Technical Efficiency Through Innovative Methods and Estimations in Financial Markets

Aikaterini Kokkinou
https://orcid.org/0000-0002-0467-880X
Higher Military Academy, Greece

INTRODUCTION

In stochastic frontier model analysis, it is acknowledged that the estimation of production functions must respect the fact that actual production cannot exceed maximum possible production given input quantities. Consequently, one of the main questions is to investigate the relationship between inefficiency and a number of factors which are likely to be determinants and measure the extent to which they contribute to the presence of inefficiency. Overall, these determining factors characterize the process of technological change. Stochastic frontier models assume that producers operate under the same production technology and that the inefficiency distribution across individuals and time are homogeneous. Estimation of technical efficiency has been the subject of research in many empirical studies on industrial productivity, contributing to the theoretical development and empirical application of SFA at both the firm and industry levels, with the purpose of screening out the external effects and statistical noise from the producer's performance and achieving a more accurate efficiency measure (Wang, 2000). Following these fundamental approaches, there has been a rapid increase in the volume of research on analysis of efficiency in production, both in theoretical and empirical research. Most of the literature focused mainly on stochastic frontier model with distributional assumptions by which efficiency effects can be separated from stochastic element in the model and for this reason a distributional assumption has to be made. Unobservable individual effects also play an important role in the estimation of panel stochastic frontier models. In contrast to the conventional panel data literature, however, studies using stochastic frontier models often interpret individual effects as inefficiency (Schmidt and Sickles, 1984), such as technical inefficiency in a stochastic production frontier model.

This chapter focuses on reviewing the stochastic frontier analysis literature regarding estimating inefficiency in financial markets level, as well as explaining producer heterogeneity along with the relationships with productive efficiency level. The chapter begins with a general overview of the main research papers on estimating productive efficiency in financial markets, both in aggregate and disaggregate level, providing the main hypotheses and results of each case. Then, the chapter continues with explaining producer heterogeneity, as well as the main determining factors towards efficiency differentiations.

A question of interest is whether inefficiency occurs randomly across producers, or whether some producers have predictably higher levels of inefficiency than others. If the occurrence of inefficiency is not totally random, then it should be possible to identify factors that contribute to the existence of inefficiency (Reifschneider and Stevenson, 1991). The important task is to relate inefficiency to a number of factors that are likely to be determinants and measure the extent to which they contribute to the presence of inefficiency. Following these foundamental approaches, there has been a rapid increase in the volume

DOI: 10.4018/978-1-7998-3473-1.ch006

of research on analysis of efficiency in production, both in theoretical and empirical research (Cowan and Salotti, 2015 and Iftekhar and Soula, 2017).

This chapter investigates technical efficiency estimation in financial markets, using both parametric and non-parametric techniques: parametric Stochastic Frontier Analysis (SFA) approach or non-parametric Data Envelopment Analysis (DEA). Contrary to the Stochastic Frontier Analysis approach (SFA), which requires a functional form to estimate the frontier production function and is based on the idea that the data is contaminated with measurement errors and noise (Bauer. 1990), Data Envelopment Analysis (DEA) approach uses linear programming techniques and cannot discriminate between inefficiency and noise. Thus, it tends to produce overestimated inefficiency measures, a fact which is the most important disadvantage of DEA in comparison to SFA (Bauer. 1990). This chapter proposes a slack-based DEA which allows a full evaluation of inefficiency in an industry's performance. The model estimated in this chapter is a DEA variant called slack-based measure, which is able to deal directly with the input excesses and the output shortfalls of the industry under evaluation (Tone, 2001). Estimated slacks are invariant to the units of measurement and are monotone decreasing with respect to each input and output slack. By using slack-based efficiency measure, we obtain different frontier levels and more appropriate performance benchmarks for inefficient industries. The production assumptions in DEA are that all actual observed inputs and outputs of any industries are feasible for all industries, as are linear combinations of observed inputs and outputs.

More specifically, this chapter focuses on reviewing the stochastic frontier analysis literature regarding estimating inefficiency it industrial level, as well as explaining producer heterogeneity along with the relationships with productive efficiency level. The chapter begins with a general overview of the main research papers on estimating productive efficiency in different industries, providing the main hypotheses and results of each case. Then, the chapter continues with explaining producer heterogeneity, as well as the main deterring factors.

This approach suggests the great importance of the interaction between the different determining factors and estimate any implication for efficiency. Over all, the major contribution of this approach is that it provides a better understanding of the contribution of technical efficiency taking into account major interrelationships and complementarities. The purpose is to study financial industries experience in an effort to determine the potential efficiency determining factors and to investigate various aspects of the relationship between efficiency and determining factors in an attempt to reach a better understanding of the contribution of alternative factors to efficiency growth.

This is of value for practitioners, policy makers and the academic community:

1. For industries, in order to make recommendations to firms on identifying, developing and deploying their resources that may influence their technical efficiency, competitiveness and consequently their performance.
2. For policy makers, the value stems for a better identification and understanding of the key resources. This will allow government entities to formulate and implement programs, which will leverage areas of industries, which require further development.
3. Last but not least, the value for the academic community mainly lies on an increased knowledge about the impacts of different determining factors on efficiency estimation.