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Optimal Production Plan and Profit Efficiency in European Non-Life Insurance Companies

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Abstract

This paper investigates profit efficiency and optimal production plan in European non-life insurance companies. To achieve our goal we have employed the directional output distance function in addition to the Lagrangian function that allows the specification of an optimal production plan for each non-life insurance system. At the beginning, based on a sample of 175 non-life insurance companies, dispersed in nine European countries over the period 2002-2008, we have estimated the parameter of our stochastic technology frontier. Then, we have used the Lagrangian function and its attached conditions to assess an optimal profit level for each non life insurance system based on the market prices of inputs and outputs. From optimal quantity of inputs, desirable outputs and undesirable outputs determined in our model we have proposed inefficiency indices for profit and production factors. Our results show that owners of European non-life insurance companies are under-paid because these companies have the possibility to attain a bigger level of profit efficiency while changing their production plan. While trying to search the sources of this profit inefficiency we find that European non life insurance companies sustain additional charges in their operating expenses and they have to enhance both equity and debt capitals.

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1. Introduction

Traditional production studies aims to identify best production alternatives that make firms more efficient. These studies are based on economic theory that considers only efficient production plans from a technical point of view. These efficient production plans are illustrated by the firm's production function and inefficient production plans are usually excluded (Fandel, 1991; Leontief, 1951; Cobb and Douglas, 1928). However, the emergence of research works based on activity analysis or on input and output correspondences (Shephard, 1970; Hildenbrand, 1966; Debreu, 1959; Koopmans, 1951) represents the first steps that deal clearly inefficient production plans.

Usually, any firm exploits multiple inputs in a transformation process to produce multiple outputs. The key posed optimization problem is to find out the best combination of inputs and outputs allowing to the firm attaining their objectives subject to their accessible technological knowledge. Any mixture of inputs and outputs is considered as technically efficient position if the firm exploits its total capacity of production. So, it cannot increase the production of any output quantity without enhancement of at least one used input in the production process. But in some particular activity sectors the outputs are divided on two types: desirable outputs and undesirable outputs like claims in insurance companies. So, the activity analysis becomes more complicated and sensible, because we cannot rely on the traditional objective functions used to minimize cost or to maximize revenue and profit of these companies. Indeed, these functions don't support the presence of undesirable outputs in the production process. Therefore, studies based on these functions to investigate technical, cost, revenue or profit efficiency of these exceptional industries, particularly for the insurance industry, provide erroneous and biased results.

More recently, the emergence of the directional output distance function by Färe et al. (2002), which takes account of undesirable outputs, provides a best illustration of the production technology of insurance companies. Thus the problem of efficiency studies is partially solved for these companies and we can easily assess their technical efficiency level. But the problem still remains unresolved and we cannot answer to the question: how we can assess cost, revenue and profit efficiency while taking account of the presence of undesirable outputs?

In this paper, in the first time we will define the technology production referring to the directional output distance function. Second, from the estimated frontier we will model efficiency profit while basing on neoclassical approach. This modeling allows us to find optimal production plan i.e. determine for each insurance company the optimal quantity for each input, desirable output and undesirable output. We apply our model on a sample of 175 non-life insurance companies dispersed in nine European countries over the period 2002-2008.

Our methodology addresses a number of issues concerning profit efficiency and optimal production plan in European non-life insurance companies such as: how to assess technical and profit efficiency of non-life insurance companies across European countries while taking account the presence of undesirable output? Which is the best production plan that must be adapted by the non-life insurance company? How profit efficiency progresses across non-life insurance markets and for the whole region?

The remainder of this paper is decomposed into four sections. Section 2 presents the literature review in which we survey some related works focused essentially on the technical and profit efficiency in insurance industry. Section 3 explains our model and employed tools to measure technical and profit efficiency and defining the optimal production plan in European non-life insurance companies. Section 4 examines the empirical implications of our model. Finally, section 5 concludes.

2. Literature Review

The European market was subjected, in the last fifteen years, to several series of transformation directives due to the globalization process allowing the enhancement of the world trade and the borders erasure across countries. These directives aim to create a single market that will have a great influence on all economic sectors especially on insurance industry. Indeed concerned countries have implemented a widespread deregulation accompanied by a harmonization of procedures for determining capital requirements and accounting standards. However, meaningful differences between these markets still persist such as difference in institutional settings and differences in income. These differences lead to a fierce competition across companies, inducing a more efficient use of productive factors.

At the beginning companies' performance is measured by the financial ratios methods like Return On Equity (ROE) et Return On Assets (ROA). But the lack of exhaustiveness in these techniques leads to the appearance of

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