Fig. 5.1** Risk and uncertainty together form the absolute quantity of unforeseen, unwanted future events, which might affect a risk owner, but we largely fail to describe the uncertainty element. Because both risk and uncertainty may materialize as high and sudden needs of capital, both risk and uncertainty could result in red phone situations for a risk owner. The division between risk and uncertainty in the figure is arbitrary, as we never know for sure the size of the uncertainty element

may find himself—the red phone situation—that indicates the existence of this cost.

However, when the red phone situation has been formulated and characterized, it is possible to reach an understanding of the resulting cost in more detail and to develop an understanding of how such cost can be predicted and addressed.

## Structural Risk Cost

The red phone serves to illustrate the situation of all risk owners who experience a sudden, substantial need of capital. The red phone allows us to divide the possible outcomes of the situation into two categories—the answered red phone calls, where the sudden need for capital is covered by an external financing source, and the unanswered red phone calls, where the necessary resources are not procured and where an additional loss is suffered as a result of the identified capital requirement.

## Structural Risk

Going forward, the economic theory for describing the losses associated with red phone calls will be called the theory of structural risk and uncertainty. The *theory of structural risk and uncertainty* is thus defined as the theory of identification, prevention, and addressing of red phone situations no matter if we are looking at risk or uncertainty and no matter how they affect a given structure.

The structural risk cost is characterized by representing the very situation in which a risk owner finds himself when exposed to a risk event of significance to the amount of extra costs experienced by the risk owner, defined as the structural risk costs.

Other types of structures such as banks, friends, family, and the government play a role too. Typically, a risk owner will call these surrounding structures on the red phone. These structures are potential negotiating partners if the red phone is used in the wake of a significant, unexpected need for capital.

In structural risk and uncertainty theory, the red phone symbolizes the acute situation in which the risk owner has run out of capital. If we can predict the existence of red phones of a risk owner, we will be able to predict the cost of running out of capital, which will allow us to include the structural risk cost in our risk deliberations, including our investment decisions, to a greater extent than today.

## The Loss if a Red Phone Call Is Not Answered

One significant factor of structural risk and uncertainty theory is the assets in the form of activities, investments, or other assets that are held by the risk owner and which risk deteriorating in value if the risk owner runs out of capital. Some assets will not be affected if a risk owner runs out of money. For example, if the risk owner owns a gold bar, the gold bar will always have a cash market value regardless of the risk owner's situation. Other assets, however, are value-wise far more sensitive in this situation.

In structural risk and uncertainty theory, we may disregard the assets that can easily be cashed if the risk owner runs out of money; instead, we shall focus on the assets whose value may suffer.

The assets that may suffer are long-term investments made by the risk owner. An example of a long-term investment could be a building project that has been started or a company's product innovation project. These are long-term investments that are within the framework of the risk owner's financial structure. Such long-term investments may suffer if the risk owner experiences a sudden need for a significant amount of capital. Significant is defined as a sudden expense the size of which exceeds the risk owner's free capital.

The risk owner now uses the red phone and calls someone outside the structure to negotiate an infusion of capital. If he succeeds in procuring the necessary capital, the outcome is said to be successful. It may well become expensive in the form of high interest rates to procure the necessary capital, but, all other things being equal, situations in which the necessary capital is procured and the risk owner's assets are maintained represent a successful outcome of a red phone situation. The point is that the alternative, in which capital cannot be procured, is often much worse financially and the actual source of worry.

It is important to stress at this juncture that only the cost of unsuccessful red telephone negotiations is defined as the structural risk cost in this book. The reason is that the cost associated with successfully answered red phone calls is what society expects to be the outcome. Banks, insurance, and the state have key recognizable functions with respect to meeting the demands of people with a sudden need for cash. The successful use of the red phone can be said to be a situation in which the market functioned. The situation we are concerned about is the situation where the red phone call is not answered.

If the required capital is not procured, a value-destruction process starts within the framework of the structure. If the risk owner has any self-awareness and value understanding, he will first let the least valuable assets suffer and only subsequently let the more valuable assets suffer, until the effect of incurring a sudden, significant cost has been brought to an end and normal activities can be resumed.

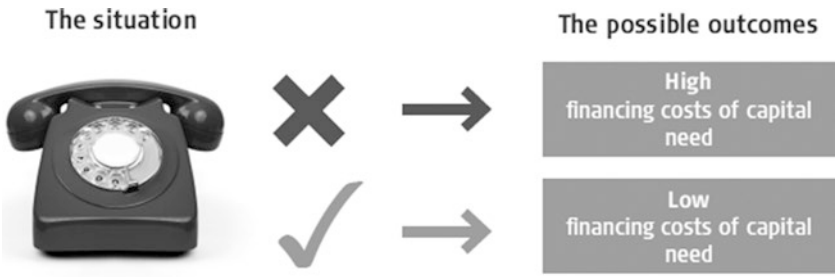


**Fig. 5.2** This illustrates two different outcomes of a red phone situation. One is that the call is answered—i.e., that the risk costs are financed by an external party. Answered calls result in low average financing costs. The other outcome is that the call is not answered. When the call is not answered, it is not possible to procure the financing to cover a suddenly occurring capital need, which means that average financing costs will be high and often unknown

The interesting point about the model illustrated in Fig. 5.2 is that it is highly significant to our understanding of risk. It shows that the hidden side of risk is fundamentally different from the well-explained side of risk. The well-explained side of risk is defined as the theoretical risk perception that forms the basis of modern market-based economic theory. However, it is no surprise that this hidden side exists. Economists have demonstrated this through observations made in society and in industry. This applies, for example, to Bowman's work, which I will come back to later in this book. As mentioned, some of the effect can also be derived from the distress cost literature and other specialized areas of the literature on capital.

Once we accept the presence of this hidden side of risk and uncertainty and realize that the observations previously described are a logical consequence of risk and uncertainty, we can make the quantum leap of revising risk literature and introducing changes to the theories underlying capital, financing, and diversification; furthermore, we will be able to revise the macroeconomic theory apparatus.

Basically, it is the interaction between risk behaviour and risk understanding that is interesting in terms of the work with structural risk and red phones. It is interesting because we have never been able to include the cost of running out of capital in our objective basis for decisions that have the potential to make us run out of capital.

This means that what we have today is merely a subjective understanding of the issues involved in choosing or not choosing risk, and we have a complete lack of an objective platform for explaining our subjective game.

It is thus important to include the structural risk cost in our economic theory apparatus.

## Cost Syndrome

The structural risk cost is complex to understand. For lack of a better designation, it is probably best described as a cost syndrome.

The word "syndrome" comes from the world of medicine and defines a collection of characteristics or symptoms gathered under one joint, clear designation whose physiological background has not yet been identified. Stress is a good example of a medical syndrome, unlike type 2 diabetes, because the latter is a disease whose origin has been precisely defined.

The reason why it is relevant to call the structural risk cost a cost syndrome is that this cost can materialize in many different ways. Structures, whether they are people, companies, organisations, or nations, perform a variety of investments in order to seek prosperity, and almost any kind of long-term investment has the potential to contribute to the financing cost of risk.

One of the biggest problems when assessing the structural risk cost is that it is not possible to put a value on many assets. Examples of activities that are known to be difficult to assess in money terms could be education, research projects (Kulatilaka 1999), and individual departmental competencies of a company.

When a risk owner runs out of capital and cannot procure the necessary capital, this will have negative value consequences for a great many assets the value of which is difficult to quantify. Consequently, the value deterioration is thus also difficult to quantify. However, it is quite clear that there will be consequences and that these will include financial consequences.

A contributory factor making it difficult to calculate the value loss is that applicable accounting practices are unsuitable for spotting these

costs and making them visible to the world (Sublett and Bakmann 2013). A person does not put the loss of a half-finished education in his tax returns. A company rarely states a financial loss to the world when it discontinues a research project because of lack of capital, just as companies will not provide information about the value of a company's department that has been closed down. This is explained not least by the fact that we often do not know the precise value of these assets.

The financial loss and, not least, the size of this loss are thus hidden in a financial context, particularly for observers standing outside the structure and attempting to analyse the cost of risk.

Even assets for which there is a market may end up as structural risk costs and thus as part of the cost syndrome that comes from an unanswered red phone call. Some research projects may have identifiable values, particularly if they are close to completion. In a perfect world, the company could sell its research project to another company. However, the market is not always perfect, and when the need for capital is sudden and significant, failed negotiations no longer mean simply that the risk owner did not have any assets that could be turned into cash, but may also represent an imperfection of the surrounding market. The consequence is that some sellable assets with a recognized market value may also end up as part of the cost syndrome that comes from an unanswered red phone call.

The experiment carried out in 2006 led to a breakthrough in the understanding of the structural risk cost because the simulation was made in a delimited, correctly reproduced risk environment where all assets had financial value. This delimitation made it possible to measure the financial effect when a risk owner runs out of capital and negotiations with the surrounding world fail. The conclusion was clear. Under these conditions, a real, financial extra cost occurs for a risk owner.

In the experiment, we were thus able to describe a cost that normally leads a hidden life in our complex society and which materializes through so many different-natured, diffuse, value-impacting effects for which it has not previously been possible to address the cost effect as a natural component of the cost of risk only based on observations of society.

## Overview of Structural Risk

Before we take a closer look at who is affected by structural risk, it is worth making a final illustration of how structural risk theory contributes to general risk theory.

There is a certain percentage probability (%) that a risk event (A) will affect a risk owner.

The financial consequences attributable to a risk are called costs (O). (O) is a negative figure.

According to standard risk theory, risk can be valued as (A) = (%) × (O).

The risk owner has a reserve capital (R).

If the risk owner is in a situation in which the size of the cost (O) of the risk events that could occur could exceed the reserve capital (R), the risk owner's future involves red phones.

If there are red phones in a risk owner's future, the risk owner is exposed to the structural risk cost (B).

The size of the structural risk cost (B) is contingent on the effect of the risk cost, which is the reserve capital (O) + (R), on the risk owner's other long-term investments, here called (I), where (O) + (R) is the maximum, uncovered capital requirement.

The size of the structural risk cost (B) must be multiplied by the probability of unsuccessful use of the red phone (%'). Note that (%) and (%') are completely independent of each other.

If (O) + (R) > 0 then (A) = (%) × (O).

If (O) + (R) < 0 then (A) = (%) × (O) + ((%')*B)).

The factor in the equation that is difficult to estimate is (B) because the size of (B) depends on the effect on (I), and this effect is unknown in most instances.

It is thus the risk owner's capital situation seen in relation to the size of the financial risk to which the risk owner is exposed that will decide whether additional factors are to be included in the calculation of the real value of a risk.

## Who Are Risk Owners?

As mentioned previously in this book, it is necessary to define a risk owner. But who are the risk owners in society?

The risk owners are all those who can be said to own, control, or administer resources, as well as long-term investments and assets. Risk owners control structures.

A risk owner may be a free entity, such as the owner of a privately owned company, or the risk owner may be the administrator of a system, such as the head of a department, or another person responsible for a budget in an organisation.

You could easily argue that the head of a department is part of the company and that it is thus the company which is the top structural risk owner; however, all this means is that there are several levels of structural risk and that red phone and structural risk costs may arise at all levels in a company. Minor red phone situations occurring in a normal operating department stand a good chance of being handled by executive management, while red phone situations occurring for a project manager who runs a project of considerable size for the company may be more difficult to handle for executive management and may in effect lead to a red phone situation for the whole company.

Another example of a situation in which structural risk costs may occur at a departmental level in a company could be one in which rules and laws prevent growth-optimized behaviour by banning the infusion of capital to a department exposed to great risk.

A risk owner may also be a private individual. As private individuals, we make decisions of significance to our structural risk situation, and as private individuals we are owners of our own capital. This means that private individuals can experience red phone situations as a result of the risk and uncertainty to which we have chosen to expose ourselves, as well as the risk and uncertainty to which we are passively exposed by the surrounding society. Finally risk owners can be the state or any other overstately organisation or union.

## The Risk Owner's Perspective on Risk

Structural risk represents a fundamental change from the theory stating that risk is an absolute entity which can be described statistically by observing the effects of risk.

What this means, for example, is that we depart from the belief that we can describe the costs of traffic accidents in society by gathering statistical information about the traffic accidents that occur. This is because in structural risk, the cost of a risk event is not an absolute, measurable entity, but rather a dynamic entity that changes depending on risk ownership.

The biggest challenge in our work with structural risk is embedded in the previous sentence because it is in complete contradiction to our collective spoken definition of risk and largely a fundamental leap away from all economic theories described in basic economics textbooks such as *Economics* (Begg et al. 1991) and basic risk theory works such as *A Treatise on Probability* (Keynes 1921a) and *Risk, Uncertainty and Profit* (Knight 1921).

In actual fact, the leap is not that big—all we have to do is accept that there is a cost involved in running out of capital and that this may result in the suffering of long-term investments that are difficult to turn into cash. This is actually so logical that it is difficult to put up an argument against it. It is only because this understanding and the change of approach required by this understanding are so fundamental and comprehensive that the dissemination of the theory of structural risk may become difficult. However, because until now structural risk is the only available method for understanding the real financial cost of risk, there is hope that the required change of approach will occur over time.

When we talk about structural risk, our optics for addressing risk is different. The same events that we address in a traditional perception of risk take on a new meaning because we are addressing events from the point of view of a specific person, company, organisation, or state. We address risk from the perspective of a structure. We see risk from inside the structure and not from a third-party perspective. And only the structure has a chance of assessing the cost of risk because the structure

contains long-term investments that are largely invisible to the surroundings, or at least impossible to appreciate value-wise.

Consequently, we move away from a situation in which we use the standard definition of risk: risk = probability × consequence, into a situation where the definition of risk is this: risk = (probability × consequence) + structure.

Until now, the view of the world has been that our behaviour is a key determinant factor for the risks to which we are exposed. For example, because there are cars on the road, there is a risk that we, as citizens, could suffer injury by being run over by a car while crossing a road or walking along the road. If we are out at night and do not wear reflectors or other measures to increase our visibility, we have a higher risk of such an accident than others who are better protected.

If we are unwilling in the situation to walk along the road without reflectors, we may be aware that we are at risk and potentially be anxious about it. We may even be knowledgeable about the probability of accidents in such a situation, through the study of statistics. Thus we may be in a situation of being exposed to a known risk.

But we could also be out taking an evening walk feeling completely safe and still be exposed to a risk of being run over by a car, without having considered the risk. In such a situation, a car accident would be said to be the product of uncertainty.

So future unexpected events constitute a total entity, which can either be described (risk) or not be described (uncertainty).

Our role in this risk scenario is only to relate to risk and to allow our behaviour to be influenced by it, which includes avoiding risk to the extent possible. We can behave on the basis of a risk scenario. We can choose to wear reflectors or not when walking along the road in the evening. We can purchase health insurance or not.

However, the risk description is the same for people staying in identical environments and assuming a given, specific risk, such as two people walking alongside the same road in darkness without reflectors. We cannot objectively separate the two people's risk; we can only separate them based on their behaviour in the specific situation. And their behaviour may be different, though their risk exposure is the same.

Let us look at an example.

We have two risk owners: one has DKK 500,000 of free capital, while the other has DKK 350,000 of free capital. They both choose to spend DKK 300,000 of their capital on a long-term investment. This investment has a 10% likelihood of generating an added expense of DKK 200,000. The risk owner's risk can be calculated as 10% (probability) × DKK 200,000 (consequence) = DKK 20,000.

The two investors and risk owners thus take precisely the same risk when making their investments, which is a risk of DKK 20,000.

The return on the investment is high—let us say DKK 500,000—but will come far into the future. The risk, however, will materialize just after the investment has been made.

This investment case is a very positive case, where the costs—the investment and the risk, totalling DKK 320,000—are fine in relation to the gain of DKK 500,000. So even if the gain is some years into the future, the return on the invested capital will be great.

Under these circumstances, the financial calculation of the return on the investment will be identical for both investors according to traditional risk theory.

But if the investments are analysed on the basis of the structural risk perspective, the risk associated with the investments is no longer the same for the two risk owners.

Risk owner 1 has a reserve capital of DKK 200,000 after making the investment (500,000–300,000) to cover the extra cost of DKK 200,000, which has a 10% likelihood of occurring. Risk owner 1's investment can be illustrated using a Monte Carlo simulation, as shown in Fig. 5.3

Figure 5.3 shows that all outcomes of the simulation are within or equal to the reserve capital available, which is why risk owner 1 has no red phone situation in his investment.

The situation is different for risk owner 2, who has a reserve capital of DKK 50,000 after making the investment. If he also makes a Monte Carlo simulation of his investment, it will look as in Fig. 5.4.

Figure 5.4 shows that risk owner 2 does not have enough free capital to cover the loss, which has a 10% likelihood of occurring. Risk owner 2 thus has a 10% risk of running out of capital. This means that risk owner

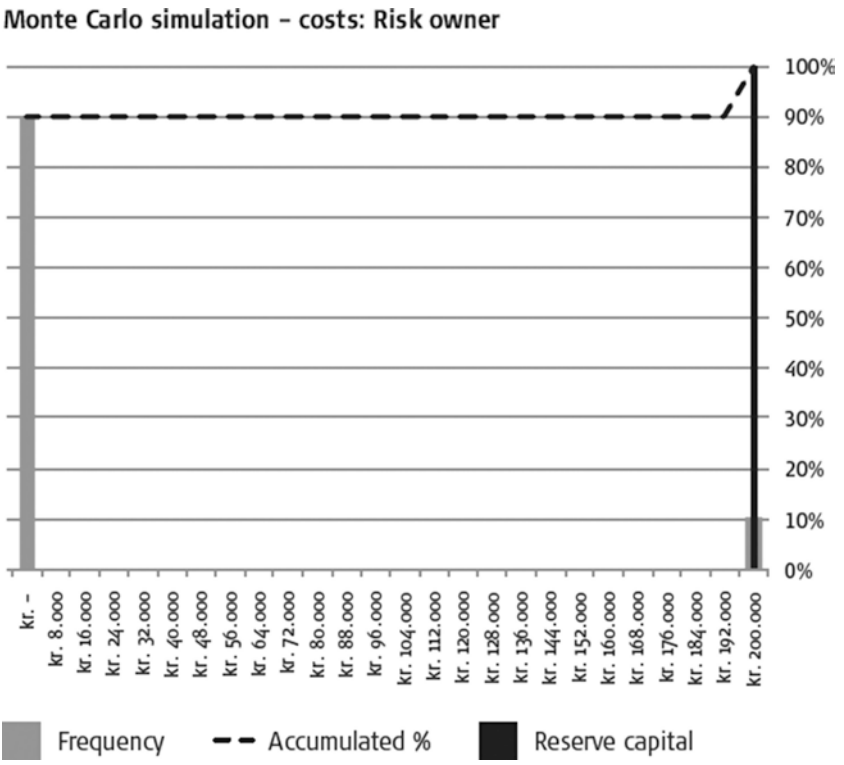


**Fig. 5.3** Monte Carlo simulation of a risk owner exposed to an added expense of DKK 200,000, which has a 10% likelihood of occurring. The risk owner has DKK 200,000 of reserve capital

2 has a red phone situation in his investment picture that has a 10% likelihood of occurring.

Because red phones mean that you are exposed to an actual financial extra loss, which will occur if negotiations with the surrounding world for capital fail, the investment case is thus different for the two risk owners. Risk owner 1 will still be able to assess his risk as consequence × probability because he has enough reserve capital to cover the loss, so he does not have to include the cost associated with the structural risk as a factor in his investment calculation.

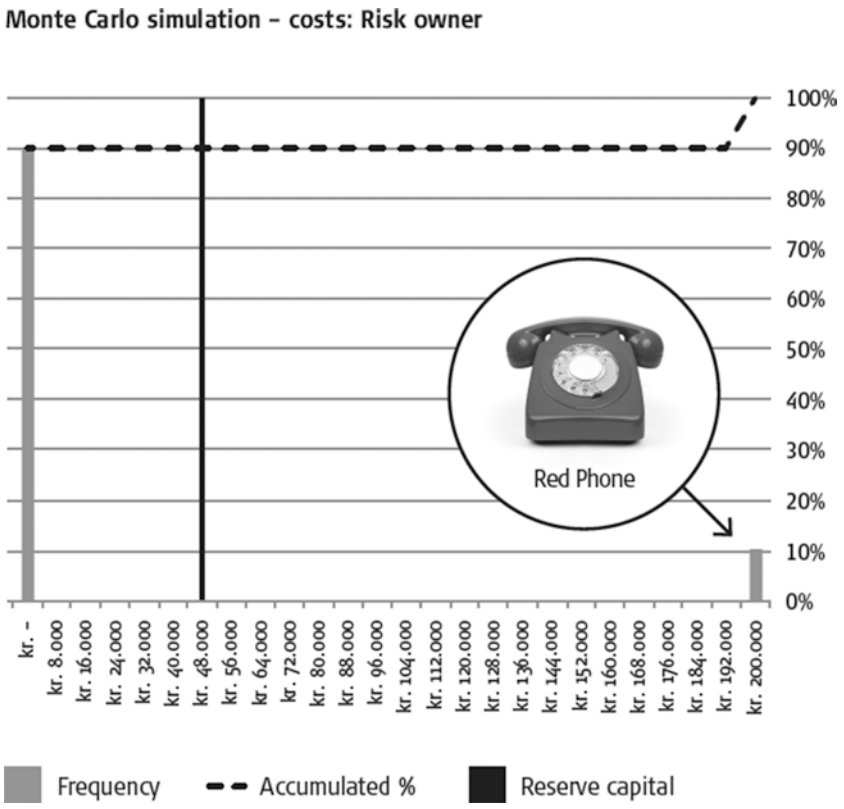


**Fig. 5.4** Monte Carlo simulation of a risk owner exposed to an extra cost of DKK 200,000, which has a 10% likelihood of occurring. The risk owner has DKK 50,000 reserve capital

Risk owner 2, however, has to include an additional factor—i.e., structure. In this risk owner's future, there could be a negotiation with capital owners in the surrounding world. If these negotiations succeed, they will result in a minor extra expense in the form, for example, of interest on a bank loan, but if the negotiations fail, the structural risk cost component of the risk description may materialize and become huge. The size of the financial loss attributable to the structural cost will depend on the long-term investments or assets possessed by the risk owner and difficult to convert into cash. Examples of long-term investments that could suffer are ongoing education, building projects, and innovation activities.

It is not enough just to assess the size of the long-term investments that may suffer a value loss in case of a sudden, major capital requirement. When we assess the size of the structural risk, we must also assess the probability of being able to procure the missing capital. If the risk owner considers it a simple matter to procure the necessary capital, this will reduce the significance of the structural risk component in the risk owner's assessment of an investment. Conversely, if the risk owner believes that the possibility of procuring the necessary capital is minimal, the significance of the structural risk component cannot be reduced in the same way—it becomes an important factor in the equation.

## Hidden Cost That Hampers Growth in Society

The structural risk cost is not only interesting because it can specify our calculations of financial risk. It has an even more interesting characteristic, which is a direct conclusion on the basis of the existence and nature of cost:

The structural risk cost hampers growth in society.

We know that all people and organisations are surrounded by risk and uncertainty. Risk and uncertainty are an integral part of our existence. So we also know that unforeseen costs could affect anyone. Furthermore, we know that people, organisations, states, etc. have limited reserves of varying sizes.

Now, we also know that if an unexpected event results in an expense which exceeds our capital reserves, we have a red phone situation. This happens all the time in our society, and sometimes the call on the red phone is not answered and additional structural risk costs occur.

The hampering effect occurs when the value of long-term investments with no logical connection to a given risk event is affected by the sudden expense directly arising from the risk event.

Let us take a risk owner who is training to become a pilot. This programme has a high tuition fee. If the risk owner incurs a sudden added expense caused by a risk event with no relation to the pilot training programme, it is not an unavoidable sacrifice that the risk owner may have to give up his training. If the risk owner has to give up his training, this

is merely a sacrifice to be made because the risk owner's reserve capital was not high enough to absorb the risk event that has occurred. In this way, the situation is different from the situation in which the risk owner is exposed, for example, to a risk event that makes him go blind. In such a case, the fact that he stops his pilot training programme would just be a logical consequence of the risk event and not a consequence of structural risk, because if you are blind, you cannot become a pilot.

The difference between the two situations outlined above is whether a red phone was involved in an attempt to mitigate the loss. In the first situation, the risk owner will try to procure enough capital to continue his training programme and will thus have a red phone situation. In an accident where the pilot-to-be becomes blind, there is no red phone because in this case, the reserve capital has no influence on the consequence, as the training programme invariably has to be stopped.

For society, it is of course always inappropriate for people to be exposed to accidents. However, the important point here is that the same accident can have different costs, depending on who is affected by it, and that the structural risk cost is not a direct conclusion of the risk event itself. The fact is that in principle the cost contribution from the structural risk effect may have any size because the size only depends on any long-term investments that have been made by the risk owner and which may suffer if there is a sudden need for resources.

A cost of this nature impedes growth in a society. The impeding element comes from the fact that, for structural reasons, long-term investments risk ending up as costs in connection with completely unrelated events. And when the risk owner experiences a negative value effect on his long-term investments, society experiences a corresponding loss. This is because the value is not directly transferred to another player in society. If a risk owner loses two years of training, nobody else can take this knowledge and continue the programme. If a company loses a research project in which it has made a considerable investment, nobody will take over the project, as the loss came about because it was not possible to sell the asset to the market.

The societal effect is described in Table 5.1. The table shows the difference between a successful red phone situation and an unsuccessful red phone situation. In the successful red phone situation, the risk owner (S)

**Table 5.1** Overview of the cost situation for (S) the risk owner, (I) the external capital owner or investor, and (C) society in case of successful red phone situations and unsuccessful red phone situations, respectively

| | S | I | C |
|---|---|---|---|
| Successful red phone call | –1 | +1 | 0 |
| Unsuccessful red phone call | –2 | 0 | –2 |

experiences a loss, but the loss is balanced by income for another player in society—i.e., the investor (I). When the red phone call is unsuccessful, the risk owner experiences a higher loss and the loss is not balanced by a gain for another player in society. Consequently, the risk owner's loss also becomes a loss to society (C).

Structural risk thus means that a risk owner's decision to assume a given risk cannot only, as was the case before, be seen as the financial risk of the individual risk owner, but may actually have financial consequences for society; these consequences may vary depending on who owns the risk.

All it takes to develop this more nuanced understanding of risk is an assessment of whether the risk that a risk owner assumes or is exposed to has the potential to generate a situation in which the risk owner runs out of capital.

The findings of this chapter play a key role in the remainder of the book, and I would like to emphasize one of the most important messages. According to Table 5.1, when a structure in society experiences a large financing cost of risk through the impaired value of long-term investments, this value is also destroyed for society. There is an irreversible destruction of wealth. In this destructive process, the professional partners of society that are involved in supplying capital or insurance to the risk owners do not suffer any loss, and this lack of loss results in an inability of market powers to achieve an economically optimal equilibrium of market conditions. This is not such a surprising finding, given that earlier in this book we defined long-term investments in structures as being of hidden value to the market; indeed, it is counterintuitive that the market should be able to establish equilibrium based on values it cannot assess and values that can often not even be traded.

# 6

# Capital

When we talk about the cost of running out of capital, it is obvious that capital in itself plays an important role. Thus we have to take a look at the theory apparatus describing capital to see whether we can find any description of the cost of running out of capital.

Reserve capital is the capital that can protect a risk owner against experiencing a red phone situation. Only when the reserve capital has been spent may the risk owner land in a situation in which he has to contact capital owners in the surrounding world and try to negotiate access to their capital.

In literature, "reserve capital" is not particularly well-characterized. Often the only reference is to savings when it comes to capital without a predefined use (Poterba 1994).

Savings are the free cash flow, which we have in our everyday lives and which does not have a predefined use. So, this is money which we receive and which has no specific purpose: surplus money.

The word savings has a positive ring to it. These are funds we may expect to use in the future for investments or to spend on consumption.



J. Lyng Jensen, S. Sublett, *Redefining Risk & Return*,
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However, if we take our knowledge of the structural risk cost components into account, we may actually distinguish between reserve capital and savings.

*Reserve capital* is made up of funds with no specific intended use, but generally intended to protect the risk owner against running out of capital if major capital requirements arise suddenly as a result of a risk event.

The word reserve capital is hardly ever used in connection with the finances of private individuals, whereas at a company level there is often a certain recognition of the need to carry financial reserves.

In 2009, for example, the Danish government and the Danish Regions established so-called quality fund projects. A region is the public organisation that is above a municipality but below the central government in terms of size. In Denmark there are five regions, and the main activity of the regions is to operate the public healthcare system, though they also have other activities, such as regional development work. The quality fund projects concern major construction investments to give Danish hospitals a major quality lift. A total of 16 large hospital construction and renovation projects have been initiated with a typical project size of DKK 1.5 to 4 billion, while some projects are even bigger. For example, the new Odense University Hospital is the biggest project, with a budget of DKK 6.8 billion. The last projects expect finalization around 2025.

These projects are partly funded by the government, which will pay 60% of the investments, and partly by the Danish Regions, which will pay 40% of the investments. Each project is born with a reserve capital the size of which is stated in its budget; this reserve has been approved in the final project pledges given by the Ministry of Health and Prevention.

This means that in addition to having money for the contracts made with contractors, suppliers of biomedical equipment, etc., each project must have capital reserves that have no predefined use, typically in the range of 10–15% of the budget.

These are not savings because it is not possible to spend this money on other projects than the hospital project that owns the reserves. So these are purely reserves.

The reason for this requirement to have reserves is to be found in the risk and uncertainty associated with major construction projects.

The construction industry realizes that projects of this magnitude take long to complete and are complex, so there is a high degree of risk and uncertainty associated with entering into such a project.

Such a project is complex to such an extent that it is not possible to plan every detail of the project in advance. As the project moves forward, unexpected situations are likely to materialize, and when these occur, there will be financial obligations that the project will have to cover. That is why all the quality fund projects are obliged to have reserves.

However, there is no consistency in the allocation of reserves in public administration. In the very same organisations that use reserves for quality fund projects, you see other projects, such as major IT projects, that have no financial reserves. This has been done even if public IT projects are known for—and notorious for being associated with—significant risk and uncertainty. The list of IT projects which have gone haywire resulting in large extra project costs is long.

Naturally, the absence of reserve capital does not mean that the project owner is not able to procure the necessary capital if a significant risk event materializes. But it means that the price of procuring such financing, the risk financing costs, is unknown at the time when the project starts. If significant, heavy costs occur due to a risk event, the financing of these risk costs may be inappropriately expensive. That will be the case if risk cost financing cannot be procured from the surrounding world, so the risk owner has to finance the risk costs through an internal shut-down of activities or investments.

The regionally owned quality fund projects are a good example, showing that some risk owners set aside actual reserves with the only purpose of protecting the risk owner against future risk costs, while others in comparable situations forget the need for reserve capital.

The reason for the lack of consistency regarding the allocation of reserve capital is that, in economic literature, reserve capital does not have a value that can be differentiated from savings. Reserve capital and savings can simply not be seen as separate value entities. One example can be seen from Murray N. Rothbard's gigantic volume *Man, Economy, and State with Power and Market* (Rothbard 2009), which contains no definition of reserve capital in the same sense as defined in this book. There is, however, a brief section entitled "The problem of security",

which touches briefly on the importance of savings in case of uncertainty. However, the reference is to savings, and there is no distinction between savings and reserve capital as two different financial tools with different financial returns.

Nevertheless, there is a clear financial distinction between reserve capital and savings, when we include the structural risk and uncertainty cost. That is, if we recognise the existence of a cost of running out of capital. Once we include the structural risk cost in our deliberations, reserve capital has a higher financial return than savings. This applies even if both pools of money are in the very same account in the very same bank at the very same interest rate.

The difference is that the owner of the capital is a risk owner and thus is prepared for sudden, future risk costs. If you are prepared for future risk costs, any free, easily accessible, non-committed funds are no longer just savings that can be used freely, but to some extent also constitute a financial reserve that protects the risk owner against structural risk costs by preventing red phone situations (Fig. 6.1).

Because structural risk costs are actual economic costs, they could also be called risk-financing costs. In such case, the reserves have a double effect because they deliver a return when placed in an account like ordinary savings and also deliver a return by minimising financing costs if significant risk events occur.

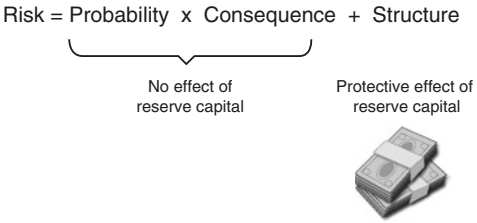


**Fig. 6.1** In traditional risk description, reserve capital has no financial value because money in the bank does not prevent risk events or reduce the scope of damage when the risk event occurs. However, the reserve capital may reduce or remove the structural component of the risk description, which means that reserve capital has a new financial function that is different from the function of savings

## Relations Between Risk and Return

Normally, we say that the higher the risk we are prepared to take, the higher the return we can achieve. But if we deduct the cost of structural risk, the picture looks different. The existence of a cost that arises when we run out of capital and cannot get the missing capital from external sources indicates a negative relation between risk and return. This means the return may decline if we assume a higher risk.

If, for example, we look at a risk owner who may choose to spend DKK 100,000 on an investment that will generate a return of DKK 200,000 after two years, this would seem like a good business proposition on the face of it. But let us assume there is a 10% risk that the investment will result in an added expense of DKK 200,000.

Financially speaking, the investment is still very attractive. Theoretically speaking, the risk owner's cost is now DKK 100,000 + (10% of DKK 200,000) = DKK 120,000. In view of a reliable return of DKK 200,000, this would still seem to be a good investment.

Let us then assume that the risk owner is able to invest in intervals of DKK 100,000, but the investments are in the same asset, so they are not independent investments. This means that if the risk occurs, it will hit the full investment. And there is still a 10% probability of the risk occurring.

Let us also assume that the risk owner has DKK 500,000 savings in the bank and no other risk at all, but he owns long-term, non-saleable investments such as a commenced educational programme.

If the risk owner invests DKK 100,000, he still has DKK 400,000 in his account. However, the 200,000 of this amount now functions as reserve capital because it protects the risk owner against a sudden cost generated by the risk associated with the investment.

Data of the investment can now be entered in a simulation tool based on the Monte Carlo simulation. A Monte Carlo simulation of the above example could thus look like Fig. 6.2

In order for the risk owner to avoid a red phone situation, it would be appropriate to divide the risk owner's capital into two. He has a reserve capital of DKK 200,000 and savings of DKK 200,000.

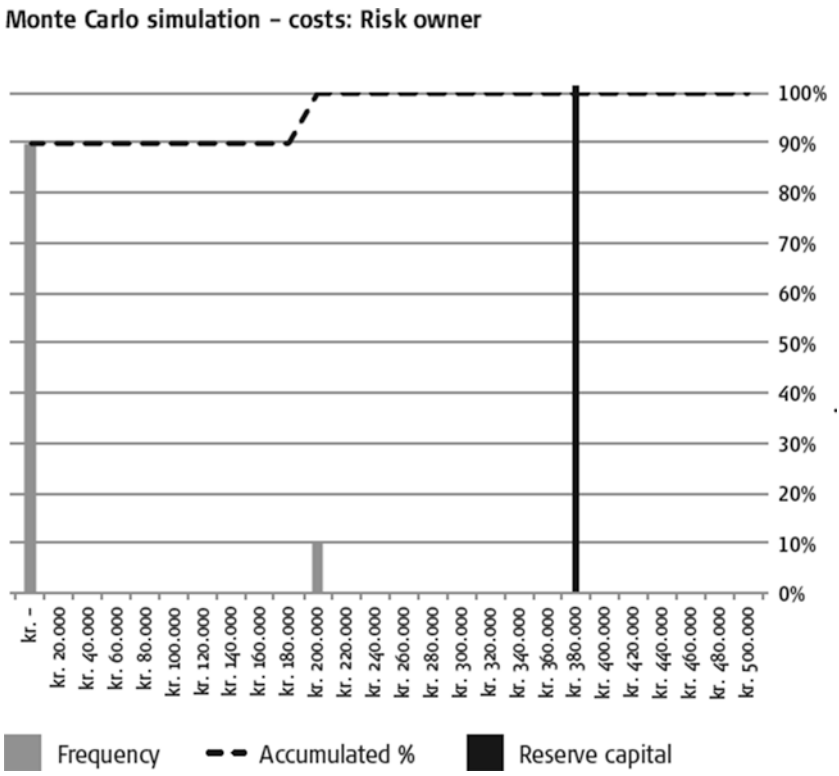


**Fig. 6.2** Simulation of the situation in which an investor and risk owner invests DKK 100,000 in an investment with a 10% likelihood of generating an added expense of DKK 200,000. Following the investment, the risk owner has capital in the amount of DKK 400,000

If the risk owner is tempted by the high return on the investment and invests an additional DKK 100,000, the situation changes considerably.

The risk owner is now in a situation where he is exposed to a sudden, future risk cost in the magnitude of DKK 400,000 (2 × DKK 200,000), but only has DKK 300,000 (DKK 500,000–DKK 200,000) in capital. The risk owner now no longer has any savings, but only reserve capital (Fig. 6.3).

A Monte Carlo simulation of the new situation shows with full clarity that in 10% of cases, the cost associated with the risk owner's investment

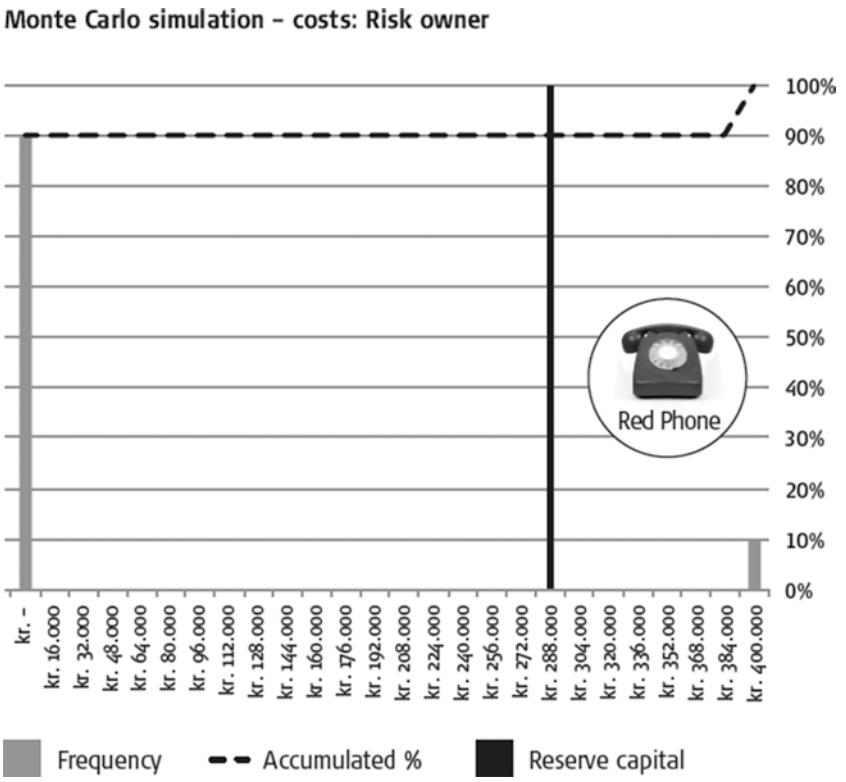


**Fig. 6.3** Simulation of the situation in which an investor has placed DKK 200,000 in an investment with a 10% likelihood of an extra cost of DKK 400,000, which exceeds his reserve capital by DKK 100,000

will exceed the reserve capital available (represented by the black line in the diagram). This means that by increasing his investment by DKK 100,000, the risk owner has brought himself into a red phone situation, and it is now no longer clear what the return on the risk owner's investment is going to be.

The cost of the investment must be calculated as DKK 200,000 + (10% of 400.000) + the structural risk cost = DKK 240,000 + the structural risk cost. The return promised to the risk owner is unchanged at DKK 400,000.

In the above situation, the risk owner increases his risk by increasing his investment, but sees that when you reach a threshold, the potential return is affected negatively because the structural risk cost comes into play.

Precisely how the structural risk cost will materialize and what it will cost is difficult to predict because this will depend on a wide range of parameters at the time of the risk event. That is why the structural risk cost is a difficult factor to include in our investment calculation. What is certain, however, is that it will be there. And it will mean that the risk owner in our example will achieve a statistically lower return on his investment than an investor with enough reserve capital making the very same investment.

We could even imagine that in special situations the structural risk cost could be so high that it makes the investment case directly negative. However, the structural risk cost is a situational risk cost that materializes as a cost syndrome which is difficult to predict. It can thus be hard to have a specific approach to the cost before it occurs. We can merely predict that it is likely to occur for the risk owner concerned and that the structural risk cost will have a negative impact on the investment case.

## Bowman's Paradox

As mentioned, the situation with a negative effect on the return in case of high risk has not gone unnoticed in economic literature.

In 1980, Edward H. Bowman published an article in Sloane Management Review (Bowman 1980), in which he demonstrated that a negative relation between risk and return could be observed. He showed that companies assuming high risk did not deliver a return commensurate with the risk.

At the time when Bowman published his article, it came as a big surprise because no theoretical economic literature supported this conclusion. Nevertheless, it was difficult to argue against directly observable effects, so all that could be done was to state as a fact that the negative association between risk and return existed and that it could not be explained. That is why it was called Bowman's Paradox.

Since 1980, numerous attempts have been made at explaining Bowman's Paradox, and among the many theories there are definitely

interesting ones. But as late as 2007, a group of researchers called Bowman's Paradox one of the most persistent paradoxes in strategic literature (Andersen et al. 2007). This is because it is still difficult to say that the paradox has found its ultimate solution.

In this connection it is interesting that when you include the cost of running out of capital in the risk theory apparatus, there is no paradox at all. Bowman's observation is simply to be expected, and if we were to start a project to support the practical relevance of the theory of structural risk, we would do precisely what Edvard H. Bowman did.

As shown in the previous example, the point is that the negative cost component, the structural risk cost, occurs precisely if a person, a company, or an organisation assumes risk to such an extent that red phone situations will or may occur in the future.

In these situations, the return declines because the structural risk cost factor begins to get financial significance in the investment calculation.

However, the theory of structural risk allows us to make more progress with the observations made by Bowman. Not only can we predict the effect that Bowman saw in the companies he observed; we can also predict that this effect is relevant for anybody who chooses to expose himself to risk or is passively exposed to it.

The effect has not been observed so specifically in private individuals, but behaviour in private individuals has been observed that suggests that people understand this situation intuitively. A number of macroeconomic observations have also been made during the two recent financial crises; it must be said that these observations largely support the existence of the structural risk cost or at least do not contradict it. More to follow on this matter later in the book.

## Financial Stress Testing

If we want to get an idea of whether we will be exposed to red phone situations in the future, we must first examine what the financial consequences of predictable risk events are expected to be. What is the consequence for the risk owner of known risk events?

In essence, this is financial stress testing in practice.

In recent years, financial stress testing has been introduced as a compulsory analysis in the financial sector—i.e. banks, insurance companies, and pension funds.

However, the story behind the introduction of the financial stress test is quite interesting, because this was not a tool that was adopted voluntarily by the financial sector in order to secure a high return to their owners. The stress test was imposed on them by the governments.

The reason was to be found in the international financial crisis that started in 2007, whose scope increased considerably with the collapse of Lehman Brothers in 2008, a collapse that sent shock waves of financial losses through many financial companies around the world. The international financial crisis lasted for several years, and it had serious consequences for people, industries, and nations all over the world.

For major financial institutions to collapse is disastrous because they are what can be called systemically significant organisations. What this means is that societal functions are heavily dependent on the functioning of these organisations. If a bank collapses, the financial consequences spread like rings in water, and the ultimate expense may turn out to be enormous in relation to the value of the bank that collapsed.

Please note that this is not a structural effect, but a direct effect of the collapse of the financial institution. If a baker has deposited DKK 500,000 with a bank that goes bankrupt, and the deposit is not covered by a depositor guarantee, the baker loses all or part of the money deposited. In its pure form, there is no structural risk involved in the baker's loss; however, it is clear that such a loss may also lead to a structural risk loss for the baker.

Beside the fact that the collapse of a financial institution can lead to losses that spread like rings in water throughout society, the collapse and its consequences also have the unfortunate effect of reducing the trust of the public in the financial system. This is a behavioural effect of the collapse, which has a huge influence on the ability of an economy to recover from the financial crisis. When people do not trust the financial system, they stop borrowing and depositing money, thus inhibiting growth further.

Consequently it is very important to the state that the financial system functions and is stable, which is why many states all over the world have designated financial institutions as systemic and thus of critical importance to society.

It is the fear of an unnecessarily large socioeconomic loss and the wish for society to trust the financial system that have induced the authorities to begin making demands as to the financial stability and robustness of financial institutions.

Because a security perspective was the driver behind the government's wish to ensure financial stability by means of stress testing of important players, the banks strongly opposed this at first, particularly because it was imposed on them by the authorities. However, their resistance has declined in recent years, and today there is a more positive view of the stress test, and it is now also being used by some companies as an important strategic steering tool, even if stress testing is still considered a defensive tool.

With the scientific publication of the existence of the structural risk cost in 2012, the view that stress testing is only a defensive tool may turn out to be outdated. The point is that with knowledge of the structural risk cost, financial stress testing suddenly acquires a new function, so the tool may also be conceived as a growth-offensive tool that is able to indicate future situations that have a negative impact on value generation.

This is primarily because financial stress testing can be used to predict red phone situations.

The performance of a financial stress test is beyond the focus of this book. However, a conceptual review of the principles of a financial stress test seems relevant.

Conceptually speaking, it can be argued that there are two approaches to stress testing: scenario testing and simulation.

In scenario testing, conditions are specified that are unexpected but which may occur in the future we are looking at, although with a certain low probability—for example, an increase of the short bond rate by 5%. Other parameters that form part of the description of the scenario are also laid down. Subsequently, the effect on the company is simulated, and an assessment is made of whether the company can survive such a scenario. If the company can survive the scenario, it passes. This method is

not particularly well-suited for identifying red phone situations because it does not give any other information than whether the stress-tested organisation survived or not.

The simulation method is better suited to predicting red phone situations. In the simulation method, a simulation is built up to show how the future of a company or project may develop. This includes the question of how significant variables may develop and with what likelihood.

Subsequently, the Montew Carlo simulation can be used, for example, to simulate the development of unforeseen costs. As an example, the graph in Fig. 6.4 shows the expected development of unexpected costs (risk costs) in one of the large quality fund projects of the Capital Region of Denmark, which is one of the five Danish Regions.

This simulation, which was carried out by the writer of this book and is reproduced with the permission of the Capital Region of Denmark, shows the risk and uncertainty driven cost of the New Copenhagen University Hospital. By simulating the construction project 20,000 times, a frequency diagram of the occurrence of costs resulting from risk and uncertainty can be generated. A frequency diagram shows that the project is often expected to be carried out within the framework of the reserve capital available.

However, it can also be seen that in this simulation the project may end up costing more than can be covered by the available reserve capital. In roughly 25% of the simulations made of the construction process, the project turns out to cost more than the total reserve capital available. In Fig. 6.4, all simulations to the right of the black line, which shows the reserve capital, required a higher budget than the one available.

In principle, all the situations to the right of the reserve capital line are red phone situations. However, minor overshoots can normally be handled by implementing minor cost reductions in the project. However, major budget overruns are red phone situations and can be demonstrated for a project by means of such a simulation graph, provided it is possible to find credible data on which to base the simulation.

The interesting point is that it makes sense to prepare this simulation graph for a construction project. This is a structure with a delimited budget and a structure that is not a financial institution. It is not a simulation graph prepared because somebody insisted on it, because there are no

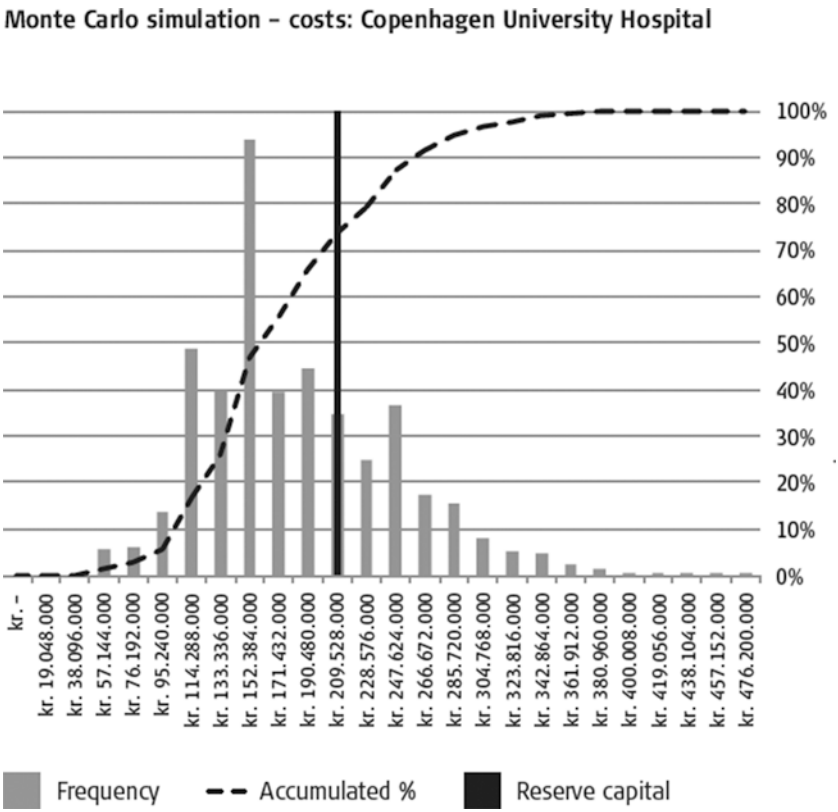


**Fig. 6.4** Monte Carlo simulation of the risk and uncertainty situation of the project entitled "The New Copenhagen University Hospital". The figure shows the distribution of risk costs in 20,000 simulated project processes. The *black line* shows the total financial reserves of the project. The graph shows that in this simulation there is approximately a 75% likelihood that the project reserves are adequate

such requirements, at least not yet. It is a simulation and stress test made only to predict red phone situations. This is done because red phones represent value deterioration of the project for the risk owner who owns the project. The red phones are situations in which the project has run out of capital, while there are still expenses to be paid. But nobody knows where the money is going to come from and what it will cost to procure it.

And it may well become expensive to procure it. It should be mentioned that the Danish government has provided a framework for the quality fund projects via the Quality Fund itself, which means that capital cannot be added to the project other than the capital allocated in the approved budget. If, for example, the New Copenhagen University Hospital lacks capital, the Capital Region is not allowed to provide it, even if it has the money available to the decision makers of the Capital Region. In other words, the quality fund projects are structurally encapsulated.

The threat of running out of capital could become very important near the end of the project if the project is short on capital, because the expenses have to be paid. Obviously, the size of the added expense is important. But in case of high added expenses, this could cost dearly because at the end of the day it may become necessary to save money by choosing cheaper solutions, which could result in disproportionately high future operating costs. Another possibility would be to close down, decide against, or reduce parts of the project. Such effects occurring inside the project add to the cost of the budget overrun that caused the effects in the first place. In other words, the situation will be unproductive and cost intensive for the risk owner. It must be remembered that this cost, when it is realized, will never be calculated or presented to anybody, as it is taking place inside the structure.

Again, we see that society as a whole does not focus on this problem. As far as is known, the Capital Region is the only region in the country with a structural risk management process targeted towards delivering data that can be used in a Monte Carlo simulation analysis—or a structural risk management process delivering data suitable for a financial stress test, if you like. When this simulation was carried out, the Capital Region was also the only region making a financial stress test of its projects, even if investments in quality fund projects amounted to DKK 40 billion in the five regions of the country.

Knowledge of future red phones is critical to our ability to maintain low risk costs. Only if we are aware of the expected scope of red phones can we organise optimally with respect to the risk to which we are exposed. If we have too little reserve capital and thus are too exposed to red phone situations in a project, the project risk may be forced down by investing in risk-mitigation measures. It is also possible to increase

the reserve capital by reducing the scope of the project. If relatively less money is spent on the project, the reserves will of course be bigger. But this requires that we examine whether red phone situations may occur in the future of the project, and this examination is carried out far too rarely.

## Ineffective Return on Reserves

As mentioned, capital can be in the form of savings and reserves. As savings, capital has no reserve function, so it may be more attractive to invest the capital to get a handsome return.

Conversely, if the capital functions as a reserve, we cannot invest the capital because the reserve has to be accessible and very liquid. If the capital is not freely accessible, we start making preconditions that may affect the accessibility of the capital, in which case the provision of cover in a risk-generated need situation is suddenly no longer a given.

On the other hand, reserves already yield a higher return than non-invested savings because reserves prevent any unacceptably high future financing costs.

However, it is clear that the higher the likelihood of us needing the reserves and the higher the cost of an unsuccessful negotiation with the surrounding world for resources, the higher the return will be on the capital when it has been allocated as reserves.

The Monte Carlo simulation in Fig. 6.4 of the New Copenhagen University Hospital's need for capital to cover risk costs tells us there is a 75% likelihood that we have enough capital. This means that only in 25% of cases is it necessary to use the full reserve capital. But it also tells us that in 25% of the cases we would wish we had more reserve capital. Because the project is subject to a strict capital framework, and no extra capital can be added from external sources beyond the capital approved in the budget, all budget overruns will lead to a red phone situation that cannot be answered.

Based on the simulation, it would seem that the project has a reasonable level of reserve capital. To be absolutely certain of having sufficient reserve capital, an additional DKK 300–500 million of reserve capital

would have to be set aside. This would be reserve capital, which would only be required in rare instances.

Even if the costs of the red phones are included, it is doubtful whether it would make sense to have this amount of reserve capital deposited on an account for the project period merely to protect the project against red phone situations.

We thus run into a technical investment problem because even if the understanding of the financial profitability of having reserves is known, it is still in many situations not possible to provide a logical financial rationale in favour of fully adequate reserves. This is a very important point and essential to understanding the financial mechanism defined by structural risk.

Savings and reserves will form an equilibrium where, depending on current risk conditions, it will be financially advantageous to move capital from reserves to savings or the other way round. The higher the risk being assumed, the more capital should be moved from savings to reserves, while the more risk free you are, the more you can move funds from reserves to savings where the funds are available for consumption or investments.

Getting back to the New Copenhagen University Hospital, this project is in an interesting situation. The project has reserves that must be deemed reasonable, but is still exposed to red phones. This means that the investment in the New Copenhagen University Hospital is financially ineffective, because future risk financing costs may arise which will be unacceptably high in relation to the financing market rate. However, it must be borne in mind that the market rate is not available to the project because according to the project framework, no capital may be added from external sources. It is not possible to borrow an extra half billion if the need arises, which is why any extra financing needs will have a completely unknown, high financing cost.

In red phone situations, there is every likelihood that decidedly value-destructive action will be taken—e.g., through the cancellation of activities in which investments have already been made. This is not because the cancelled activities are not demanded by physicians, patients, or their families, but because a red phone situation has occurred and the money

that was supposed to be used to finalize activities has to be spent instead on covering unexpected extra costs somewhere else in the project.

There is no doubt that such a situation will attract the attention of politicians, and at some point a political solution will be found and extra funds will be allocated to the project. However, at that time, the cost syndrome behind the structural risk cost will already have delivered inappropriately high financing costs.

Even if red phone situations are unwanted by risk owners, be they private individuals, private companies, public organisations, or any other structural risk owners, we have to recognise that red phones can never be completely removed, not if we want to engage in long-term investments and the risks that come with them.

## Final Points Concerning Capital

The piece of the jigsaw puzzle we try to develop in this book includes a contribution towards understanding the very function of capital in the economy.

The contribution is that free and untied capital may have two functions and thus different values; previously, the assumption was that free and untied capital would have only one function: savings.

Free, untied capital may be savings or reserves. As reserves, the capital has a higher return, or a bigger value, than as savings. This applies no matter if we are talking about a private individual or a company or another risk owner, because it is an effect derived from the risk and uncertainty surrounding risk owners and their structures.

The very same structural risk cost effect that gives reserve capital new value also means that there is a reversed relation between risk and return, meaning that the financial return of an investment declines with increasing risk. This effect arises when we no longer have enough reserve capital to cover sudden future costs; this applies no matter if these unexpected costs arise from risk or uncertainty.

# 7

# Insurance

Now that we have shed light on the importance of capital for the structural risk cost, it is time to take a look at another important risk tool available when addressing risk: insurance.

## The Historical Importance of Insurance

It is well-known in risk literature that, on average, insurance represents a cost to the insured. This is also very clear from the financial statements of any insurance company; it costs money for customers to take out insurance. In addition to covering insurance claims from customers, insurance companies also pay salaries to their staff, pay for administrative costs, and hopefully return a profit to the owners.

It has thus been the predominant view that the reason why we buy insurance is that we risk owners are afraid of risk and wish to transfer it to someone else. Buying an insurance policy is a behaviour we display when we are facing risk. In other words, we are only prepared to assume a given risk if we can take out insurance against it. For example, most of



J. Lyng Jensen, S. Sublett, *Redefining Risk & Return*,
DOI 10.1007/978-3-319-41369-3_7

us would not be prepared to borrow DKK 600,000 for a car if we could not insure the car against damage and theft.

You can thus argue that insurance creates economic growth, because it increases the number of investments that risk owners are prepared to assume. However, it is very difficult to document this effect in practice, even if recent scientific studies seem to indicate that the effect is real, not just theoretical.

This means that by having a positive effect on the number of investments we as risk owners are prepared to make, insurance creates growth.

However, the ability of insurance to directly increase the return on a specific investment by protecting the risk owner against the structural risk cost is not recognized or even mentioned in insurance literature.

## Insurance as Protection Against Red Phone Situations

Because there is a cost involved in running out of capital, it is possible, as we saw in the last chapter, to differentiate between reserve capital and savings via their respective returns. By definition, reserve capital generates a higher return than savings.

However, as a risk owner we can reach a level of reserve capital where it is no longer financially profitable to continue adding to the reserve capital. At this level, any additional capital should be considered savings intended for future consumption or investment. The likelihood of needing the saved-up capital for risk purposes is simply so small that the threatening risk cost will have to be extremely high to justify setting aside additional reserves.

This does not mean that there is nothing more to be done to reduce the structural risk cost.

Even with these big reserves, there is some likelihood of landing in situations where the realized risk costs exceed the reserves available. There is no doubt that the likelihood is low, but it could happen. This means that red phone situations may still occur for the risk owner, but they are no longer as likely.

One of the tools which can be used in this situation to reduce the likelihood of red phone situations is insurance. When we take out insurance, we pay a fixed monthly or annual premium. In return, we are protected against costs associated with any future damage or risk event. We can thus protect ourselves against high future costs by paying a lower monthly amount.

If a risk owner were to pay the same cost by using reserve capital, this would require extreme amounts of reserve capital that would only rarely be required; this would not only be financially inefficient, but also in many cases impossible in practice. Therefore, insurance allows us to remove future, rare, but high-risk costs, which would be very likely to provoke a red phone situation and thus the possibility of high structural risk costs.

Generally speaking, an insurance company makes money from selling insurance. When we as risk owners choose to take out insurance, we basically pay more for an insurance policy than the statistical value of the risk against which we are taking out insurance.

If a risk owner wishes to take out insurance against a potential risk of DKK 200,000 which has a 10% likelihood of occurring, it will cost more than DKK 20,000 to insure, even if DKK 20,000 is the statistical value of the risk (10% of DKK 200,000 = DKK 20,000). The price above DKK 20,000 is the insurance company's contribution margin to cover the insurance company's running costs and a possible profit to the owners.

Generally speaking, insurance companies pay out around 60–80% of their income to cover losses sustained by their customers. In the calculated example, let us assume that the insurance company pays out 80% of the premium to cover damage. This means it will cost the risk owner DKK 25,000 to insure against the risk of a 10% likelihood of a cost of DKK 200,000. This is because 80% of DK 25,000 is precisely DKK 20,000.

Earlier in this book we looked at a risk owner with an investment opportunity. The risk owner could invest in intervals of DKK 100,000 in an asset that would give DKK 200,000 after two years, but which in one case out of ten would generate an added expense of DKK 200,000 in

the short run. All investments were in the same asset, so if the risk event occurred, it would affect all of the DKK 100,000 investments.

The risk owner has bank savings of DKK 500,000 and no other risks but does have long-term investments, such as ongoing education or innovation projects that would be sensitive were the risk owner to run out of capital.

In the section on capital, the risk owner was unable to invest more than DKK 100,000 if he wanted to be sure to know the return on the investment. If the risk owner invested DKK 200,000, the risk owner would be exposed to a negative financial effect as a result of being exposed to future red phone situations. If there are possible red phones in the future, the structural risk cost must be included as a factor in the investment calculation, which makes the return drop (Fig. 7.1).

However, with insurance the situation is different.

Now the risk owner can invest DKK 400,000 and pay 4 × DKK 25,000 to insure against the occurrence of added expenses of DKK 800,000 with a 10% likelihood of materialising.

The situation now is that the risk owner pays 4 × DKK 5,000 in profit to the insurance company. However, the total effect is that the risk owner protects against potential added expenses of DKK 800,000, thereby removing the structural risk cost as a factor in the investment calculation.

If he chooses to invest DKK 400,000 of his DKK 500,000, the risk owner now has two options.

Option 1: the risk owner chooses the risk associated with the investment, thereby exposing himself to a potential capital need, which he cannot cover, of DKK 700,000 (4 × DKK 200,000 – DKK 100,000 reserves). The risk owner thus has a red phone situation, so there is some likelihood that there will be structural risk costs that the risk owner cannot specify precisely today, but which will have actual, financial consequences in the situation concerned (Fig. 7.2).

If the risk event occurs, but the risk owner succeeds in procuring the DKK 700,000 through loans or something similar, this will come with a price in the form of the risk owner's repayment of debt and interest, and this price is very likely to be warranted given the great potential of the investment, but this assessment depends on the price.

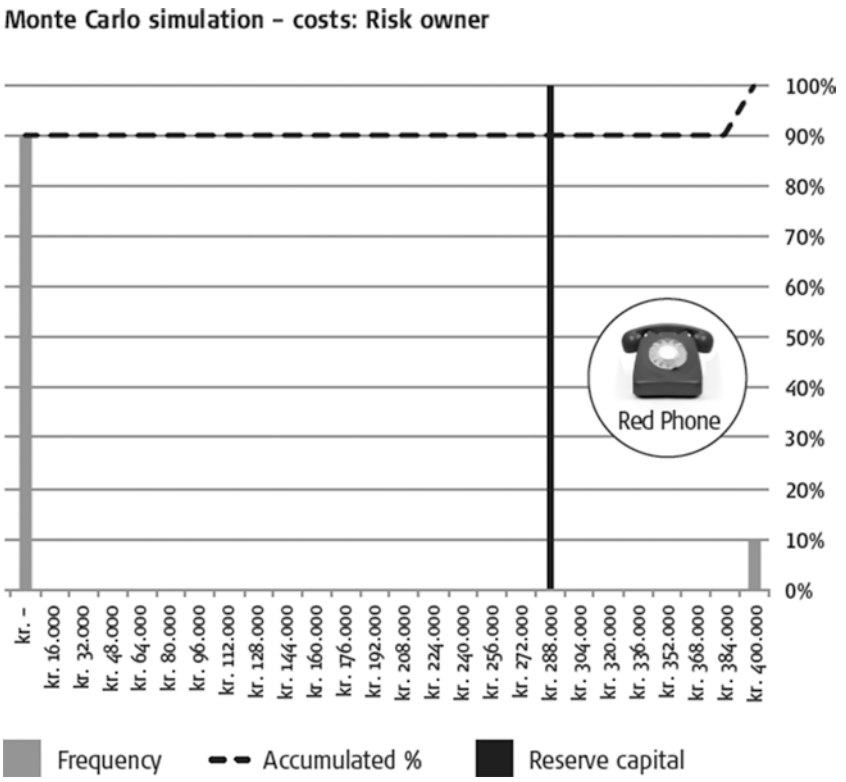


**Fig. 7.1** From the section on capital (Figure 6.3). The Monte Carlo simulation shows that a risk owner investing DKK 200,000 in an asset that has a 10% likelihood of generating an added expense of DKK 400,000 will have a red phone as an integral part of the investment in the situation where the risk owner only has DKK 300,000 of reserve capital

However, the real concern is what happens if the risk owner cannot procure the necessary capital. If the risk owner experiences an uncovered capital need of DKK 700,000 and cannot procure the capital from external parties, what will be the cost in this situation? The answer is that the cost will be high but also that it is difficult to calculate in advance. If capital cannot be procured from external parties, the cost will have to be covered internally. This means that the risk owner's long-term investments will suffer. Costs may be covered by an interrupted educational

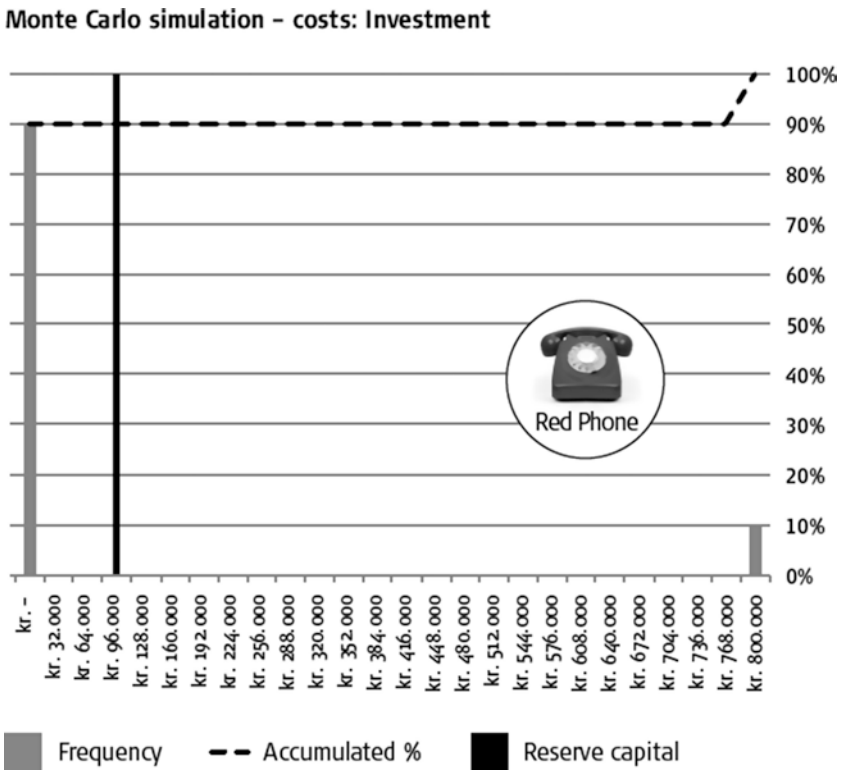


**Fig. 7.2** The risk owner who invests DKK 400,000 of his DKK 500,000 in an asset that has a 10% likelihood of generating an added expense of DKK 800,000. He has no cover for DKK 700,000 of this added expense

programme or by negative impact on a privately owned company, or many other effects may occur. No precise prediction can be made.

The risk owner's investment calculation will be = DKK 400,000 + (10% × DKK 800,000) + structural risk costs. As previously mentioned, the size of the last-mentioned factor is unknown, but it may be affected by the likelihood of being able to procure the necessary capital from external parties.

Option 2: the risk owner chooses to insure against the risk of losing DKK 200,000 per DKK 100,000 investment. The risk owner thus pays the insurance company 25% more than the statistical value of the

investment risk. In this situation, the cost of protecting against the structural risk cover is very visible because it has to be paid when entering into the insurance agreement; the cost is 4 × DKK 5,000, i.e. DKK 20,000. The risk owner thus pays the statistical value of the risk cost, plus a contribution margin of DKK 20,000 to the insurance company in order to get insured.

The risk owner's cost calculation is now = DKK 400,000 + (10% × DKK 800,000) + (4 × DKK 5,000) = DKK 500,000.

However, when you take into account that a risk event may potentially lead to high structural risk costs for a risk owner who does not have enough reserve capital, the average structural risk cost in this example only needs to exceed a value of DKK 20,000 to make it *financially advantageous* to take out insurance.

As previously mentioned, structural risk costs may be inappropriately high; this leads to a very interesting conclusion: it may become financially advantageous to take out insurance. The insured investment can now suddenly become the financially most attractive investment compared with the uninsured investment. The insurance of the investment can be the economic optimum with the highest return. The insured risk owner can achieve a higher average return on his investment than the uninsured risk owner given that otherwise the investors have comparable structures, meaning identical capital reserves and identical long term investments.

It is hard not to become enthusiastic about this situation because in the previous perception of risk economic theory, it has not been possible to achieve a higher return by taking out insurance for a given investment.

But if you include the cost of running out of capital in your investment assessment, this becomes possible.

## Defective Insurance

It is quite certain that insurance plays an important role in preventing red phone situations. As mentioned in the section on capital, it is not profitable for risk owners to hold enough reserve capital to cope with all and any unforeseen events resulting from risk or uncertainty. That is why taking out insurance can be a financially sound way to avoid specific events

with potentially high costs. When we take out insurance, the insurance company provides our reserve capital. If we purchase a new car for DKK 600,000, most of us want to be certain that we can get another one if the car is stolen or totalled in an accident. Without insurance, each one of us would have to carry reserve capital corresponding to the value of the car, which would be impossible for most people and financially uninteresting for society.

It is more capital efficient to let the insurance company function as a reserve capital depot. This is because, for example, an insurance company that decides to underwrite insurance for ten risk owners who each purchase a car for DKK 600,000 does not hold a reserve capital of DKK 6 million. If the statistics say that there is only 10% likelihood that a car is totalled, the likelihood of all ten cars being totalled is minimal. Therefore, the insurance company can have less than the DKK 6 million and still have enough capital to cover the most frequently occurring situations. The rare, expensive situations where many of the ten cars are damaged can be covered by the insurance company through re-insurance.

In this way, the insurance companies are able to remove red phones from all the insured with the use of less and more efficiently utilized reserve capital than what the risk owners would be able to do themselves.

However, as a tool for fighting structural risk costs, insurance is not always ideal.

This is because—even if compensation is paid—insurance does not aim to keep the insured fully free of costs.

Insurance is a product described in an insurance policy. The policy terms and the other general insurance conditions specify the compensation for which the policyholder qualifies. It is the product described in the insurance policy that you pay for.

Depending on the "quality" of the product, this means that even if a risk owner is insured, situations may easily arise in which a risk owner still sees considerable draws on his finances.

One such situation is when the risk owner is underinsured—e.g. due to ignorance or because the person has a higher appetite for risk than others. As a case in point, the writer of this book was exposed to a major risk event while writing this book. Parts of my farm burned down; two out of the four wings were a total wreck after the fire. Fortunately, no person or

animal was hurt, I hasten to add. The burned-down wings were a workshop and a room used for parties, so the damage was purely material and there was not a big loss of property with sentimental value.

In the subsequent dialogue with the insurance company, *Topdanmark*, it turned out that the buildings were underinsured by approx. 20–40 % according to *Topdanmark's* own calculations.

It is difficult to venture a guess as to the reason for the underinsurance, but it was probably due to two primary factors. One was ignorance on the part of the policyholder (me) about construction cost. When I took out the insurance, I had no experience with building construction. The second was the fact that it is in the interest of the insurance companies to reduce their product descriptions, and thus the insurance cover, to be more price competitive.

Whatever the reason for the underinsurance, at the end of the day there was an extra cost in the range of DKK 140,000 to 300,000 to be procured, even if the buildings were insured.

In this specific situation, the unexpected capital need did not result in a red phone situation because, firstly, I am of the opinion that one should have a large private reserve capital, and, secondly, because for historical reasons I was in a situation in which I had large savings. So I had both a large reserve capital and large savings. Naturally, it may still turn out that the rebuilding of the wings and the risk involved in a construction project will bring me into a red phone situation if it turns out that the expense becomes much higher than expected. Time will tell.

However, this situation illustrates the fact that insurance is not necessarily a guarantee against sudden capital needs, which is an absolute requirement if you want to remove the structural risk cost.

Underinsurance is not the only problem. The complex description of cover in the insurance policy may also present a problem.

If you look at public health care in Denmark, for example, there is no insurance policy. As a private individual, you have no insurance description to relate to concerning the cover provided by the national health service, as long as you are within the borders of the country. There is simply the expectation that the national health insurance will cover and be adequate in all situations. But with insurance provided by private companies, there are many aspects to be considered, which may mean that

in specific situations you have no cover. In these situations where the insurance fails to keep the risk owner free of sudden, large capital draws, the policyholder experiences a red phone situation, even if the person had expected to be red-phone-free.

One last example of situations in which insurance fails is the situation in which the incentive structure in the relation between the policyholder and the insurance company creates a conflict of interest, thereby generating situations in which the policyholder does not receive the compensation to which he is entitled.

When damage has occurred and the person suffering the damage is covered by insurance in a given company, it is in the interest of the insurance company to limit payments to the person suffering the damage as much as possible. It is even not unusual for insurance companies to employ staff in the claims processing departments who work under incentive employment contracts that reward them with a bonus reflecting the extent to which they have been able to limit payments to policyholders making insurance claims. If a family has lost its home and perhaps even family members, one can easily imagine that it does not take much obstruction from the insurance company for the family to give up part of the compensation claim to which the family was actually entitled. Obstruction from the insurance company is relatively easy because they are the experts in the situation that has arisen, while the person suffering the loss may never have experienced such a situation before.

The above-mentioned situation in which a sudden capital need occurs even if an insurance agreement has been made is a precondition in the insurance industry. This means that in market terms this is a competition parameter with free competition among insurance companies. In a free, competitive insurance market, a suitable level of insurance quality is expected. Complaint statistics for insurance companies are often published, and the press can pass on this information; risk owners may base their decision on this information when choosing an insurance company and insurance product.

The interesting point, however, is that even if there is free competition, the person suffering a loss often ends up with a large, uncovered capital need. This means that insurance under free market conditions is not able to keep the policyholder/risk owner fully free of sudden capital needs and is thus not able to keep the risk owner free from the structural risk cost.

As shown in the example with figures for a risk owner at the start of the section on insurance, insurance is theoretically a perfect solution when we reach the limit of how much reserve capital it is financially viable to have and are still exposed to red phone situations. In this situation, insurance can theoretically ensure that the risk owner maximises the return on his investments.

However, insurance was not invented to prevent red phone situations among risk owners. Insurance is a product that risk owners may choose to buy if they are not comfortable with the risk and uncertainty level they experience, or which comes with the investments considered by the risk owner.

Being a product that can be purchased by insecure risk owners, the actual inadequacy of the private insurance system plays no role because the risk owner may simply find better insurance if he wishes to do so. As long as insurance provides the security that allows the risk owner to make an investment, the insurance is good. This applies to car owners, for example. Without insurance, we would not dare to purchase an expensive car, and if we are not comfortable with a given insurance company, it is easy to switch to another company that makes us more comfortable.

Even though the products of the insurance industry are adequate to cover the market for the individual risk owners, the insurance industry product may from a societal perspective turn out to be inadequate when it comes to maintaining the highest possible productivity in society, because the market-driven insurance system does not secure the lowest possible risk costs for risk owners.

## The Anti-Social Risk Cost That Can Be Removed as It Occurs

The structural risk cost is surprising in the way it acts and strongly challenges not just our understanding of risk, but our view of the world as well. Furthermore, it carries another special quality that is relevant to discuss before continuing this section on insurance.

As mentioned before, the structural risk cost is destructive by nature. *Destructive* is defined here as meaning that unsuccessful red phone situations are situations in which a risk owner has not been able to establish

contact with other capital owners and thus has to allow a capital deficit to have a negative effect on the value of other long-term investments.

This deterioration in value of long-term investments does not directly benefit others in society, as shown in Table 5.1 earlier in the book.

If a risk owner has to give up completing his long-cycle study programme after two years of studies, the knowledge acquired by this person will not benefit others. The two years of time and money that the risk owner invested in his education are lost. In addition, he has taken up a space on the programme unnecessarily in that period. This loss applies both to the risk owner and to society. Society has become poorer because it had a citizen who invested in a study programme as a long-term investment, but this investment has now been lost.

If the risk owner in a red phone situation successfully negotiates with the surrounding world, thereby receiving adequate resources to see no negative effect on his long-term investments, the risk owner will, admittedly, still see a loss in the form of borrowing costs and interest, but society experiences no loss. This is because the risk owner's loss, which is of a financial nature only, is offset by a financial gain elsewhere in society. The money paid by the risk owner for establishing the loan and as interest will become income somewhere else in society—e.g., in a bank—and the value of his long-term investments is not affected.

However, wherever the red phone situation cannot be handled, values are in danger of being irreversibly lost to the risk owner and to society. The cost of unsuccessful red phone situations is thus anti-social. Such costs are unwanted in a society. Many other risk costs—some might argue all of them—are also unwanted in a society, so that in itself is no surprise. The surprise lies in the fact that the structural risk cost can be dealt with and made to go away *when it occurs*.

If a car runs into a tree and is damaged, we can do nothing about the cost of repairing the car. The cost is there; there is nothing we can do to change that once the damage has occurred. Obviously, we may try to prevent the accident, but if it has happened, there will be a cost of repairing the damage.

However, as regards the additional cost, the structural risk cost, things are different. It is not a natural, unavoidable consequence of the damage.

The structural risk cost only occurs when a risk owner experiences a sudden need for capital that exceeds his reserves—and only if the resulting red phone situation cannot be solved. That is why it is a cost that can be made to go away, even after the red phone situation has arisen, as society can simply decide to resolve the red phone situation for the agents of society.

However, this requires that society recognises the inappropriateness of having a society with high structural risk costs. For example, we as a society could agree that structural risk costs are not acceptable and simply refund these costs to the risk owners who experience a high risk-related need for capital. We could do it by refunding the cost no matter the risk owner's capital situation.

## Health Insurance

Health insurance is an example of a situation in which there is great variation among countries as regards the structuring of the insurance situation.

Illness could be said to represent some kind of uncertainty or, in some cases, risk. Most of the ailments we may develop are unknown to us; we have no idea what will be wrong with us next year or the year after. So, from a risk owner's perspective, this is uncertain, and we may call this kind of future illness uncertainty. However, the risk owner may also come from a family with a hereditary disease that may manifest itself over the years. In this case, the risk owner has an understanding of the consequences of the disease and perhaps also an idea about the likelihood of being affected by it, so the risk owner will see this illness as a risk. From a risk owner's perspective, future illness may be described as a mix of risk and uncertainty.

As an example, let us look at the healthcare insurance situation for two identical citizens living in Denmark and the US, respectively. Denmark and the US are known for having two widely different health systems.

With respect to the Danish healthcare system it has been based since the 1930s on a belief that access to treatment should be independent of geographical location and personal income status, and today the system is financed through general taxation.

The Danish healthcare system has two major pillars accessible to all Danish residents (Pedersen et al. 2012). The first one is primary health care, which is characterized by:

- Free and equal access to medical care with a general practitioner (equal to a family physician in the US).
- Free visits and treatment with specialists if referred to by the general practitioner.
- Free access to out-of-office health care and home visits of a doctor-on-call.
- Partial subsidies for medicine depending on personal annual need and income.
- Free dental care for children from 0–18 years. Subsidies for dental care for residents over 18 years.
- Free access to medical help in other EU countries on travels with a duration of the maximum of a year.

The basic idea in primary health care is free choice of general practitioner within a radius of 9 miles. General practitioners are self-employed but with a governmental contract regulating consultation hours and prices. They are paid directly by the state, not by the patients, and the state manages the number of general practitioners and their geographical location through a license system.

Once chosen, the general practitioner becomes the primary care physician, acting as a "gatekeeper" to the rest of the medical system. The advantage of this system is that the general practitioner has the medical history of each patient and can provide a continuity of care, much like the family physician in the US.

The second major pillar in the Danish healthcare system is the hospital sector, which is characterized by:

- Free access to treatment in all publically owned hospitals.
- Private hospitals available for use free of charge if the public healthcare system is not able to provide care within a fixed timeline. However, more than 95% of hospital services are provided by publicly owned and operated hospitals.
- Public hospitals operated by publically employed staff.

Although Danish residents have access to an extended range of free-of-charge medical services, health expenditure in Denmark was only 10.9% of GDP in 2013, in contrast to the US where the health expenditure was 17.1% of GDP (The World Bank: Health Expenditure per capita). Another interesting comparison is the percentage of the population in the two countries without health insurance. In Denmark, it is 0%, as all residents have free and equal access to health care. In the US in 2014, approximately 11% of the population was uninsured; however, this number represents a decrease compared to previous years, mainly due to Obamacare (Smith and Medalia 2015).

Income taxes in Denmark are among the highest in the world. However, they ensure a number of public services with free and equal access for all residents, where healthcare is only one of them. Other services are for instance access to free education, low cost or free day care depending on income level, minimum retirement funds, all of which provide residents with resilience towards unexpected costs and sudden changes in personal income.

Going back to these two fictitious identical persons residing under different healthcare systems, let us assume that other than the risk of being taken ill, they have no other risk in their lives. Let us also assume that they own precisely the same long-term investment because they are both attending a long, self-paid educational programme—for example, to become a 3D graphic designer.

If we now finally assume that both persons are diagnosed with an illness, such as diabetes, the situation of the two otherwise identical risk owners begins to become different.

The risk owner in Denmark will not experience any capital draw worth mentioning for diagnosis, monitoring, and treatment of the disease because the public sector will cover almost all costs. This situation can be interpreted in two ways. One is that the person has insurance via his taxes; this insurance covers the cost, so we have a classic insurance situation. The other is that in order to avoid high structural risk costs, the government chooses to refund the cost 100% after the risk event has occurred. The money for this refund obviously comes from the treasury and is thus financed via general taxation, but actually we are talking about two widely different situations.

The government sometimes chooses to save players in society when they are in trouble. This happened, for example, during the financial crisis, when the government intervened to bail out a number of banks. However, nobody would argue that the banks had paid for insurance via their taxes because they do not pay any higher taxes than other sectors. And these other sectors do not expect to be bailed out if bankruptcy is imminent because of risk, even if they pay their taxes like the banks do, and even if the money to bail out the banks initially came from taxation revenue.

So in Denmark we have a situation in which we believe that we have health insurance, but where, if we take a closer look, we might just as well call it government intervention in favour of a risk owner facing a large, sudden need for capital. This is the same model and approach that was used when the government bailed out distressed banks.

In the US, the situation is very different. In the US, there is no doubt that health insurance is based on the insurance principle and that it is the risk owners' own responsibility to protect adequately against costs in case of illness. However, far from everybody achieves 100% cover of the costs of illness.

In 2007, researchers (Himmelstein et al. 2009) carried out a study of bankruptcies in the US; even with conservative delimitations, they found that 62.1% of all bankruptcies in the US were caused by medical problems. The bankrupted persons all had debt in excess of USD 5,000 on average, or 10% of the family income before tax. Persons were declared bankrupt because they had lost significant income due to illness or because they had accumulated heavy debts to the health sector. Most bankrupted people with medically related debts had a good educational background, owned houses, and held middle-class jobs. Three quarters of the bankrupted persons had private health insurance.

The study shows quite clearly that the health insurance system in the US is not able to keep the person hit by a healthcare-related risk event free from heavy costs. This applies to such an extent that many go bankrupt.

It goes without saying, however, that not only the bankrupted persons experience structural risk costs. Structural risk costs resulting from capital shortage can easily arise without resulting in bankruptcy.

In the example with the American student attending a self-financed educational programme, a large expense may easily mean that the person

has to quit if, because of the expense, the risk owner has to find paid employment in order to be able to pay the expense or no longer has the money to continue on the educational programme. That is why the problem is likely to be much bigger than indicated in the American study of the reasons for bankruptcy; the problem is likely to be a real threat to productivity in society.

Again it is worth noting that you cannot prevent illness once it has occurred, so there will be significant costs in the wake of such illness, no matter who will foot the bill. However, the structural risk cost for the risk owner who experiences the illness may well be prevented. The structural risk cost is not a logical consequence of the illness. In the case with the American student, the loss of his educational programme is not a logical consequence of the illness. You may well be a skilful 3D graphic designer and an attractive staff member even if you have diabetes, for example. The effect on the long-term investment, the structural risk cost, may thus be removed just as it is in Denmark.

Naturally, the situation would have been different if the person had been training for a job where it would not be possible in any case to function with the disease concerned. This could be a situation where a person training to become a pilot loses his eyesight due to an illness, and where the loss of this qualification will occur no matter if the student manages to pay the bills associated with the illness or not.

## Tax-Paid Insurance

Based on the structural risk cost, the Danish health insurance system cannot be described as a pure insurance situation. Insurance is a risk product offered on a market where supply and demand influence the quality and effectiveness of products in regard to risk and uncertainty. That is not how the Danish health insurance system works.

The Danish health insurance system is not an insurance product but a state-controlled system that keeps all risk owners in society 100% free from all sudden and large capital needs resulting from illness. That is why the Danish health insurance system provides cover against structural

risk costs much more efficiently than what can be provided by a free, insurance-based health insurance system.

It is worth noting that the US, which is one of the few remaining industrialized countries with an almost 100% insurance-based health insurance system, has been moving in recent years towards a health insurance system with broader, state-controlled cover than the system generated by market forces. This movement is not based on a deliberate desire to generate more productivity in society but more on a humanitarian approach. It is likely, however, that if this movement continues, a more productive society will result from it, and structural risk costs for risk owners in the US are bound to decline.

As mentioned, the Danish health insurance system covers 100% for all diseases. This system is thus able to provide the broadest possible protection to citizens in society with the lowest possible risk costs in connection with illness, which is a contributing factor towards increasing productivity. Productivity increases because risk owners' long-term investments have a better chance of success, merely because they do not risk ending up as structural risk costs in the wake of the risk owner's illness. If the costs of keeping risk owners free from sudden capital needs are lower than the value of the investments that would be sacrificed in case of sudden capital needs multiplied by the probability that the red phone fails, growth in society increases.

It may well turn out to have been a wonderful investment for Denmark to keep citizens free from structural risk costs resulting from illness, and the Danish setup may have contributed to the handsome growth rates supplied by Denmark for many years, even if Denmark at that time had the highest general taxation level in the world. Having a 100% cost-covering, tax-financing health insurance system may, during some periods, have generated a growth-optimising situation, although further analyses and studies will have to be carried out to verify this assumption.

## Moral Hazard

The expression "moral hazard" is an important concept when you look at covering risk through insurance.

Moral hazard as a concept covers a situation in which two parties have made an agreement to share a risk but without having shared incentives when it comes to preventing damage because one of the parties will be harder hit by a possible risk event than the other party (Rees and Wambach 2008).

Moral hazard may exist, for example, in an insurance situation where one party, the insurance underwriter, will pay if damage occurs, while the other party, the policyholder, will not pay if damage occurs. In this situation, you could imagine that the policyholder is not so thorough when it comes to preventing the damage because a damage event is no longer a financial worry for him. Furthermore, the policyholder is the only one who has an actual possibility of preventing the damage.

In theory, then, the situation may lead to a higher damage level when an insurance agreement has been made, which in theory has a hampering effect on growth in society in the form of higher claims costs as well as an unwanted effect on the insurance situation, making insurance more expensive.

For example, the number of insurance claims to insurance companies regarding stolen or damaged iPhones increases whenever a new model is introduced (Devantier 2014). It is assumed that the increase in the number of insurance claims occurs because the policyholders are free from cost if their phone is damaged. It thus becomes possible to spend the money from the insurance to finance the purchase of a new phone. It is thus assumed that policyholders deliberately mislay their mobile phones or expose their phone to some sort of impact for which it was not built; subsequently, they try to get the insurance to pay for the damage or loss.

In this specific case, the situation is able to arise because compensation payments are higher than the price that the policyholder would be able to fetch for the used phone if he were to sell it, because more insurance companies pay compensation corresponding to the price of acquiring a new phone like the lost or damaged one.

There is no doubt that insurance companies often have to accept a certain level of moral risk, even if they have tools available to reduce this risk. For example, insurance policies may introduce a minor deductible to be paid by the policyholder.

The question is whether an effort to increase prevention of the structural risk cost will lead to an increased level of moral hazard?

In the situation where a market-driven insurance situation, such as fire insurance, is replaced by a state-financed effort to combat structural risk costs in society resulting from fire damage, it is probable that combating the structural risk cost will lead to a certain level of moral risk because the situation greatly resembles an insurance situation. However, it is improbable that the moral risk will have a much higher significance when it comes to a state that combats the structural risk than the effect seen in insurance today. Even if the public system provides better cover, the level of moral risk is likely to be unchanged. This is because as a policyholder you expect full cover when you take out insurance, and you are probably not going to change your behaviour much, only because you have more certainty of full cover.

This can be illustrated by an imagined example. As previously mentioned in this book, there was a fire on my farm in 2014 where a certain level of underinsurance was ascertained. If the government did not want this type of event to occur, it could establish a national claims evaluation body to assess the scope of all fire damage and award supplementary compensation if the policy concerned did not provide adequate cover. Knowing very well that there would be a cost per insurance claim in the form of remuneration to the members of the evaluation body, it is still not impossible to imagine that such an organisation would be financially worthwhile, simply because it would reduce the structural risk costs in society without increasing the level of moral hazard in the population.

Generally speaking, it is highly unlikely that government intervention towards incomplete insurance would create an increased level of moral hazard in the population. That is why it would probably be enough to assess the direct cover of the risk-combating measures vis-à-vis the positive financial effect achieved when we reduce the structural risk costs in society, so we will be able to have an assessment of the value of moving from a market-driven system into a state-financed system.

As regards the introduction of insurance to combat structural risk in areas that can be characterized as situations of uncertainty, and where internationally there is no consistent cover, such as state-guaranteed

insurance covering national disasters, illness, terrorism, and other problems, it is very unlikely that an increased level of moral hazard would ensue.

This is primarily because situations of uncertainty are situations in which the risk owner lacks knowledge, so few people spend time thinking about them. This applies, for example, to illness. Incidentally, there is no indication that people in Denmark are less responsible when it comes to taking care of their own health than people in the US, even if in Denmark you have a guarantee of full cover in case of illness.

Where a significant increase of the level of moral hazard in society could be foreseen is if new, significant types of cover were to be introduced covering everyday problems. This would apply in particular if situations were to be covered in which the policyholder has deliberately chosen risk.

In the wake of the big financial crises in 2008 and 2010, governments all over the world have shown increased preparedness to protect banks, which experience large, sudden needs for capital to such an extent that the existence of the banks would be threatened.

Prior to the financial crisis, it was quite certain that the banks had no insurance covering them if they experienced major loses; that was why the losses experienced always led to large, unexpected needs for capital. It is also certain that prior to the financial crisis, governments were not subject to any requirements that they would have to bail out banks.

In practice, however, things were different. During the financial crisis, many banks were bailed out from going bankrupt by the government.

It is probably not quite correct to call the bank bailouts an insurance situation. This is because the banks losses on loans and activities were not refunded, like in a traditional insurance situation, but instead banks were allowed to borrow capital in a situation where they would not be able to borrow capital in the free market.

On the other hand, it could be argued that states behaved like insurance underwriters, but their offer of compensation was a slightly different product from the cash payment normally associated with compensation payments.

Governments had no feeling of insurance liability as a driver. Conversely, the reasoning behind the intervention was Keynesian, macroeconomic thinking. It would be too comprehensive and beyond the

framework of this book to provide a full analysis of all the different interpretations and schools of thought related to Keynes's work, published in 1936 under the title *The General Theory of Employment, Interest and Money* (Keynes 1936) fifteen years after he wrote his risk-theory masterpiece *A Treatise on Probability* (Keynes 1921a).

In brief, though, Keynesian theory says that society should not experience major bankruptcies in structurally significant enterprises. In the wake of such big bankruptcies, there would be a temporary decline in employment and economic activity, and it could take a long time to recover from this situation. The reason that states want to save banks is not in itself so important for this book, so I will not pursue this in any further detail. Suffice it to say that an understanding of structural risk cost is not behind the rescue; the reason for it is to be found in recognized, macroeconomic theory.

Looking at the situation of a distressed bank, however, an understanding of the structural risk cost provides a clear incentive for bailing out the banks, even if the incentive for bailing out a bank is not any bigger than the incentive for bailing out any other enterprise from the cost associated with a major risk event and the resulting, large, uncovered need for capital.

In cases where states have bailed out a number of banks, a natural topic in the public political debate has been whether this made the banks more careless when it comes to taking risks.

In many banks, staff pay depends directly on the bank's short-term development in revenue and profit. Staff members thus have an incentive to take risk. Consequently, moral hazard may arise as regards staff members who choose to take risks on behalf of the bank expecting the negative outcome of the investments to be compensated or mediated by the state if the loss is threatening the existence of the bank. That would be the theory.

For clarity, it must be specified that the government's rescue of the banks consists of several different national initiatives depending on the specific approach chosen by the government. In Denmark two bank packages were implemented. One initiative was Bank Package II, which was intended to ensure the access of banks to an influx of capital in the form

of loans and guarantees. The loan had to be repaid with interest. This was an initiative that was available to banks only and which allowed banks to continue their existence. This initiative was only available to relatively healthy banks. In other words, they were offered a guarantee that the red phone call would be successful if they needed it. The second initiative is a gentle, gradual closure of banks in distress. This initiative started with Bank Package I, which established the government enterprise Financial Stability. Banks that would otherwise be declared bankrupt were taken over by Financial Stability and any healthy parts of a bank were divested, while other parts of the business were gradually closed down over a number of years. The intention was to minimize the impact of the bankruptcy of a bank in distress on the people and companies who did business with the bank concerned.

Most people would feel that government intervention affecting banks laid the basis for a higher level of moral hazard among Danish banks, not least because the terms offered by the government for loan capital under Bank Package II were seen by many as advantageous. In other words, it was found that, given the unfortunate situation in which the banks had brought themselves, the government would have been able to achieve a much higher yield from its loan engagement with the banks.

It is obvious that when a sort of government guarantee is provided to enterprises in distress, as was the case with the banks, this causes concern regarding a higher level of moral hazard.

This was also why it was necessary to increase the transparency of banking to make it clear whether a bank's business is sound. This recognition created the requirement for financial stress testing. All banks are subject to this requirement today, which can in many ways be considered a preventive instrument in regard to a bank's high moral hazard potential.

It is important to mention the banks' moral hazard in connection with government intervention during the financial crisis primarily because intervention towards enterprises in distress could easily be one of the areas that would be more generally enabled if we, as a society, were to recognize that there is a cost involved in running out of capital. This topic will be dealt with in more detail in the section on government intervention.

## Final Observations Regarding Insurance

The structural risk piece to the jigsaw puzzle fills an important void because it supplements the existing theory apparatus on the function and value of insurance.

This new piece to the jigsaw puzzle shows that insurance contains a positive value component by removing the structural risk cost from a risk owner.

Furthermore, insurance may even increase the return on an investment if the structural risk cost is higher than the excess price paid for insurance to the insurance underwriter.

What is just as interesting is the fact that the structural risk cost allows us to differentiate between insurance and a government guarantee against unexpected costs. While both types of insurance have a positive effect on the frequency and size of red phone situations for risk owners in society, only government intervention is able to keep all risk owners completely free from red phones in relation to the risk against which insurance has been taken out or intervention has been carried out.

This is interesting because government intervention is not a product and thus cannot spread naturally as a result of supply and demand the way insurance can. Government intervention may only spread if we can find a financially based argument in favour of spreading it. Previously, we only had Keynes' theory to work from, but now we are able to supplement this knowledge with a new economic driver for the spreading of government intervention: society's wish to minimise the structural risk cost component in society.

# 8

# The Different Costs of Risk

It is important to understand that with the existence of structural risk, risk no longer costs the same for all risk owners. Again, this is a point where the properties of the structural risk cost strongly challenge the leading academic view of risk because the conclusion stating that risk does not cost the same for everybody means that risk owners with low reserve capital and a low level of insurance have higher risk costs. Risk owners with low reserve capital and a low level of insurance are simply not competitive when it comes to assuming risk.

Because risk and uncertainty may of course come from the surrounding world, this means that those in society who have low reserve capital and a low level of insurance are directly restricted when it comes to growth.

It is not in the interest of a society that parts of the population are restricted compared with others in regard to growth because this means that the society will lose out in the competition with other societies that are able to optimise the structural risk cost for their risk owners.

This situation is fully comparable with the development we have seen in recent years when manufacturing companies have had to realise that they are losing competitive power because of high wage costs in production



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in their home country. Consequently, some have chosen to move their production abroad to re-establish their competitive power.

If a society is unable to hold its risk costs in check, a situation will arise in which risk owners are not competitive on costs; the ability of risk owners to carry out long-term investments will suffer as a consequence.

In a static world where all products have been invented and we are just fighting for the title of the best manufacturer or the mega company best able to live up consumer expectations, this is not a problem. However, in a changing world, a world driven by change, and a world in which each person is responsible for creating growth through new ideas, innovation, education, and entrepreneurship, it is a big problem to have unnecessarily high costs of long-term investments.

Having a society with a group of risk owners who have high structural risk costs is like having a blindfolded crew of bricklayers in a construction firm. It is inefficient and thus a situation we will never willingly accept if we can avoid it.

As mentioned, we can actually avoid this situation if we use measures such as replacing a market-based insurance system with a government-run, tax-financed intervention system. Or if we introduce state-guaranteed cover in a number of areas where there is no insurance today, such as when banks are saved from bankruptcy because of suddenly arising capital needs, or individuals are saved from the effects of natural disasters.

In recent years, the effects of climate change have manifested themselves, resulting in more storms and cloudbursts than usual and putting an enormous strain on infrastructure such as the sewer system, which is not geared to these volumes of water. Some house owners have seen their properties repeatedly flooded, causing major damage. These problems have become so big that some insurance companies simply will not underwrite insurance for some properties; they are of course fully entitled to do so because we have a free insurance market. However, the house owners affected are placed in an extreme red phone situation. The problem has become the topic of political debate in many countries because it is obvious that these house owners must be helped, but are they going to be helped through investments in an upgraded sewer system or through a government-run insurance scheme that indemnifies these house owners

in case of cloudburst? Disregarding any social and human considerations, the answer is that the government must do what is the most profitable for society financially.

Investments in an upgraded sewer system may make sense. We like our infrastructure to be adapted to current conditions, but this is not insurance. It will only reduce the factor in our risk equation, which is called probability. However, if a cloudburst occurs, house owners will still be in a red phone situation if insurance companies do not provide cover. This effect can be remedied if the government spends public funds to indemnify those affected. It is obvious that such a system will be a burden on the part of the population that pays the most tax, because the group with strong resources will end up paying to indemnify a group with fewer resources.

The reason why it is nevertheless a good investment for the group with strong resources to pay for this cover is that it can be a growth-promoting investment, not an investment driven by humanitarian spirit. It can be an investment in promoting productivity in society the same way as when the government invests in infrastructure and education, trade-promotion activities, etc. It can be a growth-driving parameter in the market economy. In other words, it can be a precondition for reaching a given level of growth in society that could not be achieved otherwise.

It is important to stress that the conclusions of this book in no way disregard humanitarian activities and assistance to disadvantaged members of society, but simply try to provide clarity and insight as regards the risk-economy mechanisms that support economic growth in society.

# 9

# Stock Taking

When trying to understand structural risk cost, there are many factors to keep track of.

It is like an "economic force of gravity", describing how factors, which we normally consider to be independent of each other systematically, influence each other financially.

To understand structural risk cost, start by looking at a risk owner who wants to carry out a long-term investment, such as the building of a new house or participating in a self-financed study programme or any other major long-term investment, it really does not matter which one.

Most people will intuitively feel that if you want to make such an investment, it is a good idea to know where the money for the investment is going to come from.

It is not a good idea to start a three-year, self-paid study programme if we can only afford the first six months of the programme, and we are unlikely to be able to procure the money for the rest of the programme. Also, it is not a good idea to start a building project costing two million if we can only procure funding for one million. If we go ahead and do it anyway, this borders on stupidity.



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This book describes what happens to risk owners who basically have enough money for their investment, but who have risk and uncertainty as part of their lives and are thus risk owners.

Most people tend not to see that risk and uncertainty are financial obligations (a consequence) that will only materialise with a specific probability. Financial obligations mean that the risk owner will have to pay if a risk event occurs. In a situation where the expense has materialized, there are different ways of financing the cost, accompanied by different financing costs, but a minimum price will also have to be paid.

When commencing long-term investments, it is in the understanding of how to relate to these risk financing costs as a risk owner and a government that the theory of structural risk finds its justification.

Long-term investments come in large, isolated quantities. One study programme. One building project. One innovative activity. Typically, we focus on the administration of our long-term investments because they are important to us in many ways, not necessarily because they create growth in society. The way the society is today, the needs of the individual person are the primary focus area for a risk owner. Structural risk arises when the risk owner expects to have enough financing for his long-term investment, but is surprised by large, unexpected costs, the size of which exceeds the available reserve capital.

In this situation, the risk owner is facing a red phone situation. And remember that red phone situations by definition are different from acquisition situations in that the risk owner is not able to walk away from the cost if the financing cost looks to be prohibitively high, as you can with acquisitions.

Here, there is only one thin lifeline that keeps the risk owner from behaving stupidly, such as the risk owner who starts on a three-year self-paid study programme but can only afford six months or who tries to build at a cost of two million but can only afford one. These risk owners thus end up financing their risk costs in a way that erodes the value of their long-term investments.

The sudden extra costs to be financed may come from risk or uncertainty. The limit between the two is theoretical and philosophical and, in practice, it is difficult to say what is risk and what is uncertainty for a given risk owner.

Generally speaking, the further ahead in time we try to describe what could go wrong, the more difficult it gets. So, the further ahead we look, the more uncertainty there is, and the more difficult it becomes to describe risk.

However, even if we cannot describe uncertainty the way we can describe—and thus relate to—risk, this does not make uncertainty less important. Uncertainty is also a financial obligation alongside risk.

Risk can be described quite simply as consequence × probability. Uncertainty cannot be described in its fundamental condition. However, in this section I will cheat a bit and describe uncertainty anyway. I am able to cheat because we know very well how uncertainty will affect a risk owner financially; it will turn up as unexpected extra costs. The fact that we basically do not know the cause of the unexpected extra cost before it appears does not really matter in this context. In this way, we are able to describe the future of a risk owner as containing describable, potential extra costs as well as non-describable, extra costs. And the best way to show this situation is through a Monte Carlo simulation.

If you want to do a simulation of a risk owner's future, you start by mapping all the risk elements that can be described. These could be dental problems, unemployment, or anything else—i.e., elements that can be described in the form of probability and consequence.

When all the risks you can think of have been entered in the simulation, a factor must be added that represents all the things that cannot be described. For example, an event that has a 10% likelihood of costing the risk owner DKK 200,000 should be entered if this seems to be a likely premise for a risk owner in the society concerned. You can add more of the same thing—e.g., a 15% likelihood of an expense of DKK 20,000. However, it is important that the variables used to describe uncertainty are based on data to some extent, such as economic analyses of society.

In this way, a model of a fictitious risk owner's future is built. It is then possible to carry out a Monte Carlo simulation on this basis.

The simulation shows what can happen to a risk owner, such as, for example, during a time frame of the next twelve months. The simulation is repeated many times, for example, 2,000 times; the outcome shows what happened each time the risk owner's future was simulated.

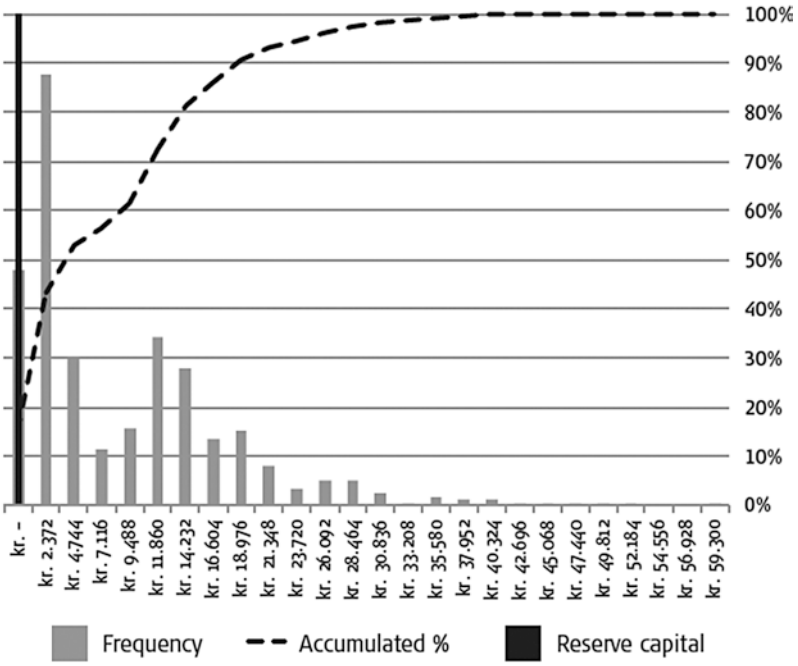


**Fig. 9.1** Simulation of a risk owner's future. This simulation is fictitious and contains both the risk owner's risk and an estimate of the effect resulting from uncertainty. The risk owner has no reserve capital and will thus have an 85% likelihood of landing in a red phone situation within the next year. You can find this information by following the *dotted line*, which is the accumulated probability. Where the value of the X-axis is zero, *the dotted line* is at 15%. This means that 15% of the 2,000 simulations made in this example resulted in absolutely no added expense for the risk owner

Sometimes the risk owner is lucky, and nothing unexpected happens. Other times all the accidents occur. Using 2,000 simulations of the risk owner's future, it is possible to draw a frequency diagram. One example of a frequency diagram can be seen in Fig. 9.1.

If the risk owner has one or several long-term investments in his ownership, it is not ideal to have no reserve capital. Actually, it would make good business sense for the risk owner to increase his reserve capital, if possible. Let us assume that the risk owner is able to reduce his general

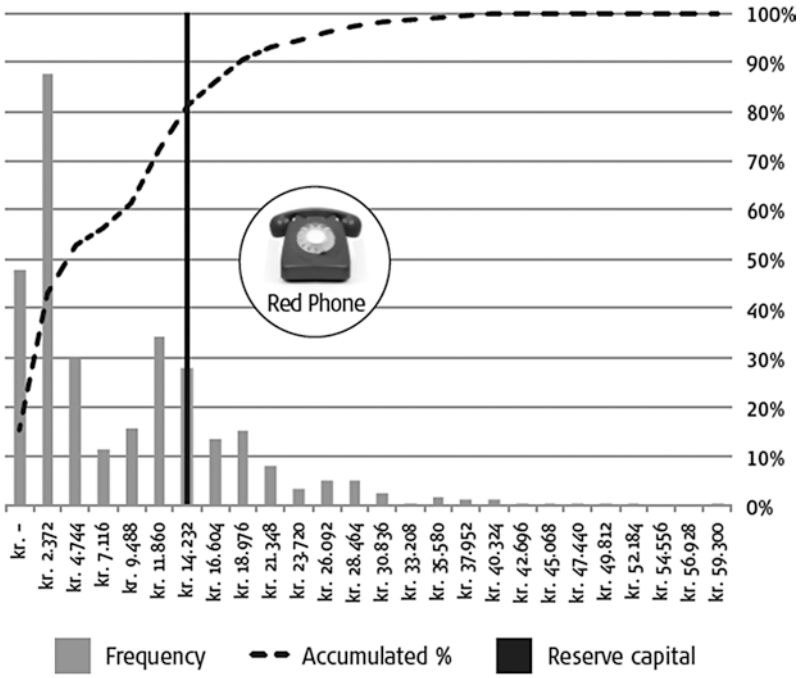


**Fig. 9.2** The risk owner has increased his reserve capital by DKK 15,000. The risk owner now has a 19% likelihood of landing in a red phone situation and thus has an 81% likelihood of having enough reserves to pay the risk costs that may arise in the coming year. This can be read from the graph where the reserve capital crosses the accumulated probability graph

consumption and instead increase his reserve capital by DKK 15,000. Fig. 9.2 shows the result.

By increasing his reserve capital by DKK 15,000, the risk owner achieves a good effect measured on the probability of landing in a red phone situation. The probability declines from 85% to 19%.

If the risk owner chooses to increase his reserve capital even more, say all the way up to DKK 59,300, which is the maximum amount that the risk owner may have to pay, this no longer has the same good effect on probability. The first DKK 15,000 gave a reduction of 66% (85% minus 19%). However, an additional DKK 44,300 reserve capital only gave the risk owner a 19% improvement (100% minus 81%).

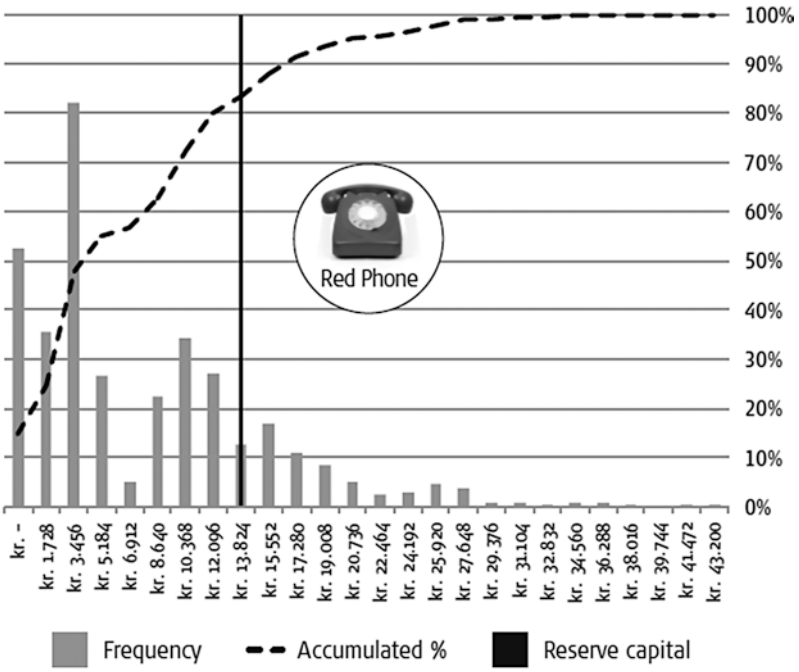


**Fig. 9.3** The risk owner has chosen to take out insurance against rare, but large, risk costs. In this example, the risk owner has paid DKK 1,000 for insurance; statistically, this insurance covers costs up to DKK 750. So the insurance company makes money off this chosen insurance. The reserve capital is now DKK 14,000, and the probability of having enough reserve capital is 84%. However, the most important effect of the insurance taken out is that the size of the red phone is reduced. The risk owner's maximum problem declines from DKK 59,300 to DKK 43,200. The maximum red phone to be handled by the risk owner now is DKK 39,300 (DKK 43,200–DKK 14,000) against a previous DKK 44,300 (DKK 59,300–DKK 15,000), simply because insurance has eliminated risks with a value of up to DKK 750. This means that the risk owner has both increased the probability of having enough reserve capital and at the same time reduced the size of the maximum problem that he could encounter over the year ahead

It thus becomes increasingly ineffective for the risk owner to increase his reserve capital, and this is where insurance is warranted.

If the risk owner chooses to take some of his reserve capital and spend it on insurance to protect against rare but expensive events, this will have a visible effect on the span in the simulation (Fig. 9.3).

The size of the problem may be a significant parameter. It is significant to the probability of handling red phone situations successfully. The chance that a risk owner is able to borrow, for example, DKK 24,000 from the bank is bigger, all other things being equal, than the chance of borrowing, say, DKK 37,600.

It is only if the risk owner fails to procure the capital he acutely needs that the structural risk cost materializes, because in this situation the risk owner has no other choice—his acute shortage of capital will be consequential to the risk owner's long-term investments. That is why it is important to reduce the "uncovered" need for capital to increase the probability of being able to procure the capital shortfall without undermining other long-term investments.

If the risk owner has reached the optimum financial point for the size of the reserve capital and taken out the insurance that seems financially attractive, it is still dangerous to be a risk owner because there is still an uncovered, possible need for capital.

In this situation, it is still possible to prevent structural risk costs in a variety of ways, such as through government insurance or government intervention. However, once the person has done what was possible, only the government is able to make an additional effort against red phones occurring for the players of the society. The government has the potential, and arguably even an obligation, to ensure low structural risk costs; this will be elaborated in more detail in the coming sections.

# 10

# Macroeconomics

Having looked at the more technical sides of the structural risk cost caused by red phone situations in a risk owner's life, it is interesting to look at how significant elements in society theoretically affect the scope of the structural risk cost in society.

In our understanding of how the national economy works, we are restricted by the underlying theory apparatus. In discussions about society, it is thus not possible to insist that insurance can lower the cost of risk in society if this statement is not supported by economic theory.

Conversely, this means that when we change the economic theory, known functions and institutions in society have the possibility of taking on a new significance and function in our economy.

## Equilibrium

Society consists of many risk owners who jointly establish equilibrium. Risk owners in society may be in different states of risk, which may change over time as regards the individual risk owner, but which, overall, are in equilibrium, so there will be a constant share of the population in each state.



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Risk states can be divided into three groups:

1. No exposure or marginal exposure to red phones
2. Exposed to red phones in the future
3. In a realized red phone situation

There will be an absolute minority of people who are able to argue that they are completely free of red phone situations in their future, even if that would be the condition they would want. When we include the fundamental uncertainty that always exists in the world around us, it is difficult to state that no situation may arise for a risk owner in which a need for resources may occur that exceeds the resources available to the risk owner. However, it may well be that the situations are so far out and speculative that it would be more precise to describe such risk owners as being free of red phones.

Most risk owners in society will be exposed to risk to such an extent that it is relevant for them to discuss how much reserve capital they need to have available and to which extent they should take out insurance. More often than not, it will not be possible to establish the necessary capital base or to pay for the optimum insurance level. That is why these risk owners will always have a certain level of red phones in their future, and the structural risk cost will thus have an actual, financial significance to them.

Finally, some risk owners may already be in a red phone situation. They are in the process of using their phone to call everyone they can: banks, mortgage credit institutions, family members, or others in an attempt to raise the necessary capital. As we know, however, it is not certain that these efforts will succeed. If their negotiations fail, there will be a period of unknown financing costs, which will always materialize internally within the individual risk owner's structure. A study programme may have to be discontinued. An ongoing building project may suffer. A newly established enterprise of the risk owner's may be hit. If the risk owner has an enterprise that cannot procure the necessary capital, the loss may mean that product development projects, market expansion projects, or other long-term investments suffer.

Any long-term investment under the risk owner's control may basically suffer and form part of the financing costs of the risk event.

If the long-term investments can be sold in the market and thus just change owners, this is considered a successful use of the red phone. It may well be that the risk-affected owner makes a bad deal and only recovers a fraction of the investment from it, but this means nothing to society. To society, it does not matter who owns an investment.

For society, it is important to ensure, for example, that a small enterprise is not lost merely because the owner comes down with an illness that does not in itself keep the owner from running the business. If the enterprise is to be discontinued, it should preferably be because it is no longer competitive or for other reasons attributable to the management of the enterprise. The enterprise should not form part of the financing cost of a risk event that in no way relates to the enterprise, and where subsequently we have no transparency as to what happened. Conversely, it is not important to society who owns the enterprise. If the owner is forced to sell the enterprise at a loss compared to its fair market value, the risk owner's loss will be someone else's gain, all other things being equal; from society's point of view, the result is thus neutral, even if it is not neutral to the individual risk owner.

## The Formula for Society's Structural Risk Cost

There is nothing to indicate that the equilibrium for structural risk will settle naturally at an ideal level in society the way it has been seen to do for much other economic equilibrium in society. One example of an equilibrium that naturally finds its ideal level is supply and demand.

The most important reason why the equilibrium for structural risk cannot settle naturally is that the cost in Situation 3 in Fig. 10.1 is complex and hidden. This means that we may have an inappropriately high level of structural risk costs in society without we economists being able to see the costs and without anybody in society being confronted with the high level of cost.

When it comes to the description of the factors that influence the equilibrium of structural risk in society, these factors may have two functions. They may be factors that increase the scope of structural risk, and they may be factors that reduce the scope of structural risk. More often than not, the same factor will be able to both increase and reduce the scope of the structural risk cost in society.

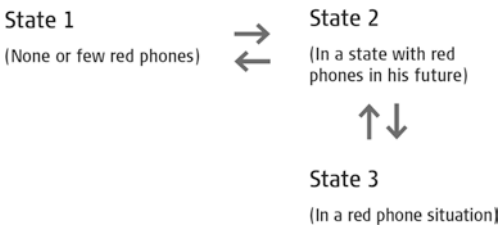


**Fig. 10.1** The equilibrium for structural risk. In state 1, the risk owner is free from red phones to the greatest possible extent and can thus not be hit by the structural risk cost, which we know is an extra cost associated with risk. In Situation 2, the risk owner's future contains red phones, and some of these risk owners are in a current red phone situation, which is Situation 3

$$\sum (\text{factor 1, factor 2, .....}) = \text{Level of structural risk}$$

**Formula 10.1** The formula for society's structural risk cost. On the left side of the equation, all factors are shown that may create or minimise sudden resource needs together with all the factors that may keep the resource need from resulting in an unsuccessful red phone situation.

By looking at the sum of contributions to and from the significant factors, it is possible to develop an impression as to whether society has a high or low level of structural risk cost (Formula 10.1).

The formula for equilibrium of structural risk in society means that the sum of contributions from factors results in a certain level of risk in society. This will be an equilibrium situation where the individual risk owners may change categories over time but where the equilibrium will be more or less stable unless major changes to the factors that form part of the equilibrium occur at a macroeconomic level. If there are no major changes to any of the components of the formula, the equilibrium will shift either towards Situation 1 or 3 in the equilibrium for structural risk.

In the following section, I will review the factors that influence the equilibrium of structural risk in society and form part of the formula for society's structural risk cost, and I will briefly explain how they can each influence the equilibrium.

## Factors in the Formula for Society's Structural Risk Cost

Because there is a cost involved in suddenly running out of capital, it is interesting to analyse the factors that could create sudden costs or prevent them. Each of these factors must be included in the formula, no matter if the factors mean something only to a societal subgroup or to everybody.

Because we have never previously attributed a variable, impressionable extra cost to sudden costs, such costs have been considered a premise in life. This also means that at least to my knowledge no measure or index exists for sudden costs in countries. The level of sudden cost in a society is not a state that we are concerned about today; this means that a country or state with a high level of sudden cost to its citizens, companies, and organisations cannot be differentiated from a county with a low level of sudden cost to the agents of society. We simply do not know how countries and states compare on this important parameter.

Measures of the risk of countries exist, but these are normally a measure of the probability of company bankruptcies or similar, business-related risk. There is also a risk index of how dangerous it is to travel to various countries and indices that in some way can be said to relate to specific risk aspects in society. However, there is no index for the frequency and size of sudden costs for risk owners in society.

It is not inconceivable, however, that an index exists that may indirectly tell us about structural costs in a country—the equality index. The equality index is interesting because it shows something about the robustness of its citizens. In principle, if all are equal, all will have equally low structural risk cost, and if inequality is extreme, only a few will be highly resistant towards structural risk cost while the majority of people will experience high structural risk cost. Remember that when we discuss structural risk, this actually applies equally well to companies and to people, though this concept may seem strange to many readers, as we are not used to discussing inequality among companies. The role of equality as an indicator for the level of the structural risk cost in a society will be discussed in the section entitled "Equality".

For lack of an index, the parameters that should form part of an assessment of a structural risk index need to be described. It is not possible in this book to provide a full overview, so only the most significant parameters will be reviewed.

## Natural Disasters

In the nature of things, natural disasters are able to generate extra costs for those affected—no matter if a meteor hits the ground, as was the case in 2013 with the Chelyabinsk meteor, or a tsunami occurs, like the one that hit Japan after Sendai earthquake in 2011. These costs may be substantial and will lead to a high level of red phone situations. Consequently, the costs associated with these disasters are higher for society than would have been necessary.

With the meteor, it may not have been possible to do more to minimize the direct damage from this natural disaster, but the question is how the subsequent expenses affected the local population.

If society is aware of the structural risk cost, it is possible to ensure that those affected are indemnified financially as far as possible, thereby also ensuring the smallest possible effect on the long-term investments of those affected by the natural disaster. The long-term investments are our concern here, because these are the ones we can do something about. We cannot change the meteor impact, or prevent it for that matter. Furthermore, we cannot do much to change clearance and rescue costs, but we can do something about the structural risk cost that potentially follows in the wake of natural disasters. Society itself can largely decide the size of this cost.

## Illness

As mentioned before, illness is a source of extra costs. If you are uninsured, illness may result in astronomical expenses, while if have a tax funded healthcare system and you only have to pay some of the costs of health service in society yourself, the costs affecting the sick person may be smaller. This is a good example of a parameter that may have a

very different weighting in the formula of a society's structural risk cost depending on the healthcare policy of the country.

## Crime

When crime is committed, this can often have financial consequences for the persons who in this book are termed risk owners. No matter if we are talking about organized crime, property crime, or any other type of crime, risk owners in society can suffer considerable costs. It would seem obvious to most people that if you are threatened with personal injury to pay DKK 500,000, you may choose to pay, no matter how this could impact any other long-term investments in your possession.

Naturally, the police and the judicial system play a big role when it comes to the significance of crime in society, just as other factors such as poverty, food shortage, etc., play a role. However, it is the criminal act in itself that generates the sudden cost for the victims.

## The Police and the Judicial System

It is obvious that, by fighting crime, the police and the judicial system have a positive effect on the quantity of sudden, added expenses in society. However, they also generate sudden, added expenses to individual members of society. A case in point is fines. It can easily be argued that fines prevent crime, which naturally is their purpose. But if we look at speeding tickets, there is not conclusive evidence that more revenue from traffic fines flowing to the treasury reduces the frequency of traffic accidents at the national level (Elvik and Christensen 2007). On the other hand, the resulting revenue to the public treasury can be characterized as sudden expenses to those caught speeding, and it can be difficult to find out if an increase in fines can be solely attributed to a wish for safer road traffic, of if an element of financing public cost also plays a role in the decision to increase fines for traffic violations.

Risk owners experience the public revenue from fines as sudden needs for capital. This means that this government financing together with any other sudden expenses imposed by the police or the judicial system affects

the structural risk cost in society and will lead to poorer conditions for long-term investments in society. Where fines in many countries are relatively small, the court system of some other countries features large fines or compensations. The best-known example is the US legal system, where it is common for civil lawsuits to result in enormous compensations. If, for example, you are a volunteer in a scout club, and a scout is injured while you are present, you may end up being held responsible and paying enormous compensation that would never be granted in other countries.

Society's laws, legal system, and the police thus make up an independent component when looking at the size of structural costs for risk owners in society. And the government not only punishes individuals with fines, but it also punishes itself because it does not know the financing costs associated with the fines.

## Corruption

In most countries, corruption is a criminal activity, but there are also many countries where it is not a criminal activity, or where it is so widespread that it is not actually subject to law enforcement as a criminal activity.

However, corruption will be experienced by risk owners as a sudden, added expense. If, for example, a risk owner is building a house and, in the process, the authorities refuse to give a specific permission unless a bribe is paid, the risk owner experiences a sudden, unexpected need for capital.

Thus, corruption has a negative effect on the value of long-term investments in society, which is why corruption is part of the formula.

## Dental Care

Dental care has not been combined with illness under one heading because the vast majority of visits to the dentist come from a different part of Maslow's hierarchy of needs than illness. In addition, many visits to the dentist are planned, such as annual dental check-ups, so they can be budgeted because they are certain to occur.

However, some visits to the dentist are the result of a broken tooth, a cavity, or other acute dental issues, which in some cases may result in enormous, unexpected expenses for a risk owner.

## Accidents and Injuries

The level of safety in society affects the number of accidents and injuries, whether they are on the kindergarten playground or are a matter of traffic safety, workplace safety, fire safety, and much more. A high level of safety thus results in low risk costs—not just because there are fewer injuries, but also because a high level of safety prevents the negative impact on the value of long-term investments that would occur in the form of risk owner costs at a high level of injuries.

## Crises and Macroeconomics

Sudden macroeconomic shifts, international security crises (wars), and financial crises will affect risk owners in society in ways that may increase structural risk costs. This could happen, for example, in the case of sudden unemployment or the crashing of big banks or other companies.

Financial crises are particularly interesting in this context because we have just been through a global financial crisis (2007 and 2008) that slowed down long-term investments and growth in society in large parts of the world. During the crisis, we saw how the authorities of many countries tried to stimulate growth in the immediate wake of the crisis, just as they tried in other ways to get the macroeconomic numbers back on the growth track. Crises form part of the equation that shows society's structural risk cost because in addition to their direct impact on the economy, crises also have a hidden negative effect on the value of long-term investments in society.

The really interesting point here is that the traditional Keynesian growth promoter following a crisis is to stimulate growth by means of public investments. So you take tax-paid funds or go into debt and spend the money on growth-stimulating measures, such as large public construction works. The Danish quality fund projects mentioned earlier in

this book are an excellent case in point, showing the Danish government's attempt to stimulate growth by increasing employment through investments.

It is not the intention of this book to argue against the effectiveness of these measures; the interesting point is that such measures do not necessarily promote long-term growth by reducing the structural risk cost in society, simply because these measures are not directed at achieving this effect.

If we furthermore assume that the investments are tax financed, and the cost means there will be a reduction of the effect of other measures in society that also form part of the equation—such as law enforcement, unemployment benefits, or disaster preparedness—rather than an increase of the tax rate, we may experience that short-term growth is certainly stimulated but that long-term growth has even poorer conditions than before the stimulation was introduced. This is unless society has economic latitude that enables financing of investments without leading to a deterioration of other parameters that form part of the equation of society's structural risk cost.

For example, the Norwegian government has a very large oil fund with money from oil and gas production in the North Sea. With the backing of this fund, there is no doubt that they can stimulate growth in society in the short run if necessary without any negative impact on other factors of importance to its society's level of structural risk costs. This means that, in theory, the Norwegian government can make growth-promoting investments without any negative effect on the level of sudden cost in the society and thus without a negative impact on the value of its society's other long-term investments.

## Conditions on the Labour Market

Becoming unemployed is a great risk to an employee. When working with structural risk, it is not important as such whether the person is to blame for being laid off or whether the company is cutting back on its labour force for some reason. The only important point is that when you have a job, it is a premise that you can lose it.

If a person loses his job rather suddenly, it is obvious that an acute shortage of resources may arise and that this may have consequences for the long-term investments held by the risk owner where these investments are affected and not saleable or otherwise easy to convert into cash in the market.

Where macroeconomic movements may change the frequency of dismissals in society, this factor as described in this book refers mainly to conditions for those who are laid off.

If, for example, society has an unemployment benefit system that guarantees a certain income to those who have been laid off, the effect of dismissals in society will not have as much weight in the formula of society's structural risk cost as this factor would have if there were no unemployment benefit system.

## The Financial Factors Included in the Formula of Society's Structural Risk Cost

I am not going to go into much detail with these factors because they have been discussed in previous sections of this book. However, the level of insurance in society, including the quality of insurance and the capital level of the agents of society, is among the most significant factors.

What we know about the capital level is that reserve capital protects against the structural risk cost. This means that if the quantity of reserve capital in society increases, and all other parameters remain unchanged, the equilibrium will be shifted simply because the structural risk cost will decline. For society, risk will thus become cheaper. Naturally, this presupposes that there is a need for the reserve capital, because otherwise this reserve capital merely functions as savings, and savings do not change the price of risk in society.

Another way of expressing the effect of an increased reserve capital in society is to say that for society long-term investments will have better conditions, so value creation in society will be greater. The reason for the increased success rate of long-term investments is thus simply that, to a smaller extent than would otherwise be the case, investments end up as unacceptably high, destructive financing costs for risk events.

## Perspectives on the Use of the Formula for Society's Structural Risk Cost

The formula for society's structural risk cost tells us in a new way how well-known factors in society influence society's risk cost level. Even if it is not yet possible to calculate the effect of each factor precisely, the formula may still prove useful when discussing observations in society and significant macroeconomic tools. In the following, I will explain how the formula can be used in a discussion of Keynes' savings paradox, tax relief, economic equality, and shifts in net wealth during crises.

## Keynes' Savings Paradox

The first element we will look at is Keynes' savings paradox (Grauwe 2009). Keynes, whose theories have formed the basis of macroeconomic crisis handling, sought to explain why it was that when a financial crisis occurred and there is a drop in the demand for goods, risk owners in society, including private individuals, start to increase their savings.

This effect of the crisis is a major problem for society because it generates an additional drop in the demand for goods, thereby exacerbating the crisis. According to Keynes' theory, it would be much better if risk owners in society did not save up money but did the opposite—increased their consumption and made it less necessary for the government to stimulate consumption with growth initiatives. According to Keynes' savings paradox, there is a lemming effect behaviour that makes most risk owners in society save up money and even sell off assets; because there is thus an increase in the supply of assets, the demand for assets falls, resulting in a value deterioration of assets. These developments all exacerbate the crisis and place the individual risk owner in a worse situation than before.

The problem looks different when considering that crises form part of the equation giving us society's structural risk cost. When a crisis occurs, risk owners experience an increasing level or frequency of sudden needs for capital—for example, in connection with unemployment. Furthermore, risk owners find it more difficult to use the red phone because banks may

not be quite as willing to lend out money as before. That is why conditions for risk owners deteriorate when it comes to long-term investments. The correct response is to adjust the factors that may counteract this effect.

If we wish to counteract the effect of the crisis, we must take the measures open to us. The individual risk owner is not able to remove the crisis and must thus resort to other means. Increasing one's reserve capital is one option.

Keynes' savings paradox is not a paradox when you look at the structural risk cost. It is actually the most growth-promoting behaviour a risk owner can display when facing an increasing risk level. This behaviour generates a maximum return on the reserve capital because reserve capital functions as a guard protecting the risk owner's long-term investments.

It is not only to the risk owner's own financial advantage to increase reserves during times of crisis, but certainly also in society's interest because in theory it is only when adequate reserves have been established in society that long-term growth again becomes profitable, as risk costs have declined to an acceptable level.

Risk owners' savings thus represent a natural, financially optimized behaviour, forming part of healthy processing of a crisis. Any attempts from the government to counteract this behaviour should probably be thoroughly analysed and considered before being implemented.

## Tax Relief

Tax relief does not form part of the formula for society's structural risk cost. To the extent tax relief is granted to get consumption going, it does not directly affect the structural risk cost. So even if risk owners get more money for consumption and long-term investments, this will not influence the scope of sudden capital needs in society or the resistance to such capital needs.

Initially, tax relief thus has the effect of being a neutral component.

However, this naturally depends on how tax relief is financed. If tax relief leads to deterioration of other government-financed components, such as sickness benefits, unemployment benefits, the police, and the judicial system, which are factors that form part of the formula of

society's structural risk cost, a tax relief may have an ingrained, negative growth component. This negative growth component will lead to deterioration of the value of long-term investments in society and must thus be compared with any positive growth components resulting from increased demand for goods.

It is quite interesting that the formula of society's structural risk costs shows this connection, because it has never been unequivocally proven that tax relief promotes growth in society, even if traditional economic theory almost unequivocally has it that tax relief should increase growth in society.

This unequivocal recommendation from economists has meant that, following the crisis, we have seen a number of European governments lowering taxes to promote growth. However, these tax reliefs may overall have had a marginal effect or perhaps even a negative effect on growth in some cases because they have led to an overall deterioration of conditions for risk owners in society.

Tax relief whose financing creates an increased level of structural risk in society must be deemed to be speculative and, more likely than not, to have no effect. The opposite applies to tax relief granted because the budget allows it after the work to reduce the factors that form part of the formula of society's structural risk cost has been optimised. Such tax relief will have no negative, ingrained growth component resulting from increased structural risk costs in society, so any positive gain from the tax relief in the form of increased demand will be intact.

## Equality

Equality as a concept has been discussed for a long time; a public discussion really took off in 2009 when Richard Wilkinson and Kate Picket published their book *The Spirit Level* (Wilkinson and Picket 2009). Both writers are epidemiologists, not economists. The book presented their research into equality based on studies of the correlation between the equality of countries and states and a large range of parameters, such as crime, illness, education, etc. They found rather good coherence among

many of the parameters studied and showed unequivocally that increased equality correlated with better results on the parameters studied. Many thus argued that they had demonstrated that equality was a desirable condition because societies with equality did best. Naturally, this gave rise to a host of protests, primarily attacking the argument claiming that equality should be a goal in its own right.

It is always healthy to display sound scepticism towards this kind of analysis because, as Mark Twain wrote, there are three types of lies: lies, damned lies, and statistics. Or as Churchill put it: "Do not trust any statistics you did not fake yourself". Statistics can be used for much good, but they have the ingrained flaw that we rarely get a clear view of the mechanisms underlying the described correlation.

*The Spirit Level* created both resistance and acceptance to the conclusions of the book, and the book certainly put equality on the agenda; despite the criticism voiced, a great many people believe that equality is a significant, valuable quality in a highly developed society.

There are two reasons why it is relevant to look at the concept of equality and, quite specifically, to look at Wilkinson and Picket's book in connection with structural risk.

The first reason, as previously mentioned, is that as far as it has been possible to ascertain, there is no international index showing the extent to which risk owners in society, be they citizens, companies, or other economic structures, are exposed to sudden costs. If such an international index were to exist, interesting correlating graphs could be made in an attempt to show the connection between the level of sudden cost in society and a great many relevant parameters.

However, for lack of a specific structural society risk index, we could perhaps use the equality index because there is some indication of an overlap; societies with high equality often have low risk. The reason for the overlap between equality and low risk is that a great many risk-reducing measures, such as the unemployment benefit system, the sickness benefit system, the police, and the judicial system, are government financed and thus require a high tax pressure. A high tax level often requires a differentiated tax rate where the best-off pay a higher percentage of their income in tax than the worst-off. As an example of a differentiated tax,

the French government briefly introduced a personal income tax of 75% on income exceeding one million euros a year.

It could thus be argued that the conditions which create the financially most advantageous basis for long-term investments by securing low structural risk costs all result in increased equality in society to some extent.

However, the most significant reason why low structural risk costs in society generate more equality is to be found in the very mechanism underlying the structural risk cost. The mechanism behind the structural risk cost means that the group which has red phones in their future or is in a red phone situation often consists of people with low reserve capital, and they are the same people who have no savings as well.

This means that those worst off in society have the highest risk costs, so they are hardest hit by the costs associated with structural risk; they are paying through a negative effect on their long-term investments. However, the goal with long-term investments is to bring the risk owner into a situation with higher income and thus the possibility of establishing a reserve capital. The worst-off risk owners thus find themselves in a vicious circle.

The conclusion is that the worst-off—those we would like to see grow and create value for themselves—have a lower return on their long-term investment than the well-off in society.

Based on this conclusion, we would expect a society with high structural risk cost, here symbolized through societies with a low level of equality, to have low social mobility, and this is in fact what Wilkinson and Picket showed in their book, in which they demonstrate a clear correlation between inequality and low social mobility.

This cannot be deemed to constitute evidence of the relevance of the structural risk cost for social mobility, because there are many other factors involved. However, it is interesting that the expected effect can actually be seen in society. If you look just at the Nordic welfare states vis-à-vis the US, it is reasonably clear that the structural risk costs must be much higher for citizens in the US than in the Nordic welfare states (Fig. 10.2).

Even if it is possible to argue that there is a certain overlap between a low structural risk level in society and high equality, there is a big difference between the statistical work of the epidemiologists and the theory presented in this book.


**Fig. 10.2** From the book *The Spirit Level* by Richard Wilkinson and Kate Pickett (Wilkinson and Picket 2009). The figure shows the link between social mobility and income equality in a country

The primary difference is that equality is not a financial mechanism. Equality and connection with the parameters that form part of Wilkinson and Picket's study do not provide any financial proof or economic theory that a society which increases equality will also achieve the desired effects on the economy of society.

The structural risk cost, on the other hand, is a financial mechanism and economic theory proven experimentally. This means that this is a significantly stronger argument in favour of the expectation that if we improve the factors that form part of the formula for society's structural risk cost, this will, all other things being equal, lead to lower risk costs in society and stronger long-term growth. This is because structural risk provides a direct causality, a causality that has not been proven to exist between equality and the parameters examined in the book *The Spirit Level*.

That is why we may also expect that, all other things being equal, it will be easier to introduce reforms in society on the basis of knowledge of the structural risk cost than on the basis of work concerning the effects of equality.

## Displacement of Equilibrium

If society is in a situation where the factors forming part of the formula of society's structural risk cost experience negative development, the equilibrium will be shifted; there will be fewer risk owners in Situation 1, which is a situation that most always leads to fewer red phones in the future. All in all, this means that the cost of structural risk increases in society as there will be more people in Situations 2 and 3.

The cost will increase because more people experience sudden, added costs that exceed their reserves and savings, and as previously mentioned, it is unclear what the financing costs of suddenly incurred costs will be.

As previously explained, the cost of unanswered red phones is a cost syndrome where all the risk owner's long-term investments may end up suffering. This damage will be difficult to calculate, but experiments have shown that the damage will be higher from a macroeconomic perspective than the costs of procuring the necessary resources from the surrounding world to be able to continue long-term investments. And more importantly, the risk cost associated with failed red phones has a completely different dynamic from the normal direct consequence of risk, as described in Table 5.1 earlier in the book.

If, all other things being equal, risk increases in society, this will mean that risk owners experience higher, more frequent unexpected extra costs. This also means that requirements concerning reserve capital will go up. In this situation, risk owners who have both reserve capital and savings can relatively easily reach the new optimal situation just by moving a large share of their untied funds from savings to reserves. This is naturally a theoretical exercise; what it means in practice is just that you no longer consider your savings to be available for consumption or investment.

The situation is much more difficult for those who only have a limited reserve capital and no savings. They now have to reduce consumption to increase their reserves, as described in Keynes' savings paradox. In this

group, not everyone will be able to do this adequately. The result will be a bigger shift of equilibrium in the segment of risk owners who have no savings than in the segment that has large savings.

People who already have red phones in their future may also be hit by an increase in the risk level in society. When you have red phones in your future, there will be some likelihood that this red phone situation materialises into a real situation where the need for capital exceeds reserves. For these people, the likelihood of landing in a red phone situation may increase, as may the size of their capital need; this reduces the likelihood that the red phone situation can be handled with the lowest possible costs. Consequently, an increase in the risk level in society will also affect those who are already exposed to red phone situations.

The conclusion is that an increase in the risk level in society will mean that the structural risk costs will increase, increasing the most for risk owners with the smallest savings. These people are often the worst-off in society. However, it is important to note that this is not a situation that is restricted to the most disadvantaged members of society.

Consequently, an increase in risk level will theoretically have the following expected effects for the agents of society:

- It will not affect the best-off as hard.
- It will increase risk costs the most for the worst-off.
- It will increase inequality in society.

This is precisely the effect that has materialized in the wake of the financial crises of 2007 and 2008, which was largely characterized by an increased risk level in society. During the crisis, inequality increased in many countries, which actually surprised a lot of people. However, there is probably no reason to be surprised because the structural risk cost is a macroeconomic mechanism that must be expected to generate this effect. This does not mean to say that the mechanism for structural risk is the full explanation, but the expected effect does match the effect we can observe in the real world relatively well.

# 11

# Self-Chosen Risk and Government Intervention

In the introductory section of this book, it was beneficial not to distinguish between self-chosen risk, such as an investment, and risk coming to a risk owner from the surrounding world.

This is because a risk owner experiences risk in the same way—no matter its source. The risk owner will experience risk as suddenly arising financial obligations. To a risk owner with limited access to reserve capital, it is thus of academic interest only whether the problems that materialize have this or that origin.

As described in the section on moral hazard, shifting responsibility from one risk owner to another may mean that a risk owner changes his behaviour. If a risk owner takes out insurance, the person may become more careless when it comes to preventing damage because the risk owner will no longer be hit as hard by the consequences of the risk if it materialises.

In addition to the moral hazard, there is another issue involved. It concerns the question of the extent to which a risk owner, be it a company or a citizen, exposes himself or itself to risk of his or its own accord.

You will not always take out insurance against such risk. And if the government offers to bail out risk owners in trouble because of a self-chosen



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risk, it really becomes risk free for risk owners to assume risk. This is a dangerous situation because some people might exploit it.

Therefore, it is necessary to distinguish between risk as an existential premise and risks actively incurred of one's own accord. However, this distinction is only relevant when we want to look at government intervention in risk events.

As long as we are looking at the value of market-based insurance and the value of the risk owner's capital, no distinction is required. The value of having reserve capital or insurance to protect a risk owner against structural risk costs is independent of the source of the sudden risk cost.

However, it is clear that when you consider whether to intervene to help a risk owner who is in a red phone situation, you might refrain from intervening if the situation has resulted from a risk taken by the risk owner of his own accord.

It is important to remember that we have never previously considered intervening to alleviate risk owners' sudden risk costs in order to maintain their productivity and secure low risk costs in society. This is a new way of thinking and a new tool that may be taken into consideration simply by adding structure to the description of risk.

When risk owners have been bailed out in the past, it has mainly been a merciful act or for fear of the consequences of a bankruptcy. The latter is the basis for establishment of the government's safety net protecting banks and other financial institutions. We know from experience with safety nets for banks that the fact that we are thus establishing a system which may be abused is a real reason to worry. Worrying about abuse of the government's rescue of banks has been a topic of discussion for many in the media.

Conversely, very few people probably find that the sickness benefit system has been abused, even if it is free and actually resembles government intervention to alleviate sudden risk costs. The difference is that, from an overall perspective, illness is not self-chosen. Furthermore, illness has such big personal consequences that the fact that treatment is free does not induce more people to get ill.

On the other hand, it is clear that when we face a self-chosen financial risk in its purest form, we do have a challenge when we establish a system that enables government intervention.

The solution is thus not to try and create an extreme, risk-free society, which would be impossible, but selectively to review the possibilities of making a financially rational effort. It may well be that fields can be identified where government intervention towards self-chosen risk is in order, provided it is understood that the purpose is to minimise structural risk costs in society in general.

A case in point could be a large building contractor who has to take risks in order to operate in the construction market. Such companies occasionally find themselves in situations where a risk has materialized and they face a likely bankruptcy. Building contractors make a living from assuming risk. They are also exposed to a great many risk and uncertainty factors beyond their control—such as sudden regulatory or labour-market changes, crises, and other macroeconomic movements.

However, building contractors take part in deciding which contracts they will enter into with clients. In these contracts, they can take part in delimiting their own risk. In addition, they exert a lot of influence over many risk factors, such as the technical risk involved in performing a given piece of work.

The conclusion in traditional risk theory has been that we cannot save a firm of building contractors. They have to go bankrupt if necessary. However, with knowledge of the structural risk cost, it does not have to be this way.

The reason is not to be found in the structure of the firm of building contractors, but in the many structures with which the firm cooperates. When an enterprise such as a firm of building contractors goes bankrupt, this means that the enterprise cannot fulfil its commitments to customers and suppliers. The bankruptcy situation itself includes recognizing that the enterprise's business partners and customers will experience sudden capital requirements. A subcontractor may have performed work on an assignment, but not yet received payment. When this payment never comes, the subcontractor will have to get the money elsewhere because he has to pay his employees for their work. A customer who has made a prepayment for an assignment that ends up not being carried out experiences a sudden loss, which may mean that he has to procure capital elsewhere, resulting in unknown financing costs resulting from the suddenly incurred cost.

It is thus absolutely certain that the bankruptcy of a major firm will lead to large, sudden, extra costs for a great many players in society, and no one can predict what the extra financing cost of these added costs will be. It is the unknown cost of financing suddenly arising capital needs among the contractor's subcontractors and customers that poses a problem and an unwanted cost to society. The contractor's bankruptcy in itself is not the problem.

One solution could be to apply the knowledge we have gained in recent years from bailing out banks to also bailing out other companies. Bailout might not be the right word, because the solution I am referring to does not involve saving the firm but rather closing the firm down in a controlled manner.

When talking about closing down a firm in a controlled manner, I refer to the process whereby all viable commitments are completed under government ownership. Only when the activities have been finalized is the company closed down.

In Denmark we have experience with this type of controlled shutdown of banks. We had a case of two banks, *Amagerbanken* and *Roskilde Bank*, which were facing bankruptcy. They went bankrupt and were closed down. However, this was done by the government taking over these companies and ending activities that could be ended while continuing activities that had to be continued until they could be ended. In this entire process, the former owners of the banks gained nothing, as the activities were managed under governmental ownership, which is an important point and the reason why such a process does not promote moral hazard among enterprise owners. The shutdown of the bankrupt company was a slow process; looking at the sum of the sudden capital needs passed on to other players and thus looking at the potential financing cost of these sudden capital needs, this is a much cheaper way of doing it than if you were to close down the company overnight, as is still practised for non-financial companies that go bankrupt.

It may well turn out that, going forward, governments will have an incentive to intervene on the behalf of more companies facing imminent bankruptcy than is the case today, when governments only utilise the opportunity to intervene in the case of financial institutions in some countries, depending on national legislation. If the intervention concerned is

in the form of a controlled shutdown, this will have a positive macroeconomic effect; however, this must be compared with the cost of a slow, controlled shutdown process. It is not unlikely that from a macroeconomic viewpoint, the net result is positive in many situations. Depending on the design of such a system, there would, however, be cases of speculation against the system, even if it is difficult to speculate in regard to the closing down of a company—i.e., a situation in which the company is not bailed out, and the former owners of the company gain nothing from choosing a controlled shutdown over a dramatic crash-and-burn shutdown.

Speculation in bailing out companies occurs more frequently in cases where the goal of intervention is the continued survival of the company, and, as stated, this is not the solution suggested in this book.

The question of whether we are talking about self-chosen risk or risk coming from the surrounding world is of significance when we discuss government intervention and the role of the government when it comes to creating ideal growth conditions for risk owners in society.

When risk is self-chosen, it becomes more difficult to intervene. However, self-chosen risk does not have to exclude all kinds of government intervention, as long as higher demands are made as to how the government handles this task.

## The Future and Structural Risk Cost

When we are able to describe the existence of the structural risk cost, the big question is: How does this change the government's task vis-à-vis the population?

Nobody has any doubt that the government's primary role is to provide safety, security, and stability for the population because this increases risk owners' prospects for creating growth. Only on these conditions will risk owners dare to venture into long-term investments. Who can be bothered to build a good house if there is war, and we risk that what we build today will be destroyed or taken away from us tomorrow?

Ensuring society's safety, security, law, and order are fundamental tasks for the government. Within this framework, the market economy can thrive, and people will dare to make long-term investments.

However, apart from national safety, security, law, and order, the government's authority and tasks towards the population are more doubtful. All other tasks require the collection of more taxes from the population to finance such assignments, and that is not always looked positively upon by the taxpayers. The clearest statement of this point probably comes from Frédéric Bastiat, a French economist who did his work in the period after the French revolution:

> All we have to do is to see whether the law takes from some what belongs to them in order to give it to others to whom it does not belong. We must see whether the law performs, for the profit of one citizen and to the detriment of others, an act which that citizen could not perform himself without being guilty of a crime. Repeal such a law without delay. … if you do not take care, what begins by being an exception tends to become general, to multiply itself, and to develop into a veritable system. (Bastiat 1848)

Bastiat is considered one of the founders of liberalism; the basic idea in his work is that the government should not interfere in anything but defence and security. All other attempts to collect taxes from one person to give it to another person are wrong and lead to corruption of the state. Bastiat called it "legal theft" when the government gave itself the right to take money from one person and give it to another.

The central concept of liberalism is that the individual person should keep as many resources to himself as possible in order to have a bigger chance of achieving growth and wealth; this has remained unchanged since Bastiat, even if subsequent liberal economists have often been less extreme than Bastiat.

Milton Friedmann, who won the Nobel Prize for economy, wrote his book *Capitalism and Freedom* in 1962 (Friedman 1962). In his work, Friedmann also argued that the government should guarantee law and order as well as protect property rights in addition to a few additional points concerning the security of currency. Here, too, we thus see the discussion of what the government's tasks are as well as the financial argument that the tasks should largely be restricted to security, law, and order. It should be mentioned that Milton Friedmann criticises John Meynard Keynes' work and the interpretations of Keynes' work, because

Friedmann is opposed to the government interfering in the market economy.

However, the emergence of the structural risk cost challenges the limitations on the role of the state as suggested by current liberalists, despite it being easy to characterise the structural risk work as a liberalistic approach aimed at creating the best possible basis for economic prosperity for the individual, whether this is a person, a company, or any other structure of society.

The structural risk cost described in this book has been proved by way of arguments and experiments, and this risk cost is relevant to growth in society. It indicates the existence of a national growth potential that can only be activated through additional government involvement, which is in stark contact to the basic thinking of the liberal economist.

Classic liberal thinking only generates growth up to a certain level. If you imagine a liberal society where the government is not working actively to protect citizens against sudden, significant costs, such a society's ability to grow will be hampered, and in the longer term this society will lose out when competing against similar societies where the government fights the occurrence of sudden costs actively and cost efficiently. When the government actively fights sudden, significant costs for citizens in society, risk costs will decline and long-term investments will have better conditions.

Given this realisation, it now becomes a central role for the government to ensure that citizens have the best possible conditions for long-term investments. This is a role that must be taken seriously. We have seen in the latest financial crises that risk may have serious consequences for citizens. Consequently, the governments that today only secure citizens' rights to law and order and property rights are governments which are not utilizing the potential of their citizens to create and implement long-term investments. These are states where a group of citizens actually does not have the same conditions as other, better-off groups in the population.

As a point of curiosity, it can be mentioned that for many years Denmark was called an economic bumblebee. The name was used as a parallel to the bumblebee, which in theory cannot actually fly but nevertheless does. This was the feeling about the Danish economy for a period. Denmark had, and still has, a very high level of taxation. Yet for a long period Denmark has been able to generate very high growth rates. Denmark has been able to grow even if the majority of economists

thought that growth would be created by giving individuals their own money, thereby stimulating demand.

It is in fact very likely, although of course not documented, that Denmark actually had a highly beneficial government model in that period and that the high tax pressure provided ideal conditions for long-term investments, which has brought Denmark forward. Naturally, additional analyses will be required to find the precise significance of the structural risk cost to national growth, but if it does have major significance, this could lead to big changes in the way we perceive the role of the government.

If we assume that this significance is important and big, then a society in crisis cannot necessarily be stimulated to obtain growth the way Keynes proposed because stimulation can have a negative effect on the structural risk costs, causing growth to subside. It will be like filling a bucket that has a hole in the bottom; there is a short-term effect, but after a while the bucket is empty again.

If you want to generate growth in a country where the significance of the structural risk cost is high, you have to take a look at the equation of society's structural risk costs and reduce the factors that can be reduced. A massive effort must be made to protect private individuals against sudden, unexpected, large costs. Only under these conditions will the population be competitive and capable of creating growth in society. Only under these conditions does it make sense to carry out stimulating measures in the country, as you have a balanced growth model focusing both on long-term value creation and short-term stimulation.

If it turns out to be of major significance for the growth of a country to create ideal conditions for long-term investments by protecting risk owners against sudden, large expenses, the recent crisis has been handled incorrectly or at least suboptimally.

This also means that there is no relatively easy way for a government to get out of a crisis by means of stimulation. Consequently, it is of even greater importance to prevent crises than we used to think, to ensure that they never recur. An economic crisis is likely to have far-reaching consequences by ruining the long-term growth potential of a nation and its agents—a consequence that is unaffected and could potentially even be worsened by current short-term growth stimulation crisis countermeasures.

# 12

# The Top Ten Most Important Realisations Regarding Structural Risk

Structural risk is a new economic theory for risk costs, and it generates new insight and understanding concerning a number of aspects. These and more are all described in this book, but in the following section I will briefly, for convenience, outline what I believe are the most important messages.

## The Cost of Risk Is Different, Depending on Who Owns It

If we take a fixed flip-the-coin experiment where an outcome is that you can lose a large sum of money, and move the experiment around among different people or structures, the actual value of the flip-the-coin experiment changes, even though the experiment does not. We used to think that risk was a constant entity. Admittedly, we have been able to observe that situations in the wake of risk events developed differently, but historically we thought that this was just an unpredictable variation of risk cost. We now know that this variation, or at least some of it, can be predicted because risk events that exceed the risk owner's reserve capital are



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associated with higher average costs than risk events that do not exceed the risk owner's reserve capital.

If a risk has the potential to generate an expense of DKK 200,000, this risk is much more costly to a person with no or limited reserve capital, while it is least costly to someone with enough reserve capital to cover the added expense.

This is where the fundamental clash with existing literature exists, and it is this effect of risk that has been observed in experiments which has given us new insight into a number of different aspects of economic and socioeconomic theory.

## Reserve Capital Generates a Higher Return than Savings

Reserve capital and savings should now be seen as two different economic concepts; reserve capital yields a higher return than savings, even if both amounts are in the same account fetching the same rate of interest. If, for example, we have DKK 1,000,000 in the bank, DKK 500,000 of this amount could be reserve capital, while DKK 500,000 is savings.

The DKK 500,000 reserve capital protects our long-term investments against the risk we have, which could, with a certain probability, result in, for example, an added expense of DKK 500,000. This means that our reserves make a bigger contribution financially in the form of a higher return than savings. Savings have no immediate function in connection with the risk to which the risk owner is exposed.

## Bowman's Paradox Is Not a Paradox

In a study of company returns, Bowman demonstrated that the return declines as the risk increases. With our understanding from items 1 and 2 above, this observation is not surprising. If, some day, we would want to check whether structural risk had an effect of relevance to industry, Bowman's study would be the very approach we would take. Furthermore,

our hypothesis would be that we would reach the very same conclusion that Bowman reached and was confounded about, a conclusion that has been considered a paradox for many years.

## Insurance Can Improve the Return on an Investment

The risk-owner-determined component of cost, the structural risk cost, can be covered by insurance against the payment of an insurance premium. If the direct risk cost rarely occurs or is enormous, it may be financially more advantageous to take out insurance against the cost rather than accept the structural risk cost that could follow in the wake of a risk event.

## The Structural Risk Cost Is Destructive and Harmful to Society

The structural risk cost makes long-term investments suffer and may hamper societal growth, as shown in Table 5.1 in this book. When a risk owner runs out of capital, the value of his long-term investments will deteriorate without a directly corresponding income being generated elsewhere in society. As a result, values disappear irreversibly in society, values that it would have made financial sense to retain. However, at the same time we often do not know the real financial worth of these values because long-term investments mature within a structure until the day they have market value, and because some long-term investments, such as education, cannot be traded at all. As a result, society is blind to the values that are irreversibly destroyed through the structural risk cost mechanism.

## The Structural Risk Cost Can Be Removed After the Risk Event Has Occurred

Unlike many other risk costs, the structural risk cost can be removed after the big, unexpected need for capital has occurred. This is done simply by providing the missing capital, thereby ensuring known and low financing cost of the risk cost. This will protect the risk owner's long-term investments in addition to eliminating the structural risk cost. According to item 5, it can be attractive for the state to keep risk owners in society free from the structural risk cost. The Danish sickness benefit system is probably closer to being an expression of government intervention to alleviate a threatening, large, unexpected need for capital in the wake of illness, assuring that citizens realise the full value of long-term investments, than it is an insurance system.

## Keynes' Savings Paradox Is Not a Paradox

It has been observed that when a risk owner experiences an increase in his risk level coming from the surrounding world, the risk owner reacts by reducing consumption and saving up capital. This can be observed, for example, during a financial crisis. Because financial crises in themselves reduce demand, this consumer behaviour results in additional decline in demand, which exacerbates the financial crisis. Historically, this has been seen as paradoxical, because the risk owners' behaviour causes their own assets to deteriorate further due to the falling demand.

However, now that we know that reserve capital is a precondition for optimizing the value of long-term investments under great risk, increasing savings, or reserves, can actually be a sensible behaviour—which one should be very cautious about changing. Risk owners' reaction is common sense and can be economically profitable both for the individual and for society, although how much benefit risk owners and society get from risk owners increasing their reserves is naturally debatable. Still, risk owners' increase of their reserves is not paradoxical because a paradox means that one is acting against one's own best interests according to

theory. Increasing reserves in the wake of an increase in risk level is the only response that is available to many risk owners, but naturally it would be preferable, and cheaper, for society if the government were able to alleviate the effect of the increase in risk level for the risk owner.

## A Purely Market-Driven Insurance System Is Not Necessarily Ideal

A market-driven insurance system will not adapt to the ideal benefit of society as prescribed by the structural risk cost. The reason is that the insurance providers cannot benefit from conserving values inside the structures of society by keeping the financing cost of risk cost known and small. Only the policyholder and the state can benefit from working on reducing the structural risk cost of society as described in Table 5.1 in this book. A market-driven insurance system thus provides no guarantee that the most financially advantageous effort is made towards the structural risk cost.

## The State Can Increase Societal Growth by Removing Risks for Risk Owners

The structural risk cost expands the government's responsibility for creating ideal conditions for growth. The state is responsible for ensuring that the parameters that make up part of the formula of society's structural risk cost are at a suitable level, thereby ensuring that the premises for the long-term investments of society's risk owners are optimized. This task cannot be carried out by the private sector, as exemplified in bullet 8 about the effect of insurance, although the private sector may well be an important part of the solution.

## Long-Term Growth Is Not Just a Matter of Stimulating Consumption

Conditions for long-term investments are best when society has been "de-risked" in such a way that risk owners in society are exposed as little as possible to big, sudden needs for capital. Accordingly, we may be in a situation where we can stimulate growth by increasing taxes, provided the proceeds are used to protect risk owners in society against sudden, significant capital needs. This is possible when the marginal cost of a known and plannable extra tax payment is less than the structural risk cost in society that can be avoided by applying the same tax money to remove or intervene against certain risk cost in society. However, this all depends on the starting point of the given society.

# 13

# The Cost of Structural Risk Management in Liberalism

The previous sections of this book deal with microeconomic and macroeconomic theory. This book contributes quite specifically to economic risk theory by clarifying the consequences of risk owners running out of capital in certain instances because of sudden, unexpected events so that they are in danger of having to accept unwanted, unnecessarily high financing costs associated with a risk event.

Being an economic theory, this work transcends ideology because ideology is a conviction or behaviour. Obviously, ideology can to some extent be based on objective knowledge, but ideology is not objective knowledge in itself.

Thus, ideologies have the same relation to economic theory as risk behaviour has to risk analysis, where analysis may change behaviour, but behaviour cannot change the analysis, all other things being equal. Economic theory may change ideologies, but ideologies cannot change economic theory. What this means is that the connection between supply and demand does not go away even if somebody were to decide not to use it as a foundation for an ideology. The connection between supply and demand described in literature will be there as long as the theory remains



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and forms an important part of the macroeconomic picture, no matter what ideologues may feel about it.

This obviously begs the question of what effect the theory of structural risk cost will have on ideologies. More specifically, it is interesting to look at how it might affect liberalism because liberalism is the ideology of the market economy, where growing wealth is given high priority.

The basic assumption behind liberalism is that government is a stumbling block to the economy, which those in power want to see grow because it increases their authority at the expense of individual freedom. This creates an effect in which government gets bigger and competitiveness declines because individuals have to pay a large share of their income in taxes, which is why they need higher wages to maintain a standard of living that corresponds with the standard of living for a comparable country.

The argument about the disruptive state has been formulated and extended by a number of philosophers (Berlin 1958; Locke 1689; Smith A. 1776; Mill 1859). One of the theory's most recent proponents is Robert Nozick, who published the book *Anarchy, State and Utopia* in 1974. In this book he writes, "Two noteworthy implications are that the state may not use its coercive apparatus for the purpose of getting some citizens to aid others, or in order to prohibit activities to people for their own good or protection" (Nozick 1974). From a structural risk perspective, this is of course extremely interesting because in reality the Nozick quote may turn out to be the perfect recipe for a financially ineffective society, given specific conditions.

With knowledge of the structural risk cost, the government is responsible for aiding growth by covering risk for individuals after such risk has materialized. This could be through intervention in favour of people who experience illness-related costs, or what we today call public health insurance. This is a responsibility that cannot be covered by the individual himself with his reserve capital, and it is a responsibility that the insurance industry cannot solve optimally on market terms because the insurance industry does not benefit from keeping the risk financing cost low for its customers. Consequently, this is a responsibility that can only be solved optimally by the government and only by redistributing money among the citizens of the state. In this way, the growth opportunity that

is represented by managing the structural risk cost is a stark contradiction to Nozick's message.

Naturally, there are variations in liberalism, but what they all have in common is that they cherish the minimum state as a goal and have clearly defined tasks for which the state is allowed to interfere with the market and the risk owners or the society.

One of the variants of liberalism is neoliberalism; in his book *A Brief History of Neoliberalism* from 2005, David Harvey provides a clear description of how he considers Neoliberalism to be defined:

> Neoliberalism is in the first instance a theory of political economic practices that proposes that human wellbeing can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets and free trade. The role of the state is to create and preserve an institutional framework appropriate to such practices. The state has to guarantee, for example, the quality and integrity of money. It must also set up those military, defence, police and legal structures and functions required to secure private property rights and to guarantee, by force if need be, the proper functioning of markets. Furthermore, if markets do not exist (in areas such as land, water, education, health care, social security, or environmental pollution) then they must be created, by state action if necessary. But beyond these tasks the state should not venture. State interventions in markets (once created) must be kept to a bare minimum because, according to the theory, the state cannot possibly possess enough information to second guess market signals (prices) and because powerful interest groups will inevitably distort and bias state interventions (particularly in democracies) for their own benefit. (Harvey 2005)

This is an interesting definition, as it describes how to set free the entrepreneurship of society, and at the same time it provides guidelines for how the state should be defined or limited in order to create the optimal conditions for entrepreneurship and the free market. But the definition does so without providing a clear opinion on how to manage financial risk, including the cost of running out of capital.

To some extent, Harvey's definition does mention risk, as it upholds strong property rights and by doing so also bans theft and other activities

that lead to infringement of people's property rights. You could also say that the state's task of defending its population is a risk-countering measure. The definition also states that certain areas, such as pollution, can be managed by the government, provided that no private organisation can manage the job; again, these areas can be seen as risks for the population managed by the state. However, it is interesting that the definition is void of any responsibility of the state for keeping its citizens free from excessive, sudden, risk-related cost. This is particularly interesting, as the definition mentions the state's requirement of keeping the financial markets functional and in a good flow. In this way it is recognized that a consumption-based need for a loan needs to be managed by the state so as to ensure that it is available on reasonable terms to citizens, but it fails completely to acknowledge the fact that a risk-driven need for capital is different from a consumption-based loan need and requires different measures by the state in order to function properly. For that same reason, Harvey's definition also fails to describe that the state has a unique position for intervening in the wake of a sudden and large cost in order to ensure that the resulting financing cost is low and known.

It is important to realize that given the goal of freedom, including the freedom of entrepreneurship and personal development, the structural risk cost must be accounted for.

In the theory of the structural risk cost, people or risk owners are not free until the consequences of the structural risk costs are more or less the same for everybody and have been reduced to a minimum. If a risk owner's structural risk costs are high, the risk owner is basically an economic slave to risk. The risk owners with higher structural risk costs have poorer growth conditions than the rest of the population because risk is more likely to reduce the value of the long-term investments of these risk owners.

Risk owners with high structural risk costs will thus become a financial B team, hampered in regard to growth and more to be seen as a resource (labour) than as a source of future growth. Consequently, not everybody has equal conditions for growth, so not everybody is free, and only free people can generate growth through entrepreneurship and personal development.

Financial freedom thus calls for a government apparatus that is capable of reducing risk costs for citizens who are not able to do so through their own efforts. The need is for a government apparatus that will prevent risk and intervene when risk events occur to prevent risk events from resulting in unnecessarily high-risk financing costs for risk owners.

The theory of structural risk indicates the necessity of a somewhat larger, more complex government apparatus than the one assumed by neoliberal thinking and the predominant view of what it takes to create a growth state. According to classic neoliberal thinking, many of the government functions that can reduce the structural risk cost contribute towards reducing the competitiveness of a state. That is why reduction of the state—e.g., through a reduction of income taxes and the resulting reduction of public services—is a favoured means for growth in neoliberal circles. However, it is far from certain that such initiatives will have the intended effect.

Naturally, it must be stressed that knowledge of the structural risk cost does not constitute approval of all government activities and is also not an argument in favour of saying that a large state apparatus creates growth by definition.

For the state apparatus to be a growth-positive component in accordance with the risk theory put forward here, it must be possible to argue in favour of the view that the state function concerned generates a lower financing cost of risk cost in society than the same function would have were it carried out in the private sector through a supply and demand mechanism.

Stating that a reduction of the state is not the growth promoter argued in liberalistic ideology is perhaps not as controversial as it may sound. Some of the most developed states have had periods of relatively high growth rates in spite of high tax rates and large governments—e.g., the Nordic countries. Nevertheless, this is going to be hard to swallow for the purest liberalists. We could start by asking them which conditions in society they would like to start with if they were to start from the bottom: a society with a minimum state and high structural risk costs or a society with a developed government where structural risk costs have been reduced as much as possible while focusing on cost efficiency? How high

a financing cost for sudden cost do they wish to pay while investing in a better future for themselves?

My personal belief is that very few people or companies would like to be in a society where long-term investments are largely the victim of haphazard, unrelated events. What good is it to have freedom to create if what you strive to create stands a poor chance of being completed? It is like building sandcastles along the water's edge. Often, a wave will erase all traces of your work before it is completed. This is neither satisfying nor is it an economically sound thing to do if there are better alternatives.

In a society that works actively to reduce the structural risk cost, you move higher up on the beach and get the opportunity to demonstrate your worth without any disturbing waves. Your work will be tested in society, and the most beautiful sandcastles, built on a level playing field, will win the day. However, when those who build at the water's edge compete against those who build higher up on the beach away from the waves, we do not have a level playing field. The competitors do not have the same financial conditions; this is a sign of a society that does not have the ability to protect its long-term investments.

Liberalism generally finds that all restrictions on the activities of individuals hamper growth; however, now that we understand the structural risk cost mechanism, we have to say that this is not necessarily true.

Freedom of growth in the form of long-term investments while risk is present requires surrendering part of one's freedom to a higher power in order to become efficient. The individual can never achieve a financially efficient condition alone, even if the market to which the individual has access is well-functioning.

# 14

# How Is This Book to Be Understood and What Kind of Society Does It Wish to Create?

When we change risk from "Risk = Probability × Consequence" into "Risk = (Probability × Consequence) + Structure", we are introducing a fundamental change to the understanding that has formed the basis of much of our economic theory apparatus, the formation of our society, and our perception of the world.

To enable this change in the definition of risk, we need the red phone as a symbol of the situation in which, as a result of a risk event, we have run out of capital and thus need to interact with the surrounding world. We need the red phone to help us recognize that the situation in which an agent of society faces a sudden and large risk-related cost is fundamentally different from a regular case involving a consumption-based financing need. It is fundamentally different because if the financing cost of our consumption need is prohibitively high, we can just decide not to buy; this option is not available for risk cost, because this we cannot ignore.

The red phone situation is the only approach to understanding that the transition to this new definition of risk is a necessity. It is the only key to an understanding that we recognise from our everyday lives and which, as economists, we are able to predict. It is also the only situation we can



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use in our financial analyses because we are able to predict red phone situations to a certain extent.

We cannot precisely predict the size of the subsequent cost, and when it occurs, it is unlikely that we could even measure it. Due to the elusive nature of this cost, it is likely to be difficult for many with a traditional economic background to get accustomed to this cost. But natural scientists are likely to be more apt in recognising the existence of the structural risk cost.

In the natural sciences, it is not unusual to recognize that knowledge is not absolute. For example, Heisenberg demonstrated that complete knowledge of the condition of electrons is not possible. We cannot at the same time both know where an electron is and the speed at which it is travelling. If we can measure the speed, we cannot know precisely where it is located. And if we want to determine the location of an electron, we cannot at the same time have knowledge of its speed.

Another example from the world of physics is the identification of the components of atoms. We can only identify and observe the components of atoms in controlled experiments in atom accelerators, such as the one in CERN. However, once the existence of a subatomic component has been documented, we no longer doubt that subatomic components form part of all matter that surrounds us, even if we cannot directly measure the subatomic particles in our everyday environment, and we are able to use this new knowledge in our development of materials and in other situations where knowledge of the components of atoms is relevant.

A similar situation could be said to apply to the cost that comes in the wake of red phone situations. In a controlled experiment, such as the one carried out at Copenhagen Business School, we were able to observe the financial effect in a simple model and thus to conclude that this effect must be valid for all economic structures in society.

Based on this simple experiment, we were able to argue that situations of sudden and high cost were likely to result in a financing situation that is different from the one to which we are accustomed from our consumption-based financing need, such as when we buy a new car.

We have now developed an economic theory, the theory of the structural risk cost, which identifies the red phone as an indicator of an extra loss associated with risk and uncertainty, thereby allowing us to predict

who is exposed to increased, future risk costs. However, with today's knowledge, we cannot give any credible estimate of the size of the structural risk cost because these costs will occur at some unknown point in the future.

Not even when the structural risk cost occurs for a risk owner in the real world can we credibly estimate its size. This is because long-term investments cannot always be turned into cash and do not necessarily have a recognized value. It is the loss of the long-term investments that makes up the loss we have described in the structural risk cost. In many situations we are able to see that there *is* a loss, which we have tried throughout this book to illustrate with examples; however, we will never reach any agreement on the size of this loss.

However, this does not have to stop us from using the knowledge we have about this cost.

The decisive insight presented in this book is that the cost is not evenly dispersed in society. When the definition of risk is "Risk = Probability × Consequence", the same risk has the same cost, no matter who owns it. However, with the new definition of risk where "Risk = (Probability × Consequence) + Structure", the cost of a given risk may vary, depending on who owns it.

People have a natural urge to improve their living conditions. This will almost always involve long-term, growth-generating investments. We can now pinpoint risk owners in society who pay an unnecessarily high price for their risk, thereby trying—in a cost-efficient way—to make the people with high risk costs more competitive.

If we, as a society, do not actively improve the competitive situation of high-cost risk owners, we will create a group of risk owners who are unable to utilise their potential as growth generators.

Never in the history of the world have we decided to make a targeted effort to optimise a society by reducing red phone costs. Some live in welfare states that may well have introduced a number of measures which can rightly be said to have reduced the cost of red phones in society. However, they were not introduced for the purpose of increasing growth in society. More often than not, they were introduced for reasons based on socialist ideology.

A targeted attempt to identify, quantify, and cost-efficiently process society's cost of red phones has never been made because for this to be done we have to redefine the concept of risk itself.

This book gives a few examples of the possible features of an economically optimized society, but these are merely examples.

What we can achieve in the future by changing the description of risk is beyond me to articulate. This will be up to people with knowledge, insight, and data allowing them to assess how society could specifically be improved. However, as a human being, I can certainly say that I would rather live in a society that has been economically optimized on the basis of the assumption that risk has an individual cost conditional upon the financial ability of people, rather than in a world where risk is a universal concept, and where the specific financial ability of the individual person does not form part of the assessment of the cost associated with risk and uncertainty.

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