Measuring Efficiency in Price Space with an Application to Japanese Securities Firms

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ABSTRACT

The authors exploit the duality between the directional output price distance function and the maximal revenue function to estimate the price efficiency of Japanese securities firms during 2000 to 2007, a period in which securities firms faced greater competitive pressures. The directional output price distance function gives the maximum feasible addition to output prices, given inputs and a revenue target. Output supply functions are theoretically derived from the directional output price distance function. The model estimates indicate that brokerage services are overproduced relative to underwriting services. In addition, they find that if securities firms were to become more efficient they could increase the prices charged for brokerage services and for underwriting securities, although the amount prices could be increased depends on the directional path used to inflate actual prices to the output price frontier.

Keywords: Data Envelopment Analysis (DEA), Output Supply Functions, Price Efficiency, Price Space, Quadratic Directional Output Price Distance Function

INTRODUCTION

The inflation of Japanese real estate and stock price bubbles in the latter 1980s has been attributed to both speculative excess and overoptimistic growth forecasts of future profitability. Part of the speculative excess was due to the practice of “zaiteku” as manufacturing firms bumped against slower productivity gains and foreign competition and began to invest in financial securities as a way to maintain profits and avoid overinvestment in productive capacity (Amyx, 2004). During 1985, 87% of the increase in corporate liabilities was channeled into financial assets, with that ratio rising to more than 100% by 1986 (Gao, 2001). At the same time stock transactions increased from 414 million to more than 946 million shares traded per day. As of March 1986, the Big Four Japanese securities firms of Nomura, Yamaichi, Daiwa, and Nikko were in the top six in equity capitalization in the world (Wright & Pauli, 1987).
During the inflation of the bubble economy Article 65 enforced the separation of banks and securities firms, shielding securities firms from competition. High Japanese savings rates provided securities firms with ready buyers of securities and commission rates were fixed at artificially high levels helping to inflate profits. Moreover, a revolving door of officials moving to and from the Ministry of Finance and private securities firms increased the securities firms’ status relative to banks and helped to postpone financial reforms. The bursting of the bubbles ushered in two decades of slow economic growth and financial reforms. In 1992, a Securities and Exchange Surveillance Commission began to oversee the securities industry. In 1996, Prime Minister Hashimoto proposed a “Big Bang” in financial reforms which included capital adequacy requirements for securities firms and allowed banks to lend, trade, and underwrite securities. In 1997, the Nikkei stock index fell by 30% from July to November. The failure of Sanyo Securities and Yamaichi Securities in November 1997 made members of the Diet aware that the Ministry of Finance was unable to control the on-going financial crisis and led to calls for greater transparency. Brokerage commissions were deregulated in three stages beginning April 1, 1994 when commission rates were deregulated on transactions over 1 billion yen. Then, in April of 1998, commissions for securities transactions greater than 50 million yen were deregulated and finally, commissions on all transactions were deregulated by the end of 1999 (Liu, 2008). In December 1998 the Financial System Reform law allowed stocks listed on an exchange to be traded outside of the stock exchange (Misawa, 2006). Also in December, a client insurance fund insured investor funds received by securities firms until those funds were invested in various securities. In an effort to promote greater transparency and provide prompt corrective action to troubled financial institutions the Financial Supervisory Agency issued a Financial Auditing Manual in 1999 that provided detailed standards and inspection procedures for securities firms (Amyx, 2004). Finally, the transactions costs of trading securities were reduced as the Securities Transaction Tax and the Bourse Transactions Tax were repealed in 1999 (Harimaya & Okuyama, 2006).

In this paper we investigate the efficiency of Japanese securities firms during the 2000 to 2007 period. This period coincides with the beginning of the financial reforms implemented in the late 1990s and allows us to evaluate the trend in securities firms’ price efficiency since the financial reforms that deregulated commissions. We estimate the price efficiency of securities firms and recover output supply functions for brokerage and underwriting services. In particular, we estimate a directional output price distance function and compare our estimates of inefficiency and the optimal supply of outputs with estimates derived from a Shephard output price distance function, a translog revenue function, and revenue function derived from DEA (data envelopment analysis). In the next section we provide some information on the state of the Japanese economy during the period 2000 to 2007 and review previous studies that measured efficiency for Japanese securities firms. Following this review, we describe the theoretical method for measuring price efficiency and output supply functions. Details are furnished in the Appendices. Afterwards, we lay out the estimating equations. Then, we describe the data and discuss the results. The final section summarizes our work.

**JAPANESE SECURITIES FIRMS' EFFICIENCY**

In this study we examine the efficiency of Japanese securities firms during fiscal years 2000 to 2007. Each fiscal year begins April 1 and ends the subsequent year on March 31. These years coincide with the beginning of the complete deregulation of brokerage commissions and efforts to increase competition and transparency in the financial sector. From the first quarter of 2000 to the first quarter of 2008 real GDP grew at an annual 1.7% rate and unemployment ranged from 4.7% in 2000, to 5.4% in 2002, to 4% in 2008. During 2000 to 2006 consumer prices fell and then ended 2006 and 2007 up about 1%.
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