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Intertemporal efficiency analysis of sales teams of a bank: Stochastic semi-nonparametric approach

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ABSTRACT

The primary role of a bank branch is evolving from a service provider towards a sales channel. Previous branch-level studies of sales efficiency consider a static setting of a single time period, ignoring the stochastic nature of sales outcomes. In this paper, we examine efficiency and performance of sales teams in a bank branch network over time, taking into account the changing demand and operational conditions, as well as random disturbances. The intertemporal sales frontier is estimated from the panel of monthly data over the years 2007–2010 using the stochastic semi-nonparametric envelopment of data (StoNED) method. The efficiency scores of sales teams and the trajectories of performance over time allow managers and the sales force to learn from past events and to develop the managerial and work practices across the network. While this study focuses on the case of a specific bank, some of the innovative features of our approach are applicable to sales efficiency assessment in other banks and financial institutions, as well as other network-based sales organizations.

1. Introduction

Performance of banks and other financial institutions is one of the prime application areas of productive efficiency analysis (see, e.g., Berger and Humphrey, 1997; Fethi and Pasiouras, 2010; and Paradi and Zhu, 2013, for reviews). While most studies focus on the institutional level, efficiency analysis at the bank branch level has been a vital field for improving managerial performance of financial institutions (see, e.g., Asmild et al., 2013). Branches have a dual role in contemporary retail banking. They provide quality service to the clients and they are an important sales channel to sell financial services and engage new clients. As the transactional services have predominantly become customer self-services via internet banking and automatic teller machines, the sales role of branches has become increasingly important for retail banks.

The sales role of bank branches has attracted some attention in the bank efficiency literature. Athanassopoulos (1998) evaluated a branch network in the dual role and used concept of market efficiency, focusing on the capability of the branches to use market potential to generate a new customer base and new sales. Cook et al. (2000) proposed an approach to handle the shared resources between sales and service activities, which enabled efficiency evaluation of sales activity, and applied this approach to evaluate both activities in bank branches. Portela and Thanassoulis (2007) evaluate operational efficiency of the bank branches of the post-internet era with a focus on sales outcomes. These studies are cross-sectional, restricted to a single time period.

Another line of bank branch studies analyzes development of efficiency over time. Portela and Thanassoulis (2006, 2010), Camanho and Dyson (2006), and Asmild and Tam (2007) have proposed methodological developments applied to bank branch networks. Gaganis et al. (2009) analyzed the efficiency development under different conditions in which the branches operate. In the field of organizational research, Bartel (2004) has studied the relation between the growth of deposits and lending and the local managerial practices. Stanton (2002) conducted a micro-level study on the performance of relationship managers of a bank over 6 years.

Drawing from these two lines of bank studies, in this paper, we focus on the sales function of bank branches, with the aim of assessing intertemporal efficiency and performance development of the sales teams that operate within branches of a specific bank. Our study is a real-world managerial application, conducted in close collaboration with Helsinki OP Bank, a regional retail bank belonging to OP-Pohjola Group, one of the leading financial service providers in Finland. The primary objective of this study is to estimate efficiency differences across sales teams and gain better understanding of the drivers of good performance, in order to help

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bank managers both at branch and overall bank network levels to make better decisions. Therefore, the objectives, scope, methods, data, and variables have been discussed with and approved by the management of the branch network, to match the information needs and the organization of the bank.

The secondary objective of this study is to propose a novel perspective on intertemporal efficiency and performance analysis, together with some innovative methodological solutions, which are directly applicable to sales efficiency assessment in other banks and financial institutions, as well as other sales networks or chains. We recognize that our approach is tailored for the purposes and circumstances of Helsinki OP Bank, and that not all of our assumptions and model specifications are necessarily relevant in all other bank applications. However, our approach has several novel features that can be replicated elsewhere. The methodological contributions of this paper include the following:

(1) Axiomatic, semi-nonparametric modeling of the intertemporal benchmark technology.
(2) Explicit modeling of changing operational conditions.
(3) Explicit modeling of random noise.

Regarding the first contribution, the previous literature on productive efficiency analysis can be classified into the parametric and nonparametric approaches, where the former approach mainly applies the stochastic frontier analysis (SFA; Aigner et al., 1977; Meeusen and Van den Broeck, 1977) and the latter one adheres to data envelopment analysis (DEA; Farrell, 1957; Charnes et al., 1978). Both approaches have been applied in the efficiency analysis of banks and other financial institutions (e.g., DEA has been applied in Sherman and Gold, 1985; Berg et al., 1993; Mukherjee et al., 2001; Banker et al., 2010; SFA has been applied in Cuesta and Orea, 2002; Bos and Kool, 2006; Bos and Schmiedel, 2007; Fenn et al., 2008; Feng and Zhang, 2012; among others). In this study, we resort to the axiomatic, semi-nonparametric StoNED method (stochastic semi-nonparametric envelopment of data), recently developed by Kuosmanen and Kortelainen (2012) (the immediate predecessors include Kuosmanen, 2008; Kuosmanen and Johnson, 2010; Johnson and Kuosmanen, 2011, 2012). This method combines the axiomatic, non-parametric DEA-style frontier with the stochastic, probabilistic treatment of inefficiency and noise similar to SFA.[1] In fact, both DEA and SFA can be obtained as restricted special cases of the more general StoNED model. To our knowledge, this study is one of the first applications of StoNED in an intertemporal setting involving multiple time periods, and the first application of the StoNED method to banks.[2]

As for the second contribution, we must emphasize that sales do not occur in isolation in the bank, but are jointly produced with the sales personnel and the customer. It is obvious that demand for loans and investment products influences the sales performance. The operating environment of the sales teams changed rapidly during the financial crisis of 2008 and the subsequent recovery. In order to assess performance and efficiency of sales teams during such turbulent times, we have to take the operating environment and the changing demand conditions explicitly into account. In this paper, we describe one possible approach that seems to work well in the present application, and that could be useful, perhaps in a modified form, in other applications.

Thirdly, it is obvious that sales activity is a random process that does not always result in the desired sales output. There may be omitted factors, such as competence and motivation of the sales personnel, which may differ across sales teams and change over time, but which are very difficult to measure and take explicitly into account in performance analysis. Due to the random nature of the sales activity and the fact that our data may be subject to omitted factors, measurement errors, and other noise, we find it important to model the random noise explicitly in our model. The empirical results of this paper suggest that the stochastic, semi-nonparametric approach is well suited for modeling service provision with random demand fluctuations and changing operational conditions. The chain managers of Helsinki OP Bank confirm that they find the results credible, easy to understand, and useful for performance assessment.

The rest of the paper is organized as follows. Section 2 describes the operational model of the sales teams and introduces the input and output variables used in our analysis. Section 3 introduces our model of intertemporal sales efficiency. Section 4 discusses the estimation method. Section 5 describes the data and reports the main results and managerial insights. Section 6 draws concluding remarks and suggests avenues for further research. Supplementary materials to this article include a detailed description of the collaborative research process with the bank (Appendix 1), development trajectories of all evaluated sales teams (Appendix 2), more detailed results of the heteroskedasticity tests (Appendix 3), and the GAMS code used in the computations (Appendix 4). These materials are provided online at http://dx.doi.org/10.1016/j.jbankfin.2013.03.1044.010.

2. Operational model of the sales teams

We have worked in close co-operation with the branch network management of Helsinki OP Bank to set the objectives and to define the inputs, outputs, and assumptions required for sales efficiency assessment. The study also included field visits to some of the branches, to interview managers and advisors, to get understanding about the sales practices. Finally, the results were discussed with the branch network management. In this section we briefly describe the operational model of the sales teams in Helsinki OP Bank and its operating environment. A more detailed description of the research process and the collaboration with the bank is presented in the Supplementary material.

2.1. Retail banking market in Finland and in Helsinki metropolitan area

The Finnish banking sector was hit hard by the bank crisis and recession in the early 1990s, caused by the sudden liberalization of the previously regulated financial markets, and the disintegration of the Soviet Union, a major trade partner of Finland at that time (see e.g., Jonung et al., 2009). The crisis resulted in a heavy consolidation of the banking sector during 1993–2000. Today, the Finnish banking sector is dominated by three large bank groups. According to the statistics of the Federation of Finnish Financial Services (FFFS, 2011), the three largest bank groups had approximately 90% of the total assets of the banking sector, and 75% of the loan and deposit markets in 2010. Parallel consolidation has taken place in other Nordic countries, involving several mergers across borders. The banks have also expanded to insurance markets through mergers and acquisitions. Further, insurance companies and even supermarket chains have started to provide banking services.

Information technology (IT) is another major factor that has strongly reshaped the retail banking sector in recent decades. At the end of 2010, the number of personal online service contracts was 5.24 Million (FFFS, 2011), which covers almost the entire population (5.38 Million). Only 3% of the bank customers in Finland

[1] In the bank efficiency literature, Post (2007) can be recognized as one of the first attempts to combine the SFA-style with the DEA-style axiomatic framework.

[2] Previous published applications of the StoNED method are in the areas of agriculture (Kuosmanen and Kuosmanen, 2009), electricity generation (Mekaroonreung and Johnson, 2012) and electricity distribution (Kuosmanen, 2012).