Growth Strategies and Information Technology Investment of Japanese Securities Firms: Econometric Analysis Using Financial Reports, 2000-2008

1. Introduction

Information technology has turned out to be a driving force of economic growth in many industrialized countries. A burgeoning number of empirical economic studies demonstrate that a substantial part of economic growth in developed countries can be attributed to the rapid spread of information technology (IT). For instance, Oliner and Sichel (2000) showed that use and production of computers account for 62% of the annual productivity growth through 1996-1999 in the US. The IT industry has had positive impacts on the overall economic growth in Japan as well, accounting for 26% to 41% of the nation's real GDP growth through fiscal 2003-2006 (Ministry of Internal Affairs and Communications, 2008). Thus, IT investment has become crucial for various industries in the modern economy.

The Japanese economy's annual investment in network devices, computer hardware, and software totaled 19.1 trillion yen or 22.2% of the total annual private capital investment in 2006 (MIC, 2008). One of the Japanese industries that have been engaged in intensive IT investment is the financial industry[1]. Although the financial industry

[1] Some point out this aspect of the financial industry. For example, Prof. Kazuto Ikeo says "The

produced only 5.2% of Japan's GDP in fiscal 2005 (National Statistics Center, 2008), the industry accounted for 19.0% of computer software investment by all Japanese industries in the same year (the ninth row and the fifth column in Table 1). Of all sub-industries in the financial sector, the most actively compiling software asset is the securities industry. Software investment by the securities industry as percentages of all industries and of the financial industry grew from 1.9% to 4.2% and from 11.8% to 17.2% over the fiscal years 2002-2007.

Table 1 Computer Software Investment of Japanese Financial Industries, Fiscal Years 2002-2008 (100 million yen)

	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008*
All industries including financial industries	37755	37412	37367	40351	41808	44400	46747
Financial industry	6087	6047	6845	7667	7899	9177	9745
Banks	3313	3414	3767	4475	4204	4550	4675
Insurance companies	1342	1173	1172	1002	1196	1543	2121
Securities companies	718	831	1173	1267	1276	1875	1675
Non-deposit money corporations	478	421	614	589	741	815	810
Shinkin banks & other financial institutions	237	209	118	334	482	393	464
Shares of financial industries in all industries (%)	16.1	16.2	18.3	19.0	18.9	20.7	20.8
Shares of securities companies in all industries (%)	1.9	2.2	3.1	3.1	3.1	4.2	3.6
Shares of securities companies in financial industries (%)	11.8	13.7	17.1	16.5	16.2	20.4	17.2

Note: *Based on respondents' projections in the September 2008 survey.
Source: The Bank of Japan (2008), "TANKAN: Short-term Economic Survey of Enterprises in Japan (Financial Institutions)"

Nowadays IT system is an indispensable platform for operation of securities firms. The basic service of the securities industry is to mediate purchasing and selling of

competitiveness of the financial industry largely depends on the performance of information system, so it [the financial industry] can be called an 'information system industry'." (*The Nikkei*, 21 December 2005, p.7)

securities (e.g. stocks and bonds)[2] (Figure 1). The business of securities firms has basically relied on percentage-based commissions charged on transactions. Securities firms have to process and analyze a tremendous amount of information concerning orders, customers, risks, and market situations on a daily basis. The fast-changing nature of the financial markets necessitates high speed data processing. The accuracy of data is crucial in order to avoid losses and to manage risk, as securities brokerage business deals with thousands of millions of yen at a time. From a managerial point of view, the minimum human resources should be allocated to such routine office work since it does not directly contribute to raising revenues. These needs have led many securities firms to make heavy investment in computer systems. Typical information systems of a brokerage firm are shown in Figure 2. The systems are interconnected to the securities markets, institutional/individual investors, information vendors, and settlement/custody institutions. The front system receives, processes, and executes orders on behalf of investors and also sometimes trades on its own account. Information on transactions that finished confirmation and notification to investors is passed to the back office system, where databases are updated, various documents are prepared, and checks and risk management are conducted. Since the majority of individual investors join in trading via online trading system, many securities firms provide advanced trading tools online. There is also a growing need for sales assistance systems such as advisory software.

[2] Securities firms are sometimes called by different names: stock brokerage firms, security brokers, brokerage houses, and investment banks. This article uses the term “securities firms”.

Figure 1　Position of Securities firms in the Securities Industry

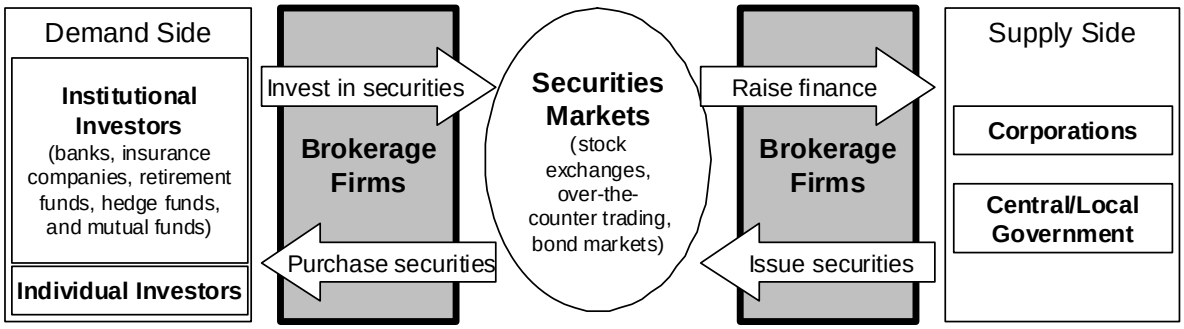
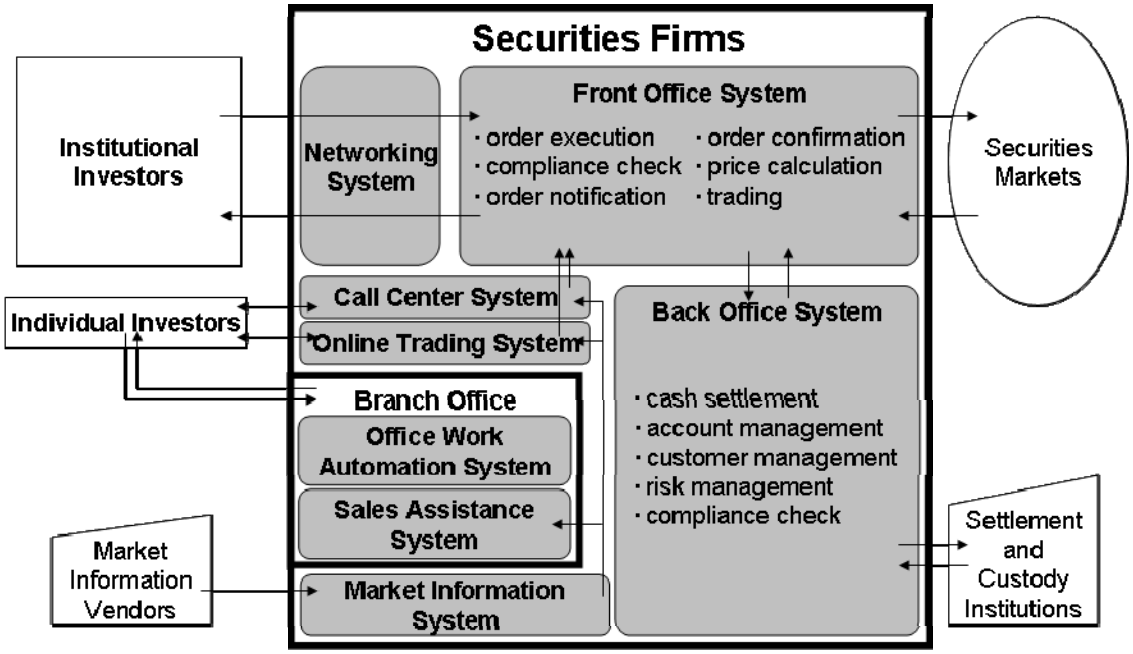


Figure 2　Information Systems of Securities firms



Sources: Based on Financial Information System Center (2007), *Financial Information System White Paper, 20th fiscal year of Heisei*, Zaikei Shoho Sha.

Behind the active investment by Japanese securities firms in IT systems is the growing need for the industry to manage households' financial wealth in preparation for their old ages. The accelerating aging of the Japanese society made the social security system no longer completely reliable. As a complement to the insufficient public support, the Japanese securities industry is expected to support living standards of the Japanese households in the future by offering wealth management services. In fact, as a result of the gradual shift of household financial assets from savings to securities and the parallel increase in the sales of investment trust, the portfolio investment income (returns to investment in foreign stocks and bonds) of Japan as percent of the nominal GDP increased from 0.64% in 1994 to 2.3% in 2007 (Ministry of Finance, 2008).

However, difficulties arise when the securities industry seeks further expansion. For instance, the growing number of sophisticated financial products will increase the burden of office work of financial institutions and make it more and more difficult for households with low financial literacy to make appropriate investment decisions. Besides it is unrealistic that sales staffs of securities firms could consult with all rich and non-rich households due to the cost and limited human resources. One of the solutions to such problems is considered to be development of IT systems.

Nevertheless, the growing social needs for the securities industry do not justify generous IT system investment. First, the unprecedentedly extensive world financial crisis and the subsequent deepening recession of the Japanese economy will force

Japanese securities firms to slash IT expenses in the upcoming year, which is already suggested in the last column of Table 1. With the high sensitivity of corporate profits to ups and downs of economies, it is a disadvantage for securities firms to possess assets as fixed ones rather than as fluid ones, because idle fixed assets tend to suppress revenues in an adverse period; and one of the largest fixed assets of securities firms is the very IT system[3]. Second, IT investment is not the objective itself but merely one of the possible means to improve quality and reduce cost of financial services. Third, it is thought that the competitiveness of securities firms rely much more on human resources (e.g., abilities of consultation and product development) than on computer systems.

Effective use of IT system requires both assessing the effectiveness of the past IT investment and, more importantly, considering the relative importance of IT investment compared with other strategies from the view point of overall corporate and industry growth strategies. How much contribution, if any, has IT made to the development of Japanese securities companies until today? Should Japanese securities companies invest more in IT system in order to achieve higher growth? Isn't there any alternative, more promising strategies other than simply focusing on IT usage?

While the economic impact of information system investment has been examined for the macro-economy, industries, and individual companies in a number of studies,

[3] For example, software asset amounted 9.2%, 21.2%, and 35.9% of total fixed assets in fiscal 2007 for Nomura, Daiwa, and Nikko, the three major Japanese securities firms. These figures take into account only *software* asset and do not include *hardware* fixed asset.

there are only a few for the Japanese securities firms (see Section 2). Given that since the late 1990s the Japanese financial system has experienced dramatic changes such as financial liberalization, globalization, computer automation, and expansion of direct finance, it is worth analyzing the impact of IT investment of Japanese securities firms on their performances, taking into account alternative development strategies.

Therefore, this article aims to investigate the relationship between the performance of Japanese securities firms and their growth strategies including information system investment. The article estimates profit functions of Japanese securities firms. The estimation utilizes the panel (consisted of multiple years and multiple firms) data collected from annual financial reports of 64 Japanese securities firms over the fiscal year 2000-2008. There were 317 securities companies operating in Japan as of 20 March 2008 (Japan Securities Dealers Association, 2008). However, financial reports of foreign-affiliated securities firms and the majority of small Japanese securities firms fail to provide some past figures such as the number of employees and the amount of software assets, which are keys for econometric estimation. This forced the analysis to focus on major Japanese securities firms.

The remainder of the article proceeds as follows. Section 2 briefly reviews related studies and presents an overview of the recent trend of the Japanese securities industry. Section 3 explains expected roles of IT in the future Japanese security industry. Section 4 describes the data and the econometric methodology employed. Section 5 presents and

discusses the result of the estimation. Section 6 gives conclusions.

2. Related Studies and Recent Trend of the Japanese Securities Industry

Motivated by the increasing importance of the financial industry, a large number of studies have examined various factors influencing the productivity of the financial industry. Though financial industry can be roughly classified into banking, securities, insurance, and lease, the majority of the past research have focused on the banking industry[4].

For example, productivity development of US banks was studied to gauge the effects of deregulation (Humphrey and Pulley, 1997), mergers and acquisitions (Akhavein et al, 1997) and the degree of competition (Berger and Mester, 2001). Among others, Parsons et al. (1993) estimated cost functions of a large Canadian bank and found a slightly positive correlation between productivity growth and adoption of computers. Auror et al. (2000) argued that their empirical study on the 20 largest US banks suggested the complementary relationship between the adoption of automatic image processing of checks and computer-skilled labor. Using panel data of over 600 Italian banks over the period 1989-2000, Casolaro and Gobbi (2005) found that IT capital accumulation significantly contributed to both cost cuts and profit increase for

[4] This is partly due to limited data availability. In Japan many companies started to mention computer software asset only after 1998 March, when the accounting standards as to computer software was established (see Takemura, Ukai, and Nagaoka (2008) for detail).

the Italian banking industry. Ukai and Takemura (2008), based on their original questionnaire surveys, showed that an increase of ¥1 had led to about a ¥14 increase in the market value (stock price) for 27 Japanese banks through 1993-1999. They also found no positive effects of computer equipment or computer software assets to the market value of nationwide banks, although the market values of regional banks were raised by computer software assets.

The source of competitiveness of securities firms has been examined by several economic studies. Shudo (1987) and Murayama and Watanabe (1989) showed that there were economies-of-scale effects among the major Japanese securities firms during the period 1972-1977 and 1985-1987. Matsuura (1998) estimated stochastic frontier functions for 25 Japanese securities companies over the periods 1986-88 and 1991-96. The results showed a widening efficiency gap between major competitive brokers and the others in the post-bubble economy period. Using a similar estimation method, Zhang and Luo (2006) investigated the technological progress, efficiency, and productivity of the US securities firms between 1980 and 2000. They revealed that only a few large investment banks achieved technological innovation, while most firms, especially smaller regional firms, lagged far behind both in efficiency and productivity. Tsutsui and Kamesaka (2005) examined the degree of monopoly of the Japanese securities industry over the periods 1983-1988, 1991-1996, and 1997-2002. They found that the industry had not been perfectly competitive throughout the three periods and

that in the second period the degree of competition actually decreased despite financial reforms.

The above four studies on the securities industry revealed the existence of firm-level and industry-level inefficiencies. However, the drastic changes in the Japanese securities industry' business environment in the subsequent years took place after these studies. Various liberalization reforms carried out in the Japanese financial industry since 1996 have had huge impacts on the management of securities firms (Securities Management Study Group, 2008). First, securities firms' traditional main source of revenues, commission fees for undertaking trade, has been threatened by the rise of online discount brokerage firms. As a result of the liberalization of entry to securities industry (December 1998) and the liberalization of securities firms' commission fees (October 1999), the revenues of securities firms that depended on commissions deteriorated. Today almost 90% of orders by individual investors come through online trading. In addition, more and more bank-owned security subsidiaries joined the underwriting market of corporate bonds, which further fueled competition (Takaoka and McKenzie, 2005). Second, the expanding selection and sales route of financial products has led to the separation of selling and production of financial products, both of which had been the business of securities firms. The sales of mutual funds, which had been exclusively allowed for securities firms, began at banks in 1998. New financial products such as Exchange-Traded Fund (ETF), Money Management Fund (MMF), and Mutual

Reserve Fund (MRF) started to offer individual investors a simple, low-cost means to diversify investment portfolio. Such expanding sales routes and selection of financial products resulted in the rise of investment advisory firms and investment management firms that are independent of securities firms.

In response to these drastic changes of the financial industry, different securities firms selected different development strategies. The three major securities firms are gradually shifting their central business from this “traditional” commission business toward “untraditional” businesses, such as asset securitization, mergers and acquisitions advisory services, wealth management specialized for affluent clients, and merchant banking investment for their own accounts. The leading online securities brokers have made intensive investment in their Internet-based trading systems to offer a variety of advanced trading tools for individual traders. Among middle to small securities firms, some select mergers, some find a niche market such as foreign exchange trading, some enter a partnership with nationwide banks, and others are forced out of securities business.

3. Data

The econometric estimation employs an unbalanced panel data of 64 Japanese securities firms over the fiscal years 1999-2007. We used two sources, *Nikkei NEEDS*® and *eol-ESPer*®, which compile detailed data reported in annual financial reports of

individual firms. Some of the unreported financial statistics such as the number of online accounts come were supplemented by websites of individual securities firms and related associations. Foreign-affiliated securities firms operating in Japan were excluded from the dataset, since they do not provide information on software assets (they use different accounting standards from the Japanese ones) and their performances are strongly influenced by the market condition of their host countries. The reason we do not use data prior to fiscal 1999 is that with the change in the law, majority of the Japanese securities firms started to report the value of their software asset in 1999. In order to precisely measure the impact of information technology on the outcomes of securities firms, we had to restrict the samples.

4. Econometric Estimation

With the above firm-level dataset at hand, we measure the extent to which different corporate strategies including information system investment contribute to the growth performance of individual Japanese securities firms. We estimate the revenue functions of individual securities firms. Potential factors explaining increases in the revenues can be classified into (1) individual characteristics (the amount of asset, the composition of sales, and investment in education and advertisement), (2) group-level characteristics (major securities firms, online-trading-specialized securities firms, and others), and (2) market factors (e.g. stock prices). In general notation, this regression can be expressed

as:

$$R_{i,t} = \alpha_i + \boldsymbol{\beta}\mathbf{x}_{i,t} + \boldsymbol{\delta}\mathbf{y}_i + \boldsymbol{\lambda}\mathbf{z}_t + \varepsilon_{i,t}, \qquad t = 1999,2000,\cdots,2007; \quad i = 1, 2, \cdots 64, \tag{1}$$

where $R_{i,t}$ is the revenue of a securities firm i in period t, $\mathbf{x}_{i,t}$ is a vector of individual characteristics (e.g. the number of employees and the book value of software asset), $\mathbf{y}_i$ is a vector of characteristics specific to the groups to which a securities firms i belongs, $\mathbf{z}_t$ is a vector of various market factors that vary over time but take the same values for all firms in the same period, and $\varepsilon_{i,t}$ is an error term. The regression analysis estimates the signs and sizes of coefficient vectors ($\boldsymbol{\beta}$, $\boldsymbol{\delta}$, and $\boldsymbol{\lambda}$), which reveal how much each of the factors in $\mathbf{x}_{i,t}$, $\mathbf{y}_i$, and $\mathbf{z}_t$ contributed to the revenues.

4. Estimation Results

The results of the econometrics analysis are presented in Table 2 and Table 3[5]. The estimation employed the Ordinary Least Square (OLS) method and Fixed Effect (FE) method. Model (3) separately estimates the revenue regressions for major firms, online brokers, and other securities firms. On the whole, all the coefficients for employees, software asset, and the average TOPIX are positive and statistically significant. The decomposition in Model (3) shows that the contribution of software asset is larger for large firms and online brokers than for other firms. The coefficients in the eight row in

[5] While model (1)-(3) uses logarithms for revenues, employees, software, education and training ,and advertisement, model (4)-(6) uses normal values to keep the sufficient number of observations.

Table2 Estimation Results I

			Model (1)	Model (2)	Model (3)		
		Estimation method	OLS	Fixed Effect	OLS		
Variables	Description of variables	Mean value (in logarithm)	Estimated Coefficient (standard error)	Estimated Coefficient (standard error)	Estimated Coefficient (standard error)		
Dependent variable					Large firms	Online brokers	Others
$\ln(R_{i,t})$	total revenue (yen)	64265 (9.05)					
Independent variables							
$\ln(L_{i,t})$	number of employees	37922 (5.66)	0.708	0.669	0.762	0.700	0.792
			(0.030)***	(0.062)***	(0.138)***	(0.105)***	(0.034)***
$\ln(S_{i,t})$	software asset (yen)	1283 (5.49)	0.242	0.112	0.315	0.400	0.068
			(0.020)***	(0.026)***	(0.095)**	(0.048)***	(0.023)**
$avetopix_t$	average of maximum	1289	0.0003	0.0001	0.0004	0.0004	0.0003
	and minimum of TOPIX		(0.0001)***	(0.0001)***	(0.0003)	(0.0004)	(0.0003)
constant			3.371	4.106	2.301	2.759	3.601
			(0.219)***	(0.359)***	(0.694)***	(0.646)***	(0.0001)***
Adjusted R^2			0.8575	0.8476	0.7886	0.6234	0.8203
Number of observations			407	407	72	101	234

* The estimated coefficient is statistically significant at the 10% level; **, significant at 5%; and ***, significant at 1%.

Table3 Estimation Results II

			Model (4)	Model (5)	Model (6)		
		Estimation method	Fixed Effect	Fixed Effect	OLS		
Variables	Description of variables	Mean value	Estimated	Estimated	Estimated Coefficient		
Dependent variable			Coefficient	Coefficient	(standard error)		
$R_{i,t}$	total revenue (yen)	64265	(standard error)	(standard error)	Large firms	Online brokers	Others
Independent variables							
$L_{i,t}$	number of employees	37922	76.23	79.53	50.38	9.29	14.27
			(7.78)***	(8.00)***	(9.74)***	(18.35)	(1.71)***
$S_{i,t}$	software asset (yen)	1283	2.141	1.98	4.10	10.85	0.79
			(0.701)**	(0.71)**	(1.59)**	(2.11)***	(0.59)
$avetopix_t$	average of maximum and minimum of TOPIX	1289	18.99	18.31	159.69	3.16	1.59
			(12.25)	(12.34)	(72.57)**	(6.50)	(1.40)
$edu_{i,t}$	expenses on education and training (yen)	103	61.09	77.08	154.74	39.01	1.57
			(21.10)**	(24.20)**	(41.45)***	(125.66)	(12.0)
$ad_{i,t}$	expenses on advertisement (yen)	638	17.36	19.37	8.21	0.074	3.76
			(4.95)***	(5.07)***	(11.28)	(7.95)	(2.07)*
$branch_{i,t}$	number of branches	25.3		-417.86	-1346.52	928.16	205.45
				(317.72)	(815.51)	(455.09)**	(43.36)***
$merger_{i,t}$	1 if after mergers and acquisitions, 0 otherwise	0.074		-18898	-73421	4855	1471
				(22476.22)	(55710)	(5474)	(2587)
constant			-98719	-91236	-230619	-6959	-2400
			(17955)***	(19895)***	(100892)**	(7948)	(1951)
Adjusted R^2			0.8844	0.8961	0.9108	0.7646	0.8340
Number of observations			331	331	61	39	231

* The estimated coefficient is statistically significant at the 10% level; **, significant at 5%; and ***, significant at 1%.

Model (3) (0.315, 0.400, and 0.056) implies that a 1% increase in software assets leads to 0.315%, 0.400%, and 0.056% increases in the total revenue for each group of securities firms..

Table 3 looks into more detail the factors of growth. In Model (4) and Model (5) it is found that education/training for employees and advertisement, in addition to employees and software, have made positive impacts on the revenues. In Model (6) the coefficients for the number of employees and education/training are highly significant for large securities firms. On the other hand, for online brokers, software makes strongly positive impacts on the revenues, while the number of employees is not much related to high revenues of online brokers. Another finding is that branches tend to raise revenues of the securities industry except large securities firms. Besides, whereas software asset is not much important for higher revenues of “other securities firms”, advertisement turned out to be effective to raise revenues.

7. Conclusion

This article investigated how much different corporate strategies have contributed to the growth performance of individual Japanese securities firms, with a special focus on IT systems. It is confirmed that software assets have made positive impacts on the revenues of the whole securities industry, but the effect differs for the three groups of securities firms: large securities firms, online brokers, and the others. The results imply

that IT system is important especially for online brokers. The main sources of high revenues of large securities firms seem to be both skilled employees who are given much training and education and the intensive investment in IT system. The desirable strategies for other securities firms may be either expanding branch networks or investing more in advertisement to improve their publicity, rather than extensive use of IT system. In order to survive and keep developing in the changeable financial market, the Japanese securities firms have to recognize their sources of competitiveness and concentrate their limited resources into the most effective measures. IT system is by no means an exception.

(2994 words)

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