# The Changing Structure of Cost for Japanese Securities Firms

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## ABSTRACT

Japanese securities firms were operating under new circumstances after the Japanese version of the Financial Big Bang was implemented. This paper examines structural changes in the Japanese securities industry by comparing the economies of scale and scope between 1998 and 2002. In particular, we focus on the online securities firms that have appeared in recent years and verify their differences from the existing ones or the impact of deregulation. This is undertaken by employing the generalized translog cost function, which can take zero outputs into consideration. The findings suggest that scale economies were observed for the online securities firms as a whole. Further, product-specific economies of scale for brokerage commissions were observed for the online securities firms. However, cost complementarities were not observed in nearly all the pairwise combinations of products. These findings support the existence of small online securities firms that are engaged in a certain specific business.

*JEL Classification:*     G24, D21, C21

*Keywords:*     *Japanese securities firms; Effect of deregulation; Cost function; Scale and scope economies*

## I.    INTRODUCTION

After the burst of the bubble economy at the beginning of the 1990s, Japanese securities markets underwent a revolutionary change on account of the sweeping relaxation of regulations. For instance, product deregulation was implemented, which allowed banks to enter into a securities business through their subsidiary firms. An additional easing of regulations was introduced by the Japanese version of the Financial Big Bang. Further, a registration system for securities business was introduced, and the establishment of a financial holding company was permitted. These were considered as significant changes in financial administration for Japan, a country that had laid emphasis on ex ante regulations. These changes affected the reorganization of the financial industry. Another important deregulation that was implemented in addition to the product deregulation was that of the equity trading commission. This deregulation permitted the appearance of discount brokers who primarily utilize an internet-trading system. They are referred to as online securities firms[1]. These firms introduced price competition for the first time in Japan's stock trading business. Thus, securities firms in Japan were operating under new circumstances after the sweeping relaxation of regulations. The existing securities firms were regrouped and the new style brokers − online securities firms − were established.

        The purpose of this paper is to clarify the change in the securities industry by analyzing the fragmentary data related to the securities firms. The aspects of "economies of scale" and "economies of scope" are the key indicators in this analysis. They function as useful characteristics to examine the feature of the firms. These indicators reveal the cost structure of or the production technology used by the objective firms. In sharp contrast to the banking industry, far fewer studies have examined these indicators for the securities firms in Japan. Sato (1987), who first examined the economies of scale and scope in the Japanese securities firms, found the evidence of economies of scale for the sample period from 1972–1977. In addition, the evidence of economies of scope was found for the "four" major securities firms for the sample period from 1968–1984[2]. Similarly, Maruyama and Watanabe (1989) estimated a Cobb-Douglas cost function and found the evidence of economies of scale for the sample period from 1978–1987. In recent years, under the influence of current studies on the banking industry, greater attention has been paid to measuring the efficiency of the securities firms. While using a stochastic frontier approach, Matsuura (1996) found that the differences in efficiency for the securities industry had increased from the mid-1980s to the mid-1990s. Using the non-parametric approach, Fukuyama and Weber (1999) measured the cost efficiency or the productivity index during the sample period from 1988–1993. Their findings suggested that the "four" major securities firms were more cost-efficient than the smaller ones and the Japanese securities industry displayed a tendency to become more technically efficient after the collapse of the bubble economy.

        In this paper, the data of the years 1998 and 2002 have been used. The effects of deregulation on the major securities firms have been analyzed, and their comparison with online securities firms has been undertaken. This paper primarily

focuses on the online securities firms that emerged during these years and their features. Using the data pertaining to the period before and after the implementation of the deregulations of the equity trading commission and taking the online securities firms into consideration are the notable features of this analysis.

Although the realignment of securities firms is an extremely important issue, as mentioned above, few researches related to this have been undertaken. The online securities firms, in particular, have had an impact on the Japanese securities markets in recent years. Hence, analyzing them is extremely meaningful. Despite their significance, the difficulties encountered were a discouragement while analyzing these issues. An analysis of securities firms is a difficult task on account of their characteristic operating style. Since these firms focus on the broking business, they do not handle other businesses, such as the trading or the underwriting and selling businesses. As a result, these businesses do not yield any earnings, and hence, the ordinary analysis cannot deal with these data. In the previous studies, the actual multi-products of securities firms were not taken into consideration because of the difficulties encountered while dealing with zero outputs[3]. In this paper, the generalized translog analysis that considers the "zero data" has been used. This is a necessary refinement in order to analyze the online securities firms. This ingenuity enables a comparison between the existing major securities firms and the online securities firms in greater detail.

The next section describes the features of the Japanese financial market reform. In section III, we focus on the changes in the Japanese securities firms, particularly pertaining to the "three" major securities firms and the online securities firms. In section IV, the estimation methodology has been presented, and some comments pertaining to the data used have been made in section V. In Section VI, the empirical results have been discussed. Section VII contains the summary and the conclusions.

## II.    FINANCIAL MARKET REFORM AFTER THE BURST OF THE BUBBLE ECONOMY

The Japanese economy experienced a remarkable increase in the stock and land prices during the late half of 1980s. This phenomenon is referred as "bubble economy." However this economy collapsed at the beginning of the 1990s, and consequently, the burst of the bubble exposed the problems hampering the Japanese economy. This triggered the reform of the financial regulations.

It became common knowledge that the some of securities firms had provided compensations to major clients for the losses incurred due to the stock market declines of 1991. The compensation payments were not a one-time incident, but stretched over a period of time since the "Black Monday" in 1987. This drew sharp criticism, and individual investors hesitated from investing in the stock market. In response to this issue, in order to recover the discipline of the market, the revision of the Securities and Exchange Law was implemented, and the Securities and Exchange Surveillance Commission was established. The relaxation of regulations was implemented under these circumstances. In 1993, the mutual entry into the banking and securities business was granted[4]. This advanced the deregulation of financial operations and had

profound effects on the following financial industry reorganizations.

In order to promote the reform of the securities market, the Japanese version of the Financial Big Bang was considered in 1996. This financial market reform was based on the British experiences and the concept of "Free, Fare, and Global." In order to put the Japanese version of the Financial Big Bang into effect, the government enacted the Law for Aligning Laws Related to Financial System Reforms (Financial System Reforms Law) in 1998 and pushed forth a sweeping relaxation of regulations. As regards product deregulation, banks could treat the investment trust, and the bank-owned securities subsidiaries would be free to engage in all securities businesses. The securities firms could be established through registration, thus accelerating the participation by companies practicing other businesses into the securities sector. Additionally, the enactment of the revisions of the Antitrust Law chartered the financial holding companies in 1997. With regard to securities trading, the repeal of the Securities Transaction Tax and the Bourse Transaction Tax were implemented in 1999, and as a result, the securities trading cost was reduced[5].

Taking commissions into consideration, the deregulation of the equity trading commission was implemented in 1994. It allowed for a reduction in the stock trading commission for the orders that were over one billion yen at that time. However, the complete liberalization of commissions and fees in stock brokerage was realized by the promotion of regulatory reform in 1999. This was one of the key factors that brought about a considerable change in the securities industry.

In addition to the financial market reforms, the financial scandals and the failures of financial institutions occurred simultaneously[6]. Under this crisis, the banking realignments, which aimed for the recovery of competitive power, were advanced, and thereby, the reorganization of the securities industry was undertaken with an exclusive focus on the subsidiaries of bank-owned securities and securities firms that were affiliated with banks. These are the factors of the reorganization of the financial industry.

As part of the effort by the trading system in order to stimulate the market, the Securities Exchanges and the Japan Securities Dealers Association encouraged the listed companies with high prices and large trading units to reduce the size of their trading units. This was undertaken to allow greater stock market access for the individual investors, who were unable to invest until then because of the high transaction prices[7]. These activities supported the expansion of the investors' base and the securities firms competed for customers[8].

The securities markets and securities firms were affected by the major financial reforms since the 1990s. Particularly post 1990s, the securities industry had experienced the substantial changes.

## III.        CHANGES IN THE SECURITIES FIRMS IN JAPAN

### A.    Reorganization of the Three Major Securities Firms Since the 1990s

In Japan, the securities firms are classified as general securities firms and other securities firms. The general securities firms are engaged in the four businesses –

broking, underwriting and selling, subscription and distribution, and trading. Although there exist approximately 40 general securities firms in Japan the businesses are dominated by the major securities firms. Other securities firms cannot undertake the underwriting and selling or trading businesses with many categorized medium and small securities firms because these require special abilities and risk tolerance. The major securities firms that handle all securities related businesses are considered as distinctive companies in Japan. In other words, the major securities firms engaged in some businesses such as securities brokerage, investment banking, and trading so that they lead the Japanese securities business in all respect. The "four" major securities firms operated until 1997. However, since the collapse of Yamaichi Securities the other three existing firms have been referred to as the "three" major securities firms.

Nomura Securities walked its own independent path. The holding company, Nomura Holdings, was established, and it realigned the group firms[9]. The Nomura Group focuses on the investment banking service and strongly endeavors to run the related business.

Nikko Securities had entered into a business alliance with the Travelers Group (now named as Citigroup) since June 1998[10]. The Citigroup sought to increase its market presence in Japan, and the Nikko Group demanded advanced financial technologies and efficiency. Thus, the affiliation met the interests of each group[11]. Citigroup has invested in the Nikko Group since then[12]. On the other hand, the Nikko Group established Nikko Beans, the online securities firm, in 1999 and actively entered the internet-trading business. The Nikko Group divided the company into two groups: one including companies that handled a wholesale business and the other including companies that handled a retail business[13].

Daiwa Securities had a comprehensive alliance with Sumitomo Bank in 1998, and in the following year, a holding company was established[14]. At that time, Daiwa Securities had branched into Daiwa Securities, which was involved in retail business and into Daiwa Securities SB Capital Markets, which was involved in the wholesale business[15][16]. Sumitomo Bank invested in the Daiwa Securities SB Capital Markets. This alliance with Sumitomo Mitsui Banking Corporation has been maintained till date[17].

## B.    The Appearance of the Online Securities Firms

As a result of the mixed effect of many deregulations, a new form of transaction – the internet-trading system – that was different from the traditional style gained attention. The online securities firms mainly used this system. This style of transaction was based on the innovations of information technology, many implemented deregulations, reform of the unit stock system, and so on. The deregulation of the equity trading commission, in particular, was recognized as the main factor. The online securities firms strengthened their presence in the securities market after the complete liberalization of the stock trading commissions in 1999. The features of the liberalization included the discount fee and the new services such as the margin transaction for individual investors, the extension of office hours, and so on. The online securities firms actively engaged in brokerage operations with the low-cost

services for individual traders. They introduced price competition in the equity trading for individual traders. The traditional securities firms had certainly been making a strong endeavor in the brokerage operations for individual investors. Additionally, the new style of trading attracted not only the traders who were experienced in trading but also those who were not highly experienced in equity investment.

The new style of securities trading and the increment of individual investors had a stimulating impact on the business activities and the operating revenue of traditional securities firms. Before the emergence of the online securities firms, the traditional securities firms could make profits through the equity trading commissions. However, the online securities firms discounted the fee and individual investors were declined the usage of traditional securities firms. The traditional securities firms suffered from not only the decrease in equity trading commissions per unit but also the decrement of customers. The success of the online securities firms was interpreted as having an indirect impact on the reorganization of traditional securities firms.

The online securities firms showed a surplus with respect to financial health. Under these circumstances, the medium sized securities firms, whose operation was based on the counter service, showed a deficit because of the reduction in the fees in stock brokerage. On the basis of their business proceeds, the three major securities firms and Mizuho Securities were ranked among the top four listed firms followed by online securities firms such as Matsui Securities or E*TRADE Securities[18]. Taking the ratio of sales and general administrative expenses to the operating revenue into consideration, the online securities firms listed the top six firms[19]. The online securities firms required the initial investments and the maintenance expense of servers, but they could function without actual branches and with fewer workers. Since they offered the competitive advantage in personnel and non-personnel expenses, they could offer low-cost services. Meanwhile, they concentrated their resources in the brokerage business and acquired superiority in the market. However, they could not acquire the revenues, such as investment profit, that would notably contribute to their business earnings in the bull market. The concentration of the business was not only their strength but also their weakness. However, while the trading volume was growing as a result of the activity of the individual investors, the advantage of the business style adopted appeared to contribute to the performance of the online securities firms.

## IV.      ESTIMATE METHODOLOGY

In the previous studies on bank cost, the conventional translog cost function had been popularly used to examine the economies of scale and scope. However, the ordinary translog functional form is inadequate to analyze the data involving zero outputs since all the outputs are entered in a logarithmic form. Since our samples of Japanese securities firms comprise some firms engaged in a certain specific business, it could be considered that some outputs are not produced in these securities firms. In other words, the ordinary translog functional form is unsuitable because the natural logarithm of zero is not finite. Therefore, in this study, we employ the generalized translog functional form proposed by Caves et al. (1980), which can overcome these

problems by replacing the logarithm of outputs by the Box-Cox (1964) transformation[20]. The generalized translog cost function used in this study is given as follows:

$$\ln C = \alpha_0 + \sum_{i}^{n} \alpha_i Q_i^{(\pi)} + \frac{1}{2}\sum_{i}^{n}\sum_{j}^{n} \alpha_{ij} Q_i^{(\pi)} Q_j^{(\pi)} \tag{1}$$

where C refers to the total cost, $Q_i$, i = 1,···, n refers to outputs, and $\alpha_0$, $\alpha_i$, $\alpha_{ij}$ and $\pi$ are coefficients to be estimated.

Furthermore, superscripts in parentheses represent the Box-Cox transformation, $Q_i^{(\pi)} = (Q_i^{\pi}-1)/\pi$, i = 1,···, n. The Box-Cox metric is analytical for $Q_i = 0$, provided that $\pi$ is strictly positive and $\lim_{\pi\to 0} Q_i^{(\pi)} = \ln Q_i$ [21].

As is given in Eq. (1), although the cost function is generally defined as a function of output and input price, it is being expressed as a function of multiple outputs alone in this study. In short, it is based on the assumption that all securities firms are confronted with the same input prices, which are determined in the perfectly competitive markets. This assumption may solicit different opinions. Due to some unavoidable reasons, the cost function cannot obtain suitable data on input prices for all the Japanese securities firms[22]. Therefore, only the symmetry condition, setting $\alpha_{ij}$ = $\alpha_{ji}$ for all ij, has to be imposed on the parameters of cost function. In order to examine the characteristics of the multi-product technologies of Japanese securities firms, several formal cost measures will be computed.

First, ray scale economies (RSE) measures the elasticity of cost with respect to a proportional increase in all outputs and is defined as follows:

$$RSE = \sum_{i}^{n} \frac{\partial \ln C}{\partial \ln Q_i} - 1 = \sum_{i=1}^{n} Q_i^{\pi}(\alpha_i + \sum_{j=1}^{n}\alpha_{ij}Q_j^{(\pi)}) - 1 \tag{2}$$

where RSE < 0 implies the economies of scale. Thus, the increase in costs is proportionally less than the increase in outputs. Conversely, RSE > 0 implies the diseconomies of scale.

Second, product-specific economies of scale ($PSE_i$) are computed through

$$PSE_i = \frac{\partial^2 C}{\partial Q_i^2} \cdot \frac{Q_i^2}{C} = \{\alpha_{ij}Q_i^{2\pi} + \eta_j(\eta_j - 1 + \pi)\} \quad (i = 1,2,3,4) \tag{3}$$

where $\eta_i$ denotes the $(\alpha_i + \sum_{j=1}^{n}\alpha_{ij}Q_j^{(\pi)})$ in Eq. (3). $PSE_i$ < 0 implies the economies of scale for the output i. Thus, the increase in marginal costs is proportionally less than the increase in output i. Conversely, $PSE_i$ > 0 implies the diseconomies of scale.

Finally, pairwise cost complementarities ($CC_{ij}$) are defined as

$$CC_{ij} = \frac{\partial^2 C}{\partial Q_i \partial Q_j} \cdot \frac{Q_i Q_j}{C} = [\frac{\partial^2 \ln C}{\partial \ln Q_i \partial \ln Q_j} + \frac{\partial \ln C}{\partial \ln Q_i} \cdot \frac{\partial \ln C}{\partial \ln Q_j}] \ \ (i,j = 1,2,3,4) \ \ \ (4)$$

where $CC_{ij} < 0$ implies the cost complementarities between the output i and j. As Baumol et al. (1982) have shown, a multi-product cost function, which exhibits weak cost complementarities over all the output combinations, denotes the economies of scope. Thus, the economies of scope are said to exist if the cost of joint production is less than the sum of the costs resulting from independent production.

## V.        DATA DESCRIPTION

As mentioned in the previous section, the business operations of the Japanese securities firms can be divided into four categories. Based on this classification, the four outputs are specified as brokerage commissions ($Q_1$), underwriting and selling commissions ($Q_2$), subscription and distribution commissions ($Q_3$), and net gain on trading ($Q_4$). Since operating revenue predominantly consists of these outputs in the case of typical securities firms, it may be considered that these four outputs reflect the entire business operations of Japanese securities firms. Therefore, it may be argued that the recent structural changes in the Japanese securities firms, such as the reorganization of the three major firms, the appearance of online securities firms, and so on, are taken into consideration. The total cost (C) in each securities firm includes selling, general and administrative expenses, and interest expenses.

The original data for this study are mainly obtained from *Nikkei's Financial Statements of Japanese Securities Firms* for a period of a year before promoting the deregulation, 1998, and the recent year, 2002. When necessary data were not found in this source, we checked each financial statement or disclosure report to compensate for the deficiencies. Moreover, some samples are added from the October 2003 issue of *Kinyuu Business*, which listed the performance ranking of Japanese securities firms for 2002[23]. The sample includes 56 firms for the fiscal year 1998 and 53 firms for 2002. The former includes two online securities firms (H.S. Securities and Matsui Securities)[24]. Additionally, the "three" major securities firms (Nomura Securities, Daiwa Securities, and Nikko Securities) are included without being reorganized. The latter includes six online securities firms (H.S. Securities, Matsui Securities, Jet Securities, Manex Securities, D.L.J. Direct Securities, and Kabu.com Securities)[25]. Due to the recent reorganization of the securities industry, including the banking sector, we refer to the "four" major groups (Nomura, Daiwa, Nikko, and Mizuho) as the major securities firms, which consist of eight securities firms[26].

Descriptive statistics are provided in Table 1[27]. The characteristics of the data are consistent with our general understanding of the reorganization of the "three" major securities firms or the appearance of online securities firms. An explanation of business operations for Japanese securities firms has already been offered and only a few important comments have been added. First, the mean value of brokerage commissions for all securities firms decreased during the period from 1998 to 2002, following the complete liberalization of stock trading commissions in 1999.   In sharp

**Table 1**
Descriptive statistics (millions of yen)

| Variables | 1998 | | 2002 | |
| --- | --- | --- | --- | --- |
| | Mean | Std. dev. | Mean | Std. dev. |
| **All securities firms** | | | | |
| Total cost (C) | 25575 | (58359) | 26863 | (55625) |
| Brokerage com. ($Q_1$) | 8116 | (15100) | 6776 | (11629) |
| Underwriting and selling com. ($Q_2$) | 1772 | (5967) | 1740 | (5472) |
| Subscription and distribution com. ($Q_3$) | 3850 | (7477) | 2555 | (6604) |
| Net gains on trading ($Q_4$) | 5476 | (15424) | 9648 | (29850) |
| No. of observations | 56 | | 53 | |
| **Major securities firms** | | | | |
| Total cost (C) | 256209 | (49025) | 109723 | (106253) |
| Brokerage com. ($Q_1$) | 66080 | (18265) | 22180 | (23564) |
| Underwriting and selling com. ($Q_2$) | 25701 | (7013) | 9553 | (11559) |
| Subscription and distribution com. ($Q_3$) | 28016 | (8490) | 11347 | (14115) |
| Net gains on trading ($Q_4$) | 60973 | (31862) | 48242 | (66129) |
| No. of observations | 3 | | 8 | |
| **Online securities firms** | | | | |
| Total cost (C) | 2220 | (228) | 4356 | (3309) |
| Brokerage com. ($Q_1$) | 1602 | (1086) | 3308 | (3366) |
| Underwriting and selling com. ($Q_2$) | 17 | (13) | 33 | (31) |
| Subscription and distribution com. ($Q_3$) | 104 | (11) | 21 | (22) |
| Net gains on trading ($Q_4$) | 311 | (341) | 1 | (3) |
| No. of observations | 2 | | 6 | |
| **Other securities firms** | | | | |
| Total cost (C) | 12924 | (16541) | 13328 | (20965) |
| Brokerage com. ($Q_1$) | 4962 | (4902) | 4149 | (4728) |
| Underwriting and selling com. ($Q_2$) | 433 | (940) | 400 | (1101) |
| Subscription and distribution com. ($Q_3$) | 2576 | (4622) | 1141 | (1907) |
| Net gains on trading ($Q_4$) | 2414 | (5065) | 3216 | (6558) |
| No. of observations | 51 | | 39 | |

contrast, the mean value for the online securities firms increased more than two times (from 1602 million yen in 1998 to 3,308 million yen in 2002). This indicates the establishment of online securities firms. Moreover, with the exception of net gains on trading, the mean value of other outputs for all securities firms also decreased during the same period. In particular, the mean value of underwriting and selling commissions for major securities firms distinctively decreased (from 25701 million yen in 1998 to 9553 million yen in 2002). Although the cooling down of the Japanese economy may have been reflected in part, it suggests the decline of the influence of major securities firms and the rise of new entrants.

## VI.       EMPIRICAL RESULTS

Due to space constraints, the parameters for cost functions are not reported[28]. Both the coefficients of determination ($R^2$) have an extremely high value, and the estimates of the Box-Cox parameter $\pi$ are statistically significant. However, some of the estimates of the quadratic-term undergo changes. This result may suggest the effects of deregulation during these periods. In other words, the different types of securities firms have been established.

The estimates of ray scale economies (RSE) and product-specific economies of scale ($PSE_i$, $i = 1,2,3,4$) are given in Table 2. In addition to the estimates based on the mean values of all observations for each variable, the estimates of the respective values of variables for each securities firm are also computed. However, these values are computed only for major securities firms and online securities firms.

In the results of 1998, the estimate of RSE indicates the diseconomies of scale at the points of the overall mean. This result is considerably different from those found in the studies by Suto（1987）and Murayama and Watanabe (1989) (in each case, the evidence of economies of scale was found). In contrast, although not statistically significant, the estimated RSE values for major securities firms suggest the economies of scale (with the exception of Nikko Securities). Similarly, the estimates for online securities firms also show negative values. In particular, the estimated absolute value for H.S. Securities is much larger than that for the major securities firms; furthermore, this indicates statistically significant economies of scale. The above-mentioned results indicate that the Japanese securities firms experienced economies of scale at the level of the smaller sized firms. These findings are exceedingly similar to the findings of most empirical studies on banking.

With regard to the estimates of $PSE_i$, the estimates for output 2 ($PSE_2$) and output 3 ($PSE_3$) indicate the economies of scale at the points of the overall mean, whereas the estimates for output 1 ($PSE_1$) and output 4 ($PSE_4$) indicate the existence of contrary evidence. Similar results also can be observed the case of estimated values for each major securities firm (with the exception of $PSE_3$ for Nomura Securities and Daiwa Securities). In addition, these $PSE_1$ and $PSE_4$ values appear to be rather high, indicating diseconomies of scale. However, as is the case with overall mean, all the estimated values are not statistically different from zero. In contrast, both the estimated $PSE_3$ values for online securities firms indicate statistically significant economies of scale.   In the case of H. S. Securities,   other estimates also suggest the

**Table 2**
Estimates of economies of scale

| | RSE | PSE 1 | PSE 2 | PSE 3 | PSE 4 |
|---|---|---|---|---|---|
| **1998** | | | | | |
| Overall mean | 0.0171 | 0.2128 | -0.0919 | -0.1131 | 0.0560 |
| **Major securities firms** | | | | | |
| Nomura | -0.1079 | 1.0651 | -0.0593 | 0.2536 | 0.4750 |
| Daiwa | -0.1809 | 1.0171 | -0.1074 | 0.1981 | 0.4615 |
| Nikko | 0.0007 | 0.6739 | -0.0998 | -0.0882 | 0.3714 |
| **Online securities firms** | | | | | |
| H.S. | -0.2936 *** | -0.0344 | -0.0300 | -0.0841 *** | -0.0404 ** |
| Matsui | -0.0963 | 0.1907 | -0.0239 | -0.0600 * | 0.0029 |
| 2002 | | | | | |
| Overall mean | 0.0095 | -0.2386 | -0.0307 | -0.0682 | 0.0340 |
| **Major securities group** b | | | | | |
| Nomura | -0.8089 | 0.0734 | 1.0398 | 0.5586 | 3.0970 |
| Daiwa Group | -0.5140 | -0.1905 | 0.0535 | -0.0286 | 0.2435 |
| Nikko Group | -0.1656 | -0.3447 | 0.0483 | -0.0504 | 0.1593 |
| Mizuho Group | 0.0058 | -0.2610 * | -0.0246 | -0.0839 | 0.0702 |
| **Online securities firms** | | | | | |
| H.S. | -0.2687 *** | -0.1577 *** | -0.0866 *** | -0.0404 | - |
| Matsui | -0.1800 | -0.1645 | -0.0273 | -0.0372 | - |
| JET | -0.4828 *** | -0.1358 *** | - | - | -0.0038 |
| Manex | -0.1963 *** | -0.1476 * | -0.0656 *** | -0.0533 | -0.0014 |
| D.L.J. Direct | -0.1894 | -0.1454 | -0.0487 ** | -0.0420 | - |
| Kabu. Com | -0.2325 *** | -0.0719 | - | -0.0317 | - |

a *** Denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

b With the exception of Nomura, measures of the major group are evaluated with each sample mean.

c Minus ( - ) denotes zero value products.

economies of scale; however, these are not statistically significant for output 1 ($PSE_1$) and output 2 ($PSE_2$).

With regard to the results for 2002, the estimate of RSE also indicates the diseconomies of scale at the points of overall mean. With the exception of the Mizuho Group, the estimated RSE values for each major securities group suggest economies of scale. However, it is important to note the fact that all the estimates are not statistically significant. As mentioned earlier, besides Nomura Securities that became an independent entity, the other major securities firms were reorganized into specialty firms. Hence, inclusive of the Mizuho Group, the estimates of RSE are based on the mean values of all observations for each group. An unanticipated finding of the economies of scale can be seen in the RSE results for online securities firms. With the exception of Matsui Securities and the D. L. J. Direct Securities, the estimated RSE values are statistically different from zero at the 1% level of significance.

With regard to the estimates of $PSE_i$, the pattern of each estimate from the 1998 results is slightly modified. In the case of output 1 ($PSE_1$), it indicates the economies of scale at the points of overall mean, whereas for output 4 ($PSE_4$) it still indicates the existence of contrary evidence. Analogous to this, three out of four of the major securities groups also denote the economies of scale for output 1 ($PSE_1$), although these are not statistically significant (with the exception of the Mizuho Group). Other differences are found in the case of output 2 ($PSE_2$)—the estimated values have changed to indicate the economies of scale (with the exception of the Mizuho Group). Furthermore, with regard to online securities firms, in addition to all the estimates for output 1 ($PSE_1$) that are minus values, half of them indicate statistically significant economies of scale. Moreover, three out of four of the estimated $PSE_2$ values also indicate statistically significant economies of scale. A possible explanation for these results is that the liberalization of commissions and fees in stock brokerage was of considerable benefit to online securities firms, including the reorganized specialty firms under major securities groups. Further, the convention of the Japanese underwriting business, which has always been concentrated in the major securities firms, has changed expeditiously.

The estimates of pairwise cost complementarity ($CC_{ij}$) are listed in Table 3 in their logical order. With regard to the results for 1998, the cost complementarities ($CC_{ij} < 0$) are indicated for $CC_{13}$, $CC_{14}$, and $CC_{24}$ at the points of the overall mean. The $CC_{ij}$ pattern is analogous to the estimates for each major securities firm, with the exception of $CC_{12}$, and $CC_{34}$. In the case of $CC_{12}$, Nomura Securities is the only firm that suggests cost complementarity. Additionally, for $CC_{34}$, all the major securities firms suggest cost complementarity. In contrast, almost all the estimates for online securities firms suggest anticomplementarity ($CC_{ij} > 0$), with the exception of $CC_{24}$. Thus, the above-mentioned results indicate that the cost advantages of producing multi-products were much higher for the major securities firms. However, it should be noted that all these results are not statistically significant.

**Table 3**
Estimates of cost complementarities

|  | CC 12 | CC 13 | CC 14 | CC 23 | CC 24 | CC 34 |
|---|---|---|---|---|---|---|
| **1998** | | | | | | |
| Overall mean | 0.0503 | -0.0720 | -0.0688 | 0.0996 | -0.0123 | 0.0157 |
| **Major securities firms** | | | | | | |
| Nomura | -0.0230 | -0.6854 | -0.3217 | 0.1574 | -0.1031 | -0.1040 |
| Daiwa | 0.1365 | -0.7014 | -0.4646 | 0.1416 | -0.1419 | -0.0167 |
| Nikko | 0.0568 | -0.3560 | -0.3499 | 0.2602 | -0.1231 | -0.0251 |
| **Online securities firms** | | | | | | |
| H.S. | 0.0094 | 0.0157 | 0.0100 | 0.0148 | -0.0009 | 0.0165 |
| Matsui | 0.0188 | 0.0178 | -0.0207 | 0.0099 | -0.0025 | 0.0001 |
| 2002 | | | | | | |
| Overall mean | -0.0441 | -0.0238 | 0.2282 | 0.0423 | -0.0319 | -0.0341 |
| **Major securities group** [b] | | | | | | |
| Nomura | -0.2388 | 0.2376 | -0.6665 | 0.5618 | -1.5314 | -1.3449 |
| Daiwa Group | -0.3250 | -0.0231 | 0.0670 | 0.0722 | -0.0811 | -0.1737 |
| Nikko Group | -0.1949 | -0.0565 | 0.2400 | 0.0692 | -0.0951 | -0.0966 |
| Mizuho Group | -0.0556 | -0.0227 | 0.2059 ** | 0.0571 | -0.0344 | -0.0390 |
| **Online securities firms** | | | | | | |
| H.S. | 0.0571 | 0.0252 | - | 0.0138 | - | - |
| Matsui | -0.0096 | 0.0299 | - | 0.0059 | - | - |
| JET | - | - | 0.0053 | - | - | - |
| Manex | 0.0373 | 0.0350 | 0.0092 | 0.0146 | -0.0039 | -0.0011 |
| D.L.J. Direct | 0.0192 | 0.0322 | - | 0.0087 | - | - |
| Kabu. com | - | 0.0259 | - | - | - | - |

a ** Denotes significance at the 5% level.
b With the exception of Nomura, measures of the major group are evaluated with each sample mean.

c Minus ( - ) denotes that either one or both of the two products are zero value.

With regard to the results for 2002, the $CC_{ij}$ pattern at the points of the overall mean is slightly modified from that in the case of the results for 1998. In particular, $CC_{12}$ and $CC_{34}$ values are modified to suggest cost complementarity. The $CC_{ij}$ pattern for each major securities group is consistent with the above-mentioned results. As regards $CC_{12}$, all the major securities groups suggest cost complementarity. On the other hand, analogous to the 1998 results, almost all the $CC_{ij}$ estimates for online securities firms suggest anticomplementarity. It should be noted that, despite reorganization, the major securities firms still hold the cost advantages of producing multi-products as compared to the online securities firms. In case of the online securities firms, not much time has passed since the foundation, and hence, more time for experiencing cost complementarities is required. However, these possible explanations distinctly require further investigation because the $CC_{ij}$ values are not statistically supported.

## VII.         SUMMARY AND CONCLUSIONS

This paper examined the structural changes in the Japanese securities industry by comparing the economies of scale and scope for the period between 1998 and 2002. In particular, we focused attention on the online securities firms that emerged in recent years and verified their differences with the existing securities firms or the impact of deregulation. By employing the generalized translog cost function, we considered nearly all the business operations of the Japanese securities firms, including zero outputs that had not been considered in previous studies. The findings suggest that the ray scale economies were observed for the online securities firms as a whole. In case of the major securities firms, although the estimates are minus values indicating scale economies, they are not statistically significant. Further, for half of the online securities firms, significant product-specific economies of scale for brokerage commissions are observed. However, almost all the pairwise combinations of products, cost complementarities are not observed for the online securities firms.

In other words, the findings in this study support the existence of small online securities firms that are engaged in a certain specific business. Furthermore, it is consistent with the reorganization of major securities firms that break into specialty business. However, although the above findings appear to support the rise of online securities firms, the question regarding whether the online securities firms will continue flourishing independently in the future remains to be examined. If the Japanese financial industry is deregulated in order to allow banks to engage in "universal banking," the existing fierce competition among securities firms or with banks will positively increase in intensity. Moreover, it is necessary to conduct further studies using a different research methodology, particularly for treating zero outputs. Despite these limitations, we believe that our results have shed new light on the studies of Japanese securities firms.

**ENDNOTES**

1.  Strictly speaking, they are referred to as online securities firms that mainly utilize the internet system or the call-center system. A traditional securities firm, on the other hand, is characterized by face-to-face selling.
2.  The four major securities firms comprise Nomura Securities, Nikko Securities, Daiwa Securities, and Yamaichi Securities.
3.  In the many small securities firms, zero outputs are found pertaining to the trading business. In order to include these firms in the analysis, previous studies treated the revenue as a whole.
4.  The banks and securities firms were permitted to enter the businesses of opponent parties by their own subsidiaries.
5.  These taxes do not exist in the U.S.A.
6.  The succession of money-related scandals, the huge payoffs by the Dai-Ichi Kangyo Bank and Nomura Securities to the corporate racketeers were revealed in 1997. In the same year, the series of failures of financial institutions, the bankruptcies of Sanyo Securities, the Hokkaido Takushoku Bank, and Yamaichi Securities, were occurred.
7.  The Securities Exchanges and the Japan Securities Dealers Association asked the enlisted firms to either split the stocks or to reduce the minimum number of trading units. Additionally, for the purpose of luring individual investors, the cumulative stock investment program was developed in 1993 and small-lot stock trading was introduced in 1995.
8.  Indeed as the brokerage business is important for the individual investors, it is also important for block trading. The major securities firms have an advantage of this business
9.  Kokusai Securities was affiliated with Nomura Securities. However in order to rearrange the group, Nomura Securities sold its stocks of the former to the Mitsubishi Group. Thus, since then, Mitsubishi Securities was established on the foundation of Kokusai Securities.
10. Travelers Group merged with Citicorp in October 1998 and has been named as Citigroup since then.
11. Nikko Securities was committed to Mitsubishi Group in the past, but it maintained a distance from Mitsubishi Group in order to promote its relations with Citigroup.
12. In addition to the capital subscription in 1998, Citigroup purchased the shares of the Nikko Securities' banking subsidiary, which was involved in the trust and banking business, at 50% and established the NikkoCiti Trust and Banking

Corporation in 2001.

13. In 2002, the Nikko Cordial Group comprised Nikko Cordial Securities, which handled retail business, Nikko Citigroup Securities, which handled wholesale business, Nikko Beans, which handled internet trading, and so on.

14. The Sumitomo Bank completely merged with the Sakura Bank and became the Sumitomo Mitsui Banking Corporation in 2001.

15. Existing Daiwa Securities inherited the former corporate name and specialized in retail business.

16. Daiwa Securities SB Capital Markets changed its corporate name to Daiwa Securities SMBC. This was in response to the merger of the Sumitomo Bank and the Sakura Bank and their acquisition of Sakura Bank's security subsidiary.

17. In 2002, the Daiwa Securities Group was comprised Daiwa Securities, Daiwa Securities SMBC, and so on.

18. The Mizuho Securities is the one of main companies of the Mizuho Financial Group. The group was established with the assistance provided by the Dai-Ichi Kangyo Bank, the Fuji Bank, the Industrial Bank of Japan, and their related companies.

19. For example, the Kabu.com Securities was ranked first and Matsui Securities was ranked second.

20. Under the translog cost function, there are several studies that accommodate these problems by inserting a small positive value for zero outputs (see Gilligan and Smirlock (1984) and Kim (1987) for examples).

21. While estimating the generalized translog function, it is more common to search the optimal value of $\pi$ by repeating the substitutions of the different values of $\pi$. In this paper, we adopt a method of estimating the values of $\pi$ simultaneously with the other coefficients by following Kitasaka's (2002) method of representing the Box-Cox transformation by dummy variables.

22. For instance, to calculate the price of labor (wage rate), the data for labor costs is required. However, there exist some firms whose data cannot be publicly viewed because all the used samples may not be publicly listed companies. Incidentally, Suto (1987) also employs the same assumption.

23. Although a majority of the added samples are not publicly listed companies, they are ranked within the top 40 firms in the reference. Some of the online securities brokers are also included.

24. The name of the firm was changed from H.I.S. Kyouritsu to H.S. Securities in April 2001.

25. In addition to these six firms, there exists another online broker—E*TRADE Securities. However, we were unable to obtain the necessary detailed data pertaining to this firm from the financial statements.

26. These eight securities firms are as follows: Nomura Securities; Daiwa Securities and Daiwa Securities SMBC (included in Daiwa group); Nikko Cordial Securities, Nikko Citigroup Securities, and the Nikko Beans (included in Nikko Group); Mizuho Securities and Mizuho Investors Securities (included in Mizuho Group). Incidentally, the "three" major securities firms imply the above-mentioned – Nomura Securities, Nikko Securities, and Daiwa Securities.

27. With the exception of net gains on trading ($Q_4$), outputs are definitely positive values. Thus, the zero value samples are regarded as not being engaged in the applied business operation. In contrast, there exist some samples whose net gains on trading ($Q_4$) are minus values, thus implying the occurrence of a loss. However, as the minus products are not presumed as usual, we define all these samples holding zero value.
28. The authors will provide estimation results upon request.

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