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Introduction

The purpose of this paper is to focus on the investment behavior of firms in the major developed economies in order to shed light on what aspects of such behavior might be particular to Japanese corporate society. It has long been the case that aspects of the Japanese employment system viewed as particular to the country such as lifetime employment and seniority wages have received much attention from analysts. However, the behavior of Japanese firms with respect to the accumulation of capital—the latter being just as important as labor in the production process—is yet to receive sufficient analysis from an international comparative viewpoint.

In this paper micro data on the manufacturing industries of Japan, the US and France are analyzed in order to establish the characteristics, if any, of Japanese investment behavior. The attempt of the paper is closely related to the issues of the governance structures of the Japanese corporate sector, especially the role of Japan's unique 'main bank' system.

The paper is divided into two parts. In the first part, we ask whether those forms of corporate behavior that are said to be features of the Japanese economy, such as *yokonarabi* behavior and long-term perspective on the part of managers, are actually reflected in the data. While a number of difficulties are present in conducting an analysis along these lines, at least according to the methods adopted in this report there does not in fact seem to be any clear support for such hypotheses as *yokonarabi* behavior and long-sightedness in the data.

In the second part, panel data is used to fit an investment function to the data from each country, and differences in the estimated parameters between countries are used to infer the features of investment behavior specific to that economy. To our knowledge, this is the first attempt at such an analysis. Regarding the relationship between capital spending and fund raising, it is shown by the estimations that investment by Japanese firms is constrained to a large degree by cash flow. In addition, it is seen that in a comparison of sensitivity to economy-wide factors and firm specific factors regarding profitability, Japanese firms are relatively sensitive to macroeconomic factors of profits.

Ⅰ Empirical Studies of the 'Unique' Japanese Corporate System

1. The Literature on Japanese Corporate Behavior

From the point of view of economists, a firm is agent of production, using such inputs as capital and labor to transform in some way and hence add value to an input, which is purchased in one market and sold upon transformation in another. Of these two factors of production, it is usually labor—and employment practice in particular—that is singled out in discussions of the various features of corporate behavior that are hypothesized to be characteristic of Japanese firms. Of these 'unique' employment practices, the lifetime employment system and the seniority wage system stand out as having received most attention. However, these terms should not be taken too literally. For example, the existence of these systems does not necessarily imply that a given worker will always work from entry into the work force until retirement within the same firm, and the systems do not actually operate in every firm within the Japanese economy. Instead we can say that it's a commitment to the long term relationship where in general and barring unusually poor financial conditions a 'normal' employee (in terms of contract) will not face unilateral termination of his or her contract with the firm by which he or she is employed, and where the employee can expect increased salary and promotion at regular intervals in a way that is egalitarian but eventually aims at more accurate evaluation of individual productivity. A number of studies based on international comparison have found evidence of such a system at least for male workers in large corporations. For such workers it is seen that average length of employment is longest in Japan and that the wage profile over time exhibits considerable curvature. However, it is not necessarily the case that these systems are unique to Japan. For example, countries in continental Europe (and Germany in particular) tend to have employment traditions that are relatively close to those found in Japan.[1]

In addition, it is worth noting that these systems are not driven purely by tradition. Indeed, by guaranteeing long-term employment companies are promoting the accumulation of firm-specific human capital while gaining information on and

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1 A study using recent data to examine average employment length and the wage curve is that contained in the 1996 Economic White Paper.

providing incentives to workers through the process of long-term competition. In this way it is seen that these ‘traditions’ are rational from an economic perspective.[2]

As the above discussion makes clear, regarding labor there are a number of aspects of Japanese firm behavior that are in some sense characteristic of that economy’s corporate culture, although these characteristics are not always pervasive. This naturally raises the question of whether the same is true for that other major factor of production, capital. On this matter there is a relative shortage of research to date. In this paper our aim is to test empirically a number of hypotheses regarding characteristics of Japanese investment behavior in order to create a set of stylized facts describing the same.

It is possible to present cases for and against the likelihood of country-specific investment behavior. In economic theory a given vector of factor input costs will be associated with a (assuming strictly convex technology) certain combination of labor and capital according to the maximizing behavior of the firm. Thus, specific conditions and resulting behavior in the labor market would be expected to have a dual role in optimal capital accumulation decisions. On the other hand, capital, in contrast to labor, is highly mobile across borders. The latter will tend to make capital and investment behavior more homogenous internationally.

According to the work of Komiya (1993, in Japanese), large Japanese firms are not well described by the classical understanding of corporations as entities, which employ labor at the market wage and distribute the profits accruing from the use of that labor among the owners of capital. Rather, he suggests that they are better explained by the ‘worker management model,’ whereby firms attempt to maximize payments to core employees within the lifetime employment system using residual earnings after general outlays to factors of production. For such firms permanence and stable expansion have greater importance, implying a willingness to bear ‘growth costs’ such as capital spending and research & development in order to keep hold of even marginally talented staff. In response, Yoshikawa (1991, in Japanese) argues that the model of Atkinson (1973) implies worker management firms will chose lower growth paths than traditional firms (i.e. those which maximize the value of their stock),

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2 See, for example, Yashiro (1997, in Japanese) for a broad discussion of Japanese employment practices.

suggesting that the investment of the former type of firm will in fact generally be smaller than that of the latter.[3]

It is often pointed out that Japanese capital spending as a ratio to GDP has been high by international standards even in the so-called Stable Growth Period that has followed the first Oil Shock. However, the reasons why this has been the case are not entirely clear. Regarding the theory of investment behavior, We have seen the major development from the Jorgenson approach of viewing investment as a means of moving from the present capital stock to the optimal capital stock as determined by the relative price and technology parameters to the theory of Tobin's q which based on the ratio 'q', the ratio of the firm's stock market value to the resale value of the firms assets. However, while investment behavior has been estimated by fitting investment functions in each county based on Tobin's q theory, the explanatory power of these regressions is not always good and the data used in estimation and specification of function form differ among analysis. Overall, international comparisons of investment behavior based on this line of analysis are problematic in practice.

While there is a lack of theoretical analysis on the characteristics of Japanese firms, debate on this matter is often carried out by journalists and other such commentators. Examples of characteristics that have been hypothesized in mass media channels include the emphasis that Japanese firms are alleged to place on market share and *yokonarabi* behavior. In fact, questionnaires concerning the objectives of management conducted in Japan and the US often find that Japanese managers put more weight on market share than their American counterparts.[4] Journalists often depict Japanese firms as caught in a cycle where companies are simultaneously trying to raise their share of a given market by heavy capital spending, which in turn leads to excess production capacity, imbalance between supply and demand and hence a worsening of profitability.

Another supposed difference between Japanese and US firms that often comes up in public discussion is the relatively long time horizon over which decisions are said to be made by Japanese management. For example, Dertouzos et al. (1989) argued that

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3 In a dynamic model, Atkinson shows that when one takes the objective function of worker management firms to be the present discounted value of payments of the form described above a low rate of technological progress will lead to a situation where the subjective discount rate of the firm exceeds the market interest rate. Consequently, firms select a relatively low growth path.

4 Although it is slightly dated, see, for example, Dertouzos et al. (1989).

the international competitiveness of US firms in the 1980s was falling and proposed a number of explanations. One of these was that US corporations were subject to pressure from stockholders that led them to seek short-term rather than long-term profits, with the result that firms hesitate to undertake investments, which involve a heavy long-term financial burden and low short-term profits. Dertouzos et al. used various examples to illustrate this point. Among Japanese researchers too Yoshikawa (1991) and Komiya (1993), whom we have already had cause to mention, as well as other researchers such as Aoki, Koike and Nakatani (1986, in Japanese) have made either direct or indirect reference to the longer perspective of Japanese corporations. However, to date there has been very little empirical work on this idea of the difference in term of perspective between Japanese companies and US.

Another important topic concerning capital spending is means of fund raising. On this topic, however, a considerable amount of empirical research has already taken place. A number of options exist for fund raising that are open to private corporations, such as cash flow (internal funds), debt and equity finance. According to the Modigliani-Miller Theorem, in a perfectly frictionless world with complete financial markets, no transaction costs and no taxes the value of the firm is independent of the means of finance, which it adopts. In other words, in going about the objective of maximizing its own value the firm should decide the appropriate rate of capital spending, but not take into consideration the means with which this spending is to be financed.

However, it is readily seen that this rather counterintuitive conclusion breaks down when the assumptions of no taxes[5] or transaction costs are removed. In a world without transaction costs it is possible for an investor to be fully informed about all relevant aspects of potential borrowers without incurring and costs. In reality, it is not feasible for a lender to gain all such information, and what information is gained will be costly. In situations of asymmetric information such as this, the so-called agency problem arises between the lender (principal) and the borrower (agent).[6]

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5 If we remove the no tax assumption, while the interest payment for debt is subtracted from profit as cost but the dividend payment isn’t tax deductible. Thus, equity finance or internal finance results in heavier tax burden than the case of debt finance. Therefore, the debt finance is the cheapest method of finance in the world with corporate tax.

6 The agency problem refers to a situation that may arise when a principal entrusts through some form of contract an agent with the execution of a certain task from which the returns are to be shared between those two parties. Here it is possible that asymmetric information due to the

Let us consider first the case of raising of funds through issuing debt. Under the system of limited liability, holders of stock in the firm are able to gain large returns when high-risk-high-return investment pays off and at the same time receive the protection of limited liability when the investment does not succeed. For holders of debt, however, return is limited to the interest payments specified in the contract and losses may be large if the firm runs into difficulties. When the firm's creditors have insufficient control of the firm the company will generally chose relatively risky investments, thereby jeopardizing payments to the holders of debt. Given the presence of asymmetric information the control over the actions taken by a firm exercised by its creditors is necessarily limited, and in this situation the natural response of the holders of debt will be to include in the interest rate a premium to cover possible loss. Therefore, the cost of inside funds (cash flow) is low relative to debt.

Consider now the case of equity finance. Now the principal is the owner(s) of stock and the agent is the management of the company in question. Here the incentives of the management are of course not fully described by maximization of the stock market value of the firm. The managers may well wish to maximize various tangible and intangible benefits accruing to them that are not fully consistent with maximization of stock market value, including fringe benefits and prestige from expanding the size of the firm. Since the majority of investors adopt the balanced portfolio strategy in order to disperse risk it follows that they have even less incentive than creditors to incur costs for the purpose of monitoring against such unproductive expenditure in any one specific firm. Thus from the assumption of rational behavior we can reasonably anticipate that as a result of this lack of sufficient monitoring on the part of stock holders, managers are likely to make less that fully efficient spending decisions leading to an effective loss suffered by the former. Again this loss will be built into the value of stock, and will be incurred by the firm when new stock is issued. Hence, inside funds (cash flow) are effectively cheaper than equity finance too.

As we have seen in the discussion above, in a world of asymmetric information the cost of funds is lowest for cash flow, higher for debt and even higher for equity finance. In consequence, while firms that have ample cash flow for projects that are profitable at the cost of internal funds will be able to undertake all of these investments,

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inability of the principal to monitor perfectly the behavior of the agent leads to divergence of objectives, and as a result to the agent choosing actions that do not maximize the returns accruing to the principal.

firms which are constrained by a shortage of cash flow will be unable to make investments which would have been profitable if external funds could be raised at the same cost as internal funds as a result of the agency problem. Clearly the greater the agency cost the larger the number of otherwise profitable investment projects that cash flow constrained firms will be unable to undertake, and, in turn, the larger the deadweight loss to society. It has often been claimed that established practices within Japan's financial system, with its 'keiretsu' and 'main bank' relationships, have promoted the accumulation of information regarding borrowers and reduced costs of acquiring such information and therefore served to mitigate the inefficiencies generated by the agency problem.

Based on firm micro data, a number of empirical studies have been made of the Japanese financial system. Both Hoshi, Kashyap and Scharfstein (1991) and Okazaki and Horiuchi (1992, in Japanese) divided firms according to the presence or absence of main bank and keiretsu affiliation and found that upon regressing a Tobin's q type capital spending function with cash flow included as a dependent variable it could be observed that the effect of the cash flow restraint was weaker thus investment was generally stronger for firms with one or both of these affiliations. Also using firm micro data, Nakatani (1984) divided firms into those affiliated with bank keiretsu and those without such affiliation. It was shown that those firms with this affiliation had significantly lower but more stable profit, and higher debt-equity ratios than the other group. In addition, Hoshi, Kashyap and Scharfstein (1990) showed that firms affiliated with a main bank had significantly smaller losses when financial difficulties arose, with banks aiding those firms that ran into difficulties as a result of the inherent uncertainties of investing but in turn receiving on average higher interest payments during normal times and the privilege of sending their officials to take part in management of the firm in question. This is the 'risk-sharing hypothesis'.

2. Aggregations and Processing of the Company Level Data Sets

In this chapter we use micro data at the firm level to test empirically for the existence or otherwise of *yokonarabi* behavior and long-sighted decision-making within Japanese firms—both of which are hypothesized to be characteristic of Japanese corporate behavior. The data we adopt is financial data from firms in Japan, France and the US. The reason for including French firms in the data set along with those from Japan and the US is that France is an important representative of the European mainland economies.[7] In this way, it becomes possible for us to draw comparisons between the Japanese system, the Anglo-Saxon model of the UK and the US and the so-called Rhine model centered on the German economy.[8]

Data on Japanese firms was collected from the Development Bank of Japan data bank for firms listed on the Tokyo and regional stock exchanges. That on US firms is from the COMPUSTAT database of Standard & Poors, while that on French companies is from the Groupe DASFA database.[9]

The data set was limited to firms within the manufacturing sector. Of those there were 1,286 Japanese firms in a 1956—94 sample, 372 US firms in a 1980—94 sample and 289 French firms in a 1985—94 sample. In carrying out comparative analysis the data set was therefore restricted to the 1985—1994 period. In the case of Japan the number of firms is seen to be much larger that for the other two countries. However, in order to maintain homogeneity, it was decided that only the 400 largest firms would be included in the data set.[10]

Table 1 gives a comparison of the distributions of the major financial indices of the firms in the sample described above for the three different countries. The debt-equity ratio, which gives a good indication of the financial position of the firm, had an average of 223% for the Japanese sample, while those of the French and US samples

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7 It is certainly possible to consider using German rather than French data. The problem here is that many large German corporations are not listed, and as such firm financial data can be difficult to use. France can perhaps be seen as falling somewhere between the Rhine model and the Anglo-Saxon model.

8 The Rhine model is defined by Albert (1991), and refers to the type of capitalism characteristic of Germany, Switzerland, Northern Europe, and other such countries. According to Albert in these economies the links between firms and banks are strong, relationships between employers and employees are stable over the long-term and tend to be cooperative, the public sector is relatively large relative to other market economies, and emphasis is placed on social equality.

9 The Japanese data is from individual financial statements since these provide quite detailed information on the operations of individual firms. For US data we used the more common consolidated statements. For French data we would have preferred to use consolidated statements but due to availability used individual figures in the case where parent companies were the primary agents of operation and consolidated figures when parent firms were not actually involved in direct operation.

10 Specifically, the 400 largest firms in terms of gross assets as of the most recent data.

were lower at 180% and 165% respectively. Relative to the French and US samples it was found that the variance between the averages of different industries was large. In Japan, particularly high levels were recorded by petroleum (591%), nonferrous metals (414%) and iron & steel (340%).

Regarding the ratio of operating profits to current stock, a statistic that demonstrates corporate profitability, it is seen that the US rate averages a high 13.1%, far above the rates recorded in Japan (5.7%) and France (3.7%). The series covers a period when the US economy was generally strong and as such cyclical factors may in fact play a part in the relatively high rate. However, another interpretation is that the high rate is a reflection of the hypothesized tendency of US managers to focus on the maximization of return to holders of company stock.

In order to compare the relative size of companies in the three economies we look next at gross assets. To make a comparison possible the series are converted into dollars using the OECD purchasing parity rates. It is found that Japanese companies are about half the size of their US and French counterparts by this measure. The statistics may well be biased, however, by the exchange rate conversion and by the fact that Japanese statistics are calculated on an individual basis while the US and French figures are consolidated.

Finally, we consider the rate of revenue growth, a statistic that gives an indication of the capacity for industry expansion. The rate for Japan is the lowest at 3.5%, while those of the US and France are in double figures (14.8% and 11.6% respectively). One possible reason for the low Japanese rate includes the fact the much of the sample period is over the post-Bubble Economy recession. Another is that the rate of inflation has been low in Japan relative to the other two economies.

As has been shown in the preceding few paragraphs, the sample statistics show large differences between the large corporations of the three economies. Moreover, if we consider these statistics it is hard to avoid the impression that from a range of perspectives including profitability, capacity for expansion and financial position Japanese firms are as yet generally weaker than their overseas, and especially US, counterparts.

However, there are a number of reasons why we should avoid reading too much into the raw statistics. First, the value of assets within corporate financial data is the book value so that even if statistics such as the debt-equity ratio are calculated in the same manner the real values in an economic sense may be elusive. While previous researchers have attempted to overcome this problem by estimating market value for each type of asset, the authors of the present report were unable to obtain the necessary information to perform the estimation for all three countries, and as such it is the bookkeeping value that has been adopted. However, flow base figures must be adjusted for the differences in inflation rates between the three economies. Investment and GDP deflators have been used for these purposes.

Second, figures for the three countries are of course denominated in three different currencies. While the above-mentioned OECD purchasing power parity rates have been adopted on this occasion, these and the effective rates often diverge greatly (this has been particularly true of the yen/dollar rate), implying that the choice of rate will have a significant impact on the resulting figures.

Third, it is important to take fully into account the differences in accounting conventions between the three countries. The main differences in accounting procedures are summarized in Table 2. It is clearly the case that these differences in procedures are reflected in the final balance sheet figures. One aspect, which is closely related to the analysis carried out in this report, is the re-evaluation of tangible fixed assets. Evaluation of assets at market value, along with the presence of inflation implies that the value of assets tends to be larger then that is otherwise. In addition, regarding calculation of depreciation costs the straight-line method of calculation combined with growth in the total size of tangible fixed assets tends to overvalue the assets compared with that of diminishing balance depreciation method. Finally, rules regarding reserve funds also affect the level of profit recorded to some degree.

3. Degree of *Yokonarabi* behavior in Japanese Industry

It is often claimed in the mass media and by various other commentators that Japanese industry is particularly prone to so called *yokonarabi* behavior, with these claims being supported by various anecdotal evidence. However, the definition and theoretical implications of such behavior are yet to receive sufficient consideration. As such it is not surprising to find that there has been almost no empirical investigation of whether *yokonarabi* behavior is present in the capital spending decisions of firms.

Yokonarabi behavior can be considered irrational, such as that stemming from various past industrial policies, or as rational choice taking into consideration the objective of maintaining share and long-term profits within the context of an oligopolistic market. Miyagawa, Wakabayashi and Uchida (1996, in Japanese) adopt the latter view in an empirical analysis of the paper & pulp, cement, iron & steel, electronic parts and automobile industries. Estimating an equation taking capital spending as the dependent variable and including the cash flow and other such variables of other firms within the same industry as independent variables it was found that only paper & pulp showed evidence of *yokonarabi* behavior in the sense that these explanatory variables were significant.

While this study is interesting in the sense that it investigates the relationships of mutual dependence that bind firms within a given industry as they relate to capital spending, if *yokonarabi* behavior is thought to arise as a result of firms attempting to maintain market share by adjusting the size of capital spending to match that of other firms in the industry then the study becomes insufficient.

In this report we will attempt to estimate the extent of *yokonarabi* behavior by the direct approach of asking whether the firms in a given industry tend to have similar rates of capital spending at a given point in time. To be more specific, for each of the different industries in each year of the sample and for each country the variability of investment in cross-section is measured by the variation coefficient.[11] However, use of the raw capital spending figures would bias the figures because of the differences in size of the various firms. In this connection, capital spending has been standardized by making use of such size-related statistics as fixed tangible assets, gross assets and cash flow.

Results are given in Table 3. While the actual estimation has been carried out using cross section data from each year, since trends are generally similar from year to year the results have been pooled and the statistics show here are averages for the sample period. As can be seen clearly from the figure, regardless of the size related statistic chosen the results are roughly similar for the three economies. For example, looking at the variation coefficient based on fixed tangible assets standardization we find that

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11 The coefficient of fluctuation for a given sample is the standard error divided by the mean. The statistic provides a measure of variance that is independent of the sample size. It takes a value of zero if all observations in the sample are of identical value and increases with the amount of variation.

apart from food and electric machinery in France most industries within the three economies range from 0.5 to 0.7. In other words, the variance of investment between firms within the same industry is roughly similar for the three economies, and we are led to the conclusion that there is no clear evidence of *yokonarabi* behavior in any country or industry to be found using this approach to the data set.

The method of investigation used above gives us, of course, no absolute information on the degree of *yokonarabi* behavior. In this sense, it is difficult to rule out the possibility that Japanese firms tend towards this type of behavior based on the results that we have found so far. However, it is possible to say that the data does not appear to support the hypothesis that Japanese firms are particularly prone to *yokonarabi* behavior.

Unfortunately, long series of the type of financial data we are seeking are not available from the countries other than Japan, and as such international comparisons are limited to a recent 10-year sample. However, data for Japanese firms is available in each year from 1956, so that in this case we are able to apply the above methods to a rather longer series. Table 4 gives variability in cross section of the same type used above, with the period from 1956 to the recent past broken into four sub-periods. The figure shows that, if we take the all industries row as being representative of broader trends, as a general tendency the further back into the past we go the lower the relative variability of capital spending.

Looking now by industry it can be seen that for such materials processing industries as textiles, chemicals, petroleum, ceramics and iron & steel the trend of increasing variability over time holds true. For machinery related industries such as electric machinery, precision machinery and transport machinery, however, there is little trend over time in the series. In other words, for the machinery related industries the extent of *yokonarabi* behavior appears to be unchanged over time while decreasing in materials processing.

One possible explanation for the different trends observed in the materials processing, machinery related industry figures concerns market conditions, and the extent of competition in particular. On one hand, the machinery related industries have faced various forms of international competition in each period. In the High Growth Period, there was import competition from American and European manufacturers and the market for such products continued to internationalize in the 1980s. In years that are more recent, these industries have faced strong competition in the form of goods exported from other East Asian economies. As such these firms have faced little change in basic market conditions. On the other hand, materials processing industries were generally in a state of oligopoly during the High Growth Period but were later forced to adapt to more international and hence competitive markets as a result of increasing import penetration and demand from other Asian countries. It may be supposed that the change in market conditions had the effect of lessening *yokonarabi* behavior over time as was observed in the series.

In addition, during the High Growth Period the investment behavior of many Japanese firms was shaped in part by administrative guidance as one aspect of the comprehensive industrial policies that were in place. One of the effects of this constraint on investment behavior may have been to cause certain similarities in firm investment decisions. Researchers are divided as to what extent these measures on the part of the Japanese government were actually enforced or effective, but certainly there has been a history of intervention in the investment decisions of such materials processing industries as iron & steel, aluminum refining, textiles, shipping and petroleum. Clearly, there is some possibility that the investment behavior of firms within these industries was influenced by government policy.

The motivations that cause firms to act in collusive ways are not yet clearly established. However, if government policies and oligopolistic market structure contribute to the *yokonarabi* behavior of large firms then it might be expected that a similar analysis that used only large firms in the sample would show stronger evidence of *yokonarabi* behavior. In this connection, estimation has been made using data from only the largest firms within chemicals, iron & steel, electricity, shipping and automobiles (5 to 10 firms per industry). The results of the estimation are given in Table 5. In general, the statistic is seen to be lower than was the case in Table 4. In addition, for chemicals, iron & steel and automobiles it is observed that variability is increasing over time.

In summary of our results on *yokonarabi* behavior as seen in the capital spending decisions of firms, while in the High Growth Period a relatively strong tendency towards *yokonarabi* behavior was observed, with that tendency being strongest in materials processing, if we look at the cross country data of the last 10 years it is seen that *yokonarabi* behavior has lessened over time and is now comparable to the situation found in France and the US. While the causes of *yokonarabi* behavior are as yet not entirely clear, two possibilities are strategic behavior aimed at maintaining market share and other such concerns and industrial policy, although the latter is of less importance in modern day Japan. That these two causes are of some importance is suggested by the fact that *yokonarabi* behavior tends to be strongest among the largest firms.

4. The Term Perspective of Japanese Management

During the latter half of the 1980s in particular it was often claimed that while Japanese management took a long-term perspective and made capital spending decisions with a view to long-term results, US managers were overly concerned with the present value of the firm's shares and as such were reluctant to carry out investment, which would reduce short-term profits. However, it would appear that a stock market value would reflect long-term as well as short-term profits. If the market is rational it is not likely to consistently require the sacrifice of long-term for short-term profits, and as such it is far from clear why US management would become shortsighted as a result of pressure from the stock market. In 1989 Stein (1989) showed in a noncooperative game including managers on one hand and stockholders on another that even with the assumption of an efficient market there was no stable Nash Equilibrium and as a result that incentives exist for managers to pursue short-term as opposed to long-term profits. However, the result is shown to hold in a finitely repeated game and it is not clear whether the findings will withstand generalization to an infinite dimensional problem.

On the empirical side relatively little research on time horizons has been conducted as of yet, partly as a result of the difficulty of formalizing the problem. For example, suppose the subjective discount rate, which a given firm uses to calculate present discounted profits, is large. In this case the firm will have a relatively strong preference for present over future cash flow and will be observed to behave in a 'short-sighted' manner. However, it is not possible for the econometrician to observe the discount rate.[12]

In this report, our approach will be to draw inference from the actual investment behavior of firms. The intuition for the method that we adopt is as follows. If a firm has a long time horizon then it may be expected that the firm will make

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12 Suzuki and Takenaka (1982, in Japanese) estimated the discount rates of investors using an Abel type investment function and found that the value for Japanese investors was lower than that for US investors.

investment decisions in accordance with its perception of the underlying growth potential of the economy. On the other hand, if the firm makes decisions with an eye only to short-term profitability then it may be expected that the firm will react to short-term fluctuations in business conditions by varying capital spending. If this is the case and if the potential rate of economic growth is less volatile than the actual rate then theoretically it is true that relatively high variance in the capital spending of a given firm will generally imply *ceteris paribus* a relatively short time horizon. Based on the argument we have calculated the variation coefficient for each firm in the 10-year series in order to analyze the extent of variability of capital spending for each company. However it should be noted that the extent of business cycle fluctuation has not been the same for all three countries during the sample period, and, since capital spending by firms in economies that have experienced greater volatility will reflect this difference, the figures will be biased across countries. In order to address the bias the variation coefficient for each firm has been deflated by that of the total value added of the industry to which the firm belongs within the country to which the firm belongs.

Table 6 gives the distribution of the index of firm capital spending stability within that industry. A small value for the index implies that the firm has carried out capital spending relatively independent of current business conditions, and as such the firm may be though of as having a relatively long time horizon. The values given in the figure are the share of firms in a given class of stability when total firms in the industry are set at 100. Values in the far right column are the average of the index for each industry. Looking at the average for manufacturing it is found that Japan has the lowest at 4.98, with the US larger (7.35) and France larger still (10.00).

These results appear to show that Japanese firms have relatively long time horizons. However, it should be noted that the sample period is one of boom and bust in Japan, and that the coefficients for total value added are large as a result. Hence, deflation by these coefficients does bring down the Japanese figures considerably, although the variation in capital spending is large. Overall, it is difficult to conclude that Japanese managers have the longest time horizons of the three countries. Furthermore, if we look at a lower level of aggregation, it is seen that while there are a few industries such as food where the differences in the figures are large, in electric machinery and a number of other industries there is very little difference, a fact that further weakens an conclusion claiming that there is considerable difference in time horizons between US and Japanese managers. Regarding France the volatility of the value added series is rather low in comparison to that of the other two countries and the index is large, suggesting that there may in fact be a preponderance of somewhat shortsighted firms within that economy.

What should be kept in mind, however, is that investment spending by firms is not entirely determined by demand conditions. Rather there is influence from such supply side factors as substitution away from or towards intermediate goods and labor input, and as such the results found above are not sufficient to allow us to make a clear judgment about time horizons of managers. In summary, we suggest that the results should be interpreted as failing to show strong evidence that Japanese firms have considerably longer time horizons than US managers.

Ⅱ International Comparison Based on the Results of the Capital Spending Function Estimation

1. Estimation of the Capital Spending Function

In the previous part firm level data related to capital spending was used for a number of estimations aiming to determine whether certain hypothesized features of Japanese corporate behavior were reflected in capital spending. However, capital spending is determined by a range of variables and the data on capital spending used in the previous chapter alone may be insufficient for analytical purposes.

In this part, we identify a number of likely variables and fit the resulting capital spending function to the data. In this way we hope to make clear the nature of capital spending behavior while using the results from the US and French data to provide reference. The data used in this chapter is company level data drawn from the same sources in the same three countries. Although analysis of capital spending by fitting investment functions using company level micro data has become popular in recent years, these papers are confined to firms in one country[13] and tend to adopt various methods of estimation, so that international comparison based on the existing literature is problematic.

The significance of the empirical work conducted in this paper is that the same capital spending function is fitted to the micro data of the three countries (i.e. Japan, France and the US) so that the resulting parameter estimates can be used to draw out characteristics of investment behavior that may be specific to one or more of the countries in the sample.[14] In order for such an international comparison to provide a useful basis of analysis, much care must be taken in specifying the capital spending function.

In this paper, our starting point for specification is Tobin's q. In addition, we consider variables pertaining to fundraising and financial position. As is well known, capital spending theory based on Tobin's q—here q is the ratio of stock market value to capital

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13 Regarding Japan see Hoshi, Kashyap and Scharfstein (1991), Okazaki and Horiuchi (1992, in Japanese), Asako, Kuninori, Inoue and Murase (1991, in Japanese), Hanazaki and Hachisuka (1994, in Japanese), etc. Regarding the US, see, for example, Fazzari, Hubbard and Petersen (1988) and Schaller (1990). Regarding the UK, see, for example, Blundell, Bond, Devereux and Schiantarelli (1992).

14 Although the area of interest is different from that of the present research, a pioneering paper on international capital spending comparisons using micro data is provided by Cummins, Hassett and Hubbard (1995). The paper uses balance sheet data from 14 different countries to investigate the influence of tax reform on capital spending.

stock resale value—is a useful and generally applicable argument that covers as special cases such work as that of Jorgenson's neoclassical theory. However, while the theory itself is elegant the estimation of capital spending functions based on Tobin's q is not a straightforward matter. The reason is that this approach requires current as opposed to book values of balance sheet items, while in practice actual balance sheet entries are book values as is seen clearly in the case of Japan. For the firms in three different countries in our sample, it is in practice more-or-less impossible to find current values for the purpose of estimation of Tobin's q.[15]

Taking the above into consideration it has been our approach to estimate q not from the balance sheet items but rather to use the fact that q is also found as the ratio of the marginal product of capital to the cost of capital as a result of the maximizing behavior of the firm[16]. Using this measure, we investigate to what extent capital spending is sensitive to this ratio. In other words, if return to asset (ROA) is used as a proxy for marginal productivity of the same and if the interest rate (R) is taken as the cost of capital,[17] then we investigate the nature of the following equation.

(1) $I = f(ROA, R)$

To this basic Tobin's q type model we include consideration of various aspects of fund raising and other financial incentives and constraints. That is to say, that the traditional Modigliani-Miller approach, whereby capital spending and fund raising is shown independent on the assumption of perfect financial and capital markets, is not the approach adopted in this report. Rather incompleteness of markets and asymmetric information are recognized as causing nontrivial distortions in outcomes that lead to failure of the Modigliani-Miller theorem and the capital spending decision is largely affected by the fund raising and financial position of the firm. By including variables related to those factors in the model to be estimated it becomes possible to derive certain implications about the functions of the different financial markets themselves.

By adding additional explanatory variables to Equation (1), then, we get the model to be estimated in this report

(2) $I_{it} = f(ROA_{it}, R_{it}, CASH_{it}, DEBT_{it}, K_{it})$

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15 For individual companies within Japan, Tobin's q has been estimated by Asako, Kuninori, Inoue and Murase (1989, in Japanese), and Hayashi and Inoue (1990).

16 For example, Suzuki and Takenaka(1982 in Japanese) and Suzuki and Otaki(1984 in Japanese) estimated Tobin's q as a ratio of the return on asset to the cost of capital

17 Here marginal return on asset is approximated by average return on asset and, regarding the cost of capital, taxes and depreciation expenses are ignored.

Here I [investment] is net increase in tangible fixed assets + depreciation expenses,

ROA [return on asset] is (operating profit / average tangible fixed assets calculated from average of start and end of period figures)×100,

R [interest rate] is (interest payments / average interest-bearing liabilities calculated from average of start and end of period figures)×100,

CASH [cash flow] is net profit/loss after tax - dividends - director's bonus + depreciation expenses,

DEBT [debt-equity ratio] is (debt / net worth)×100, and

K [capital] is a tangible fixed asset at start of period.

Investment, operating profits, cash flow and interest rate are converted into real terms by, respectively, the investment deflator, the GDP deflator, the GDP deflator again and the wholesale or producer's price index of each industry. The first subscript is the cross sectional dimension of the panel and the second is the time series dimension.

The theory behind Equation (2) is as follows. Return on asset and the interest rate are from Tobin's q theory, while cash flow and debt-equity ratio are related to fund raising and funding composition aspects. Regarding cash flow, while a more detailed discussion is given below we can expect that since the cost of cash flow as an inside fund is lower than the cost of outside funds, an increase in cash flow will encourage investment, ceteris paribus. On the other hand, an increase in the debt-equity ratio will give the impression of increasing risk, and as such access to funds will decline and this will, in turn, tend to weaken capital spending. As for the capital stock, this is included as an explanatory variable because of the perceived need of firms to renew existing capital stock. An alternative explanation is that large firms tend to have relatively large amount of capital spending. Here capital stock is a proxy for the size of the firm.

In summary, then, the a priori expectations for the signs are as follows.

$$(3) \quad \frac{\partial I}{\partial ROA} > 0, \quad \frac{\partial I}{\partial R} < 0, \quad \frac{\partial I}{\partial CASH} > 0, \quad \frac{\partial I}{\partial DEBT} < 0, \quad \frac{\partial I}{\partial K} > 0$$

As is clear from Equation (2), the data is a pooled two-dimensional data set (i.e. a panel) in the sense that there is a time series dimension and a cross section dimension. In this report, we adopt the Variance Components model approach to estimation.

2. Results of the Estimation

The specification of (2) we have used is linear in the log of all variables except those expressed in rates:

(4) $\ln I_{it} = a_i + b\ ROA_{it} + c\ R_{it} + d \ln CASH_{it} + e\ DEBT_{it}\ f \ln K_{it}$

Our interest in running this regression is to compare estimated coefficient values for the three countries in the sample (i.e. Japan, France and the US). In the first case regression was run for all manufacturing industries, and in the second case regressions were run for each industry separately. In each case, the data was pooled across the three economies. In order to draw the cross country comparisons with the pooled data set dummy variables were used to indicate the country, which generated the data.

Consider, for example, the following generic regression model with one explanatory variable and two different sources of data.

$$Y_1 = a + b_1X_1 + u_1 \quad \text{(group 1)}$$
$$Y_2 = a + b_2X_2 + u_2 \quad \text{(group 2)}$$

Now define a dummy variable D such that the dummy takes on a value of zero for data generated by the first group and a value of one for data generated by the second group and consider the following equation.

(5) $Y = a + b_1X + (b_2 - b_1)\ DX + u$

The coefficient of DX is the estimated difference between the parameter belonging to the first group and that of the second group.[18]

In our case, a dummy for Japanese data takes a value of one for data generated by Japanese firms and a value of zero otherwise. A French dummy is defined similarly. We estimated the difference in each coefficient among three countries by adding Japan and France dummies in each explanatory variable. The results of the regression of Equation (4) with these dummies are shown in Table 7. The US coefficients shown in the figure are estimated actual coefficient values, while those for Japan and France are the difference between estimated actual values for that country and estimated US coefficients. We shall call these the (estimated) shift coefficients.

Looking at the adjusted R^2, a statistic that gives a general measure of the explanatory power of the regression, we find that the value ranged from a low of 0.80 in nonferrous metals to a high of 0.95 in petroleum. Overall, the statistic was distributed closely around the 0.9 levels. This is a reasonable level for panel data estimation.

18 It is necessary to assume here that the error term follows the same distribution in the data generated by the two groups.

Considering now the values taken by the estimated coefficients of the various explanatory variables, return on asset was seen in the US to be positive and significantly different from zero in all industries but textiles, chemicals and precision machinery. The negative signs of most of the estimated shift coefficients of the same in Japan and France indicate that the estimated actual coefficients are lower in those two countries than in the US. These shift coefficients were significant in 8 out of the 15 industries in Japan and 11 out of the 15 (actually out of 14 because the French nonferrous metals sample is empty) in France.[19]

While return on asset tended to be highly significant as an explanatory variable, this was not generally the case for interest costs paid by each corporation. In the US, this latter variable was significant only in paper & pulp, chemicals, petroleum, nonferrous metals and transport machinery. Moreover, in nonferrous metals and transport machinery the sign of the coefficients were positive, contradicting a priori sign expectations. Similarly, in Japan and France few industries showed highly significant (shift) coefficients for interest payments.

Regarding cash flow, in the majority of cases, the sign was positive as expected and the coefficient was significantly different from zero. The coefficient was positive in all US industries and significant in all except iron & steel, nonferrous metals and metallic products. In Japan, the coefficient was significant in 11 industries, while in France the figure was seven. Comparing the size of the coefficient between the three countries, in many industries that of Japan was the largest, followed in order by France and the US. The elasticity of capital spending for all industries with respect to cash flow was 0.29 in the US, 0.35 in France and 0.56 in Japan.

Looking now at the coefficient of the debt-equity ratio, as was the case with interest payments the number of industries within which this explanatory variable was highly significant was rather small. In the US, the coefficient was negative and significant as would be expected from the theory only in manufacturing as a whole, in food and in electric machinery. Looking at the shift coefficients in France and Japan it is seen that the coefficient was significant only in a few cases and the sign was often wrong.

Lastly, let us observe estimated coefficients for the capital stock. It turns out that the capital stock has very strong explanatory power. In the case of the US, all industries have positive and significant coefficients. The shift coefficients in France and Japan

19 Here the manufacturing sector as a whole, which is calculated by adding the different industrial groups together, is counted in the total even though it may perhaps be inappropriate to treat along with the other industries.

are generally negative and significant, implying greater sensitivity to this variable within US industry.

In summary of the overall trends we have uncovered in the above discussion, in all three countries the capital spending decisions of firms are generally sensitive to return on asset, cash flow and the size of existing capital stock, while on the other hand the interest rate and debt-equity ratio were found to be unimportant in terms of explanatory power. In the remainder of this paper the results from the above regression are extended in a number of ways in order to clarify the various characteristics of capital spending and firm behavior in these three economies and draw out implications for their economic structure.

3. Cash Flow and Capital Spending

Were it the case that internal funds (i.e. cash flow) and funds raised externally to the firm had the same cost then fund raising and the optimal amount of capital spending would be independent. However, as soon as we accept the existence of the agency problem we are forced to conclude that the cost of finance from cash flow and the cost of that from external sources differ, and that the amount of cash flow, the relative price of which is low, will influence the optimal amount of capital spending.

As was discussed in the previous part, according to the agency approach of industrial organization, for a range of reasons there is a tendency for the information available to the agent and the principle to be asymmetric, a situation which provides incentives for moral hazard type behavior on the part of the agent and leads to the emergence of agency costs. Jensen and Meckling (1976) define agency costs to be the sum of the following three individual costs.

a. The costs of monitoring in order to prevent adverse behavior on the part of the agent due to moral hazard.

b. Premium to guarantee that the agent will not take actions that would adversely affect the welfare of the principal.

c. Cost related to the divergence between the optimal policies of the agent and the principal.

Agency relationships of the above nature can be found in the relationship between stockholders (principal) and managers (agent) or between managers (principal) and workers (agent). In the case of corporate finance, however, the relationships with which we are concerned can be summarized as those between external suppliers of funds (principal) and the firm (agent).

Suppliers of funds such as banks, buyers of corporate debt and holders of new stock issues react to imperfect and asymmetric information in financial markets by making use of a range of monitoring devices and by including a premium on top of the (imputed) interest rate in line with perceived risk. Therefore, to the extent that agency cost is included in the cost of external funds and passed along to the corporation, the amount of cash flow will come to have important bearing on the investment decision of firms.

To sum up this relationship between capital spending and fund raising from a slightly different perspective, when seeking to fund a given investment the company will react to the presence of the agency cost by funding as much as possible by internal funds. However, if internal funds are insufficient to meet spending plans the remainder will be funded from external sources, beginning with the cheapest source of external funds. This process simply reflects rational choice on the part of the firm.

This so-called financing hierarchy[20] is shown graphically in Figure 1. If we assume that the firm has a choice of three different sources of funding, namely cash flow, bank lending and equity finance (issue of new stock), finance will proceed from cash flow to bank lending and then to equity finance as a result of the existence of agency costs.[21] While in the figure optimal investment is at I_1, in the case where cash flow is very plentiful it might be the case that investment would increase out to I_2.

In this way the agency problem leads to a failure of the Modigliani-Miller theorem and the capital spending decisions of firms becomes intimately related to fund raising. Indeed, as was seen in Table 7, cash flow is significant and positive in the capital spending function and these results are suggestive of an important role for fund raising issues in investment decisions. In other words, the table shows that in each country in the sample cash flow serves as a constraining factor in spending decisions.

Next, we note that, as was mentioned above, the coefficient of cash flow was generally largest for Japanese industries, followed by those of France and then the US. These results suggest that the internal funds constraint is most binding in Japan and weakest in the US. How, then, should we interpret these results?

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20 See Fazzari, Hubbard and Petersen (1988), Oba and Horiuchi (1990, in Japanese), or Noma, Hanaeda, and Yonezawa (1992 in Japanese), for example.

21 We wish to stress, however, that the order shown in the figure of the financing hierarchy is just an example, and that it is not possible to give a set order of funding cost for such alternative sources as bank lending, bonds, equity finance through sale of new stock, etc.

As was discussed above, the reason cash flow acts to constrain investment is that external funds are relatively expensive because of agency costs. From this interpretation it follows that we must recognize the importance of monitoring of firms that attempts to mitigate imperfect and asymmetric information and, in turn, lessens the impact of the agency problem. As has been emphasized out by Aoki (1994), monitoring proceeds in three stages from evaluation of the project to monitoring the use of funds and finally to various measures in the event that the firm should run into financial difficulties. The principal who carries out these monitoring activities will be influenced by the various characteristics of the financial market in the country in which it is operating.

Figure 2 gives some indication of external fund raising by the non-financial sector in the three countries under consideration. In Japan it is seen that lending from banks is the most important method of raising money, while in the US a greater share of fund raising is through corporate bonds than is the case in the other two countries. In France the main fund raising method is equity finance. In other words, Japanese firms are relatively dependent on banks for the supply of their funding needs, while in France and the US the capital market is relatively important.

In the face of these differences in corporate financing systems between different countries, let us consider how monitoring is carried out by the various principals. In Japan, it is generally the case that the main bank conducts all three stages of monitoring. In other words, the conventional view points out that the main bank system plays an essential role as one of the most important components of the corporate governance structure in Japan. In the US, on the other hand, the monitoring function is dispersed between a range of organizations, including investment banks, bond rating agencies and venture capital. Lastly, monitoring in France is carried out around the central role played by the savings and commercial banks within the universal banking system.[22]

In discussions of monitoring by creditors in different countries the Japanese main bank system is often held to be effective in tracking the activities of agents. A well-known example is the research of Hoshi, Kashyap and Scharfstein (1991). Here Japanese firms are divided into two groups, those belonging to keiretsu with strong affiliations with a given bank and those firms not belonging to keiretsu and with only weak affiliations with banks. For both groups, a separate estimation of the extent to which

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22 As is seen in Germany, under universal banking, direct lending tends to play a dominant role in financing investment, with corporate bonds and equity finance rather weak. However, steady deregulation in France during the latter half of the 1980s and, in addition, the French ‘Big Bang’ of 1988 has led to a strengthening of the securities markets. As is seen in Figure 2, equity finance, once rather unimportant, has in recent years become a major source of funds.

cash flow acts as a constraint on investment was carried out. The results showed that capital spending by firms within keiretsu was less sensitive to cash flow than was the case for independent firms. The authors argued that these results implied that the traditional main bank and keiretsu financial system was effective in mitigating imperfect and asymmetric information, and, moreover, that the lack of such a system in the US could be contributing to the degree to which firms in that economy are constrained by cash flow.

In contrast, by using a similar firm level data set and the same function for estimation across countries, this report has found results contrary to those of Hoshi, Kashyap and Scharfstein (1991), specifically that the cash flow constraint is strongest in Japan. In other words, this paper suggests that the monitoring system of main banks in Japan may not in fact be as effective as has been previously thought. At the same time, however, the following two points need to be kept in mind.

First, the sample period used in our estimation is one where the monitoring function of main banks is thought to have weakened in Japan. The sample adopted in the present study, which is from FY1980 to FY1994, not only includes large fluctuations in business conditions with the Bubble Economy and subsequent collapse, but also financial deregulation and internationalization of the economic structure and an accompanying shift in the fund raising practices of large corporations away from banks and towards bonds and stocks. At the same time, banks reacted to these changes by investing in land and other secured loans. Overall, the ability of banks to monitor companies appears to have declined sharply during these years.

Second, as was observed in Table 1, there are slight differences in the samples for the three different countries. For example, comparing the balance sheet positions of firms by focusing on the debt-equity ratio as an average for pooled data in each country we found that while the ratios were 165% and 180% in the US and France respectively, in Japan the figure was 223%. As is clear from the Modigliani-Miller theorem, highly levered firms will have high financial risk and a high standard error on return per share. Now the figures indicate that Japanese firms are, as a whole, more highly levered and hence more risky than their US and French counterparts.[23] With this in mind, it can be argued that the relative strength of the cash flow constraint is a result of the high-risk nature of the Japanese firms in the sample.

In summary, then, the differences in economic conditions and structure in different countries make it difficult to draw a simple conclusion on the relative strengths of cash flow constraints in the sample countries. Never-the-less, our findings make it difficult

23 For simplicity, we are assuming here that business risk is more-or-less the same in the three economies.

to take as given the argument that the Japanese external financing system centered on main banks is more effective in mitigating agency costs than is the US (or French) system centered as it is on capital markets such as those for bonds and stocks.

4. Capital Spending by High Risk Firms

In general, risk faced by holders of corporate stock comprises of financial risk and business risk. In this section, however, our interest will be in financial risk and, in particular, how the capital spending decisions of firms are affected by the amount of financial risk to which they are subject. In order to carry out this analysis firms will be divided into a high-risk group and an 'otherwise' group. Although there is no generally accepted definition of what comprises a high-risk firm, for the purposes of this report high-risk firms will be classified as those with debt-equity ratio of equal to or higher than 300%.[24]

In contrast to the method of estimation adopted in the previous section where data for each industry was pooled across countries, in this section the estimation is carried out within each country. A dummy variable is defined to take the value of unity for firms with debt-equity ratio of 300% or more and zero otherwise and included in the regression in order to observe the differences in coefficients for the two groups of firms.

In Table 8 the results of the estimation are displayed. The table gives the actual coefficients for firms with a debt-equity ratio of less than 300% and the 'shift' value of the coefficients for the high-risk firms that are the difference in the value of the coefficients for the two groups. At a very general level it is seen in the table that for all countries the number of times that the shift coefficients have shown up as significantly different from zero is about one quarter, implying that there is not a great deal of difference between the capital spending decisions of high risk firms and those of other firms. Indeed, for France and the US the number of industries where the shift coefficients are significant for all variables (excluding debt-equity ratio) is less than three.

For Japan's 15 industries significant shift coefficients implying differences in investment behavior between the two groups are found in 8 industries for capital stock, in 7 industries for cash flow and debt-equity ratio, and in 6 industries for return on asset.

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24 In reality some firms have a ratio that is above 300% in some periods and below in others. These firms are classified into one of the two categories depending on the figure in the given period. The share of high-risk firms so defined in the total is 8.7% in the US, 13.2% in France and 18.2% in Japan.

The direction of the shift for high-risk firms is positive for capital stock and return on asset and negative for cash flow and debt-equity ratio.

Regarding the debt-equity ratio coefficient in particular, for the under 300% group in all three countries most industries recorded positive values despite a priori expectation of a negative sign. In other words, for companies with a low ratio a marginal increase in leverage is not recognized as an increase in risk, implying that capital spending is not negatively affected. For firms where the ratio is over 300%, on the other hand, a significant negative shift coefficient is found in seven Japanese industries, five US industries and four French industries. In addition, if we calculate the actual coefficients for these industries (as opposed to the shift coefficients) the value is found to be consistent with theory, i.e. negative, in all 5 US industries, all 4 French industries and 3 of the 7 Japanese industries. It appears that for high-risk firms that a marginal increase in leverage does in fact act to restrain investment.

Focusing on the cash flow coefficients for Japanese firms, for firms with a debt-equity ratio of under 300% it is found that the estimated coefficients are, for all industries barring petroleum, positive and highly significant, implying that cash flow is an important constraining factor in investment decisions. On the other hand, for high-risk firms as we have defined them, the value of the coefficient is lower for seven of the industries. In other words, high-risk firms seem to be less constrained by cash flow than the other group. Incidentally, this effect of a lessening of the cash flow constraint for high-risk firms did not appear in the French sample at all and appeared for only three of the industries in the US. Thus, it seems that this phenomenon is rather particular to Japan.

The weakening of the cash flow constraint for high-risk enterprises can be explained in terms of the monitoring function of main banks. Highly leveraged firms will tend to have relatively lower cash flow than other firms because of high interest payments and other such factors. Main banks tend to give such firms special attention in terms of monitoring, and by improving the firms' creditworthiness help indirectly to lessen the impact of the cash flow constraint. In the last section we demonstrated that it was not necessarily the case that the Japanese financial system centered on main banks is more effective than the French or US systems centered around the capital market in mitigating the constraint that lack of cash flow places on capital spending. However, the results of this section suggest that when we differentiate firms in terms of leverage we find that for some types of firms, namely high-risk firms, main bank monitoring is in fact effective in mitigating the constraint.

5. Responsiveness to Economy-Wide and Firm Specific Factors

As was explained above, the basic capital spending function used in this report as seen in Equation (2) is based on Tobin's q approach with additional consideration of fund raising and balance sheet issues. The theory behind Tobin's q is that holders of stock will make rational appraisal of the return to investment and its present discounted value. Thus, the rate of return on asset used in the model can be thought of as representing expected future returns.

However, the return on asset data used in this report is simply actual return per unit of capital in the period in which the investment is carried out. It follows that the approach we have taken models expectations as static, i.e. that present return on asset is thought of as reflecting return in the next period.

However, when treating expected return on asset in a formal model a number of alternative approaches are available. In this section, we will adopt one of these alternative methods in order to look at characteristics of capital spending in the same three countries from a different perspective. Specifically, in this section we will use, in addition to the same return on asset variable used to date, proxy return on asset in the form of rate of growth of economy-wide value added and average return on asset in the industry to which the firm belongs.

Regarding the rate of growth in gross domestic product, this variable is of course one of the most immediate indicators of the average state of domestic economic activity, and as such plays a primary role in the formation of business plans by corporate managers. On the other hand, return on asset is a vital micro level indicator of the business conditions facing a given firm. Average return on asset for a given industry is in a sense somewhere between these two indicators in terms of level of aggregation and serves to indicate the state of the business environment for that industry.

Using these three variables we intend to investigate whether the capital spending decisions of firms in the sample tend to be sensitive to economy-wide (macroeconomic) shocks, to industry-wide (semi-macroeconomic) shocks or to firm level (idiosyncratic) shocks.

Table 9 gives the result of estimation including two of the above three variables, namely return on asset of the individual firm and national growth rate, in the same regression. The other explanatory variables are, as was the case in Tables 7 and 8, interest rate, cash flow, debt-equity ratio and capital stock. The regression was run separately for each of the three different countries in the sample. Table 9 gives coefficients for only firm level return on asset and economic growth rate.[25]

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25 Because the explanatory variables are largely independent the overall fit of the regression and behavior of the other variables in the regression recorded in Table 9 are much as in Tables 7 and 8.

The table shows large differences in the patterns of sensitivity of capital spending between countries. Looking at the results from the US sample first, while return on asset for the individual firm has a coefficient sign consistent with the theory (i.e. positive) and highly significant in all industries except textiles, that of macroeconomic growth rate is significant and positive only for ‘other manufacturing’. In contrast, in Japan the individual return on asset variable is significant and positive only for three industries while the macroeconomic growth rate is highly significant for 11 out of the 15. In France, capital spending does not appear to be particularly responsive to either of these two variables.

Table 10 gives the results of estimation that is the same as that of Table 9 apart from the addition of the industry average return on asset variable. Counting the number of industries where a priori expectations regarding the sign (i.e. positive) and significance of the coefficient are satisfied, we find that in the US for individual firm return on asset there are 12 industries, for average industry return on asset there are 5 and for the economy-wide growth rate there is 1. In Japan, on the other hand, the corresponding figures are 2, 4 and 10. In France, very few coefficients come up positive and significant regardless of the level.[26]

Summarizing the differences we have found in capital spending behavior of US and Japanese firms in Tables 9 and 10, there is a remarkable contrast in the level of economic activity to which capital spending responds, with US firms responding to firm level shocks while Japanese firms tend to pay more attention to economy-wide shocks. The fact that Japanese managers are more responsive to macro-level shocks implies that firm behavior will exhibit similarities. These similarities may be interpreted as *yokonarabi* behavior by commentators.

In addition, this responsiveness of capital spending to economy-wide shocks on the part of firms has important implications for the business cycle. In particular, in times of boom, investment will tend to increase further and in times of recession, capital spending will tend to fall further. In other words, this aspect of investment behavior will have the effect of amplifying business activity fluctuations. In fact, this has been the case in the boom and bust of the late 1980s and early 1990s, a period that witnessed a surge followed by abrupt decline in capital spending that has hindered the subsequent return to growth.

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26 On this point (i.e. the low explanatory power of return on asset in French firms’ capital spending decisions) an explanation that has been offered is that an artificially high interest rate has been used to protect the French currency and therefore investment spending is not responsive to return on asset. However, economists recognize the lack of sensitivity as a puzzle now.

The differences in responsiveness of capital spending to return on asset between Japan and the US indicate that for the government bodies responsible for smoothing the business cycle may well need to adopt methods specific to their own economies. The results also suggest that on the question of differences in capital spending decision making between the two countries that there is room for re-evaluation in the light of the findings here.

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Table 1 Distribution of Major Financial Ratios
(1)JAPAN

Debt-Equity Ratio (%)

	less than 50	50-100	100-150	150-200	200-300	300-500	over 500	average	No.of Sample
Food	6.9	31.9	21.4	16.0	17.8	5.7	0.3	146.2	332
Textiles	9.3	18.6	20.5	14.9	15.5	5.6	15.5	252.3	161
Paper & Pulp	2.6	6.1	10.4	20.0	25.2	22.6	13.0	311.9	115
Chemicals	6.3	25.0	18.0	14.9	17.9	10.2	7.6	220.7	616
Petroleum & Coal	0.0	5.2	10.3	5.2	10.3	27.6	41.4	591.4	58
Stone, Clay & Glass	6.0	33.3	20.8	16.7	14.3	6.5	2.4	159.8	168
Iron & Steel	4.9	10.8	11.8	11.8	21.2	24.1	15.3	340.4	203
Nonferrous Metals	0.0	3.4	15.8	15.3	27.7	14.1	23.7	414.4	177
Metal Products	6.3	27.1	24.3	11.8	16.0	8.3	6.3	182.3	144
Non Electrical Machinery	12.2	19.6	21.7	13.8	13.1	10.4	9.3	216.2	443
Electrical Machinery	18.6	27.0	14.4	13.3	17.2	5.4	4.1	165.9	592
Transportation Equipment	1.6	19.9	16.6	15.0	27.6	14.5	4.7	229.4	427
Precision Instruments	9.1	34.5	39.1	13.6	3.6	0.0	0.0	106.9	110
Miscellaneous Manufacturing	7.9	26.4	19.5	12.3	17.8	9.2	6.8	212.7	292
Total Manufacturing	8.2	22.7	18.4	14.2	18.3	10.3	7.9	223.2	3838

Ratio of Operating Profit to Operating Asset (%)

	less than 3	3-6	6-9	9-12	12-15	15-20	over 20	average	No.of Sample
Food	23.2	38.0	27.4	8.7	2.4	0.3	0.0	5.3	332
Textiles	31.7	32.9	26.1	6.8	1.2	1.2	0.0	4.8	161
Paper & Pulp	20.0	45.2	27.0	7.0	0.0	0.9	0.0	5.0	115
Chemicals	14.3	35.9	21.8	13.8	6.5	6.5	1.3	7.0	616
Petroleum & Coal	15.5	56.9	19.0	6.9	0.0	1.7	0.0	5.0	58
Stone, Clay & Glass	21.4	27.4	33.9	16.1	1.2	0.0	0.0	5.8	168
Iron & Steel	31.0	30.5	24.1	9.9	2.0	0.5	2.0	5.3	203
Nonferrous Metals	29.4	47.5	19.8	2.8	0.6	0.0	0.0	4.2	177
Metal Products	6.9	25.0	26.4	22.2	15.3	4.2	0.0	8.2	144
Non Electrical Machinery	36.1	33.6	12.9	8.8	5.6	2.0	0.9	5.0	443
Electrical Machinery	27.0	33.8	19.4	11.3	5.2	2.5	0.7	5.6	592
Transportation Equipment	33.0	43.8	14.1	7.3	1.9	0.0	0.0	4.3	427
Precision Instruments	38.2	30.0	18.2	6.4	2.7	2.7	1.8	4.8	110
Miscellaneous Manufacturing	12.7	31.5	36.6	7.5	3.4	2.4	5.8	7.6	292
Total Manufacturing	24.7	35.8	22.1	10.1	4.1	2.2	1.0	5.7	3838

Total Asset (%,$million)

	less than 100	100-500	500-1000	1000-5000	5000-10000	10000-50000	over 50000	average	No.of Sample
Food	0.0	0.0	0.0	24.7	45.2	27.1	3.0	10949.1	332
Textiles	0.0	0.0	0.0	21.1	29.2	49.7	0.0	13172.3	161
Paper & Pulp	0.0	0.0	0.0	17.4	28.7	53.9	0.0	14461.6	115
Chemicals	0.0	0.0	0.0	20.8	27.6	49.2	2.4	14225.3	616
Petroleum & Coal	0.0	0.0	0.0	0.0	5.2	86.2	8.6	29319.1	58
Stone, Clay & Glass	0.0	0.0	0.0	22.6	32.1	43.5	1.8	11588.0	168
Iron & Steel	0.0	0.0	0.0	14.3	38.4	27.6	19.7	31470.3	203
Nonferrous Metals	0.0	0.0	0.0	19.8	28.2	50.3	1.7	13106.7	177
Metal Products	0.0	0.0	0.7	56.3	20.8	22.2	0.0	6860.6	144
Non Electrical Machinery	0.0	0.5	0.0	28.7	28.4	37.5	5.0	16039.8	443
Electrical Machinery	0.0	0.0	0.3	35.0	26.0	24.5	14.2	25073.7	592
Transportation Equipment	0.0	0.0	1.9	32.6	29.3	25.8	10.5	22531.8	427
Precision Instruments	0.0	0.9	0.0	27.3	32.7	35.5	3.6	11169.3	110
Miscellaneous Manufacturing	0.0	0.0	0.7	38.0	29.8	28.8	2.7	10938.4	292
Total Manufacturing	0.0	0.1	0.3	27.6	29.8	35.9	6.2	17070.9	3838

Rate of Change in Sales (%)

	less than 0	0-3	3-6	6-9	9-12	12-15	over 15	average	No.of Sample
Food	26.8	22.3	24.7	13.3	6.0	2.7	4.2	3.3	332
Textiles	50.9	16.1	19.9	6.8	2.5	0.6	3.1	-0.7	161
Paper & Pulp	40.0	19.1	16.5	14.8	6.1	0.9	2.6	2.9	115
Chemicals	32.0	15.1	19.3	14.3	9.1	4.1	6.2	3.1	616
Petroleum & Coal	69.0	5.2	1.7	1.7	3.4	1.7	17.2	-1.1	58
Stone, Clay & Glass	33.3	19.0	14.3	13.1	7.1	4.8	8.3	3.3	168
Iron & Steel	51.7	12.3	7.9	9.9	5.9	6.4	5.9	-0.2	203
Nonferrous Metals	44.1	9.0	7.9	10.7	11.3	6.2	10.7	2.3	177
Metal Products	19.4	11.1	18.1	15.3	11.8	11.1	13.2	6.9	144
Non Electrical Machinery	36.6	11.1	10.2	11.1	7.9	7.0	16.3	4.4	443
Electrical Machinery	29.2	15.5	12.2	12.5	10.0	5.7	14.9	4.8	592
Transportation Equipment	36.3	7.7	13.6	11.5	11.0	8.4	11.5	4.0	427
Precision Instruments	41.8	6.4	13.6	9.1	7.3	8.2	13.6	4.7	110
Miscellaneous Manufacturing	28.1	15.4	15.1	15.4	9.9	6.8	9.2	5.0	292
Total Manufacturing	34.9	13.9	14.8	12.3	8.5	5.6	10.0	3.5	3838

(2)USA

Debt-Equity Ratio (%)

	less than 50	50-100	100-150	150-200	200-300	300-500	over 500	average	No.of Sample
Food	8.7	20.4	23.8	15.5	20.4	8.7	2.6	179.0	265
Textiles	4.9	34.3	37.3	4.9	13.7	2.9	2.0	147.2	102
Paper & Pulp	1.6	21.4	47.6	17.6	9.1	1.6	1.1	141.0	187
Chemicals	8.5	32.3	31.2	12.0	9.5	2.8	3.7	156.3	433
Petroleum & Coal	0.0	14.3	31.5	19.7	22.7	9.9	2.0	191.0	203
Stone, Clay & Glass	1.5	32.4	20.6	11.8	17.6	4.4	11.8	322.4	68
Iron & Steel	4.8	31.0	20.2	2.4	13.1	10.7	17.9	292.8	84
Nonferrous Metals	5.5	41.8	30.8	9.9	7.7	4.4	0.0	121.6	91
Metal Products	11.7	21.9	35.2	11.7	11.7	4.7	3.1	154.7	128
Non Electrical Machinery	1.9	37.9	22.3	13.3	9.5	11.4	3.8	173.8	211
Electrical Machinery	13.0	33.1	24.2	12.8	10.6	3.5	2.8	145.9	538
Transportation Equipment	3.5	15.0	19.8	24.5	22.4	9.7	5.0	213.1	339
Precision Instruments	5.3	38.9	30.5	9.9	10.7	3.1	1.5	141.8	131
Miscellaneous Manufacturing	17.3	41.8	23.4	6.8	6.8	3.0	0.9	114.5	428
Total Manufacturing	8.1	29.6	27.3	13.3	12.9	5.5	3.2	164.5	3208

Ratio of Operating Profit to Operating Asset (%)

	less than 3	3-6	6-9	9-12	12-15	15-20	over 20	average	No.of Sample
Food	0.8	5.7	6.1	10.2	10.6	30.7	36.0	19.1	264
Textiles	7.8	4.9	22.5	16.7	16.7	23.5	7.8	11.6	102
Paper & Pulp	10.7	8.0	17.6	20.3	18.7	16.6	8.0	11.7	187
Chemicals	2.3	3.7	7.5	17.8	15.0	20.1	33.6	16.7	428
Petroleum & Coal	8.4	21.8	33.7	21.8	10.9	3.5	0.0	7.7	202
Stone, Clay & Glass	8.8	10.3	10.3	19.1	17.6	8.8	25.0	13.1	68
Iron & Steel	22.9	13.3	14.5	16.9	10.8	16.9	4.8	8.6	83
Nonferrous Metals	14.3	23.1	13.2	14.3	15.4	11.0	8.8	9.6	91
Metal Products	3.1	3.9	6.3	20.3	22.7	28.9	14.8	14.3	128
Non Electrical Machinery	16.2	16.2	17.6	17.1	12.9	17.1	2.9	8.9	210
Electrical Machinery	14.1	11.5	11.7	18.8	19.0	14.3	10.5	10.8	531
Transportation Equipment	9.1	8.8	16.4	26.5	19.9	13.2	6.0	10.6	317
Precision Instruments	3.1	2.3	8.5	22.3	24.6	20.0	19.2	14.5	130
Miscellaneous Manufacturing	1.7	5.7	9.2	12.3	19.1	23.4	28.6	16.8	423
Total Manufacturing	7.8	9.1	13.0	18.0	16.9	18.2	17.0	13.1	3164

Total Asset (%,$million)

	less than 100	100-500	500-1000	1000-5000	5000-10000	10000-50000	over 50000	average	No.of Sample
Food	4.2	17.0	7.2	40.8	18.1	12.8	0.0	4506.1	265
Textiles	19.6	31.4	28.4	20.6	0.0	0.0	0.0	646.9	102
Paper & Pulp	0.0	13.9	7.0	57.2	18.7	3.2	0.0	3399.8	187
Chemicals	0.9	18.0	12.2	42.7	18.5	7.6	0.0	3946.6	433
Petroleum & Coal	0.0	0.0	1.5	20.7	17.2	48.8	11.8	22696.3	203
Stone, Clay & Glass	2.9	25.0	4.4	45.6	14.7	7.4	0.0	3287.0	68
Iron & Steel	0.0	22.6	29.8	36.9	10.7	0.0	0.0	1870.7	84
Nonferrous Metals	0.0	28.6	0.0	44.0	16.5	11.0	0.0	3779.7	91
Metal Products	0.0	25.8	29.7	43.0	1.6	0.0	0.0	1200.5	128
Non Electrical Machinery	0.9	14.7	19.0	45.5	8.5	11.4	0.0	3492.7	211
Electrical Machinery	2.6	20.3	13.2	35.3	14.1	10.0	4.5	9008.8	538
Transportation Equipment	0.0	14.5	13.0	41.3	11.2	15.3	4.7	8837.2	339
Precision Instruments	3.8	21.4	26.0	28.2	7.6	13.0	0.0	3703.7	131
Miscellaneous Manufacturing	56.1	20.8	4.5	15.6	1.7	1.2	0.0	2427.7	1279
Total Manufacturing	3.1	18.3	13.3	39.9	12.4	10.9	2.0	5983.2	3208

Rate of Change in Sales (%)

	less than 0	0-3	3-6	6-9	9-12	12-15	over 15	average	No.of Sample
Food	16.2	9.8	13.2	19.6	10.2	14.7	16.2	8.1	265
Textiles	24.5	9.8	16.7	10.8	10.8	7.8	19.6	7.6	102
Paper & Pulp	20.9	15.5	17.6	11.2	8.0	10.2	16.6	7.2	187
Chemicals	18.2	8.3	13.9	15.0	12.7	10.9	21.0	9.1	433
Petroleum & Coal	51.7	11.3	8.9	3.9	5.9	5.9	12.3	0.5	203
Stone, Clay & Glass	25.0	16.2	14.7	11.8	10.3	10.3	11.8	4.0	68
Iron & Steel	34.5	8.3	3.6	9.5	13.1	9.5	21.4	5.7	84
Nonferrous Metals	51.6	3.3	7.7	3.3	7.7	3.3	23.1	4.9	91
Metal Products	21.1	7.0	12.5	11.7	12.5	14.8	20.3	10.9	128
Non Electrical Machinery	28.0	9.5	11.4	9.5	7.6	7.6	26.5	8.4	211
Electrical Machinery	23.6	10.2	12.5	11.3	8.7	7.2	26.4	49.5	538
Transportation Equipment	30.7	8.8	10.9	8.8	6.8	9.7	24.2	7.2	339
Precision Instruments	16.0	8.4	16.8	10.7	13.7	7.6	26.7	12.3	131
Miscellaneous Manufacturing	17.8	12.6	11.0	14.3	11.0	9.8	23.6	9.4	428
Total Manufacturing	24.9	10.1	12.3	11.8	9.7	9.4	21.8	14.8	3208

(3)FRANCE

Debt-Equity Ratio (%)

	less than 50	50-100	100-150	150-200	200-300	300-500	over 500	average	No.of Sample
Food	5.8	25.9	25.4	14.3	12.5	8.9	7.1	210.3	224
Textiles	8.7	20.7	26.1	13.0	17.4	9.8	4.3	173.8	92
Paper & Pulp	14.7	22.7	20.0	10.7	16.0	8.0	8.0	170.4	75
Chemicals	12.0	23.0	21.0	10.0	17.0	14.0	3.0	175.7	100
Petroleum & Coal	9.4	21.9	28.1	9.4	21.9	6.3	3.1	165.1	32
Stone, Clay & Glass	9.2	23.1	29.2	10.8	16.9	7.7	3.1	168.1	65
Iron & Steel	6.8	28.8	23.7	8.5	25.4	5.1	1.7	161.2	59
Nonferrous Metals									0
Metal Products	9.4	23.1	23.1	11.1	17.1	11.1	5.1	193.9	117
Non Electrical Machinery	8.6	27.6	21.9	11.4	14.3	11.4	4.8	181.7	105
Electrical Machinery	12.9	23.4	15.8	16.4	22.2	5.3	4.1	182.2	171
Transportation Equipment	11.6	26.1	17.4	15.9	12.3	13.8	2.9	160.8	138
Precision Instruments	16.7	37.0	18.5	9.3	13.0	1.9	3.7	141.7	54
Miscellaneous Manufacturing	12.3	28.9	21.9	12.3	11.2	8.6	4.8	180.5	187
Total Manufacturing	10.4	25.5	21.9	12.7	15.8	9.1	4.7	180.2	1419

Ratio of Operating Profit to Operating Asset (%)

	less than 3	3-6	6-9	9-12	12-15	15-20	over 20	average	No.of Sample
Food	56.7	27.2	11.2	3.6	0.9	0.4	0.0	3.4	224
Textiles	46.7	27.2	14.1	5.4	2.2	3.3	1.1	4.3	92
Paper & Pulp	48.0	29.3	6.7	1.3	1.3	5.3	8.0	6.0	75
Chemicals	49.0	34.0	11.0	3.0	2.0	1.0	0.0	3.7	100
Petroleum & Coal	93.8	6.3	0.0	0.0	0.0	0.0	0.0	0.3	32
Stone, Clay & Glass	26.2	33.8	26.2	10.8	1.5	0.0	1.5	5.3	65
Iron & Steel	84.7	13.6	0.0	1.7	0.0	0.0	0.0	1.5	59
Nonferrous Metals									0
Metal Products	48.7	29.1	11.1	6.0	2.6	2.6	0.0	4.2	117
Non Electrical Machinery	49.5	37.1	6.7	1.9	1.0	1.9	1.9	3.9	105
Electrical Machinery	60.8	25.1	4.7	2.9	0.6	3.5	2.3	3.7	171
Transportation Equipment	60.1	24.6	8.0	6.5	0.7	0.0	0.0	3.1	138
Precision Instruments	63.0	25.9	5.6	1.9	1.9	1.9	0.0	3.4	54
Miscellaneous Manufacturing	53.5	28.3	9.1	4.3	2.7	1.6	0.5	3.7	187
Total Manufacturing	55.1	27.6	9.2	4.0	1.4	1.7	1.1	3.7	1419

Total Asset (%,$million)

	less than 100	100-500	500-1000	1000-5000	5000-10000	10000-50000	over 50000	average	No.of Sample
Food	8.5	42.4	15.6	25.9	4.5	2.7	0.4	2186.9	224
Textiles	4.3	54.3	8.7	22.8	3.3	3.3	3.3	5653.6	92
Paper & Pulp	0.0	22.7	18.7	50.7	1.3	2.7	4.0	4838.7	75
Chemicals	2.0	52.0	23.0	20.0	1.0	2.0	0.0	1090.9	100
Petroleum & Coal	0.0	0.0	0.0	3.1	25.0	71.9	0.0	14743.7	32
Stone, Clay & Glass	1.5	6.2	30.8	47.7	7.7	4.6	1.5	4034.0	65
Iron & Steel	18.6	8.5	50.8	15.3	0.0	6.8	0.0	1671.4	59
Nonferrous Metals									
Metal Products	4.3	41.0	10.3	22.2	11.1	6.8	4.3	6664.9	117
Non Electrical Machinery	5.7	47.6	10.5	27.6	8.6	0.0	0.0	1225.2	105
Electrical Machinery	8.2	33.9	16.4	22.8	11.7	5.8	1.2	3917.1	171
Transportation Equipment	0.0	19.6	10.1	33.3	13.0	15.2	8.7	14630.3	138
Precision Instruments	11.1	48.1	24.1	7.4	9.3	0.0	0.0	979.1	54
Miscellaneous Manufacturing	9.1	46.0	20.3	13.9	1.6	5.3	3.7	5394.6	187
Total Manufacturing	6.0	36.5	17.3	24.5	6.8	6.5	2.4	4914.4	1419

Rate of Change in Sales (%)

	less than 0	0-3	3-6	6-9	9-12	12-15	over 15	average	No.of Sample
Food	35.7	10.7	8.9	12.5	10.3	4.9	17.0	-3.5	224
Textiles	32.6	9.8	10.9	12.0	1.1	9.8	23.9	6.6	92
Paper & Pulp	45.3	12.0	9.3	6.7	2.7	4.0	20.0	0.8	75
Chemicals	30.0	13.0	18.0	8.0	9.0	8.0	14.0	4.8	100
Petroleum & Coal	59.4	9.4	0.0	12.5	3.1	6.3	9.4	-1.2	32
Stone, Clay & Glass	30.8	9.2	9.2	12.3	12.3	7.7	18.5	16.5	65
Iron & Steel	50.8	6.8	3.4	8.5	8.5	8.5	13.6	2.3	59
Nonferrous Metals									
Metal Products	32.5	12.0	6.0	7.7	8.5	7.7	25.6	21.6	117
Non Electrical Machinery	27.6	9.5	9.5	5.7	7.6	7.6	32.4	58.7	105
Electrical Machinery	32.7	7.6	17.0	9.4	4.1	4.1	25.1	14.9	171
Transportation Equipment	32.6	10.1	8.0	8.0	6.5	13.0	21.7	13.4	138
Precision Instruments	31.5	13.0	13.0	13.0	7.4	7.4	14.8	6.1	54
Miscellaneous Manufacturing	34.2	9.1	5.3	9.1	11.2	4.8	26.2	8.4	187
Total Manufacturing	34.7	10.1	9.7	9.5	7.6	6.9	21.6	11.6	1419

Table 2 Differences in Accounting Systems

	Japan	United States	France
Reappraisal of tangible fixed assets	Not accepted	Not accepted	Accepted. Appraisal difference will be recorded in the assets section
Appraisal of investment	Short-term by lower of book or market value・Long-term by acquisition cost	Market value except for long-term holding purpose(since 1994)	Short-term by lower of book or market value・Long-term by lower of acquisition cost or appraisal value
Depreciation method	The declining-balance method is common.	The straight—line method is common.	Declining-balance method or straight-line method. Company may decide depreciation rate in the range which is economically rational
Accelerated depreciation	Not accepted	Not accepted	Accepted
Recording interest as a part of asset	Not accepted	Accepted	Accepted
Research & Development cost	Can be recorded as asset	Recorded as cost	Can be recorded as asset
Investment subsidy	Deducted from asset value	Recorded as profit	Recorded as profit
Employment of external pension fund	Usual	Usual	Rare
Accounting standard for benefits after retirement	Common for retirement allowance reserve to be accumulated up to the allowed limit by the Tax Law. Pension Funds' Assets is appraised by the book value	The difference between the present discount value of expected benefits cost in the future and pension assets based on market price will be recorded as accrued cost.	Can be recorded as a provision for retirement allowance, or as a personnel cost at the time of payment
Director's bonus	Paid out of profit	Recorded as cost	Recorded as cost

Table 3 Variation Coefficients of Capital Investment

Capital Investment/Tangible Assets

	Japan	USA	France
Food	0.65	0.59	1.26
Textiles	0.75	0.59	0.78
Paper & Pulp	0.76	0.57	0.55
Chemicals	0.77	0.59	0.51
Petroleum & Coal	0.59	0.48	0.35
Stone, Clay & Glass	0.63	0.44	0.64
Iron & Steel	0.69	0.66	0.51
Nonferrous Metals	0.82	0.46	0.72
Metal Products	0.54	0.54	
Non Electrical Machinery	0.68	0.54	0.70
Electrical Machinery	0.58	0.57	1.23
Transportation Equipment	0.47	0.45	0.59
Precision Instruments	0.70	0.44	0.45
Miscellaneous Manufacturing	0.64	0.72	0.84
Total Manufacturing	0.66	0.55	0.70

Capital Investment/Total Assets

	Japan	USA	France
Food	0.76	0.53	1.18
Textiles	0.70	0.68	0.83
Paper & Pulp	0.74	0.41	0.61
Chemicals	0.83	0.46	0.63
Petroleum & Coal	0.57	0.39	0.36
Stone, Clay & Glass	0.67	0.39	0.78
Iron & Steel	0.68	0.66	0.59
Nonferrous Metals	0.86	0.45	0.64
Metal Products	0.66	0.55	
Non Electrical Machinery	0.70	0.47	0.75
Electrical Machinery	0.66	0.58	0.82
Transportation Equipment	0.57	0.52	0.83
Precision Instruments	0.67	0.45	0.44
Miscellaneous Manufacturing	0.60	0.55	0.82
Total Manufacturing	0.69	0.51	0.72

Capital Investment/ Cash Flow

	Japan	USA	France
Food	0.76	0.74	1.23
Textiles	0.90	0.85	0.74
Paper & Pulp	0.60	0.69	0.97
Chemicals	0.82	1.08	0.85
Petroleum & Coal	0.79	0.79	0.47
Stone, Clay & Glass	0.81	0.61	1.08
Iron & Steel	0.92	0.95	0.94
Nonferrous Metals	0.86	0.73	0.76
Metal Products	0.54	0.74	
Non Electrical Machinery	0.98	0.87	1.14
Electrical Machinery	2.26	1.05	0.87
Transportation Equipment	0.45	1.03	0.89
Precision Instruments	0.59	0.95	0.61
Miscellaneous Manufacturing	0.50	1.04	1.37
Total Manufacturing	0.84	0.87	0.92

Table 4 Variation Coefficients of Capital Investment

(Long Time Series for Japan)

1956-1965

	Capital Investment /Tangible Assets	Capital Investment /Total Assets	Capital Investment /Cash Flow
Food	0.57	0.80	0.92
Textiles	0.61	0.80	0.79
Paper & Pulp	0.57	0.64	0.70
Chemicals	0.47	0.66	0.58
Petroleum & Coal	0.38	0.48	0.46
Stone, Clay & Glass	0.53	0.60	0.69
Iron & Steel	0.54	0.64	0.72
Nonferrous Metals	0.50	0.58	0.65
Metal Products	0.52	0.65	0.65
Non Electrical Machinery	0.58	0.74	0.71
Electrical Machinery	0.54	0.61	0.60
Transportation Equipment	0.51	0.72	0.62
Precision Instruments	0.58	0.70	0.63
Miscellaneous Manufacturing	0.56	0.67	0.69
Total Manufacturing	0.53	0.66	0.67

1973-1980

	Capital Investment /Tangible Assets	Capital Investment /Total Assets	Capital Investment /Cash Flow
Food	0.56	0.79	1.10
Textiles	0.76	1.17	1.88
Paper & Pulp	0.62	0.71	0.84
Chemicals	0.55	0.70	1.10
Petroleum & Coal	0.67	0.84	1.22
Stone, Clay & Glass	0.60	0.70	0.97
Iron & Steel	0.76	0.81	1.19
Nonferrous Metals	0.67	0.84	1.72
Metal Products	0.75	1.00	1.41
Non Electrical Machinery	0.68	0.87	1.72
Electrical Machinery	0.55	1.02	2.12
Transportation Equipment	0.62	0.70	1.55
Precision Instruments	0.48	0.63	0.75
Miscellaneous Manufacturing	0.77	1.45	1.76
Total Manufacturing	0.65	0.87	1.38

1966-1972

	Capital Investment /Tangible Assets	Capital Investment /Total Assets	Capital Investment /Cash Flow
Food	0.56	0.75	1.01
Textiles	0.54	0.71	1.82
Paper & Pulp	0.57	0.66	1.11
Chemicals	0.58	0.67	0.88
Petroleum & Coal	0.38	0.50	0.54
Stone, Clay & Glass	0.51	0.61	0.83
Iron & Steel	0.58	0.62	1.04
Nonferrous Metals	0.46	0.62	0.90
Metal Products	0.65	0.66	0.88
Non Electrical Machinery	0.75	0.84	1.34
Electrical Machinery	0.58	0.69	0.91
Transportation Equipment	0.41	0.58	0.78
Precision Instruments	0.55	0.60	0.75
Miscellaneous Manufacturing	0.62	0.70	1.12
Total Manufacturing	0.55	0.66	0.99

1981-1994

	Capital Investment /Tangible Assets	Capital Investment /Total Assets	Capital Investment /Cash Flow
Food	0.71	0.99	1.33
Textiles	0.88	1.04	2.08
Paper & Pulp	0.72	0.77	1.05
Chemicals	0.67	0.79	1.92
Petroleum & Coal	0.70	0.86	1.15
Stone, Clay & Glass	0.75	0.86	1.11
Iron & Steel	0.85	0.95	1.25
Nonferrous Metals	0.65	0.83	1.24
Metal Products	0.79	0.99	1.62
Non Electrical Machinery	0.70	0.94	1.57
Electrical Machinery	0.56	0.74	2.72
Transportation Equipment	0.48	0.63	1.08
Precision Instruments	0.66	0.76	0.97
Miscellaneous Manufacturing	0.67	0.81	1.07
Total Manufacturing	0.70	0.85	1.44

Table 5 Variation Coefficients of Capital Investment

(Leading Companies in Japan)

1956-1965

	Capital Investment /Tangible Assets	Capital Investment /Total Assets	Capital Investment /Cash Flow
Chemicals	0.25	0.26	0.31
Iron & Steel	0.18	0.19	0.23
Electrical Machinery	0.29	0.39	0.37
Shipbuilding	0.36	0.56	0.37
Automobile	0.23	0.27	0.29

1966-1972

	Capital Investment /Tangible Assets	Capital Investment /Total Assets	Capital Investment /Cash Flow
Chemicals	0.33	0.32	0.33
Iron & Steel	0.19	0.22	0.44
Electrical Machinery	0.30	0.40	0.43
Shipbuilding	0.27	0.49	0.50
Automobile	0.23	0.33	0.39

1973-1980

	Capital Investment /Tangible Assets	Capital Investment /Total Assets	Capital Investment /Cash Flow
Chemicals	0.50	0.53	0.59
Iron & Steel	0.24	0.29	0.31
Electrical Machinery	0.24	0.41	0.38
Shipbuilding	0.30	0.41	0.39
Automobile	0.29	0.36	0.36

1981-1994

	Capital Investment /Tangible Assets	Capital Investment /Total Assets	Capital Investment /Cash Flow
Chemicals	0.46	0.49	0.57
Iron & Steel	0.28	0.27	0.34
Electrical Machinery	0.25	0.42	0.35
Shipbuilding	0.34	0.42	0.44
Automobile	0.43	0.44	0.57

1)We define leading companies as follows;

Chemicals: Asahi Chemical Industry, Mitsui Toatsu Chemicals, Showa Denko, Sumitomo Chemical, Mitsubishi Chemical, Ube Industries

Iron & Steel: Nippon Steel, Kawasaki Steel, NKK, Sumitomo Metal Industries, Kobe Steel

Electrical Machinery: Hitachi, Toshiba, Mitsubishi Electric, NEC, Fujitsu, Oki Electric Industry Matsushita Electric Industrial Co., Sharp, Sony, Sanyo Electric Co.

Shipbuilding: Sumitomo Heavy Industries, Mitsui Engineering & Shipbuilding, Hitachi Zosen, Mitsubishi Heavy Industries, Kawasaki Heavy Industries, Ishikawajima-Harima Heavy Industries

Automobile: Nissan Motor, Isuzu Motors, Toyota Motor, Hino Motors, Nissan Diesel Motor, Mazda Motor Daihatsu Motor, Honda Motor, Suzuki Motor, Fuji Heavy Industries

Table 6 Fluctuation of Capital Investment

Distribution of (Variation Coefficients of Firm's Capital Investment/Variation Coefficient of Industry's Value Added)

Japan

	Total No.of Sample	less than 1	1 to 4	4 to 7	7 to 10	10 to 20	over 20	Average
Food	36	2.8	2.8	16.7	22.2	36.1	19.4	12.17
Textiles	17	0.0	23.5	23.5	23.5	29.4	0.0	7.70
Paper & Pulp	12	0.0	8.3	58.3	16.7	16.7	0.0	6.66
Chemicals	63	3.2	84.1	11.1	1.6	0.0	0.0	2.52
Petroleum & Coal	6	50.0	50.0	0.0	0.0	0.0	0.0	0.87
Stone, Clay & Glass	17	0.0	17.6	52.9	11.8	17.6	0.0	7.78
Iron & Steel	21	0.0	14.3	47.6	14.3	23.8	0.0	7.60
Nonferrous Metals	18	0.0	5.6	55.6	22.2	11.1	5.6	7.55
Metal Products	17	0.0	47.1	52.9	0.0	0.0	0.0	4.43
Non Electrical Machinery	47	6.4	51.1	38.3	4.3	0.0	0.0	3.84
Electrical Machinery	60	20.0	76.7	3.3	0.0	0.0	0.0	1.55
Transportation Equipment	43	0.0	67.4	25.6	7.0	0.0	0.0	3.75
Precision Instruments	12	0.0	41.7	33.3	8.3	16.7	0.0	5.18
Miscellaneous Manufacturing	32	0.0	31.3	40.6	21.9	6.3	0.0	5.73
Total Manufacturing	401	5.2	47.6	27.4	9.2	8.5	2.0	4.98

USA

	Total No.of Sample	less than 1	1 to 4	4 to 7	7 to 10	10 to 20	over 20	Average
Food	31	0.0	0.0	0.0	6.5	54.8	38.7	21.72
Textiles	12	0.0	0.0	25.0	33.3	41.7	0.0	9.73
Paper & Pulp	20	0.0	0.0	75.0	25.0	0.0	0.0	6.09
Chemicals	47	0.0	25.5	48.9	19.1	6.4	0.0	5.81
Petroleum & Coal	22	0.0	77.3	13.6	9.1	0.0	0.0	2.97
Stone, Clay & Glass	9	0.0	0.0	11.1	11.1	55.6	22.2	16.92
Iron & Steel	12	0.0	0.0	50.0	16.7	33.3	0.0	9.05
Nonferrous Metals	10	0.0	10.0	10.0	60.0	20.0	0.0	8.47
Metal Products	15	0.0	0.0	0.0	20.0	60.0	20.0	15.31
Non Electrical Machinery	24	4.2	95.8	0.0	0.0	0.0	0.0	1.73
Electrical Machinery	60	10.0	90.0	0.0	0.0	0.0	0.0	1.83
Transportation Equipment	45	0.0	6.7	31.1	26.7	33.3	2.2	9.26
Precision Instruments	15	6.7	80.0	13.3	0.0	0.0	0.0	2.05
Miscellaneous Manufacturing	47	0.0	17.0	51.1	21.3	10.6	0.0	6.08
Total Manufacturing	369	2.2	35.2	24.9	15.2	17.6	4.9	7.35

France

	Total No.of Sample	less than 1	1 to 4	4 to 7	7 to 10	10 to 20	over 20	Average
Food	27	0.0	3.7	7.4	14.8	59.3	14.8	14.53
Textiles	10	0.0	0.0	30.0	20.0	30.0	20.0	11.61
Paper & Pulp	8	0.0	37.5	25.0	25.0	12.5	0.0	6.13
Chemicals	11	0.0	54.5	36.4	9.1	0.0	0.0	4.31
Petroleum & Coal	4	0.0	0.0	50.0	25.0	25.0	0.0	8.25
Stone, Clay & Glass	8	0.0	0.0	12.5	25.0	50.0	12.5	12.88
Iron & Steel	6	0.0	0.0	33.3	50.0	16.7	0.0	7.77
Nonferrous Metals								
Metal Products	14	0.0	21.4	57.1	0.0	21.4	0.0	6.75
Non Electrical Machinery	14	0.0	0.0	14.3	57.1	14.3	14.3	10.55
Electrical Machinery	21	0.0	28.6	47.6	14.3	9.5	0.0	5.62
Transportation Equipment	17	0.0	5.9	52.9	23.5	11.8	5.9	8.16
Precision Instruments	6	0.0	0.0	16.7	16.7	50.0	16.7	12.39
Miscellaneous Manufacturing	23	0.0	0.0	8.7	13.0	56.5	21.7	14.32
Total Manufacturing	169	0.0	11.8	28.4	20.1	30.2	9.5	10.00

Table 7 Estimated Investment Function

	ROA			R			CASH			DEBT			K			Constant			$AdjR^2$	No.of Observ ations
	USA	Japan Shift	France Shift	USA	Japan Shift	France Shift	USA	Japan Shift	France Shift	USA	Japan Shift	France Shift	USA	Japan Shift	France Shift	USA	Japan Shift	France Shift		
Total Manufacturing	0.00140	-0.00082	-0.00132	-0.00100	0.00156	-0.01065	0.28852	0.27114	0.06232	-0.00013	0.00033	0.00042	0.68946	-0.29349	-0.08004	-1.00303	0.55782	-1.73273	0.92	11223
	(8.59)**	(-2.57)**	(-7.21)**	(-1.04)	(0.81)	(-2.78)**	(18.86)**	(10.71)**	(3.64)**	(-2.07)**	(4.36)**	(4.58)**	(42.41)**	(-10.71)**	(-4.05)**	(-12.70)**	(4.36)**	(-18.1)**		
Food	0.00242	-0.00513	-0.00233	-0.00185	0.00033	-0.00246	0.14175	0.69847	0.21968	-0.00056	0.00182	0.00076	0.85539	-0.62288	-0.22325	-1.49442	0.59608	-1.36890	0.93	1077
	(3.37)**	(-2.51)**	(-2.99)**	(-0.53)	(0.03)	(-0.25)	(1.93)*	(5.71)**	(2.89)**	(-2.87)**	(4.01)**	(3.26)**	(10.85)**	(-4.93)**	(-2.67)**	(-4.77)**	(1.12)	(-4.04)**		
Textiles	0.00095	0.00052	0.00701	-0.00553	-0.00511	-0.01693	0.33192	0.23493	0.05923	0.00000	0.00063	0.00040	0.64322	-0.21411	0.05673	-1.06261	0.12284	-2.61230	0.87	474
	(0.78)	(0.17)	(3.17)**	(-0.40)	(-0.26)	(-0.76)	(2.25)**	(1.32)	(0.39)	(0.01)	(1.45)	(0.97)	(4.08)**	(-1.03)	(0.34)	(-1.95)*	(0.13)	(-4.20)**		
Paper & Pulp	0.00477	-0.01527	-0.00446	-0.00441	-0.01147	-0.03442	0.36319	1.18886	0.00612	0.00022	0.00028	0.00025	0.48428	-0.93270	0.11833	0.26386	0.41027	-3.14706	0.93	493
	(1.94)*	(-2.32)**	(-1.59)	(-2.22)**	(-0.86)	(-2.15)**	(4.36)**	(6.27)**	(0.07)	(0.36)	(0.44)	(0.39)	(5.38)**	(-4.34)**	(1.15)	(0.50)	(0.38)	(-5.39)**		
Chemicals	0.00125	-0.00228	-0.00126	-0.00500	0.00677	-0.00856	0.18763	0.29668	0.15123	-0.00004	0.00012	0.00032	0.73739	-0.30039	-0.11319	-0.65137	0.41344	-2.00845	0.90	1573
	(1.60)	(-1.90)*	(-1.55)	(-2.05)**	(1.66)*	(-0.88)	(3.91)**	(3.84)**	(2.77)**	(-0.28)	(0.76)	(0.94)	(15.21)**	(-3.68)**	(-1.76)*	(-3.08)**	(1.23)	(-7.24)**		
Petroleum & Coal	0.01046	-0.01347	-0.01071	-0.00596	-0.00736	-0.01207	0.13917	-0.04874	0.01620	-0.00062	0.00056	0.00083	0.78697	-0.17228	0.03447	-0.85705	2.05721	-1.33120	0.95	394
	(5.27)**	(-5.47)**	(-3.37)**	(-2.02)**	(-1.05)	(-0.61)	(1.81)*	(-0.51)	(0.11)	(-1.62)	(1.38)	(0.99)	(9.38)**	(-1.19)	(0.22)	(-1.81)*	(1.85)*	(-1.90)*		
Stone, Clay & Glass	0.00691	-0.00229	-0.00701	-0.00442	-0.01679	-0.02909	0.34099	0.18013	0.03852	0.00015	-0.00030	-0.00090	0.67784	-0.27788	-0.18063	-1.72110	1.57189	-0.29384	0.92	400
	(2.05)**	(-0.51)	(-2.04)**	(-1.12)	(-1.49)	(-1.35)	(3.29)**	(1.17)	(0.36)	(0.90)	(-1.11)	(-1.56)	(6.09)**	(-1.59)	(-1.50)	(-3.08)**	(1.86)*	(-0.48)		
Iron & Steel	0.00562	-0.00695	-0.00687	0.00060	-0.00162	0.00065	0.07949	0.34674	0.40496	-0.00017	0.00048	0.00022	0.85767	-0.34896	-0.41858	-1.40242	0.77562	-1.65759	0.88	447
	(1.74)*	(-1.52)	(-2.07)**	(0.18)	(-0.16)	(0.02)	(0.93)	(2.48)**	(3.66)**	(-0.55)	(1.37)	(0.25)	(8.19)**	(-2.19)**	(-3.10)**	(-2.17)**	(0.93)	(-2.25)**		
Nonferrous Metals	0.00987	-0.00400		0.01921	-0.00764		0.10520	0.39255		-0.00020	0.00020		0.86610	-0.29485		-1.93039	0.37053		0.80	370
	(3.75)**	(-1.16)	-	(3.17)**	(-1.00)	-	(1.57)	(2.89)**	-	(-0.22)	(0.21)	-	(11.87)**	(-1.92)*	-	(-4.22)**	(0.52)	-		
Metal Products	0.00629	-0.00391	-0.00622	-0.00660	0.00230	-0.00568	0.09357	0.60532	0.20044	-0.00001	0.00011	0.00021	1.07933	-0.76404	-0.48848	-3.42952	2.61475	1.09366	0.88	471
	(2.93)**	(-0.99)	(-2.89)**	(-0.96)	(0.13)	(-0.35)	(0.51)	(2.21)**	(1.09)	(-0.01)	(0.16)	(0.35)	(5.76)**	(-2.52)**	(-2.55)**	(-4.80)**	(2.28)**	(1.47)		
Non Electrical Machinery	0.00341	-0.00311	-0.00359	0.00481	-0.02380	-0.00744	0.17989	0.45618	0.17854	-0.00039	0.00101	-0.00007	0.79369	-0.42018	-0.12910	-1.30314	0.46138	-1.48013	0.89	1023
	(2.61)**	(-1.97)**	(-2.13)**	(0.37)	(-1.57)	(-0.34)	(2.93)**	(5.37)**	(2.52)**	(-0.97)	(2.37)**	(-0.12)	(11.40)**	(-4.44)**	(-1.49)	(-3.17)**	(0.90)	(-3.07)**		
Electrical Machinery	0.00107	0.00205	-0.00191	0.00092	0.00045	0.01044	0.32771	0.02453	-0.00749	-0.00037	0.00080	0.00092	0.65102	-0.01958	-0.07581	-0.74934	-0.29502	-1.67993	0.93	1709
	(4.25)**	(3.53)**	(-2.39)**	(0.22)	(0.08)	(0.98)	(9.78)**	(0.46)	(-0.18)	(-2.04)**	(3.59)**	(3.21)**	(17.23)**	(-0.31)	(-1.43)	(-4.15)**	(-0.97)	(-6.68)**		
Transportation Equipment	0.00423	-0.00178	-0.00344	0.00835	-0.01595	-0.00414	0.12190	0.62847	0.18309	-0.00023	0.00007	0.00044	0.92803	-0.70448	-0.24656	-2.02557	1.94774	-0.91980	0.92	1223
	(4.25)**	(-0.87)	(-3.25)**	(2.38)**	(-1.49)	(-0.28)	(2.54)**	(6.50)**	(3.37)**	(-1.59)	(0.35)	(1.76)*	(16.31)**	(-6.61)**	(-3.55)**	(-8.13)**	(4.89)**	(-3.06)**		
Precision Instruments	0.00155	-0.00234	-0.00144	0.00087	0.04019	-0.06478	0.21110	0.85798	0.16155	-0.00040	0.00386	0.00071	0.77345	-0.82454	-0.13792	-1.03019	0.31893	-1.80816	0.92	390
	(1.39)	(-1.11)	(-1.28)	(0.09)	(2.96)**	(-3.07)**	(3.02)**	(6.01)**	(1.92)*	(-0.65)	(3.27)**	(0.94)	(9.32)**	(-4.95)**	(-1.42)	(-2.39)**	(0.38)	(-3.46)**		
Miscellaneous Manufacturing	0.00082	-0.00225	-0.00106	0.00203	-0.01279	-0.00175	0.39656	0.36200	-0.04503	0.00018	-0.00017	0.00022	0.58180	-0.47247	-0.00902	-0.96887	1.67038	-1.70449	0.92	1179
	(2.96)**	(-3.86)**	(-2.77)**	(0.61)	(-1.90)*	(-0.17)	(8.76)**	(3.64)**	(-0.87)	(0.86)	(-0.71)	(0.86)	(13.42)**	(-4.61)**	(-0.17)	(-4.97)**	(4.23)**	(-6.75)**		

Estimated Equation：$\ln(I)_{it}=a_i+b*ROA_{it}+c*R_{it}+d*\ln(CASH)_{it}+e*DEBT_{it}+f*\ln(K)_{it}$

where I=Capital Investment
ROA=Return on Asset (=Operating Profit/Tangible Assets*100)
R=Cost of Capital (=Interests Paid/Interest Bearing Liabilities*100)
CASH=Cash Flow(=Profit after Tax-Devidends-Directors' Bonus+Depriciation)
DEBT=Debt-Equity Ratio(=Debt/Net Worth*100)
K=Capital Stock(=Tangible Assets at the Beginning of the Period)

Upper row:Coefficient,Lower row in parenthesis:t statistics
** significant at 5% level
* significant at 10% level

Table 8 Estimated Investment Function of Risky Companies

(1)Japan

	ROA		R		CASH		DEBT		K		Constant		AdjR^2	No.of Observations
	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift		
Total Manufacturing	-0.00046	0.00231	0.00026	-0.00006	0.71017	-0.40876	0.00089	-0.00088	0.25242	0.38217	-0.31805	-0.41060	0.80	5286
	(-1.57)	(3.27)**	(0.15)	(-0.02)	(29.62)**	(-10.51)**	(7.10)**	(-6.26)**	(9.74)**	(9.2)**	(-2.9)**	(-2.29)**		
Food	-0.00265	0.00684	-0.00413	0.04415	0.84723	-0.08613	0.00235	-0.00063	0.23034	0.16181	-1.04983	-1.39598	0.74	467
	(-1.53)	(0.61)	(-0.46)	(1.14)	(9.46)**	(-0.28)	(5.17)**	(-0.43)	(2.46)**	(0.57)	(-2.66)**	(-0.84)		
Textiles	-0.00694	0.01289	-0.02036	0.04135	0.93989	-0.73335	0.00381	-0.00365	0.00370	0.80246	0.00937	-1.90629	0.77	236
	(-1.82)*	(2.54)**	(-1.30)	(1.31)	(6.03)**	(-3.52)**	(4.57)**	(-3.68)**	(0.02)	(3.11)**	(0.01)	(-1.54)		
Paper & Pulp	-0.01374	0.00757	-0.03706	0.02825	1.51458	0.14108	0.00042	0.00002	-0.47153	-0.02566	1.28356	-0.98002	0.74	159
	(-1.93)*	(0.56)	(-1.51)	(0.97)	(7.92)**	(0.34)	(0.36)	(0.02)	(-2.11)**	(-0.06)	(1.31)	(-0.59)		
Chemicals	-0.00426	0.00365	0.00254	-0.00496	0.84897	-0.57649	0.00216	-0.00230	0.07217	0.54840	0.16622	-0.38743	0.76	859
	(-3.56)**	(1.49)	(0.73)	(-0.50)	(9.30)**	(-4.59)**	(6.03)**	(-6.14)**	(0.70)	(4.19)**	(0.49)	(-0.78)		
Petroleum & Coal	-0.00246	-0.00024	-0.01044	-0.00396	0.16521	-0.06500	-0.00499	0.00496	0.79230	-0.12884	-0.03541	0.71421	0.44	76
	(-0.46)	(-0.04)	(-0.52)	(-0.18)	(0.92)	(-0.33)	(-2.32)**	(2.30)**	(1.08)	(-0.17)	(-0.01)	(0.11)		
Stone, Clay & Glass	0.00514	-0.02690	-0.01246	-0.01965	0.50633	0.37679	0.00043	0.00009	0.44080	-0.21917	-0.50299	0.10959	0.69	238
	(1.70)*	(-1.87)*	(-1.11)	(-0.70)	(4.43)**	(0.68)	(0.69)	(0.13)	(3.14)**	(-0.47)	(-0.80)	(0.07)		
Iron & Steel	-0.00614	0.00913	-0.01492	0.02932	0.59671	-0.32562	0.00344	-0.00318	0.24095	0.42894	0.24269	-1.47886	0.80	280
	(-1.50)	(1.34)	(-1.26)	(1.40)	(3.96)**	(-1.62)	(3.75)**	(-3.36)**	(1.47)	(2.00)**	(0.33)	(-1.62)		
Nonferrous Metals	0.00242	0.00274	0.01427	-0.00941	0.96512	-0.75203	0.00403	-0.00410	0.05722	0.78028	-1.03399	-0.80575	0.68	246
	(0.66)	(0.57)	(2.06)**	(-0.97)	(4.75)**	(-2.89)**	(3.70)**	(-3.73)**	(0.25)	(2.70)**	(-1.31)	(-0.74)		
Metal Products	0.00211	0.02023	-0.00989	0.04903	0.70642	-0.70331	0.00100	0.00007	0.25908	0.76440	-0.50066	-3.75551	0.79	181
	(0.70)	(1.97)**	(-0.73)	(0.89)	(3.66)**	(-1.16)	(1.01)	(0.04)	(1.17)	(1.11)	(-0.55)	(-1.40)		
Non Electrical Machinery	-0.00044	-0.00136	-0.01412	-0.05221	0.84656	-0.55463	0.00098	-0.00041	0.20773	0.46720	-0.88499	0.13236	0.80	622
	(-0.40)	(-0.75)	(-1.72)*	(-2.04)**	(11.31)**	(-4.85)**	(1.74)*	(-0.66)	(2.58)**	(3.86)**	(-2.42)**	(0.25)		
Electrical Machinery	0.00203	0.00318	0.00103	0.03430	0.47805	-0.35336	0.00184	-0.00171	0.49308	0.38863	-0.89720	-0.93684	0.88	797
	(3.66)**	(2.29)**	(0.33)	(1.51)	(10.07)**	(-4.45)**	(4.98)**	(-4.18)**	(8.69)**	(4.03)**	(-3.87)**	(-1.96)*		
Transportation Equipment	-0.00332	0.01278	-0.01056	0.01649	1.08349	-0.66915	0.00104	-0.00171	-0.12977	0.74294	0.53569	-1.52614	0.89	584
	(-2.04)**	(4.48)**	(-1.27)	(0.88)	(13.90)**	(-5.39)**	(3.01)**	(-4.55)**	(-1.55)	(5.70)**	(2.05)**	(-2.97)**		
Precision Instruments	-0.00088	-0.06523	0.04122	0.70799	1.05725	-1.08442	0.00324	0.00000	-0.01959	0.00000	-0.85885	0.00000	0.70	149
	(-0.48)	(-1.24)	(3.89)**	(1.24)	(8.10)**	(-0.58)	(2.87)**	-	(-0.13)	-	(-1.29)	-		
Miscellaneous Manufacturing	-0.00128	-0.00929	-0.00933	-0.04125	0.77148	0.03883	-0.00018	0.00030	0.07983	-0.02125	0.82103	0.61700	0.81	392
	(-2.94)**	(-1.45)	(-1.93)*	(-1.66)*	(9.62)**	(0.21)	(-1.07)	(1.01)	(0.98)	(-0.09)	(2.78)**	(0.52)		

Estimated Equation： $\ln(I)_{it}=a_i+b*ROA_{it}+c*R_{it}+d*\ln(CASH)_{it}+e*DEBT_{it}+f*\ln(K)_{it}$
With Coefficiant dummy for samples of debt－equity ratio over 300%

Upper row:Coefficient,Lower row in parenthesis:t statistics
** significant at 5% level
* significant at 10% level

(2)USA

	ROA		R		CASH		DEBT		K		Constant		AdjR^2	No.of Observations
	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift		
Total Manufacturing	0.0014022 (10.17)**	0.00157 (2.33)**	-0.00062 (-0.72)	0.00004 (0.02)	0.29796 (22.02)**	-0.11870 (-2.90)**	0.00068 (4.08)**	-0.00087 (-4.69)**	0.65965 (44.31)**	0.12307 (2.8)**	-0.91458 (-12.4)**	-0.28104 (-1.23)	0.93	4538
Food	0.00251 (3.87)**	-0.00206 (-1.16)	-0.00058 (-0.21)	-0.00618 (-0.27)	0.16600 (2.59)**	0.13085 (0.52)	0.00094 (1.94)*	-0.00190 (-3.42)**	0.75685 (10.58)**	-0.04365 (-0.16)	-1.05881 (-3.45)**	0.25525 (0.31)	0.93	388
Textiles	0.00131 (1.13)	0.03584 (0.41)	-0.00251 (-0.20)	-0.24865 (-0.43)	0.35056 (2.57)**	-0.54710 (-0.34)	0.00062 (0.57)	0.00501 (2.00)**	0.63923 (4.47)**	0.00000 -	-1.23213 (-2.53)**	0.00000 -	0.86	146
Paper & Pulp	0.00420 (2.16)**	0.00006 (0.00)	-0.00419 (-2.64)**	0.02178 (0.04)	0.40382 (5.93)**	-0.05901 (-0.05)	0.00126 (1.46)	-0.00244 (-0.83)	0.44594 (6.15)**	0.14125 (0.15)	0.21783 (0.53)	1.33228 (1.36)	0.80	260
Chemicals	0.00187 (2.76)**	0.00294 (0.99)	-0.00364 (-1.75)*	-0.00836 (-0.52)	0.18386 (4.52)**	0.10125 (0.56)	0.00065 (1.44)	-0.00044 (-0.88)	0.71625 (16.81)**	-0.10112 (-0.56)	-0.58677 (-2.96)**	-0.30878 (-0.41)	0.92	614
Petroleum & Coal	0.01089 (6.92)**	-0.00049 (-0.04)	-0.00407 (-1.67)*	-0.00497 (-0.53)	0.15165 (2.44)**	-0.17637 (-0.58)	0.00008 (0.14)	-0.00130 (-1.14)	0.75668 (10.74)**	0.02296 (0.07)	-0.77742 (-1.69)*	1.68930 (1.18)	0.90	286
Stone, Clay & Glass	0.00766 (2.50)**	-0.01943 (-0.66)	-0.00323 (-1.03)	-0.05856 (-1.03)	0.38514 (3.92)**	-0.29452 (-1.21)	0.00134 (1.70)*	-0.00112 (-1.25)	0.60491 (5.76)**	0.28006 (0.51)	-1.59969 (-2.84)**	1.40787 (0.26)	0.91	99
Iron & Steel	0.00538 (1.84)*	-0.02917 (-1.65)	-0.00734 (-0.54)	0.01170 (0.84)	0.09882 (1.21)	0.14927 (0.61)	-0.00298 (-2.50)**	0.00290 (2.31)**	0.94369 (9.48)**	-0.37666 (-1.42)	-1.88369 (-3.17)**	2.40895 (1.84)*	0.76	108
Nonferrous Metals	0.01001 (4.28)**	-0.01620 (-0.34)	0.02088 (4.10)**	-0.01220 (-0.07)	0.10773 (1.83)*	0.02805 (0.06)	0.00061 (0.38)	0.00028 (0.04)	0.84401 (11.48)**	-0.01012 (-0.03)	-1.84694 (-4.05)**	0.00000 -	0.89	124
Metal Products	0.00532 (3.13)**	0.04960 (2.15)**	-0.00775 (-1.57)	0.11850 (2.20)**	0.20161 (1.34)	-0.40480 (-1.30)	-0.00051 (-0.59)	-0.00255 (-1.44)	0.98323 (6.31)**	-0.68684 (-1.17)	-3.22403 (-5.80)**	1.23174 (0.54)	0.83	175
Non Electrical Machinery	0.00323 (3.06)**	0.00010 (0.02)	0.00181 (0.18)	-0.03940 (-0.65)	0.20273 (3.69)**	-0.12647 (-1.05)	0.00097 (1.34)	-0.00077 (-0.70)	0.76485 (12.37)**	0.09614 (0.81)	-1.34008 (-4.03)**	0.15711 (0.13)	0.88	296
Electrical Machinery	0.00106 (5.20)**	0.00728 (2.54)**	0.00270 (0.80)	-0.06493 (-2.52)**	0.31651 (11.28)**	-0.19680 (-1.77)*	0.00009 (0.27)	-0.00083 (-1.88)*	0.62509 (18.87)**	0.21510 (1.88)*	-0.52235 (-3.06)**	-0.39169 (-0.71)	0.95	745
Transportation Equipment	0.00458 (4.70)**	-0.00023 (-0.07)	0.00983 (2.88)**	-0.01396 (-1.23)	0.12365 (2.62)**	0.18989 (1.07)	0.00143 (2.67)**	-0.00147 (-2.54)**	0.89020 (15.43)**	-0.11476 (-0.57)	-1.97183 (-7.72)**	-0.20437 (-0.26)	0.91	503
Precision Instruments	0.00254 (2.84)**	-0.01345 (-0.66)	0.00114 (0.16)	-0.09325 (-0.55)	0.24705 (4.47)**	-0.78934 (-1.22)	-0.00002 (-0.04)	0.01775 (0.80)	0.71036 (9.90)**	-0.08569 (-0.25)	-1.01101 (-2.39)**	-2.30480 (-2.77)**	0.94	189
Miscellaneous Manufacturing	0.00067 (2.75)**	0.00009 (0.06)	0.00234 (0.82)	-0.01535 (-0.66)	0.44857 (10.75)**	-0.35191 (-2.57)**	0.00165 (3.26)**	-0.00231 (-3.82)**	0.53105 (13.19)**	0.12659 (0.92)	-1.05062 (-5.75)**	2.12082 (2.62)**	0.92	605

(3)France

	ROA		R		CASH		DEBT		K		Constant		$AdjR^2$	No.of Observa tions
	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift	less than 300%	over 300% shift		
Total Manufacturing	0.00008	0.00005	-0.00977	-0.01385	0.34797	0.00429	0.00048	-0.00069	0.60330	0.03480	-2.72314	-0.05052	0.79	1399
	(0.65)	(0.11)	(-1.74) *	(-0.94)	(24.71) **	(0.19)	(4.48) **	(-3.37) **	(32.46) **	(0.9)	(-30.6) **	(-0.26)		
Food	-0.00002	0.00193	0.00171	-0.00558	0.39036	-0.04831	0.00060	-0.00083	0.58117	0.15122	-2.88539	-0.27730	0.85	222
	(-0.05)	(0.57)	(0.13)	(-0.13)	(12.24) **	(-0.92)	(2.52) **	(-2.27) **	(13.00) **	(1.58)	(-14.51) **	(-0.57)		
Textiles	0.01017	-0.00931	-0.02188	0.01979	0.34660	0.06848	0.00089	-0.00063	0.70837	0.02178	-3.58899	0.17853	0.85	92
	(4.79) **	(-1.54)	(-1.19)	(0.14)	(10.67) **	(0.75)	(2.32) **	(-1.17)	(11.45) **	(0.09)	(-11.16) **	(0.14)		
Paper & Pulp	0.00087	-0.00044	-0.02945	-0.01982	0.31246	0.05188	0.00061	0.00010	0.66985	-0.09443	-2.83310	-0.12759	0.81	74
	(0.34)	(-0.08)	(-0.95)	(-0.38)	(4.22) **	(0.48)	(1.54)	(0.08)	(6.83) **	(-0.47)	(-5.94) **	(-0.14)		
Chemicals	0.00006	-0.00873	-0.01160	-0.04727	0.34678	-0.08501	0.00025	-0.00109	0.61966	0.11460	-2.72675	1.07586	0.77	100
	(0.17)	(-1.18)	(-0.80)	(-0.29)	(7.78) **	(-0.47)	(0.52)	(-0.26)	(9.17) **	(0.45)	(-9.28) **	(0.55)		
Petroleum & Coal	-0.00085	-1.16043	-0.01552	-5.24709	0.07150	3.70699	0.00041	0.78422	0.87096	-27.94270	-1.61948	0.00000	0.74	32
	(-0.19)	(-1.19)	(-0.43)	(-1.24)	(0.31)	(1.19)	(0.30)	(1.87) *	(3.49) **	(-1.91) *	(-1.64)	-		
Stone, Clay & Glass	-0.00053	-0.00731	-0.01261	-0.29364	0.38967	0.00745	-0.00106	0.00029	0.42856	0.02265	-1.75266	0.48501	0.86	63
	(-0.67)	(-0.31)	(-0.47)	(-2.13) **	(7.13) **	(0.09)	(-1.20)	(0.19)	(6.06) **	(0.11)	(-4.55) **	(0.49)		
Iron & Steel	-0.00239	0.00362	-0.01999	0.12834	0.50334	-0.41450	-0.00028	0.00677	0.37598	0.58663	-2.74496	-0.85131	0.79	59
	(-1.14)	(1.22)	(-0.47)	(0.80)	(5.34) **	(-0.73)	(-0.24)	(0.99)	(3.23) **	(1.10)	(-5.50) **	(-0.37)		
Metal Products	0.00005	0.00018	-0.01471	-0.00438	0.30085	-0.01702	0.00032	-0.00103	0.58105	0.06181	-2.37896	0.07892	0.65	115
	(0.17)	(0.21)	(-0.67)	(-0.07)	(6.97) **	(-0.23)	(0.86)	(-0.80)	(8.86) **	(0.43)	(-6.77) **	(0.11)		
Non Electrical Machinery	0.00000	-0.00123	-0.00792	0.02810	0.38310	0.03328	0.00061	-0.00376	0.63943	0.30082	-3.02543	-0.41271	0.83	105
	(-0.00)	(-0.17)	(-0.33)	(0.48)	(6.81) **	(0.34)	(0.85)	(-2.40) **	(9.29) **	(1.21)	(-8.63) **	(-0.33)		
Electrical Machinery	0.00072	-0.00921	0.01062	0.04509	0.30039	0.04073	0.00053	0.00062	0.59768	-0.10837	-2.41006	0.26697	0.68	167
	(0.55)	(-2.53) **	(0.64)	(0.82)	(6.39) **	(0.53)	(1.41)	(0.47)	(8.72) **	(-0.64)	(-7.97) **	(0.31)		
Transportation Equipment	0.00093	-0.00029	0.01198	-0.04073	0.27409	0.07005	0.00021	0.00008	0.72000	-0.08451	-3.00246	0.27726	0.69	136
	(1.20)	(-0.24)	(0.44)	(-0.66)	(4.70) **	(0.79)	(0.58)	(0.05)	(8.71) **	(-0.56)	(-8.45) **	(0.45)		
Precision Instruments	0.00010	-0.01318	-0.06393	-7.53794	0.36825	0.00000	0.00048	0.00000	0.63708	0.00000	-2.80055	0.00000	0.80	52
	(0.57)	(-0.13)	(-2.76) **	(-0.68)	(6.40) **	-	(0.76)	-	(10.05) **	-	(-6.53) **	-		
Miscellaneous Manufacturing	-0.00011	-0.00366	0.00561	-0.03852	0.32509	0.07469	0.00074	-0.00144	0.61057	-0.12101	-2.74388	0.80504	0.74	182
	(-0.28)	(-1.01)	(0.35)	(-1.08)	(6.10) **	(0.96)	(2.89) **	(-2.83) **	(10.57) **	(-1.17)	(-9.10) **	(1.37)		

Table 9 Response to Macroeconomic & Idiosyncratic Shock :Case1

	ROA			GDP		
	USA	Japan	France	USA	Japan	France
Total Manufacturing	0.00148 (10.85) **	0.00047 (1.79) *	0.00010 (0.81)	-0.00231 (-0.71)	0.06584 (14.03) **	0.01428 (1.16)
Food	0.00267 (4.28) **	-0.00232 (-1.41)	0.00005 (0.12)	-0.00607 (-0.59)	0.03478 (2.50) **	0.05193 (1.77) *
Textiles	0.00103 (0.95)	-0.00051 (-0.17)	0.00814 (4.64) **	0.01616 (0.75)	0.09564 (3.03) **	0.01883 (0.48)
Paper & Pulp	0.00540 (2.86) **	-0.01231 (-2.05) **	0.00055 (0.25)	-0.04583 (-3.32) **	0.02946 (0.92)	-0.01115 (-0.17)
Chemicals	0.00169 (2.54) **	-0.00193 (-2.21) **	0.00008 (0.24)	-0.01136 (-1.52)	0.07434 (6.63) **	0.07795 (1.67) *
Petroleum & Coal	0.01063 (6.95) **	-0.00250 (-1.34)	0.00056 (0.14)	-0.03107 (-3.04) **	0.02022 (0.47)	-0.07969 (-0.83)
Stone, Clay & Glass	0.00875 (2.91) **	0.00252 (0.87)	-0.00019 (-0.21)	-0.03628 (-1.72) *	0.02840 (1.25)	-0.07878 (-1.26)
Iron & Steel	0.00547 (1.91) *	-0.00020 (-0.06)	-0.00128 (-1.24)	0.00845 (0.26)	-0.03188 (-1.15)	-0.00660 (-0.09)
Nonferrous Metals	0.00991 (4.55) **	0.00478 (1.96) *		-0.01368 (-0.56)	0.04735 (1.65) *	
Metal Products	0.00617 (3.83) **	-0.00047 (-0.15)	0.00003 (0.11)	0.01295 (0.67)	0.09242 (2.89) **	-0.03685 (-0.68)
Non Electrical Machinery	0.00346 (3.42) **	0.00032 (0.35)	-0.00017 (-0.13)	-0.00184 (-0.14)	0.07224 (4.66) **	0.00863 (0.18)
Electrical Machinery	0.00110 (5.42) **	0.00313 (6.56) **	-0.00037 (-0.30)	0.01105 (1.60)	0.07876 (7.76) **	0.08593 (2.17) **
Transportation Equipment	0.00641 (5.70) **	0.00036 (0.27)	0.00083 (1.34)	-0.04316 (-3.26) **	0.07178 (6.40) **	0.00871 (0.18)
Precision Instruments	0.00230 (2.54) **	-0.00083 (-0.47)	0.00012 (0.66)	-0.00944 (-0.75)	0.08699 (2.96) **	-0.03974 (-0.76)
Miscellaneous Manufacturing	0.00084 (3.51) **	-0.00096 (-2.30) **	-0.00024 (-0.59)	0.01751 (1.91) *	0.06603 (4.73) **	0.01184 (0.30)

Estimated Equation : $\ln(I)_{it}=a_i+b*ROA_{it}+c*ROA2_t+d*R_{it}+e*\ln(CASH)_{it}+f*DEBT_{it}+g*\ln(K)_{it}$

Where ROA=Return on Asset(=operating Profit/Tangible Asset*100)

ROA 2 = ROA Industry Average

Table 10 Response to Macroeconomic & Idiosyncratic Shock :Case2

	ROA			ROA2			GDP		
	USA	Japan	France	USA	Japan	France	USA	Japan	France
Total Manufacturing	0.00118 (8.04) **	-0.00042 (-1.47)	0.00009 (0.79)	0.00300 (5.23) **	0.00541 (6.06) **	-0.00145 (-0.81)	-0.00437 (-1.35)	0.05776 (11.83) **	0.01763 (1.36)
Food	0.00204 (3.26) **	-0.00132 (-0.70)	-0.00015 (-0.37)	0.01263 (4.52) **	-0.00656 (-1.07)	-0.06834 (-3.66) **	-0.00814 (-0.79)	0.03724 (2.64) **	0.00737 (0.24)
Textiles	0.00334 (1.99) **	-0.00073 (-0.23)	0.00824 (4.63) **	-0.00563 (-1.79) *	0.00229 (0.23)	0.00149 (0.29)	0.02074 (0.97)	0.09073 (2.44) **	0.02392 (0.56)
Paper & Pulp	0.00230 (0.99)	0.00455 (0.50)	0.00056 (0.26)	0.01171 (2.23) **	-0.04401 (-2.42) **	0.00307 (0.21)	-0.05310 (-3.75) **	0.04651 (1.44)	-0.02177 (-0.26)
Chemicals	0.00116 (1.67) *	-0.00175 (-1.88) *	0.00015 (0.44)	0.00874 (2.99) **	-0.00175 (-0.38)	-0.01488 (-1.89) *	-0.01129 (-1.53)	0.07753 (4.95) **	0.10127 (2.12) **
Petroleum & Coal	0.00943 (2.70) **	0.00253 (0.62)	-0.00007 (-0.02)	0.00264 (0.38)	-0.01610 (-1.39)	-0.00099 (-0.08)	-0.03145 (-3.06) **	0.00874 (0.20)	-0.08745 (-1.11)
Stone, Clay & Glass	0.01233 (3.63) **	0.00469 (1.34)	-0.00012 (-0.12)	-0.01989 (-2.12) **	-0.00959 (-0.75)	0.00496 (0.38)	-0.02444 (-1.14)	0.04373 (1.29)	-0.10015 (-1.16)
Iron & Steel	0.00630 (1.49)	-0.00392 (-1.06)		-0.00204 (-0.27)	0.01964 (2.07) **		0.00615 (0.18)	-0.06059 (-1.95) *	
Nonferrous Metals	0.01019 (3.12) **	0.00661 (1.81) *	-0.00116 (-1.19)	-0.00075 (-0.12)	-0.00573 (-0.66)	-0.02449 (-2.03) **	-0.01377 (-0.56)	0.05570 (1.76) *	0.10309 (1.17)
Metal Products	0.00562 (3.05) **	-0.00109 (-0.35)	-0.00001 (-0.05)	0.00297 (0.57)	0.03144 (1.70) *	0.03628 (1.50)	0.00705 (0.32)	-0.02984 (-0.38)	-0.18616 (-1.65) *
Non Electrical Machinery	0.00406 (3.40) **	-0.00035 (-0.35)	0.00022 (0.16)	-0.00317 (-0.91)	0.00577 (1.64)	0.00595 (1.56)	-0.00266 (-0.20)	0.06217 (3.73) **	-0.02920 (-0.49)
Electrical Machinery	0.00082 (4.08) **	0.00205 (3.19) **	-0.00011 (-0.09)	0.01112 (7.86) **	0.00340 (2.41) **	-0.01855 (-2.07) **	0.00150 (0.22)	0.07378 (7.14) **	0.11339 (2.74) **
Transportation Equipment	0.00642 (5.38) **	-0.00004 (-0.02)	0.00083 (1.34)	-0.00001 (-0.00)	0.00166 (0.46)	-0.00064 (-0.09)	-0.04312 (-2.27) **	0.06917 (5.69) **	0.01283 (0.19)
Precision Instruments	0.00065 (0.50)	0.00022 (0.11)	0.00012 (0.67)	0.00431 (1.55)	-0.00555 (-1.17)	-0.00126 (-0.11)	-0.00590 (-0.46)	0.09356 (3.15) **	-0.03760 (-0.67)
Miscellaneous Manufacturing	0.00080 (3.01) **	-0.00097 (-2.33) **	-0.00024 (-0.59)	0.00060 (0.40)	0.01019 (1.09)	-0.00283 (-0.28)	0.01704 (1.84) *	0.04560 (1.94) *	0.01594 (0.38)

Estimated Equation： $\ln(I)_{it}=a_i+b*ROA_{it}+c*ROA2_t+d*GDP_t+e*R_{it}+f*\ln(CASH)_{it}+g*DEBT_{it}+h*\ln(K)_{it}$

Where ROA=Return on Asset(=operating Profit/Tangible Asset*100)

ROA２= ROA Industry Average

GDP=Annual Growth Rate of GDP

Figure 1 Cost of Capital and Capital Investment

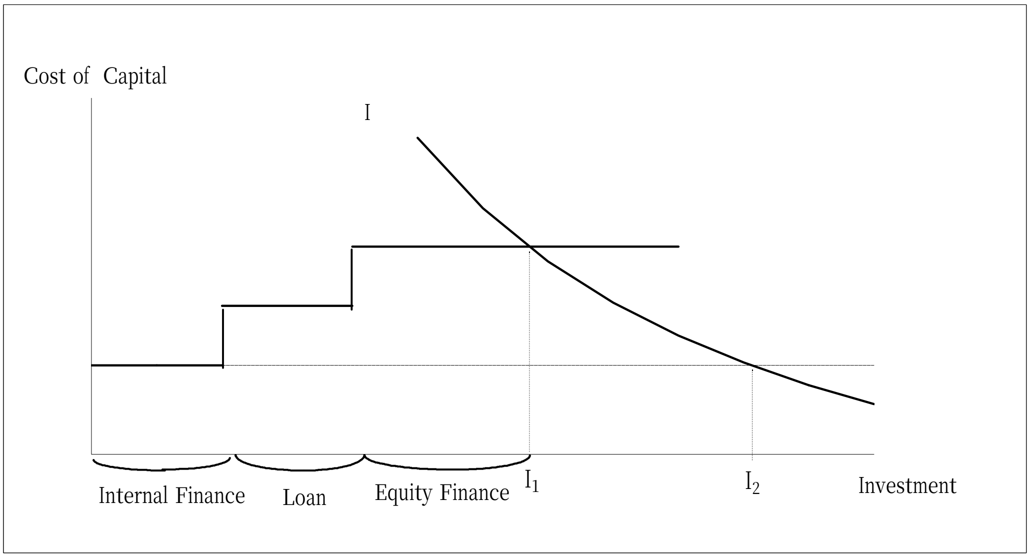
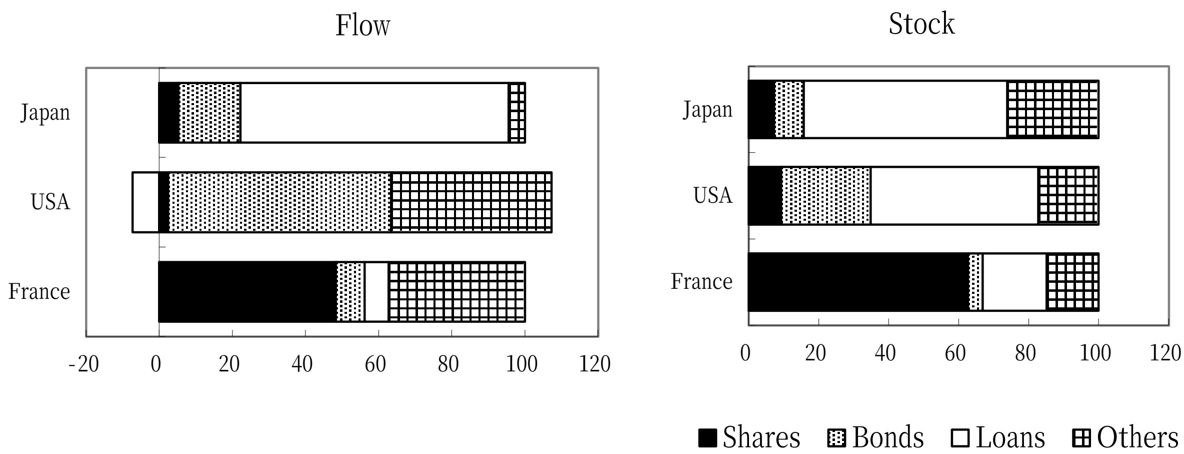


Figure 2 Financing of Nonfinancial Enterprises

(1990−95 average)



Source:OECD Financial Statistics