FUNDAMENTALS OF RISK AND INSURANCE

VAUGHAN

5TH EDITION

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EMMETT J. VAUGHAN
UNIVERSITY OF IOWA

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PREFACE

If it ain't broke, don't fix it.

WILL ROGERS

Although the fifth edition of *Fundamentals of Risk and Insurance* incorporates a number of changes, its purpose, organization, and approach remain essentially the same as that of the first four editions. The original goal was to create a consumer-oriented text, and I have kept this orientation throughout this edition. The changes I have made are primarily to update the material and to reflect the changes in the field of insurance since 1986, when the fourth edition was completed.

The insurance industry and its environment continue to change, and my purpose has been to capture the flavor of that change in this revision. Changes in the legal environment, revisions in policy forms, the introduction of new forms of insurance, and a myriad of new problems continue to make insurance an exciting field of study. In the legislative area, for example, the Risk Retention Act of 1986, the Tax Reform Act of 1986, the Revenue Act of 1987, and the Medicare Expansion Act of 1988, all introduced changes that required updating and modification of the existing material, I have added new material on the Risk Retention Act and pooling mechanisms to Chapter 3, and have added a discussion in Chapter 10 of the regulatory issues arising from the spread of risk retention groups. The changes relating to retirement programs that were introduced by the Tax Reform Act of 1986 are incorporated into the discussion in Chapter 23.

In the field of life insurance, universal life and other innovations continue to modify the structure of life insurance products. Universal life is now a decade old, and it continues to exert a significant influence on the entire life insurance field as it gains momentum. In this edition, as in the fourth edition, the concept of universal life is discussed in the first chapter on life insurance, rather than in the chapter on special policy forms, as was done in the third edition.

Keeping up with the changes in the Social Security system continues to be a challenge; the Medicare system was substantially changed by the amendments enacted by Congress in 1987, and I have updated the chapter on Social Security to reflect these changes.

In the property and liability field, the years 1987 and 1988 brought additional changes in the standard forms of coverage. The new portfolio programs that were introduced in 1985 were revised in 1988, and I have incorporated the changes in the new forms into the discussion in Chapters 33 and 34.

Finally, I have addressed the current issues relating to insurance: the increasing incidence of AIDS and the problems it poses both for society and for the insurance industry, the continuing availability problems in certain lines of insurance, tort reform, industry profitability, cash flow underwriting, and the controversy relating to availability and affordability of insurance. All of these topics involve the way in which we as a society will spread the risks we face.

In spite of the many changes, the main emphasis in the book remains on the insurance product and its use within a risk management framework. The traditional fields of life insurance, health insurance, property and liability insurance, and social insurance are all treated in relation to the wide range of insurable risks to which the individual or organization is exposed. In several chapters specific contracts are examined in some detail, since I continue to believe that we can best emphasize the principles of insurance by studying their application in specific insurance contracts.

The book is divided into three major sections.

In the first section, we examine the concept of risk, the nature of the insurance device, and the principles of risk management. This section also provides an overview of the insurance industry and the manner in which it operates.

The second section examines the traditional fields of life and health insurance as solutions to the risks connected with the loss of income. The Social Security system, workers' compensation, and other social insurance coverages are discussed in this section to permit the student to integrate the coverage under these programs in income protection planning.

The final section of the book deals with the risks associated with the ownership of property and legal liability. The coverages applicable to the individual or family are treated in chapters that are separate from those designed for the business firm, permitting those instructors who prefer to concentrate on coverages for the individual to give only slight treatment to commercial coverages.

The book is designed to fit a one-semester or two-quarter course, but it may be adapted to longer and shorter sequences. I have composed what I consider to be a logical sequence of subject matter, but the book can be used flexibly. Sections Two and Three in particular may be taken in different order.

A two-quarter course can cover the entire text. Although the whole text could also conceivably be covered in the single semester, the result would be a whirlwind tour of the field of insurance. I believe that it will be necessary for most instructors to omit certain chapters. I suggest that Chapters 7, 8, 27, 33, 34, and 35 be deleted in a single-semester course. For a single quarter course meeting for 10 weeks, Chapters 6, 9, 13, 20, 23, and 32 may also be deleted.

Obviously, individual instructors may choose to delete chapters other than those I have suggested. Alternate course schedules are suggested in the instructor's manual. As for earlier editions, a Student Study Guide, prepared by Professor Richard B. Corbett of Florida State University is available for the fifth edition.

I have been supported and encouraged in this revision by many people. First and foremost are the members of my family, all of whom sacrificed much to assist me. I thank them for their help, but more importantly, for their understanding. In addition, I owe much to my teacher and former coauthor, the late Curtis M. Elliott. His influence left an indelible mark on me and on this book.

As a book progresses through successive editions, the number of people to whom an author is indebted increases geometrically, since the efforts of so many people become a part of the work. As a result, there are many people to whom special thanks are due. They include my colleague, Michael Murray, who offered valuable suggestions for this as well as earlier editions and who helped to clarify many of the concepts herein. The reviewers of the first four editions, whose contributions to those editions helped to shape this one as well were Richard C. Allgood, CPCU, Garth H. Allen, Albert L. Auxier, W. Oscar Cooper, Robert W. Cooper, Bill Feldhaus, Roger A. Formisano, John W. Haney, Kenneth J. Krepas, E. J. Leverett, Joseph R. Morrin, Robert J. Myers, John J. O'Connell, S. Travis Pritchett, Gary K. Stone, and Robert Witt. Each made valuable suggestions and comments and without question had a positive influence on the book. Tim Vaughan provided the computer programming that simplified the computations in Chapter 13, and Joyce Ruplinger and Kathryn Kurth provided invaluable assistance in preparing the manuscript and index for earlier editions.

The reviewers for this edition, to whom I am especially indebted, are Kenneth J. Krepas, Dede Pahl, and Therese M. Vaughan. Each offered insightful recommendations that aided in the process of the revision.

I also offer thanks to all of my former students. Their many comments and intelligent questions contributed to the design of the book and to the examples and illustrations used. Each of the past and present graduate teaching assistants at The University of Iowa who have shared with the author the pleasant task of teaching the basic Insurance course contributed significantly to the earlier editions and to this one. They are Lois Anderson, Phillip Brooks, Robb Fick, Tim Hamann, Terry Leap, Lacy McNeill, Joseph Panici, Mark Power, Roger Stech, Ellen Steele, Mike Steele, Patrick Steele, Art Cox, Robert Carney, and Changsu Ouh. I also thank the users of the first four editions who took time to write to me with their suggestions and com-

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ments. Bob Hedges, Robert J. Myers, W. O. Cummings, Jerry Todd, and Jane H. Finley in particular took the time to share their insights with me in this way. Finally, I thank Joan Vaughan, who assisted in the preparation of the manuscript.

From the teachers who will use this book as a text, I will be grateful to receive advice concerning any errors that should be corrected and any material that should be added or omitted when it is again revised. To the students who will be compelled to read it, I extend the hope that the material presented will seem as exciting and interesting as it has seemed to me.

Emmett J. Vaughan

Iowa City, Iowa
July 1988

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SECTION ONE

RISK AND INSURANCE

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CHAPTER 1

THE CONCEPTUAL FRAMEWORK

> ***"When I use a word," Humpty Dumpty said, in***
> ***a rather scornful tone, "it means just what I***
> ***choose it to mean — neither more nor less."***
> ***"The question is," said Alice, "whether you can***
> ***make words mean so many different things."***
> ***"The question is," said Humpty Dumpty,***
> ***"which is to be master, that's all."***
>
> **LEWIS CARROLL**
> ***Through the Looking Glass***

Every field of knowledge has its own specialized terminology, and terms that have very simple meanings in everyday usage often take on different and complicated connotations when applied in a specialized field. In this chapter we will examine a number of basic concepts used in the study of insurance. In particular, we will concern ourselves with the concept of risk, for risk is the basic problem with which insurance deals.

THE CONCEPT OF RISK

It would seem on the surface that the term *risk* is a simple enough notion. When someone states that there is risk in a given situation, the listener understands what is meant: that in the given situation there is uncertainty about the outcome and that the possibility exists that the outcome will be unfavorable. This loose intuitive notion of risk, which implies a lack of knowledge about the future and the possibility of some adverse consequence, is satisfactory for conversational usage, but for our purpose a somewhat more rigid definition is desirable.

Economists, statisticians, decision theorists, and insurance theorists have long discussed the concepts of "risk" and "uncertainty" in an attempt to arrive at a definition of risk that might be useful for analysis in each field of investigation. Up to the present time, they have not been able to agree on a definition that can be used in each field with the same facility; nor does it appear likely that they will do so in the near future. A definition of risk that is suitable for the economist or statistician may very well be worthless as an analytic tool for the insurance theorist. The fact that each group treats a different body of subject matter requires the use of different concepts, and although the statistician, the decision theorist, and the insurance theorist all use the term *risk*, they may each mean something entirely different.

Insurance is still in its infancy as a body of theory. As a result, we find many contradictory definitions of risk throughout the literature dealing with this phenomenon from an insurance point of view. One reason for these contradictions is that insurance theorists have attempted to borrow the definitions of risk used in other fields. Surprising as it may seem, insurance text writers have not been able to agree on a definition of this basic concept.

To compound the problem, the term *risk* is used by people in the insurance business to mean either a peril insured against (e.g., fire is a risk to which most property is exposed) or a person or property protected by insurance (e.g., many insurance companies feel that young drivers are not good risks). From time to time in this text, we may use the term *risk* in one of the two ways insurance practitioners use it, but for the most part we will use it in the abstract to indicate a situation where an exposure to loss exists.

CURRENT DEFINITIONS OF RISK

If we were to survey the best-known insurance textbooks used in colleges and universities today, we would find a general lack of agreement concerning the definition of risk. In general, we would find the term defined in one of the following ways:

1. Risk is the chance of loss.
2. Risk is the possibility of loss.
3. Risk is uncertainty.
4. Risk is the dispersion of actual from expected results.
5. Risk is the probability of any outcome different from the one expected.

While each of these definitions differs from the others, all fall into one of two major categories: those that view risk as a condition of the real world and those that view it as a subjective phenomenon that results from the imperfections of human knowledge.

There is no sign at this point that insurance theorists will be able to agree on any of the definitions just put forward in the near future. Each has found numerous adherents, and each has certain qualities that make it preferable for some purposes.[1] Although the insurance theorists have not agreed on a universal definition, there are common elements in each of the definitions: indeterminacy and loss.

- The notion of an indeterminate outcome is inherent in each of the definitions: the outcome must be in question. When risk is said to exist, there must always be at least two possible outcomes. If we know in advance what the result will be, there is no risk, regardless of whether or not there is loss. For example, investment in a capital asset generally involves a realization that the asset is subject to physical depreciation and that its value will decline. Here the outcome is certain and so there is no risk.
- At least one of the possible outcomes is undesirable. This may be a loss in the generally accepted sense in which something the individual possesses is lost, or it may be a gain smaller than the gain that was possible. For example, the investor who fails to take advantage of an opportunity "loses" the gain that might have been made. The investor faced with the choice between two stocks may be said to "lose" if he or she chooses the one that increases in value less than the alternative.

Our Definition of Risk

For our purposes, two of the definitions just given will be used, but in a slightly modified form, providing, we hope, a precise, yet intuitively acceptable, notion of risk. We define risk as follows:

> Risk is a condition in which there is a possibility of an adverse deviation from a desired outcome that is expected or hoped for.

Because an "adverse deviation from a desired outcome" may be viewed as a loss, this definition is quite similar to the definition of risk as "the possibility of loss." It is also similar to the definition of risk as "the probability of any outcome different from that which is expected." The major differences are the substitution of "possibility" for "probability" and the introduction of the notion of an *adverse* deviation from a *desired* outcome that is expected or *hoped for*. If you own a house, you hope that it will not catch fire. When you make a wager, you hope that the outcome will be favorable. The fact that the outcome in either event may be something other than what you hope constitutes the possibility of loss or risk.

Note that in this definition risk is a condition of the real world; it is not subjective, but rather a combination of circumstances in the external environment. The possibility of loss must exist, even though the person exposed to that possibility may not be aware of it. If the individual believes that there is a possibility of loss where none is present, there is only imagined risk, and not risk in the sense of a state of the real world.

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[1] For a discussion of the various definitions of risk that are listed, see the appendix to this chapter.

Note also that there is no requirement that the possibility be measurable; only that it must exist. When we say that an event is possible, we mean that it has a probability between zero and one; it is neither impossible nor definite. We may or may not be able to measure the degree of risk.

In its broadest context, this definition includes any situation in which there is a possibility of an unfavorable outcome. For example, the student who does not study faces the possibility of receiving an *F* for the course. Few would deny that there are some risks that do not involve money. Since our purpose here is to relate risk to insurance, however, we will focus on a special type of risk—that which entails the possibility of financial loss. We define *financial loss* as a decline in or disappearance of value due to a contingency. This means that if the loss of value is intended or if it is certain, it is not a loss within the context of our definition.

The Degree of Risk

As if the problem of agreeing upon a definition of "risk" were not enough, we are faced with the equally perplexing one of agreeing on what we mean by the "degree of risk." Precisely what is meant when we say that one alternative involves "more risk" or "less risk" than another?

For those who define risk as uncertainty, the answer is relatively simple. The greater the uncertainty, the greater the risk. Those who define risk as uncertainty maintain that risk is greatest when there are two possible outcomes, each of which is equally likely to occur. In other words, they maintain that uncertainty (risk) is at its highest point in the individual case when the probability of loss is 0.5.

Suppose that we take the dangerous game of Russian roulette to examine this position. If I hand you a revolver in which I have placed three cartridges, leaving three of the chambers in the cylinder empty, the chance of loss is 3/6 or 1/2. To those who define risk as uncertainty, this represents the point of greatest risk. Accordingly, if I place one more bullet in the cylinder, the degree of risk declines. Thus, there would be less risk when there are four bullets in the cylinder than when there are three, less when there are five than when there are four. This position seems to run contrary to the logical notion of the degree of risk.

It would seem that the most commonly accepted meaning of "degree of risk" is related to the likelihood of occurrence. We intuitively consider those events with a high probability of loss to be "riskier" than those with a low probability. In our example, it seems more accurate (or at least less confusing) to state that adding the fourth bullet increases rather than decreases the risk. Adding the fifth bullet increases the risk even more. This intuitive notion of the degree of risk is consistent with our definition of risk. If risk is defined as the possibility of an adverse deviation from a desired outcome that is expected or hoped for, the degree of risk is measured by the probability of such an adverse deviation.

For the individual, the higher the probability of loss, the greater the risk, for the greater the probability of loss, the greater the probability of a deviation from what is hoped for. In the case of the individual, the hope is that no loss will occur, so that the probability of a deviation from what is hoped for (which is the measure of risk) varies directly with the probability that a loss will occur. Adding the fourth and fifth bullets increases the probability of a deviation from the hoped-for outcome. If a sixth bullet is added, the player can no longer expect or even hope that the outcome will be favorable. The sixth bullet makes the outcome certain, eliminating risk. If the probability of loss is 1, there is no chance of an outcome other than that which is expected and therefore no hope of a favorable result. When the probability of loss is zero, there is no possibility of loss and therefore no risk.

In the case of the individual, we ignore what is "expected" and measure risk in terms of the probability of an adverse deviation from what is hoped for. Actuarial tables tell us, for example, that the probability of death at age 52 is approximately 1% and that at age 79 it is about 10%. At age 97, the probability of death increases to nearly 50%. Using the probability of an adverse deviation from the outcome that is hoped for, we view the risk of death at age 79 as greater than that at age 52, but less than that at age 97.

In the case of aggregate exposures, estimates can be made about the likelihood that a given number of losses will occur, and predictions may be made on the basis of these estimates. Here the expectation is that the predicted number of losses will occur. In the case of aggregate exposures, where large numbers are involved, the degree of risk is not the probability of a single occurrence or loss, but the probability of some outcome different from that predicted or expected. This concept will be treated in greater detail in Chapter 2.

At times we use the terms *more risk* and *less risk* to indicate a measure of the possible size of the loss. Many people would say that there is more risk involved in a possible loss of $1000 than in that of $1, even though the probability of loss is the same in both cases. It would seem that we should make some allowance in the measurement of risk for the financial impact of the loss. Certainly both the probability and the amount of the potential loss contribute to the risk's impact. Given two situations, one involving a $1000 exposure and the other a $1 exposure, and assuming the same probability in each case, it seems appropriate to state that there is a greater risk in the case of the possible loss of $1000. This is consistent with our definition of risk, since the loss of $1000 is a greater deviation from what is hoped for (that is, no loss) than is the loss of $1. On the other hand, given two situations where the amount exposed is the same (e.g., $1000), there is more risk in the situation with the greater probability of loss.

While it may be difficult to relate the size of the potential loss and the probability of that loss in the measurement of risk, the concept of *expected value* may be used to relate these two facets of a given risk situation. The expected value of a loss in a given situation is the probability of that loss multiplied by the amount of the potential loss. If the amount at risk is $10 and the probability of loss is 0.10, the expected value of the loss is $1. If the amount at risk is $100 and the probability is 0.01, the expected value is also $1. This is a very useful concept, as we shall see later.

RISK DISTINGUISHED FROM PERIL AND HAZARD

It is not uncommon for the terms *peril* and *hazard* to be used interchangeably with each other and with "risk." However, to be precise, it is important to distinguish these terms. A *peril* is a cause of a loss. We speak of the peril of "fire" or "windstorm," or "hail" or "theft." Each of these is the cause of the loss that occurs. A *hazard*, on the other hand, is a condition that may create or increase the chance of a loss arising from a given peril. It is possible for something to be both a peril and a hazard. For instance, sickness is a peril causing economic loss, but it is also a hazard that increases the chance of loss from the peril of premature death. Hazards are normally classified into three categories:

- *Physical hazards* consist of those physical properties that increase the chance of loss from the various perils. Examples of physical hazards that increase the possibility of loss from the peril of fire are the type of construction, the location of the property, and the occupancy of the building.
- *Moral hazard* refers to the increase in the probability of loss that results from evil tendencies in the character of the insured person. More simply, it is the dishonest tendencies on the part of an insured that may induce that person to attempt to defraud the insurance company. A dishonest person, in the hope of collecting from the insurance company, may intentionally cause a loss or may exaggerate the amount of a loss in an attempt to collect more than the amount to which he or she is entitled.
- *Morale hazard*, not to be confused with moral hazard, results from a careless attitude on the part of insured persons toward the occurrence of losses. The purchase of insurance may create a morale hazard, since the realization that the insurance company will bear the loss may lead the insured to exercise less care than if forced to bear the loss alone.

CLASSIFICATIONS OF RISK

Risks may be classified in many ways; however, there are certain distinctions that are particularly important for our purposes. They are discussed in the paragraphs that follow.

Financial and Nonfinancial Risks

In its broadest context, the term *risk* includes all situations in which there is an exposure to adversity. In some cases this adversity involves financial loss, while in others it does not. There is some element of risk in every aspect of human endeavor, and many of these risks have no (or only incidental) financial consequences. Even a blind date carries an element of risk. In this text we are concerned with those risks that involve a financial loss.

Static and Dynamic Risks

A second important distinction is between static and dynamic risks.[2] *Dynamic risks* are those resulting from changes in the economy. Changes in the price level, consumer tastes, income and output, and technology may cause financial loss to members of the economy. These dynamic risks normally benefit society over the long run, since they are the result of adjustments to misallocation of resources. Although these dynamic risks may affect a large number of individuals, they are generally considered less predictable than static risks, since they do not occur with any precise degree of regularity.

Static risks involve those losses that would occur even if there were no changes in the economy. If we could hold consumer tastes, output and income, and the level of technology constant, some individuals would still suffer financial loss. These losses arise from causes other than the changes in the economy, such as the perils of nature and the dishonesty of other individuals. Static risks, unlike dynamic risks, are not a source of gain to society. Static losses involve either the destruction of the asset or a change in its possession as a result of dishonesty or human failure. Static losses tend to appear with a degree of regularity over time and, as a result, are generally predictable. Because they are predictable, static risks are more suited to treatment by insurance than are dynamic risks.

Fundamental and Particular Risks

The distinction between fundamental and particular risks is based on the difference in the origin and consequences of the losses.[3] *Fundamental risks* involve losses that are impersonal in origin and consequence. They are group risks, caused for the most part by economic, social, and political phenomena, although they may also result from physical occurrences. They affect large segments or even all of the population. *Particular risks* involve losses that arise out of individual events and are felt by individuals rather than by the entire group. They may be static or dynamic. Unemployment, war, inflation, earthquakes, and floods are all fundamental risks. The burning of a house and the robbery of a bank are particular risks.

Since fundamental risks are caused by conditions more or less beyond the control of the individuals who suffer the losses and since they are not the fault of anyone in particular, it is held that society rather than the individual has a responsibility to deal with them. Although some fundamental risks are dealt with through private insurance,[4] it is an inappropriate tool for dealing with most fundamental risks, and some form of social insurance or other transfer program may be necessary. Unemployment and occupational disabilities are fundamental risks treated through social insurance. Flood damage or earthquakes make a district a disaster area eligible for federal funds.

Particular risks are considered to be the individual's own responsibility, inappropriate subjects for action by society as a whole. They are dealt

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[2] The dynamic-static distinction was made by Willett. See Alan H. Willett, *The Economic Theory of Risk and Insurance* (Philadelphia: University of Pennsylvania Press, 1951), pp. 14–19.

[3] The distinction between fundamental and particular risks is based on C. A. Kulp's discussion of risk (which he referred to as "hazard"). See C. A. Kulp, *Casualty Insurance*, 3rd ed. (New York: Ronald Press, 1956), pp. 3, 4.

[4] For example, earthquake insurance is available from private insurers in most parts of the country, and flood insurance is frequently included in contracts covering movable personal property. Flood insurance on real property is available through private insurers only on a limited basis.

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