DECISIONAL METHODS APPLIED IN INSURANCE AREA

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ABSTRACT: *Mathematical models applied in the insurance field, represent an ongoing concern for people that work in actuarial departments, serving this way fundamental informations to their managers when they have to adopt economic decisions. This work approaches a synthetic manner both mathematical models of decision making under conditions of risk and uncertainty, as well as a practical application of qualitative risk analysis in the insurance of goods domain.*

KEY WORDS: *risk; uncertainty; risk management; insurance.*

JEL CLASSIFICATION: *G22*

1. RISK AND UNCERTAINTY

Globalization of the world economy can be defined as being the most dynamic process of national states interdependences growth as a result of the enlargement and deepening transnational connections broader and more varied spheres of economical, political, social and cultural life and having as implication the fact that the problems become rather global than national, asking for a solution rather global than national.

The economic world, social, political and natural environment in which they live, work and develops people is full of uncertainties. Currently they admit more and more that a system which works in order to obtain a result in future, operates by definition, in a situation of uncertainty, even if specific situations are characterized by different degrees of risk, uncertainty or even indeterminacy. Risk and uncertainty are not the subjects of choice, they are simply part of being human.

The terms "risk" and "uncertainty" are often used to express the same thing, but it is claimed in the specialized literature, there is a clear difference between them. Uncertainty is the fact of not knowing what will happen in the future, and the risk is considered as a characterization of uncertainty degree; the greater the uncertainty is, the more pronounced risk and vice versa, most human actions have a certain degree of

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uncertainty and risk, which is due, on the one hand, to the one who acts, on the other hand, to some environmental factors. Uncertainty is therefore the lack of certainty respectively uncertainty, doubt, hesitation. Uncertainty induces the opportunity to reach to some danger, to have to face a danger a trouble, to support a possible loss, which means to have a risk. The risk is, in fact, consciously expose yourself to a higher or lower risk. The risk is therefore the possibility of a loss as a result of the occurrence of unpredictable events and phenomena. The notion of risk was and is still used mainly in insurance field, but lately has found increasing application in many areas of human activity, each trying to obtain the best performance by managing it correctly.

Based on these definitions variety they express their opinion, fully justified that the risk draw up a series of characteristics that can be consideredbut also that meanings can be assigned as follows; means the probability of an undesirable event occurence; expresses the variability of the result under the environmental pressure;has significance only when trying to estimate the possible fluctuations of the profitability rate in the provisional analyzes; risk analysis is a systematic analysis of any business risk. As such, the risk involves:

a) strategy adopted - the selection of a variant from several data;
b) the state of nature - minimum conditions that depend the adoption of some strategies;
c) result of the action - the gain or loss, evaluated in monetary units;d) matrix of the earning - the results associated action to the multitude of combinations between the strategy adopted and the state of nature.

It is essential the fact that with the development of the economic system, with its increasing complexity uncertainties are multiplied, therefore, it becomes more vulnerable. Risk is part of the economic and social life, as he is in the form of commercial risks (the risk of absolutization products, competitive risk, price risk etc.), social risks and production risks. Given the reality of risk and uncertainty, substantiating the decisions will require deep and timely knowledge of both environments, internal and external, in which economic agents operate. Rationalization of human actions and decisions is not so much avoiding risks and uncertainties removal, but also in controlling risks and their consequences in reducing uncertainty and indeterminacy to acceptable levels in a given situation. Man always coexists with risks, but their consequences were amplified and agravated once the society advanced from the lower to the higher level.

2. RISK MEASUREMENT METHODS

Estimating the size of the risk and and its consequences as well, can be achieved only under the conditions of the probability knowledge and extent of the effects, the period in which they manifest and their dynamics. The criteria for classification and estimation of the effects are grouped by some authors, according to three dimensions: size (complexity, number of variables), importance (time factor) and probability (level of uncertainty).

Making a real measure of the size of risk, especially in terms of comparability, involves conversion based on equivalents of the qualitative aspects in the quantitative

aspects, using this particular method of aggregation (eg,by using the typical scale +, 0, -, for large positive influences, null influences large negative influences).

Researchers consider that size and risk measurement mode is given by the attitude towards risk, of how a decision maker thinks and takes into account a risk. (Iosif, 1997)

In assessing risk, there is no certainty and rationality is often determined by the amount of time horizon in which decisions can be taken, resulting probability that a risk and attitude towards of a decider may be brought in many alternatives:

a) **Comparability** implies the existence of two probabilities of risk occurence, **A** and **B**. The decision maker will prefer either situation **A** to **B** (**A**> **B**) or the situation **B** to **A** (**B**>**A**), or he is indifferent to two situations (**A = B**);
b) **Transitivity** requires the existence of preference relations and indifference or transitivity relations, meaning if we have **A> B** and **B>C** appears that **A> C**. Similarly if **B>A** and **C>B** we have **C>A**;
c) **Continuity** means that in case of three probabilities that **A>B** and **B>C**, there is a probability **D = (P, A, B, C)** where we have **D = B**;
d) **Independence** means that if an individual is indifferent to the two events (**A, B**) and if one of these events is a win of a compound probability (**C**), it can be replaced with another (**D**) without change the preference for the probability of event occurrence, so when **A = B** and **C = D** we have (**p, A, C**) = (**p, B, D**);
e) **Monotony** concerns the fact that if two probabilities appear starting from the same results, the decision maker will prefer that result that is likely to occur, even if the other probability is preferred.

The distinction between risk and uncertainty is the fact that in case of risk probabilities of each possible alternative are known, while in situations of uncertainty, probabilities of alternatives are unknown. The significance of the distinction between risk and uncertainty has been reduced considerably by the introduction of subjective probabilities derived from the impossibility of full knowledge of phenomena, being in return for objective probabilities in which the comments are real and are based on statistical data, obtained through observations over a period of time. Therefore any uncertainty can be transformed into one risk by associating of subjective probabilities to possible alternatives.

Decision-making process, the notions of uncertainty (medium of risk) and certainty (abstraction of risk) can not be opposed, but a gradation can be achieved according to the quality of informations that affect the quality of economic decisions. As a result of studies in this regard it was concluded that the decision problems depend not only on the profile, size and time horizon in which risk situations are manifested, but also existential space. These spaces (universes) can be: determined, uncertain, accidental or hostile.

The determined universe is that space where decisions are made knowing all the details of a problem, in which decisions are close to reality, deviations being relatively small, insignificant.

The uncertain universe is a set of circumstances or decisions that lead to the possibility of finding known ways in order to exit from the state of instability, but without being able to know the probability of identified phenomena appearance

objectively or the probability of decision correctness of in these the circumstances, in determining the optimum decision making are used several criteria:

- **Laplace criterion** or "equal opportunities" criteria identifies with the situation where the theoretical probability of the occurring risk can be considered equal (**1/3, 1/3, 1/3**), area and the probability of influence being theoretically the same.
- **Wald criterion** or " maxi-min criterion" is pessimistic criterion which establishes that the best decision is one that maximizes the minimal gains. Applying this criterion limits consciously obtaining better results in the desire to achieve full safety of the result that corresponds to the chosen variant.
- **Hurwicz criterion** is a criterion that applies to optimistic, pessimists decision makers or those who are situated between these two extremes.This situation is measured using an index whose value depends on the decision maker aversion towards risk and it is therefore a subjective criterion.
- **Savage criterion** is based on the phenomenon of opportunity cost, using as calculation formula the difference between the result corresponding to a certain decisions, but random and the best possible result that can be achieved if the event had not occurred.
- **Maxi-max criterion** is an optimistic criterion where whatever event occurs, the decision maker will act in a way that he will get the best result.The decision maker will choose the maximum output for each alternative result, and then the maximum value of these peaks.This decision criterion is risky especially in the long term.

Random universe expresses a set of circumstances that have a statistical stability which allows the implementation of probability models based on random variables behavior. Optimal decision making can be determined using the following models:

- **The statistical stability model** according to which the behavior of variables or events can be modeled as laws of probabilityhaving as fundamental law, the law of large numbers.
- **The Hope - Variation model** which has as main function a variable characterized by the average variation. After calculating hope and deviations from the average can be compared and decisions can be chosen.

Hostile universe is that existential space in which risk existence is certain and the occurrence probability of others is very high.

3. PROPERTY INSURANCE, A WAY TO PREVENT A DESTRUCTIVE RISK ACTION

In the insurance field, risk is defined as a future and uncertain event, this concept being associated with two dimensions: the probability of occurrence and physical and financial consequences. (Constantinescu D.A., 2004)

The probability of occurrence can be determined using mathematical statistics. We consider, for example, auto accidents. If we refer to a single driver, it is very difficult to say when and how he will have an accident and,

especially, which will be the consequences of this accident. But if we refer to a region or country and a certain period of time, then we can analyze some statistics on automobile accidents and determine their probability of producing under similar conditions.

Another dimension of the risk (material and financial consequences) is as important as the first. We used to pay attention only to events that have a higher frequency of realization and to neglect those who have a unique frequency. In the category of rare and very rare accidents we find the field of aviation and fluvial transport, sea and ocean, but whose consequences are very serious, awareness and assessing these risks both at the individual and the social levels are absolutely necessary.

To these two dimensions associated with the concept of risk, you should add a third: the perception of risk. This is necessary because the way we are aware of dangers differs from one individual to another. For example, we can consider that for a smoker, the risk of developing cancer is much higher than for a non-smoker. Ironically is that the smoker has a tendency to underestimate or even ignore this risk. Therefore, in the analysis and especially, in the interpretation of natural and technological risks we are exposed to, psychosocial component associated to the concept of risk has an essential role in the design and development of means of protection against these risks.

Production of this kind of phenomena or events may cause material losses to cause discomfort in the economic activity, to jeopardize human life or bodily integrity. As a result, man is subjected to multiple and varied threats caused by natural forces, by using technology or certain social or social - economical factors.

This causes which generate damages in economy can be grouped into two major categories: independent of the will of people, which include earthquake, drought, lightning, landslide, hurricane, storm, torrential rain, hail, flood, frost, death and so on, and dependent on the will of man, which include accidents, burglaries, disability, floods, fires, explosions, accidents during transport.

Through the specific means available, insurances help create conditions for realization of the objectives regarding the development of national economy, the expansion of foreign economic relations, tourism etc. Insurances contribute to the achievement of economic and social progress, of the country by maintaining the continuity of the production process, by protecting and defending the integrity of public property, private, cooperatives, personal, by creating for the population additional means of provision and savings.

Along with the development of production factors and relationships that are established between people in the production process, there was also a

continuous evolution of used insurance forms of goods and people insurances, both in terms of content and scope, as well as speaking of used insurance forms.

As a conclusion, in an economy of uncertainties, the insurance favors the passing of public savings to financial market, economic uncertainties can favor or disfavor the evolution of future economic agents wealth and insurance contract appears as a conditional debt emitted by the insurer and purchased by the insured person.

After the field covered by, insurances can be grouped as follows: insurances of goods, personal insurances and civil liability insurances.

4. ADDITIONAL PROCESS IMPROVEMENT USING RESOURCES AUTOMATIC FOR EVALUATION AND SUBSCRIPTION OF RISKS IN THE INSURANCE AREA

The aplication "RISK ANAYSER" is an assistance information system of decisionsin the insurance of assets and people. The usability of this aplication can be seen in more directions:the accomplishment of objective risk analysis, eliminating so a part of subjectivity of underwriting risks from the company officials of insurance; the posibility of closing some of this insurances by the untrained sell stuff complete in this,because the process is largely automated and not least,the possibility to make portals in order of on-line subscriptions of this type of insurance (Figure 1). (Achim, 2008)

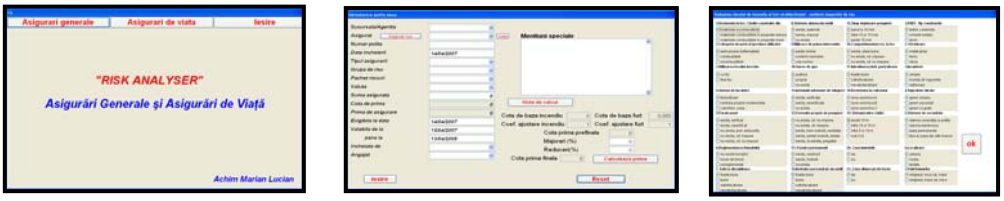

Figure 1. Informatics systems usable in insurance area - „RISK ANALYSER”

Design approach and the realisation of a system for assisting decision in the insurance business, is to convince certainly that the introduction of information technologies in the management organisation and, especially,interactive assistance of decisions suppose an detailed knowledge and a laborious effort of modelling all processes involved in the business of underwriting of risks in the insurance companies.

Knowing that, this area of insurance, provides jobs in which the salaries of employess is made directly proportional to income, under this impulse is possible to performe superficial risk analysis or even subjective, only from desire of maximize their own earnings. Computer science aplication have one of the main objectives eliminate bias risk assessments and underwriting policies exclusively on objective principles.

Another sphere of action of application refers to the fact that in Romania, until now, there is an extremely alert pace in the direction of stability employees in the insurance companies. Because of this, almost always there are employees with rather low experience which are in the stage of accumulation of knowledge. Underwriting risks,especially in property insurance,will be made after a prior training about two-three months,under a close monitoring. This aplication, doesn't eliminate the preparation of the theoretical part of employee, but offers practical support to allow that underwriting activity can begin from the first days of work.

Also, going on the principle of good faith of the insured(thing that happens in life insurance contracting), with this application can lay the groundwork on-line subscription of this type of shelds,work performed by most banking companies.

Subsequent will be performed the inspections risk of field, by the insurer representatives, for comparing the insured statements with reality and will be made the possible ajustements to insurance premium, going even to the cancelling of the contract if the declarations made by the insured are largely innacurate.

From the perspective of evolution on the society based on knowledge, I consider that soon the implementation stage of field inspections risk will be exceeded, he shelds will be closed based on facts from future electonic databases held by the service planning from the local goverments, and in this moment the perspective of subscription complete on-line, will be a definite reality.

In the developed countries, insurances reperesent a part of education, of tradition even to life, while in Romania ,in present, we're far from talk of an education to the entire population in this area. In particular, in the conditions of our country, besides the lack of tradition are included and other factors objective financial, the offert are least adapted to market conditions and less flexible. There is no other developed system of financial services (credits, mortgages), which binds to a poor infrastructure, of a payment system ponderous and inconvenient.

The extend of the risks of all categories, who affect an increasing number of people, natural or legal, impose as a strict necessity increase of insurance activity. The share of some phenomenona or events can cause material losses, to hamper economic activity to put in danger the life or physical integrity of people.

Dangers and risks to which man is subjected generate damage and therefore, he must know them so he can put the shelter their effects and act against them.

Analysis of these risks must be well done, in addition to quantitative criteria, on basis of qualitative which can be for insurers fundamental criteria in adoption of ensurance decisions. A special attention should be given agregation models of resulting indicators of risk analyzes.

5. CONCLUSIONS

A support system from decisions is a powerful tool and must be an integrated component of work decision who can expand the ability of marker to process quickly available informations and to approach complex problems, time consuming, decreasing the time of decisional process, improving reliability of decisional process,of the process of exploration and learning, and create an strategic advantage or competitive

for organisation. The advantages obtained by using a decision support system are not identified in all situations or from all decision makers,but depend the suitability between decider,decisional content and decision support system .

The need for information is felt at all levels, the content and thedynamic activities specific insurance companies reflect a big need for informations looking the companies financial status, the confidence in the approved budget and the degree of implementation of the development strategy.

Without an informational system and the evidence well done, syncope and shortcomings in activity may occure, that can be known only based on the analysis and by studying informations on time.

In supporting this approach to realise an informatical system for decision support regarding risk exposure of assets belonging on law person and persons, in life insurance, we took, beginning from the most complete solutions underwriting of insurance market, two models who include the analysis of insurable caracter in terms of some groups of indicators.

So the insurance decision, in the case of goods, will be taken only after analysis 28 qualitative parameters, aggregated in 2 indicators, and acording to the obtained score, the correspinding decision will be generated. (Figure 2)

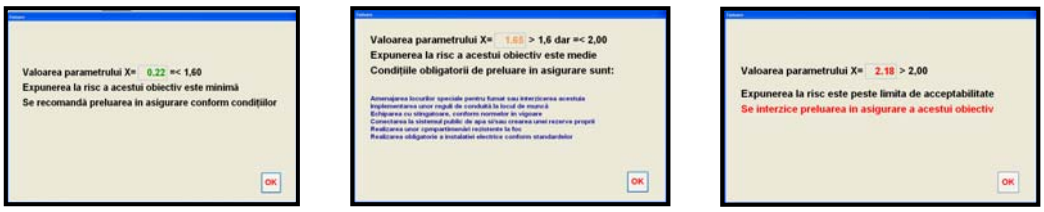

Figure 2. Adopting economic decisions

Regarding life insurance, underwriting risks is quite delicate, being involved more factors, especially medical terms, which will determinate insurable character of a person. In this regard, not being able to create a system which can try to analyse alone this character, I realised an algorithm to assist the writer close to the final decision.

Such an informatical system , specialised in risks evaluations in the insurances, must represent an instrument that allows users to control the decision-making process and have the ability to give informations, both in terms of reasons for not accepting the insurance and the potential ways to solve these problems.

Primary aim of analysis of decisions isn't primarly resolving, in order to provide solutions,various decisions problems but to help and stimulate decider to think, give structure to the problem to understand it better , to clarify the set of objectives and to identify the action alternatives to asses.

Although it is an inexorable necessity, which doesn't have an alternative in present, the informatisation suppose firm and explicit options, transposed in systematic actions both at macro and microeconomic level, claiming a strategic employment, on long term, in promoting and supporting information technology with sufficient resources. Approaching informatisation has as results, improving performances and

accentuation of the inteligent character of activities benefiting from the assistance of the computer, the satisfaction of his final users requirements in superior conditions from the recourse situation at traditional information technologies.

Business decision-making environment must integrate a whole experience and beliefs of decision makers with the techniques and decision support systems used. Currently, the business informational environment is becoming more complex due to the increased amount of information relevant to business, the number of information resources and the number of technologies used for accessing and storing data.

Decision support systems should serve as the main vehicle for policy makers in order keep up with the exponential growth in size, complexity and speed with which businesses need to be led. A decision support system should be an integral component of the decision process, that extends the ability of decision maker to process information quickly and to approach the complex , time consuming issues, reducing the time spent in this process. It will also improve the reliability of decision making process encouraging the exploration and learning process, thus creating a strategic competitive advantage for the organization.

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