

Limits
of
Insurability
of
Risks

BARUCH BERLINER

LIMITS OF INSURABILITY OF RISKS

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Foreword

In my opinion Dr. Baruch Berliner, Non-Life Actuary of the Swiss Reinsurance Company, Zurich, has accomplished the difficult task of defining the limits of insurability in his book. He has also managed to turn this extremely important and topical subject affecting many fields of technology into an easily readable and exciting form which does not call for any prior knowledge of mathematics.

The criteria of insurability have been painstakingly analyzed and practical conclusions convincingly drawn. The carefully selected examples are of interest and value.

The book is primarily intended for all those whose job is or will be to determine the cover limits for their company. I believe

FOREWORD

it will achieve its goal of providing them with useful pointers and decision-making guidelines.

Universities have also been borne in mind. Apart from being practical, the book is also of great theoretical value, as it gives a comprehensive and original survey of the concept of “insurability.”

Finally, the book contains surprising elements which will stimulate the intellect of the reader, to whom I wish much pleasure in reading it.

H. B. Vischer
Deputy Chairman of the Board
Swiss Reinsurance Company

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B. Berliner

Contents

FOREWORD	vii
ACKNOWLEDGMENTS	ix
INTRODUCTION	1
THE CRITERIA OF INSURABILITY	3

CONTENTS

ANALYSIS OF THE CRITERIA OF INSURABILITY	13
3.1 giving numerical values to the criteria of insurability	13
3.2 the geometric model	14
remark on the subjective area of insurability	17
3.3 the importance of the geometric model	19
3.4 some remarks	25
 THE DIMENSIONS OF INSURABILITY	 29
4. degree of randomness	29
4.1.1 degree of randomness and correlation coefficient	29
4.1.2 two meanings of the degree of randomness	32
4.1.3 degree of randomness and the law of large numbers	33
4.2 maximum possible loss (MPL)	36
4.3 average loss amount and loss frequency	38
4.3.1 the ergodic hypothesis	38
4.3.2 loss frequency and the law of large numbers	41
4.3.3 risk behavior of the population	42
4.3.4 the effect of reinsurance on the area of insurability	43
4.4 insurance premium	46
4.4.1 the pure risk premium and the fluctuation loading	46
4.4.2 the two types of safety loadings	52
4.4.3 risk premium and utility theory	57
4.4.4 the insurance premium for similarly structured objects of various sizes	63
4.4.5 reinsurance cover and reinsurance premium	67
4.5 moral hazard	70
4.5.1 determining the problem	70
4.5.2 deliberate intervention in a risk	71
4.5.3 three risk categories	72
4.5.4 moral hazard, interest, motivation	75
4.6 public policy	78
4.6.1 public policy and ethics of insurance	78
4.6.2 public policy and the need for insurance	80
4.6.3 how risks consistent with public policy can cease to be so as a consequence of an insurance cover	83
4.6.4 public policy and collective fairness	86

4.6.5	public policy and the fighting of crime, terrorism and social unrest	88
4.7	legal restrictions	92
4.7.1	legal restrictions: an “objective” insurability criterion	92
4.7.2	legal restrictions determined a posteriori	93
4.7.3	cover prohibitions for private insurance	94
4.7.4	restrictions on the individual risk carrier	97
4.7.5	legal cover provisions	98
4.7.6	the reasons for legal restrictions	99
4.8	cover limits	100

INSURABILITY LIMITS AND THE POLICYHOLDER	104
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EXAMPLES OF RISKS AT THE LIMITS OF INSURABILITY	109
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CONCLUDING REMARK	118
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Introduction

Advancing technology, social progress, the growth of urban conglomerations and social problems, accumulation problems, possibilities of chain reactions, and the increasing complexity and size of numerous risks are bringing us closer and closer to the limits of insurability, confronting us more and more frequently with the question, “What risks are still insurable?”

A generalized *answer* to this question is *not achievable*, since it will depend upon *subjective considerations*. Nevertheless, an attempt can be made to identify those considerations which are subjective, and to limit them so far as possible in favor of an *objective, generally acceptable viewpoint*.

The practical answers to the question of the insurability of risks will always contain a subjective element, reflecting, for example, the business policy guidelines of an insurance company. Nevertheless, certain *basic objective principles* should be followed.

To examine the question of the *insurability of risks*, it is first necessary to clarify this concept. A general definition, convenient and useful as it might be, *cannot be proposed* because of the subjective content and complexity of the concept, which is why we prefer to subject it to as *clear and comprehensive an analysis as possible*.

In the model which we use for analysis, we will “automatically” *overcome* a complicated and often confusing “interference factor,” that is, partial insurability, where an insurer is willing to accept only part of a risk.

We shall set up *criteria* and interpret them as *dimensions of insurability*, which, as with a checklist, have to be gone through individually when assessing a risk in order to obtain a clear answer as to the insurability of the risk.

The analysis of individual criteria will lead us to numerous *basic findings*, which we believe to be convincing and illuminating enough to be accepted as objectively correct. We shall formulate basic findings as *principles* and recommend *measures* and *rules of conduct* as well.

We shall close the study with a discussion of examples of risks at the limits of insurability.

We hope that the following comments will provide a useful aid to answering the increasingly important question, “What risks are still insurable?”

The Criteria of Insurability

The concept “insurability” has a converse, that is, *uninsurability*. As these two concepts mutually exclude each other, there must be a *boundary line or area* between them. The aims of this study will be to mark out the *area of insurability* and to examine the boundary area. We shall set up criteria to mark off this area of insurability as follows:

The Criteria of Insurability

- a. Randomness (of the loss occurrence)
- b. Maximum possible loss
- c. Average loss amount upon occurrence

- d. Average period of time between two loss occurrences
- e. Insurance premium
- f. Moral hazard
- g. Public policy
- h. Legal restrictions
- i. Cover limits

These criteria are not independent of each other. Degree of randomness, moral hazard, and public policy are, for example, criteria which are definitely dependent upon and mutually influence each other. What is important, however, is that none of the nine criteria can be replaced by a combination of the remaining eight. The individual criteria will be considered more closely at a later stage.

Most criteria contain both subjective and objective aspects.

We are going to define now a model upon which we shall base our studies. The model avoids contradictions which can easily be inherent in other model approaches.

Definition 1: We say that a *criterion* is *satisfied*, if it confirms the insurability of a risk.

Definition 2: If at least *one criterion* is *not satisfied* for a certain professional risk carrier, then the respective risk is said to be *subjectively uninsurable* for that carrier.

By *professional risk carriers* we mean insurance companies, pension funds, and other institutions which grant risk covers against payment of a premium. When we speak of risk carriers, it is always professional risk carriers which are meant.

A criterion can be *not satisfied independently* or *conditionally*.

Definition 3: A criterion is said *not* to be *satisfied independently* if it can be satisfied *exclusively* by quantitative and/or qualitative changes which directly affect the criterion itself.

Definition 4: A criterion is said *not* to be *satisfied conditionally* if it can be satisfied by quantitative and/or qualitative changes which *only* affect other criteria.

Example:

If a risk carrier sets an absolute upper limit L on his commitment per event as a matter of business policy, which under no circumstances may be exceeded, then criterion b is not satisfied for him in respect of all those risks which could give rise to a maximum loss larger than L , *independently* of how well the other criteria are satisfied. If, on the other hand, the largest possible loss amounts to 10% of L , the risk carrier will be prepared to grant cover against an appropriate premium; if, however, the premium P offered is regarded as insufficient, he will refuse the risk. *Conditioned* by the inadequate premium offer P , a largest possible loss of $L/10$ can still turn out to be a value which fails to satisfy criterion b.

Conversely, we can reason that the premium P would suffice to cover a risk with a largest possible loss of, say, $L/20$, not however one with a maximum possible loss of $L/10$. *Conditioned* by the level of the largest possible loss of $L/10$ (criterion b), criterion e (insurance premium) turns out not to be satisfied.

This example, together with Definitions 3 and 4, leads to certain conclusions:

1. The dependence of the criteria upon each other leads to the possibility that criteria may not be satisfied conditionally.
2. If two criteria are mutually dependent and one of them is not satisfied conditionally in respect of a

certain risk, a certain risk carrier, and the other criterion, then the roles of the two criteria can be exchanged.

3. The statement that a criterion is not satisfied independently is much more rigorous than saying that it is not satisfied conditionally. In the first case the criterion can only be satisfied by changes which affect the criterion itself, but in the second case, also by indirect changes which only relate to other criteria.
4. A criterion is not satisfied if it is not satisfied either independently or conditionally. It is thus, according to Definition 2, perfectly possible for a risk to be subjectively uninsurable although it is not the case for a single criterion that it is not satisfied independently. For subjective uninsurability, it is sufficient that certain criteria be merely not satisfied conditionally.

It is thus not enough when investigating insurability of a risk to go through the criteria of insurability one by one and to check whether each is satisfied without taking into account the influence of some criteria on others.

In the example, criterion b (largest possible loss) was not satisfied independently *only if* the maximum possible loss exceeded the limit L . For a maximum loss equal to $L/10$, however, we could not say that criterion b was not satisfied independently. The same held for the insurance premium criterion e for premium P , for a risk with a maximum possible loss of $L/20$ was in fact insurable against a premium of P . Only the combination $(L/10, P)$ shifted the risk into the area of uninsurability, although it was not necessary for *any* criterion to be not satisfied independently in this connection.

When the risk carrier is faced with the choice of granting cover for a given risk at given terms, or not, he must make a decision. Subjectively, therefore, every risk is either insurable or not for every risk carrier, and one can thus conclude that a risk is *subjectively insurable* if it is *not subjectively uninsurable*.

As we shall soon see, the corresponding statement for objective insurability does not hold. From the objective point of view there are risks which are neither insurable nor uninsurable.

Definition 5: The *subjective area of insurability* consists of the set of all subjectively insurable risks.

Definition 6: The *subjective area of uninsurability* consists of the set of all subjectively uninsurable risks.

The subjective areas of insurability and uninsurability are separated by a dividing line.

Definition 7: We describe the set of all risks for which at least one criterion is not satisfied independently as the *area of absolute uninsurability*.

Definition 8: We call the not absolutely uninsurable part of the uninsurability area the *conditionally uninsurable area*.

This consists of the set of all risks for which every unsatisfied criterion is not satisfied conditionally.

Conclusion:

A risk in the conditionally uninsurable area has *at least two criteria* which are not satisfied conditionally.

Proof*

Let criterion K_1 be conditionally not satisfied because of criterion K_2 . Then, by definition, criterion K_1 can be satisfied by quantitative and/or qualitative changes affecting criterion K_2 alone. If the risk could not be rendered insurable by changes not

* The nonmathematically inclined reader may omit this section.