Japanese Companies' Overseas Business Expansion and Impacts of Changes in Exchange Rate[*1]

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Abstract

Japanese companies have been active in expanding business operations abroad. This paper focuses on the expansion of business operations of listed Japanese companies' overseas bases to analyze how differences in the asset size of overseas bases (share of overseas bases' assets) affect changes in the corporate value (PBR: price-to-book value ratio) due to changes in exchange rate. In addition, it analyzes the impact of changes in overseas bases' balance sheets and profits/losses due to changes in exchange rate on related performance indicators (equity capital, equity capital to total assets, and return on equity (ROE)). We use panel data to obtain the following estimation results. We find that the larger the asset size of company's overseas bases, the larger the company's export volumes, and, prior to the Lehman Shock, the higher the company's corporate value rises when the Japanese Yen depreciates. We also find that the impact on the corporate value increases somewhat although the increase is smaller compared with the situation where the Japanese Yen depreciates after the Lehman Shock. On the other hand, it becomes clear that the larger the asset size of company's overseas bases, the larger the impact of changes in exchange rate on the company's equity capital and the equity capital to total assets ratio through changes in the foreign currency translation adjustment. An analysis of the impact of changes in exchange rate on the ROE shows that depreciation of the Japanese Yen tends to increase the ROE because net profits have a larger positive effect on ROE. However, as the equity capital increases, the positive effect is partially offset. These results suggest that it is necessary to conduct the study by taking into account not only the impacts on export and other trade activities but also the impacts on companies' overseas assets when we study the impact of changes in exchange rate on corporate value.

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I. Introduction

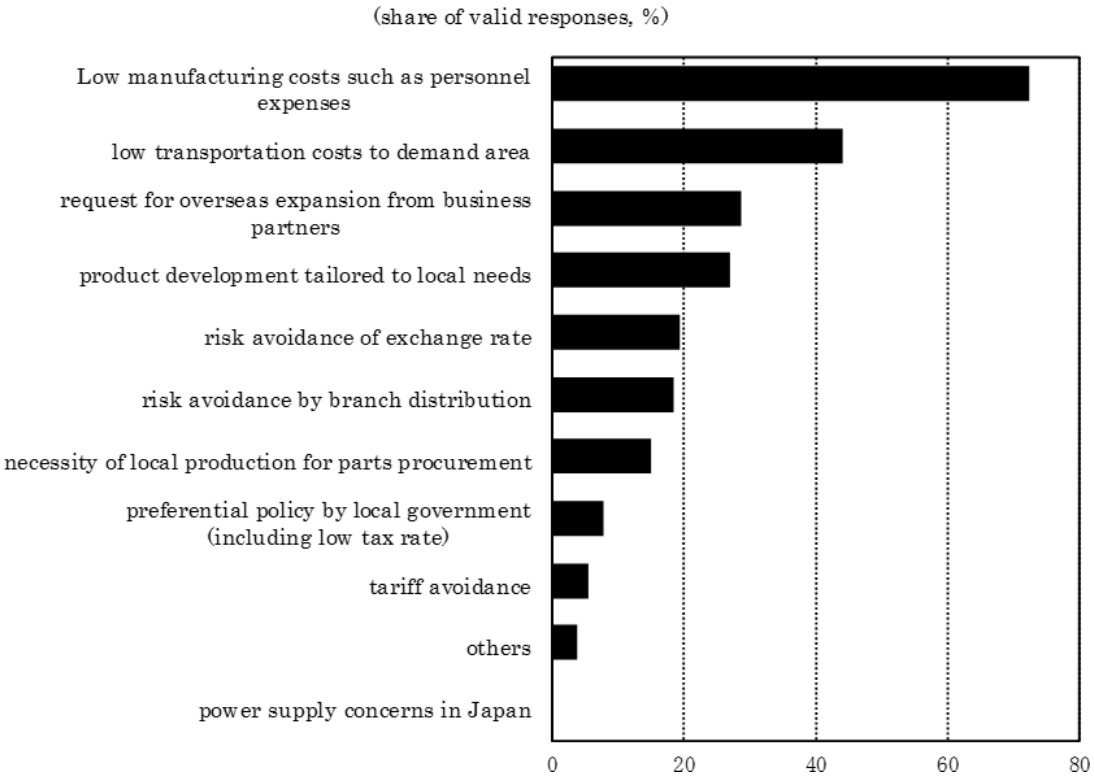
Japanese companies actively expand overseas business for various reasons such as harnessing global demand, product development to respond to the needs of local markets, and cost reduction. In the process, they expand their overseas bases' business. On one hand, in connection with the relationships between exchange rate and utilization of companies' overseas bases in recent years, it is noted that expansion of overseas bases' business has accelerated since the Japanese Yen rapidly appreciated after the Lehman Shock in 2008 and the Great East Japan Earthquake in 2011. The large economic jolt triggered by the Lehman Shock brought not only sharp decline in demand for exports from Japan but also rapid appreciation of the Japanese Yen. The latter caused a decline in price competitiveness for Japanese export companies. As a result, export companies in manufacturing industries particularly seemed to suffer significant adverse effects on their business performance.

The export companies seem to have subsequently strengthened countermeasures to mitigate the influence of the appreciation of the Japanese Yen on exports. Figure 1 shows the results of a survey that asked companies in manufacturing industries about why they conducted "overseas production" rather than "export from Japan." The results show that "avoidance of exchange rate risk" is answered as one of the reasons, following "lower manufacturing costs such as personnel expenses," "lower transportation costs to demand areas" and "product development suitable for local needs."

Figure 2 shows the outlook for domestic and overseas supply capacity in the medium- and long-term in the results of the same survey. There is some intention toward strengthening foreign investment after 2012. If companies undertake production in foreign countries, it will be possible for them to mitigate effects of changes in exchange rate on business performance via exports. For that reason, some Japanese export companies have shifted production bases from Japan to foreign countries.

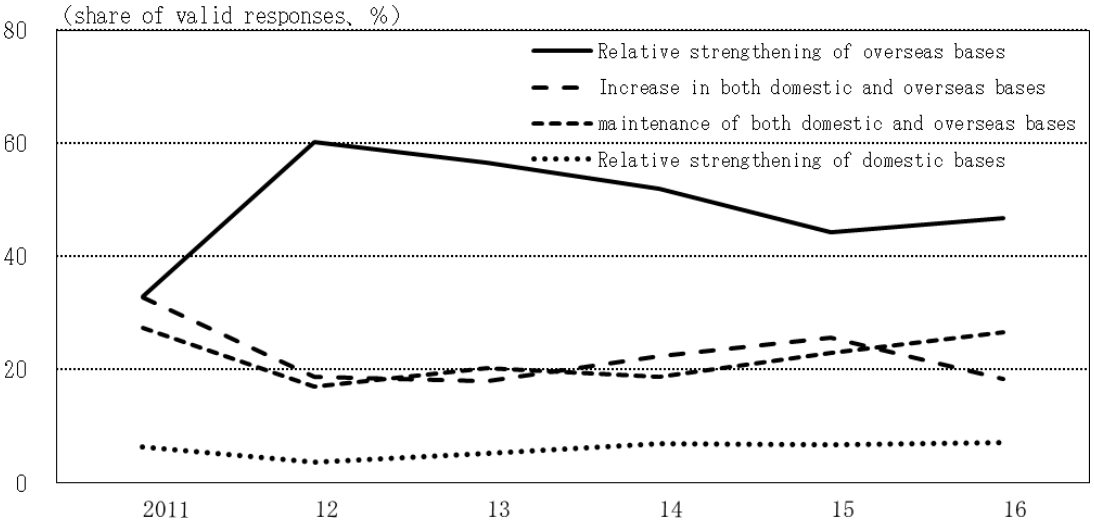
On the other hand, as shown in this survey's results, companies expand overseas bases' business not only to mitigate the influence of changes in exchange rate on exports but also to capture overseas demand and to reduce costs. Companies have no willingness to mitigate the influence of changes in exchange rate on their performance if they are to expand overseas bases' business in the situation where it is not so necessary to consider mitigating the influence of the depreciation of the Japanese Yen on exports. If companies expand overseas bases' business for any purpose, their assets, liabilities and profits/losses are expected to increase. They are likely to be recorded in terms of a local currency in many cases. Changes in exchange rate change the values of the assets, liabilities and profits/losses of overseas bases in terms of the Japanese Yen. They may have considerable impact on companies' per-

Figure 1. Reasons for overseas production rather than export from Japan (manufacturing industry)



Note: This graph is created based on "2013 Survey on Planned Capital Spending (Development Bank of Japan Inc.)."

Figure 2. Domestic and overseas supply capacity in the medium to long term (manufacturing industry)



Note: This graph is created based on "Survey on Planned Capital Spending (Development Bank of Japan Inc.)."

formance. Thus, it is necessary to consider not only export trends but also the developments in overseas bases that are affected by exchange rate trends when we investigate the impact of changes in exchange rate on companies.

In this paper, we focus mainly on expanding overseas bases of Japanese companies to analyze the influence of changes in exchange rate on companies. Specifically, it is aimed at conducting empirical analyses regarding the following issues: (1) how differences in the business size of companies' overseas bases affect the changes in corporate value and (2) how differences in the business size of overseas bases affect the impact of changes in exchange rate and changes in overseas bases' balance sheets and profits/losses on the related performance indicators (equity capital, equity capital to total assets, and return on equity (ROE) on consolidated basis[1]). Discussions regarding the influence of exchange rate on Japanese companies are often focused on aspects such as exports. However, the impact of overseas bases' business on corporate value and corporate performance might increase in the process of expanding overseas bases further in the future.

We use panel data of listed companies based on our available data to conduct empirical analysis on the issues although it is not easy to analyze directly such influences due to data constraints. We overview the previous studies on the relationships among exchange rate, companies' overseas expansion, and corporate value in Section 2. We show analytical viewpoints of our empirical analysis and explain analytical methods in Section 3. We explain data which are used for the empirical analyses in Section 4. We point out the analytical results in Section 5. We make conclusions in Section 6.

II. Previous Studies

There are empirical studies focused on foreign direct investment and exchange rate analyzing the relationships between business expansion of overseas bases and exchange rate. Previous studies suggested that appreciation of home currency increased foreign direct investment. Two factors are typically identified as the key underlying drivers.

One factor is that production costs such as wages in other countries are relatively lower due to appreciation of the home currency. The other factor is that it becomes easier to expand overseas bases through acquisition of overseas assets because appreciation of a home currency increases purchasing power of the home currency. Cushman (1985, 1987) and Culem (1988) highlighted the point that wages in other countries are relatively lower. Klein and Rosengren (1994) conducted an empirical analysis to show that it is easy to acquire assets in the appreciating home currency.

In addition, empirical studies attempted to investigate the relationships between expansion of overseas bases and volatility of exchange rate. If a home currency significantly appreciates, companies that export their products from their home country to other countries

[1] Unless otherwise mentioned, in this paper, we refer to indicators on a consolidated basis for indicators of performance.

face large losses in terms of profit/loss performance. On the other hand, if overseas bases for production are set up, they can be used flexibly to mitigate losses caused by changes in exchange rate. In terms of relationships with exchange rate volatility in the case of economic shock, Aizenman (1992) showed that companies increase investments in foreign countries when the exchange rate volatility increases. In addition, Sung and Lapan (2000) pointed out that they reduce the impact by establishing overseas bases if exchange rate volatility increases although risk-neutral companies mainly establish domestic bases when the exchange rate is stable.

There are not many analyses on profitability and corporate value regarding the relationships between companies' overseas expansion and corporate performance. Kondo, Nakahama, and Ichise (2014) empirically analyzed the impact of aggressive expansion of Japanese listed companies on profitability and corporate value. They showed that an increase in the degree of companies' overseas expansion has some positive effect on consolidated profitability and corporate value and that this effect has increased in recent years. In addition, regarding companies' overseas expansion, there are studies that used explanatory variables indicating whether companies enter overseas or not although they do not analyze the relationships with profitability or corporate value (Yamashita and Fukao 2010, Hijzen et al. 2010). There are no studies that used variables which indicate the extent (number of overseas bases and overseas bases' assets/consolidated total assets).

A comprehensive survey of the related studies was conducted in Ogawa, Shinada, and Okamoto (2014) on the influence of exchange rate fluctuations on corporate value. Jorion (1990), Bodnar and Gentry (1993), and Bartov and Bodnar (1994) conducted empirical analysis regarding US companies. They pointed out a common analytical result that the impact of exchange rate on corporate value is limited.

Baba, Fukao, Sasaki (1997), He and Na (1998), and Ogawa, Shinada, and Okamoto (2014) conducted empirical analysis regarding Japanese companies. Baba, Fukao, and Sasaki (1997) focused on the Japanese electromechanical industry. They showed that exchange rate fluctuations had the effect of raising the stock prices of companies with high overseas expansion and appreciation of the Japanese Yen lowered the stock price of companies with high dependence on export while depreciation of the Japanese Yen gave rise to the opposite effect. He and Na (1998) also showed that the stock price-earnings ratio is affected by exchange rate for some Japanese companies.

In the absence of analyses related to relationships between companies' overseas expansion and corporate value, further analyses on Japanese companies related to exchange rate are conducted by Baba, Fukao, and Sasaki (1997) and Ogawa, Shinada, and Okamoto (2014). Ogawa, Shinada, and Okamoto (2014) used recent time series/panel data to analyze the relationships between countermeasures against exchange rate fluctuations and corporate value for Japanese companies since the 2000s. The study empirically analyzed the internationalization of production or sales systems and the response to financial management for Japanese listed companies by using the price-to-book value ratio (PBR) as corporate value. It showed that changes in exchange rate have a significant effect on corporate value for Jap-

anese export companies even compared with companies which established overseas subsidiaries. Furthermore, it also pointed out that the influence was not completely mitigated although there is tendency to mitigate the influence of changes in exchange rate on corporate value by establishing overseas production or sales bases. Moreover, it showed that overall there is no effect of enhancing corporate value by utilizing such financial management instruments as forward exchange contracts, derivative transactions, and foreign currency-denominated bond issuance to mitigate changes in exchange rate.

It is possible to capture the influence of changes in exchange rate on companies' overseas balance sheets such as assets and liabilities by looking at the foreign currency translation adjustment included in net assets and comprehensive income in financial statements. There are studies on the relationships between comprehensive income and stock price in the previous studies on foreign currency translation adjustment. There are no studies which analyze the impact on performance indicators (equity capital, equity capital to total assets, and ROE) related to foreign currency translation adjustment or profit/loss.

Compared with the previous studies, the analysis in this paper mainly has two characteristics. One is that this paper uniformly treats the relationships between companies' overseas expansion, corporate value and exchange rate to analyze the impact of changes in exchange rate on corporate value. Regarding overseas business expansion, we take into account the degree of overseas expansion rather than presence or absence of overseas bases. In addition, the analysis focuses on the influence of changes in exchange rate on overseas bases' balance sheets and profits/losses using the same method. We use data on foreign currency translation adjustment to analyze directly the impact on companies' important performance indicators such as equity capital, equity capital to total assets and ROE.

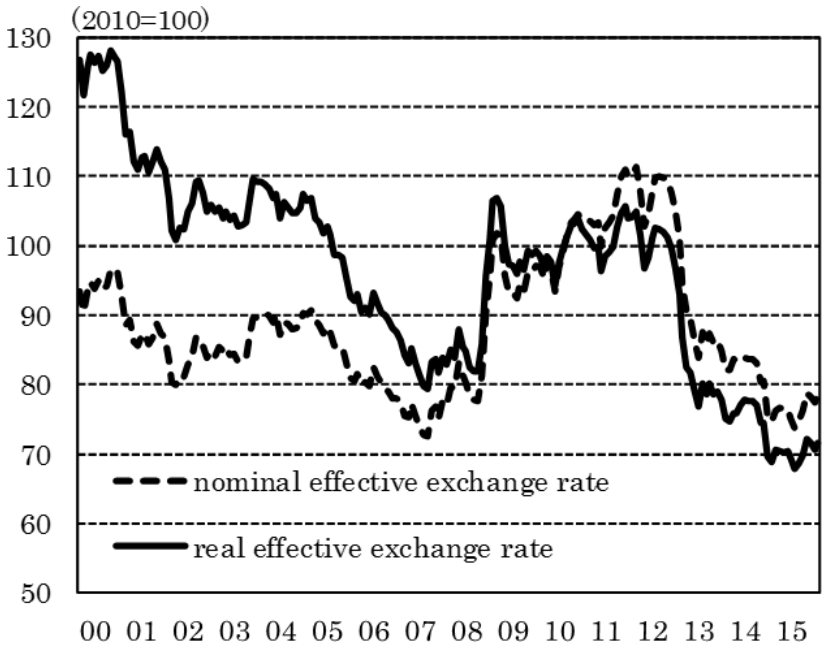
III. Analytical Viewpoint and Analytical Method

III-1. Analytical Viewpoint

The influence of changes in exchange rate on corporate value might be smaller for companies whose scale of overseas bases is larger in the case of appreciation of home currency or increase in the exchange rate volatility if companies expand overseas bases in order to mitigate the impacts of changes in exchange rate on exports. However, it is also necessary to consider the influence of changes in exchange rate on overseas bases themselves. For example, if growth of the world economy increases and it is in an environment where companies can actively exploit overseas demand, it is conceivable for companies to take strategies expanding overseas bases' business in addition to exports even in the case of depreciation of the home currency. In this case, the influence of changes in exchange rate on corporate value might increase through both overseas bases' business and exports.

The Japanese Yen was on a depreciating trend during the period from 2000 to 2008 before the Lehman shock occurred, as shown in Figure 3. As the world economy continued growing steadily at that time, companies could actively exploit overseas demand. While

Figure 3. Trend of real effective and nominal effective exchange rates



Note: This graph is created based on "data of effective exchange rate (Bank of Japan)."

Japanese companies expanded exports by utilizing the advantage of the depreciated Japanese Yen, it was also possible for them to promote expansion of overseas bases' business without considering it necessary to mitigate the influence of changes in exchange rate on exports. On the other hand, Japanese companies continued promoting expansion of overseas bases as the Japanese Yen significantly depreciated from 2011. One of the reasons is that, Japanese companies mainly seemed to mitigate the influence of changes in exchange rate on exports in the situation where the Japanese Yen significantly appreciated in a short period. If the companies actively employed strategies for utilizing overseas bases instead of exports to mitigate the influence of changes in exchange rate, they could face a possible situation where the influence of changes in exchange rate on corporate value did not significantly change from 2011 despite the large depreciation of the Japanese Yen. We conduct the following empirical analyses based on the above-mentioned viewpoints.

[Analysis 1]

- How differences in the business size of overseas bases or exports affect the influence of changes in exchange rate on corporate value.
- How the influence of changes in exchange rate on corporate value changes before and after the Japanese Yen appreciated significantly.

As the companies' overseas bases expand, sizes of their assets, liabilities and profits/losses are increasing. As these are likely to be recorded in a local currency in many cases, the amounts that are converted into Japanese Yen are affected by changes in exchange rate

of the Japanese Yen in terms of the local currency. Among them, the fluctuations in overseas bases' balance sheets can be cumulatively included in the foreign currency translation adjustment in financial statements. It occurs when the balance sheets of overseas subsidiaries denominated in terms of a foreign currency are incorporated into consolidated accounts in terms of the Japanese Yen. Specifically, the foreign currency translation adjustment reflects the cumulative difference between assets or liabilities of overseas bases in the Japanese Yen converted by exchange rate on account settlement and equity capital of overseas bases in the Japanese Yen converted by exchange rate at the time of contribution or profits/losses converted by exchange rate at the time of occurrence. As a result, the changes in foreign currency translation adjustment means the approximate changes in balance sheets of overseas bases due to changes in exchange rate for the current year.

Foreign currency translation adjustment is one of the components of equity capital. If changes in exchange rate change foreign currency translation adjustment, equity capital changes through the foreign currency translation adjustment. They might have influence on equity capital to total assets, which is an indicator showing the financial soundness of companies. In other words, depreciation of the Japanese Yen generally increases equity capital through the foreign currency translation adjustment. Also, equity capital to total assets rises due to the effect of increase in Japanese Yen-denominated net assets. On the other hand, appreciation of the Japanese Yen decreases equity capital; it decreases equity capital to total assets due to the effect of decrease in the Japanese Yen-denominated net assets. This influence becomes larger as companies' overseas bases expand. That might have considerable impact on equity capital and equity capital to total assets.

The impacts of changes in exchange rate for each period cumulatively accumulates over time. For this reason, the impact of changes in exchange rate might decrease both equity capital and equity capital to total assets in the phase where the Japanese Yen appreciated largely after the Lehman Shock.

Return on equity (ROE) has been used by investors as one of the important indicators of corporate performance related to equity capital. Investors have focused on ROE in recent years as pointed out in the Project Report on "Competitiveness and Incentives for Sustainable Growth: Building Favorable Relationships between Companies and Investors" (commonly referred to as the 'Ito Review') published by the Ministry of Economy, Trade and Industry.

In general, investors request companies to reinvest internal reserves to grow. They expect measures such as returns to shareholders if companies cannot make effective use of such reserves. Based on this idea, it is commonly recognized that companies should set ROE targets, as a minimum, at above capital costs. On the other hand, international comparison shows that ROE has remained low in the long run although the ROE of Japanese companies has recently increased somewhat. ROE levels have been concentrated, trending low, with less variation among companies.

ROE is calculated as "current net profit(loss)/current equity capital." The ROE also fluctuates through equity capital if the foreign currency translation adjustment fluctuates. In ad-

dition, because net profit/loss is also affected by changes in exchange rate, ROE also fluctuates through fluctuations in net profit/loss. These effects are enhanced as overseas bases expand. It is possible that the impact on ROE becomes larger as well. We conduct the following empirical analysis about the followings based on these viewpoints.

[Analysis 2]

・How differences in the asset size of overseas bases affect impacts of changes in exchange rate on equity capital, equity capital to total assets, and ROE through overseas bases' balance sheets or profits/losses.

III-2. Analytical Method

[Analysis 1]

We analyze the impact of changes in exchange rate on corporate value. We base the analysis on the following empirical model according to Ogawa, Shinada, and Okamoto (2014). We use the following analytical model (1) to estimate how exchange rate affects a corporate value (price-to-book value ratio (PBR)) while controlling other factors, which include PBR of the entire companies to be analyzed.

$$V_{i,t} = \beta_0 + \beta_1 V_{m,t} + \beta_2 FX_t + \lambda_j A_{j,i,t} + \varepsilon_{i,t} \quad (1)$$

where $V_{i,t}$: price-to-book value ratio (PBR) of company i at time t, $V_{m,t}$: PBR of the entire companies to be analyzed, FX_t: nominal effective exchange rate or real effective exchange rate, $A_{j,i,t}$: a group of control variables for each company i at time t which includes return on total assets (ROA, recurring profit/loss/total assets) and debt ratio (interest-bearing debt/total assets).

As in the previous studies, the change in corporate value of each company is divided into a change in the corporate value of the entire company under analysis and changes in other factors. The coefficient β_2 represents the influence of changes in exchange rate on PBR. The coefficient β_2 is defined as exchange rate exposure in the previous studies. It is intended to grasp the impact of changes in exchange rate on corporate value by utilizing sign and magnitude of the coefficient. The corporate value is calculated as "price-to-book value ratio (PBR) = stock price/net assets per share."

In this paper, we cover companies belonging to all industries except for financial and insurance industries listed on the Tokyo Stock Exchange, Osaka Stock Exchange, and Nagoya Stock Exchange. Among them, as explained later, we analyze by narrowing down to companies whose asset data classified by domestic bases and overseas bases can be continuously acquired. As for the exchange rate, we use the real effective exchange rate and the nominal effective exchange rate, which are published by the Bank of Japan based on the BIS standard. This is the main analysis method to grasp the exchange rate exposure, which can be undertaken in this way for each company group classified according to the business size of overseas bases.

[Analysis 2]

As mentioned in the analytical viewpoint, the influence of changes in exchange rate can

be reflected in the changes in foreign currency translation adjustment as balance sheets of overseas bases are translated into the Japanese Yen. Regarding changes in equity capital, we measure the contribution impact of foreign currency translation adjustment and other factors based on the equity capital in the previous year. In addition, we also consider the impact on equity capital to total assets. Equity capital to total assets is "equity capital/total assets," and it is possible to estimate the influence of changes in foreign currency translation adjustment on equity capital to total assets by identifying the difference between current equity capital to total assets and that ratio calculated by excluding the fluctuations in foreign currency translation adjustment. Based on this method, we analyze whether the impact differs for each company group classified according to the scale of overseas bases' business in Analysis 1. Also, we consider the degree of annual and cumulative impact from the financial years 2007 to 2011 when the Japanese Yen appreciated largely.

Next, we investigate the effect of changes in exchange rate on ROE. At first, we use the following empirical model to conduct the empirical analysis according to the model utilized in the previous studies.

$$ROE_{i,t} = \beta_0 + \beta_1 FX_t + \gamma_j A_{j,i,t} + \varepsilon_{i,t} \quad (2)$$

where $ROE_{i,t}$: ROE of each company i at time t, FX_t: nominal effective exchange rate at time t, $A_{j,i,t}$: a group of control variables (A_j, j = 1, 2, 3, ...) for each company i at time t. It includes ownership ratio of overseas corporations, total assets (natural logarithms), sales growth rate, debt ratio. ROE is calculated by "current net profits (losses)/current equity capital." The nominal effective exchange rate is published by the Bank of Japan based on BIS standard.

Based on this method, we analyze the impact of changes in exchange rate on ROE by assessing sign and magnitude of the coefficient β_1 related with the exchange rate. We estimate this exchange rate exposure for each company group classified according to the scale of overseas bases' business. We investigate the effect of changes in foreign currency translation adjustment on ROE through equity capital by the following empirical model.

$$ROED_{i,t} = \beta_0 + \beta_1 FTA_{i,t} + \gamma_j A_{j,i,t} + \varepsilon_{i,t} \quad (3)$$

where $ROED_{i,t}$: the contribution of changes in foreign currency translation adjustment in the difference between ROE in previous year and ROE in current year for each company i at time t. It is measured by "ROE in previous year× (changes in foreign currency translation adjustment/current equity capital)" for each company i. $FTA_{i,t}$: "fluctuations in foreign currency translation adjustment/current equity capital" for each company i at time t.

As changes in exchange rate affect foreign currency translation adjustment, the sensitivity of "fluctuations in foreign currency translation adjustment/current equity capital" to rate of changes in exchange rate is estimated by the following model.

$$FTA_{i,t} = \beta_0 + \beta_1 FXC_t + \varepsilon_{i,t} \quad (4)$$

where $FTA_{i,t}$: "changes in foreign currency translation adjustment/current equity capital" for each company i at time t, FXC_t: rate of changes in nominal effective exchange rate.

Because "fluctuations in foreign currency translation adjustment / current equity capital" is an explanatory variable of the model (3), it is possible to estimate the impact of changes

in exchange rate on ROE through foreign currency translation adjustment and equity capital by estimating models (3) and (4). In addition, we analyze the difference from the ROE calculated by excluding fluctuations in foreign currency translation adjustment regarding current equity capital to grasp the influence of fluctuations in foreign currency translation adjustment on ROE. Equity capital is expected to expand through foreign currency translation adjustment in depreciation of the Japanese Yen, which affects decline in ROE. Therefore, we consider the yearly and cumulative impact after the financial year 2011 when the Japanese Yen largely depreciated for each company group classified according to the scale of overseas bases' business in Analysis 1. This is a fundamental part of our analysis to grasp the influence of exchange rate fluctuations on equity capital, equity capital to total assets and ROE.

IV. Data

In Analysis 1, we pay attention to how the scale of overseas bases' business affects the impact of changes in exchange rate on corporate value. It is conceivable that we utilize asset size as a stock-based indicator which is not affected by business performance in every year though sales of overseas bases are available as indicators showing their scale. As described in the previous section, data on asset size of overseas bases can be obtained in the segment information of financial statements. Since the data on total assets of overseas bases can be obtained in the segment information by location, "share of overseas bases' assets = total assets of overseas bases/consolidated total assets" can be provided as an index showing the asset size of overseas bases. However, because disclosure criteria for segment information specified by the Business Accounting Deliberation Council is to disclose when overseas bases' sales accounts for more than 10% of consolidated total sales in principle, companies which disclose segment information under these conditions are subject to analysis. In addition, due to the simplification of disclosure format, it is until the financial year 2009 that we can obtain the data of total assets of overseas bases for most companies. Therefore, companies whose data can be obtained for the period from financial year 1999 to financial year 2009 are subject to analysis.

Depending on the share of overseas bases' asset, companies can be grouped by their size. The base year for grouping companies is financial year 2009, for which the data can be obtained most recently. We classify the companies into three groups: (a) 0% or more and less than 20% [smaller share group], (b) 20% or more and less than 40% [medium share group], and (c) 40% or more [larger share group], according to the share of overseas bases' assets. The grouping is designed to ensure a certain number of companies for each corporate group and their distribution. As for indicators related to export size, "foreign sales" is disclosed, which is sum of export sales from Japan to foreign countries, local sales of overseas subsidiaries, and export sales from the country to another country in segment information. Sales of overseas subsidiaries is also recorded as "overseas bases' sales" in segment information. It is possible to calculate the export sales from Japan for each company, even if it is

a rough estimate, if "overseas bases' sales" is subtracted from "foreign sales". We can calculate "share of export sales = (foreign sales − overseas bases' sales)/consolidated sales" as an indicator on export size.

The data showing performance of Japanese companies and the scale of overseas bases' business and exports are available in the "Company Financial Data Bank" by Development Bank of Japan Inc. which contains data on financial statements of Japanese listed companies. In our analyses, it is one of our objectives that we investigate the scale of overseas bases' business and exports. These data can be obtained in segment information of securities report in which sales, operating profit, and total assets are mainly disclosed, classified by industry and by domestic and overseas regions. Assets and sales of overseas bases can be obtained from segment information for domestic and overseas regions. It is possible to estimate the export sales from Japan though it is a rough estimation. Indicators required for grouping based on the scale of overseas bases' business and exports are calculated with this method. However, in the segment information, the displayed items are simplified for most companies after financial year 2010. Items such as total assets of overseas bases are not disclosed as a whole. Therefore, analyses using scale of overseas bases' business and exports are mainly conducted by utilizing data up to financial year 2009 for the period we can obtain these data.

As for the exchange rate, we use the nominal and real effective exchange rates published by the Bank of Japan. We calculate corporate value using the price-to-book value ratio (PBR), based on stock price, in investigating the influence of changes in exchange rate on companies. We source the stock price data required for the calculation from the Nihon Keizai Shimbun "NEEDS—Financial QUEST." We calculate ROA and ROE using the relevant data inputs obtained from the "Company Financial Data Bank."

V. Analytical Results

V-1. Impact of Changes in Exchange Rate on Corporate Value

We estimate exchange rate exposure for each corporate groups classified by the share of overseas bases' assets by using the empirical model (1). The estimation period is from financial year 1999 to financial year 2009. The analyses are based on fixed effect model by using panel data. Table 1 shows descriptive statistics of panel data during a period from financial year 1999 to financial year 2009 and during a period from financial year 2010 to financial year 2015. When we look at the average and the variance of each indicator, we find some data whose dispersions are slightly large. In addition, there are also variables (for example, exchange rate (FX) and PBR (PBR_M)) whose correlations are relatively high for the entire sample of companies under analyses though it is confirmed that there are not variables whose correlation is high in general. Table 2 shows the results of estimation based on the empirical model (1) for each of the corporate groups which include (a) 0% or more and less than 20% [smaller share group], (b) 20% or more and less than 40% [medium share group],

Table 1-1. Basic statistics (financial years 1999-2009)

Variables	Average	Standard Deviation	Minimum	Maximum
PBR（price-to-book value ratio）	1.35	1.12	0.22	14.57
PBR_M(PBR of entire company under analyses）	1.94	0.56	1.39	2.81
REER（real effective exchange rate）	86.88	12.73	69.98	102.33
NEER（nominal effective exchange rate）	92.57	11.76	76.10	108.73
ROA（recurring profit and loss／total assets）	5.51	3.73	-15.78	24.29
DEBT（interest-bearing debt／total assets）	16.27	14.57	0.00	79.83

Note: Number of companies is 345.

Table 1-2. Basic statistics (financial years 2010-2015)

Variables	Average	Standard Deviation	Minimum	Maximum
PBR（price-to-book value ratio）	1.55	1.32	0.00	35.53
PBR_M(PBR of entire company under analyses）	1.95	0.40	1.39	2.53
REER（real effective exchange rate）	102.64	12.06	82.61	126.80
NEER（nominal effective exchange rate）	86.5	5.45	75.48	100.00
ROA（recurring profit and loss／total assets）	5.52	4.61	-18.68	31.60
DEBT（interest-bearing debt／total assets）	19.19	15.62	0.00	86.14

Note: Number of companies is 341.

and (c) 40% or more [larger share group] classified by asset size of overseas base. The coefficient on the PBR of the entire sample of companies under analysis (PBR_M) is significantly positive. The coefficient shows that the corporate value (PBR) for each company has a relatively strong correlation with the PBR of the entire sample of companies under analysis (PBR_M). The coefficient on real effective exchange rate (REER), which is the exchange rate exposure, is significantly positive for (a) corporate group whose share of overseas bases' assets is 0% or more and less than 20%. On the other hand, it is significantly negative for both (b) and (c) corporate groups whose share of overseas bases assets is 20% or more and less than 40% and 40% or more, respectively. The results show that corporate value (PBR) increases when the Japanese Yen depreciates. Comparing the exchange rate exposures between (b) medium share group and (c) larger share group, the absolute value of the coefficients are larger for the corporate group whose share of overseas bases' assets is larger. The

Table 2-1. Estimated results by the empirical model (1): explained variable PBR (financial years 1999-2009)

	Share of overseas bases' assets (0% or more and less than 20%)	Share of overseas bases' assets (20% or more and less than 40%)	Share of overseas bases' assets (40% or more)
PBR_M (PBR of entire company under analyses)	0.458 (0.053)***	0.441 (0.033)***	0.697 (0.115)***
REER (real effective exchange rate)	0.005 (0.002)***	-0.002 (0.001)*	-0.013 (0.004)***
NEER (nominal effective exchange rate)	—	—	—
ROA (recurring profit and loss/total assets)	0.078 (0.007)***	0.077 (0.004)***	0.114 (0.013)***
DEBT (interest-bearing debt/total assets)	-0.003 (0.003)	-0.002 (0.003)	0.027 (0.008)***
C (constant term)	-0.368 (0.188)**	0.460 (0.123)***	0.679 (0.454)*
number of companies	115	156	74
coefficient of determination	0.24	0.32	0.16

Note: The estimation results are estimated by fixed effect model.
( ) indicates the standard deviation. ***, **, * indicate significance at 1%, 5%, 10% level respectively.

Table 2-2. Estimated results by the empirical model (1): explained variable PBR (financial years 1999-2009)

	Share of overseas bases' assets (0% or more and less than 20%)	Share of overseas bases' assets (20% or more and less than 40%)	Share of overseas bases' assets (40% or more)
PBR_M (PBR of entire company under analyses)	0.708 (0.057)***	0.571 (0.038)***	0.698 (0.130)***
REER (real effective exchange rate)	—	—	—
NEER (nominal effective exchange rate)	0.002 (0.004)	-0.005 (0.003)*	-0.024 (0.010)***
DEBT (interest-bearing debt／total assets)	-0.014 (0.003)***	-0.018 (0.002)***	-0.008 (0.007)
C (constant term)	0.043 (0.419)	1.162 (0.283)***	2.967 (0.946)***
number of companies	115	156	74
coefficient of determination	0.15	0.20	0.08

Note: The estimation results are estimated by fixed effect model.
( ) indicates the standard deviation. ***, **, * indicate significance at 1%, 5%, 10% level respectively.

results are the same in the case of nominal effective exchange rate (NEER). When the impact of changes in exchange rate on companies is analyzed, it is necessary to consider the export situation in addition to the overseas bases.

We consider the influence of changes in exchange rate on corporate value based on the share of export sales indicating export size in addition to the share of overseas bases' assets. Figure 4 shows the trend in share of export sales during the estimation period for each of the corporate groups. It shows that the share of export sales has an upward trend for each of the corporate groups. Also, it shows that the share of export sales is higher for the corporate group whose share of overseas bases' assets is higher. In other words, in the estimation period, the larger the asset size of overseas bases, the more export is done in general. The companies seem to expand exports in parallel with expanding overseas bases in the process of overseas expansion. As we had a depreciating trend for the Japanese Yen in the sample period, it is possible that the companies expand overseas bases without taking into account adverse effects of appreciation of the Japanese Yen on exports. As a result, the larger the asset size of companies' overseas bases, the greater the influence of changes in exchange rate on corporate value might be through both overseas bases' business and exports.

Next, we compare the effect of changes in exchange rate on corporate value during the period from financial year 2010 to financial year 2015 with that during the period from financial year 1999 to financial year 2009. We estimate exchange rate exposure for the period from financial year 2010 to financial year 2015 as well as during the period from financial year 1999 to financial year 2009. Table 3 shows the estimation results during both periods for the entire sample of companies under analysis. It shows that the exchange rate exposure is significantly negative during the both periods. The exchange rate exposure during the pe-

Figure 4. Trend of export sales share (by share of overseas bases' assets)

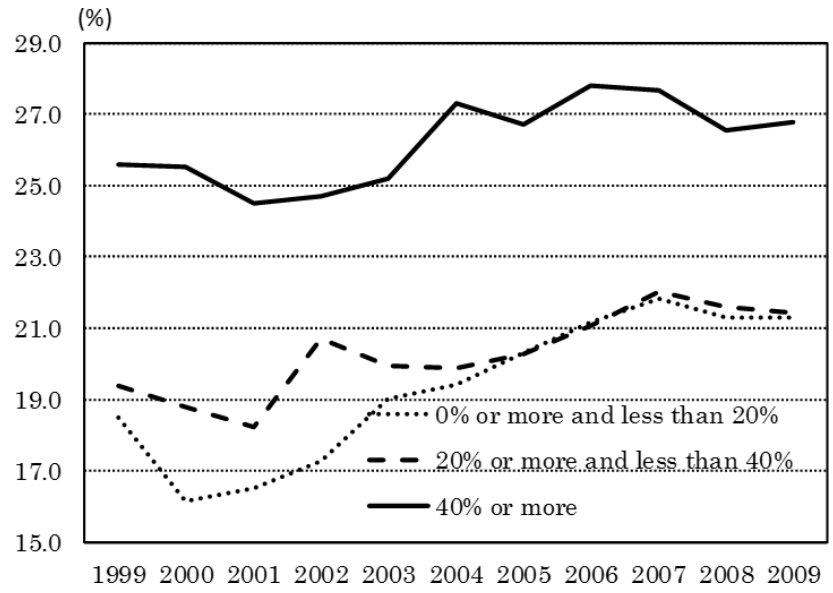


Table 3-1. Estimated results by the empirical model (1): explained variable PBR

	Financial years 1999- 2009	Financial years 2010 - 2015
PBR_M (PBR of entire company under analyses)	0.493 (0.034)***	0.281 (0.071)**
REER (real effective exchange rate)	-0.003 (0.001)**	-0.006 (0.003)**
NEER (nominal effective exchange rate)	—	—
ROA (recurring profit and loss／total assets)	0.087 (0.004)***	0.065 (0.006)***
DEBT (interest-bearing debt／total assets)	0.005 (0.002)**	-0.002 (0.003)
C (constant term)	0.293 (0.126)**	1.060 (0.399)***
number of companies	345	341
coefficient of determination	0.21	0.26

Note: The estimation results are estimated by fixed effect model.
( ) indicates the standard deviation. ***, **, * indicate significance at 1%, 5%, 10% level respectively.

Table 3-2. Estimated results by the empirical model (1): explained variable PBR

	Financial years 1999 - 2009	Financial years 2010 - 2015
PBR_M (PBR of entire company under analyses)	0.643 (0.038)***	0.239 (0.080)***
REER (real effective exchange rate)	—	—
NEER (nominal effective exchange rate)	-0.007 (0.003)***	-0.011 (0.004)***
DEBT (interest-bearing debt/total assets)	-0.014 (0.002)***	-0.009 (0.003)***
C (constant term)	1.198 (0.279)***	2.068 (0.500)***
number of companies	345	341
coefficient of determination	0.12	0.22

Note: The estimation results are estimated by fixed effect model.
( ) indicates the standard deviation. ***, **, * indicate significance at 1%, 5%, 10% level respectively.

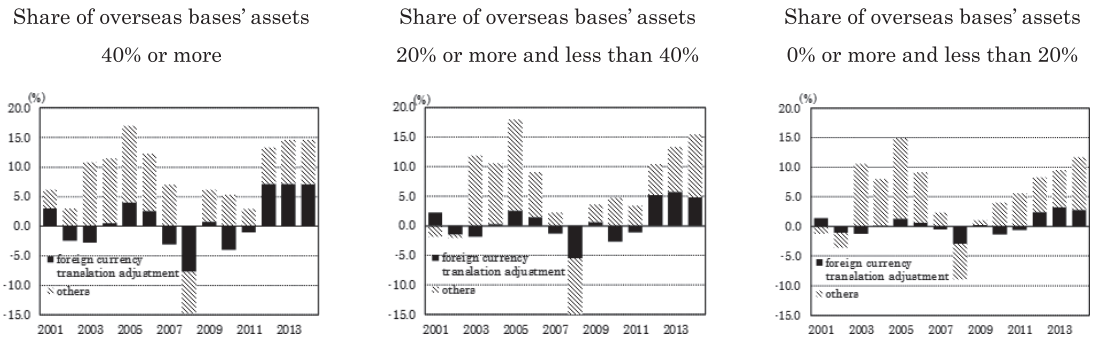
riod from financial year 2010 to financial year 2015 is slightly higher than that during the period from financial year 1999 to financial year 2009. However, if we take into account the fact that the Japanese Yen depreciated considerably during the period from financial year 2010 to financial year 2015, the level might not significantly change. It is possible for companies to decrease the fluctuations in exchange rate exposure because some companies expand overseas bases to mitigate the influence of changes in exchange rate on exports.

V-2. Impact of Changes in Exchange Rate on Equity Capital, Equity capital to total assets, and ROE

Figure 5 shows the impacts of foreign currency translation adjustment and other factors that contribute to changes in equity capital on the basis of equity capital in previous year. It shows that the higher the share of overseas bases' assets, the greater the impact of changes in foreign currency translation adjustment on equity capital. Moreover, the accumulated impacts are small on the phase where the cycle in appreciation and depreciation of the Japanese Yen continues. However, changes in foreign currency translation adjustment greatly contribute to changes in equity capital and its accumulated impacts are large in the phase where the Japanese Yen largely appreciates or depreciates during the period from financial year 2007 to financial year 2011 and after financial year 2012. Figure 6 shows the impact at each year during the period from financial year 2007 to financial year 2011 and the accumulated impacts starting from financial year 2007. It indicates that equity capital is cumulatively damaged by about 15% for corporate group whose share of overseas bases' assets is 40% or more.

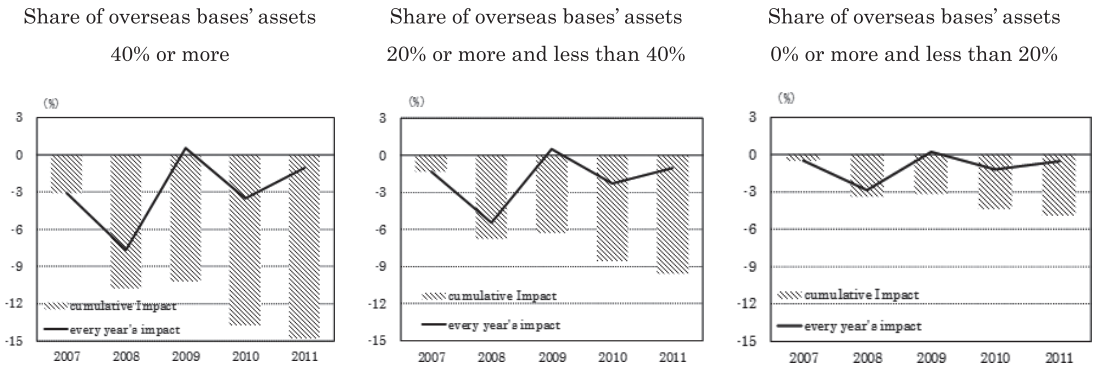
Figure 7 shows the impact of changes in foreign currency translation adjustment on equity capital to total assets. The corporate group with higher share of overseas bases' assets has greater impact on equity capital to total assets like the impact on equity capital. It has a similar trend for annual and cumulative impact. For the corporate group whose share of

Figure 5. Impact of fluctuations in foreign currency translation adjustment on changes in equity capital (impact based on capital in previous year)



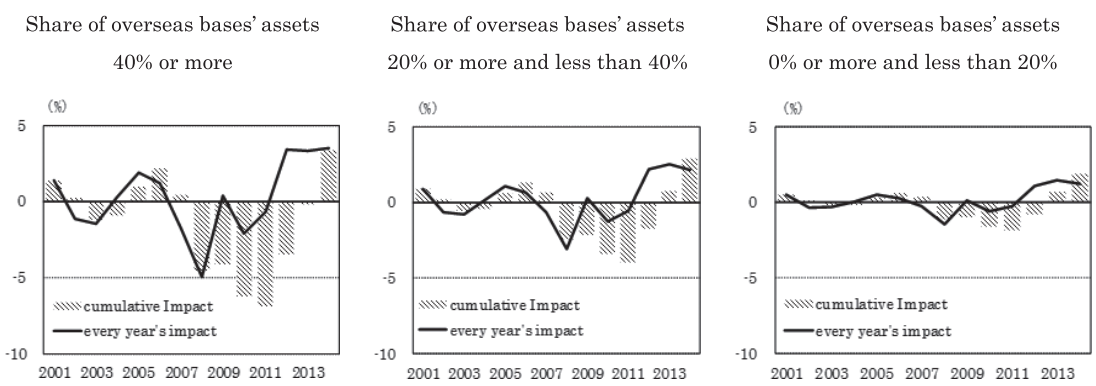
Note: Number of companies (40% or more): 56, number of companies (20% or more and less than 40%): 154, number of companies (0% or more and less than 20%): 111.
The accumulated impact is accumulated since financial year 2007.

Figure 6. Impact of fluctuations in foreign currency translation adjustment based on capital in previous year (financial years 2007-2011)



Note: Number of companies (40% or more): 56, number of companies (20% or more and less than 40%): 154, number of companies (0% or more and less than 20%): 111.
Every year's impact.

Figure 7. Impact of fluctuations in foreign currency translation adjustment on equity capital to total assets (by shares of overseas bases' assets)



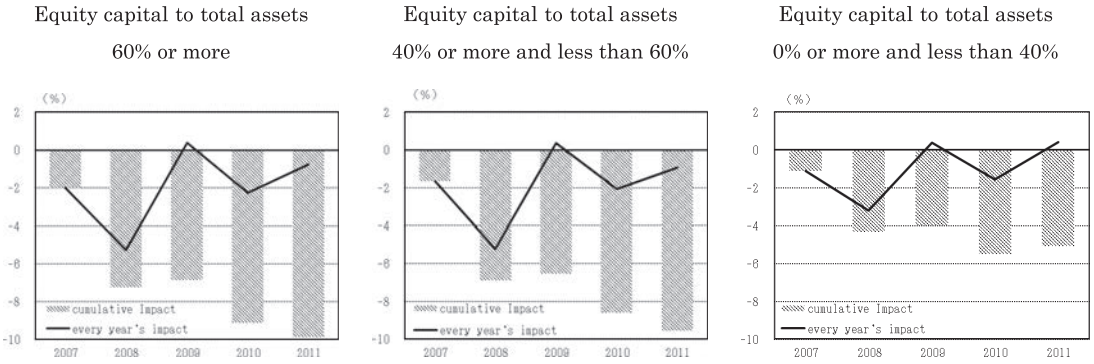
Note: Number of companies (40% or more) is 56, number of companies (20% or more and less than 40%) is 154, number of companies (0% or more and less than 20%) is 111.
The accumulated impact is accumulated since 2001FY.

overseas bases' assets is 40% or more, the equity capital to total assets cumulatively declines by more than 5% during the period from financial year 2007 to financial year 2011.

Figure 8 shows the impact in each year and the accumulated impacts starting from financial year 2007 for each corporate group whose share of overseas bases' assets is 40% or more. It shows that the impact on the corporate group with higher equity capital to total assets is greater. Equity capital to total assets cumulatively declines by approximately 10% during the period from financial year 2007 to financial year 2011 for the corporate group whose share of equity capital to total assets is 60% or more.

Next, we show the analytical results regarding impacts on ROE. Table 4 shows the basic statistics of the variables. Table 5 shows the analytical results estimated according to the empirical model (2) for each of the corporate groups. The signs of the coefficients on the control variables are consistent with the results of previous studies. In addition, the coeffi-

Figure 8. Impact of fluctuations in foreign currency translation adjustment on equity capital to total assets (share of overseas bases' assets: 40% or more)



Note: Number of companies (60% or more) is 27, number of companies (40% or more and less than 60%) is 21, number of companies (0% or more and less than 40%) is 8.
The accumulated impact is accumulated since financial year 2007.

Table 4. Basic statistics (financial years 2001-2014)

Variables	Average	Standard deviation	Minimum	Maximum
ROE（return on equity）	4.41	9.55	-95.41	52.83
NEER（nominal effective exchange rate）	88.95	9.03	76.66	106.72
SHARE_FC（holding share of overseas companies）	16.99	12.46	0.00	61.44
ASSET（total assets）	8.19	0.66	6.58	10.68
SALE（sales growth rate）	3.46	15.17	-82.96	156.33
DEBT（interest-bearing debt/total assets）	48.53	19.27	2.75	98.02

Note: Number of companies is 321.

cient on the nominal effective exchange rate (NEER), that is, exchange rate exposure is significantly negative for each of the corporate groups. It indicates that the ROE increases in depreciation of the Japanese Yen. Factors as a numerator of ROE (net profits/losses) are influenced by changes in exchange rate because net profits/loses seems to be affected by changes in export, import and profits/losses of overseas bases. Depreciation of the Japanese Yen has, in general, a positive effect on exports and a negative effect on imports. As well, the depreciation of the Japanese Yen has a positive effect on profits/losses of overseas bases if profits can be yielded. As a result, the depreciation of the Japanese Yen seems to increase net profits/losses. As we consider in Analysis 1, we analyze companies with certain scale of export and overseas bases' business. The net profits/losses generally seem to increase in depreciation of the Japanese Yen. In addition, channels through which a denominator of ROE (equity capital) is influenced by changes in exchange rate are mainly considered to be balance sheets of overseas bases and part of net profits/losses. It is supposed that depreciation of the Japanese Yen has positive effects on equity capital in general through balance sheets

Table 5. Estimated results by the empirical model (2): explained variable ROE (financial years 2001-2014)

	Share of overseas bases' assets (0% or more and less than 20%)	Share of overseas bases' assets (20% or more and less than 40%)	Share of overseas bases' assets (40% or more)
NEER	-0.043	-0.038	-0.064
(nominal effective exchange rate)	(0.024)*	(0.020)**	(0.027)***
SHARE_FC	0.208	0.188	0.022
(holding share of overseas companies)	(0.047)***	(0.039)***	(0.044)
ASSET	4.336	-9.190	-5.138
(total assets)	(3.062)	(2.588)***	(2.601)**
SALE	0.178	0.273	0.190
(sales growth rate)	(0.014)***	(0.013)***	(0.018)***
DEBT	-0.210	-0.324	-0.235
(interest-bearing debt/total assets)	(0.034)***	(0.032)***	(0.039)***
C	-19.932	95.034	63.963
(constant term)	(24.467)	(21.300)***	(21.297)***
number of companies	111	154	56
coefficient of determination	0.17	0.25	0.19

Note: The estimation results are estimated by fixed effect model.
( ) indicates the standard deviation. ***, **, * indicate significance at 1%, 5%, 10% level respectively.

of overseas bases and part of net profits/losses. Thus, the depreciation of the Japanese Yen increases ROE through the numerator of ROE (net profits/losses) while it offsets the increase in ROE through an increase in the denominator (equity capital). It is likely that the depreciation of the Japanese Yen increases the ROE because of the larger effect of changes in the numerator (net profits/losses) due to changes in exchange rate.

We use data on foreign currency translation adjustment to analyze the effect that the denominator (equity capital) offsets changes in ROE. Table 6 shows the estimation results regarding sensitivity of "changes in foreign currency translation adjustment/current equity capital" (FTA) to a rate of change in exchange rate (FXC) based on the empirical model (4) for each of the corporate groups. This result indicates that depreciation of the Japanese Yen has positive impact on "changes in foreign currency translation adjustment/current equity capital." The impact is larger for the corporate group with a higher share of overseas bases' assets.

Table 7 shows the estimation results regarding sensitivity of contribution of changes in foreign currency translation adjustment in changes in ROE to "changes in foreign currency translation adjustment/current equity capital" (FTA) based on the empirical model (3). This result shows that the changes in foreign currency translation adjustment have a negative im-

Table 6. Estimated results by the empirical model (4): explained variable FTA (financial years 2001-2014)

	Share of overseas bases' assets (0% or more and less than 20%)	Share of overseas bases' assets (20% or more and less than 40%)	Share of overseas bases' assets (40% or more)
FXC (change rate of nominal effective exchange rate)	-0.178 (0.007)***	-0.325 (0.008)***	-0.441 (0.019)***
C (constant term)	0.082 (0.054)	0.130 (0.062)**	0.071 (0.152)
number of companies	111	154	56
coefficient of determination	0.32	0.47	0.42

Note: The estimation results are estimated by fixed effect model.
( ) indicates the standard deviation. ***, **, * indicate significance at 1%, 5%, 10% level respectively.

Table 7. Estimated results by the empirical model (3): explained variable ROED (financial years 2001-2014)

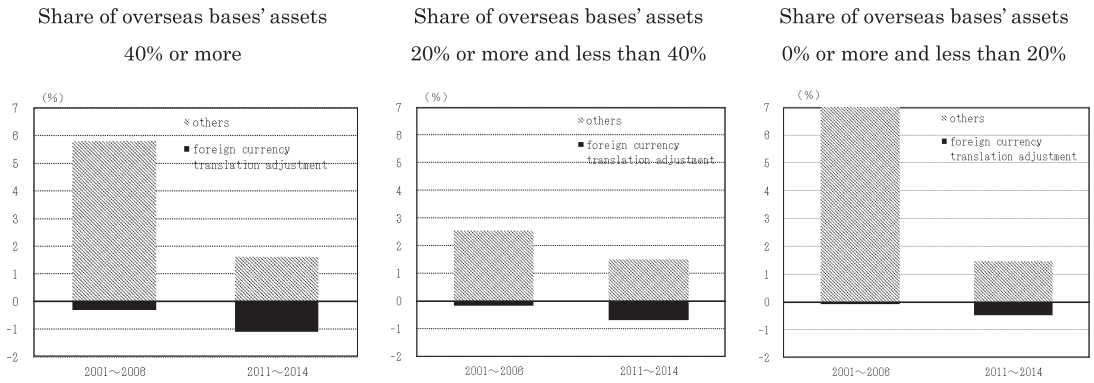
	Share of overseas bases' assets (0% or more and less than 20%)	Share of overseas bases' assets (20% or more and less than 40%)	Share of overseas bases' assets (40% or more)
FTA (fluctuations in foreign currency translation adjustment/current equity capital)	-0.148 (0.007)***	-0.042 (0.002)***	-0.067 (0.003)***
C (constant term)	0.006 (0.018)	-0.003 (0.008)	0.038 (0.015)**
number of companies	111	154	56
coefficient of determination	0.23	0.16	0.43

Note: The estimation results are estimated by fixed effect model.
( ) indicates the standard deviation. ***, **, * indicate significance at 1%, 5%, 10% level respectively.

pact on ROE if they contribute to an increase in the current equity capital. However, there are not clear relationships in the negative level among the corporate groups classified by share of overseas bases' assets because the impact also depends on the level of ROE before the change. The results of the empirical models (3) and (4) show that depreciation of the Japanese Yen has a negative impact on ROE through "changes in foreign currency translation adjustment/current equity capital." The ROE declines by 0.01%-0.03% if the Japanese Yen depreciates by 1%.

Figure 9 shows the cumulative effect of changes in foreign currency translation adjustment in depreciation of the Japanese Yen by calculating the difference between current ROE and the same ratio calculated by deducting changes in foreign currency translation adjust-

Figure 9. Impact of fluctuations in foreign currency translation adjustment and other factors on the change in ROE (by share of overseas bases' assets)



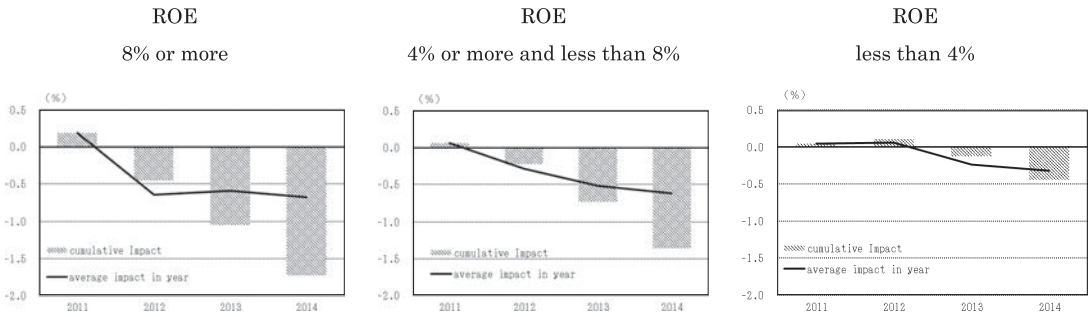
Note: Number of companies (40% or more) is 56, number of companies (20% or more and less than 40%) is 154, number of companies (0% or more less than 20%) is 111.
The cumulative impact.

ment from equity capital. It specifically shows the analytical results of fluctuation factors of ROE, which are broken down into changes in foreign currency translation adjustment and other factors during the periods from financial year 2001 to financial year 2006 and from financial year 2011 to financial year 2014. During the period from financial year 2001 to financial year 2006 the cycle of appreciation and depreciation of the Japanese Yen continued. The Japanese Yen depreciated significantly from financial year 2011 to financial year 2014. The results show that changes in foreign currency translation adjustment accumulatively exert considerable declining pressure on ROE from financial year 2011 to financial year 2014 because equity capital continues to increase through changes in foreign currency translation adjustment. For the corporate group whose share of overseas bases' assets is 40% or more, the ROE cumulatively declines by about 1%, which offsets the effect that other factors increase the ROE.

Figure 10 shows comparison in the impact of changes in foreign currency translation adjustment has large impact on the ROE among the corporate groups classified by ROE in financial year 2011 whose share of overseas bases' assets is 40% or more. Changes in foreign currency translation adjustment considerably pull down the ROE for each of the corporate groups. They cumulatively pull down the ROE by more than 1% for the corporate group whose ROE is 4% or more and less than 8%. They cumulatively pull down the ROE by more than 1.5% for the corporate group whose ROE is 8% or more.

The ROE tends to rise because the numerator (net profits/losses) has larger positive effect on the ROE than the negative effect that denominator (equity capital) has on the ROE in depreciation of the Japanese Yen. However, it is also necessary to take into account the influence that changes in foreign currency translation adjustment lower the ROE. According to the analytical results regarding foreign currency translation adjustment, the larger the asset size of overseas bases, the more the balance sheets of overseas bases are exposed to the influence of changes in exchange rate. In addition to the factor that balance sheets' scale of overseas bases itself is large, one of the factors in the background may be that applying flex-

Figure 10. Impact of fluctuations in foreign currency translation adjustment on changes in ROE (share of overseas bases' assets: 40% or more)



Note: Number of companies (8% or more) is 13, number of companies (4% or more and less than 8%) is 22, number of companies (less than 4%) is 21.
The cumulative impact is the cumulative impact since financial year 2011.

ible hedging is difficult because instruments to mitigate this influence are usually limited to natural hedging.

After the Lehman Shock the Japanese Yen rapidly appreciated. Some companies have promoted establishment of overseas bases for the purpose of mitigating the influence of exchange rate on exports. On the contrary, the influence of changes in exchange rate on balance sheets of overseas bases has increased. If companies expand overseas bases in the future, they are likely to be greatly affected by the changes in exchange rate. If the Japanese Yen depreciates and expansion of balance sheets precedes in developing overseas bases, it is possible that there might be greater influence of a decline in ROE through changes in foreign currency translation adjustment. In particular, in the case where the Japanese Yen rapidly depreciates in a short period or where the Japanese Yen continuingly depreciates even if the short-term impact is small, its impact is accumulated and can have large decreasing pressure on the ROE.

VI. Conclusion

In this paper we focused on the expansion of overseas bases' business of listed Japanese companies to analyze how differences in the asset size of overseas bases affect the impact of change in exchange rate on the corporate value (PBR). In addition, we analyzed the impact of changes in overseas bases' balance sheets and profits/losses due to changes in exchange rate on the related performance indicators, which include equity capital, equity capital to total assets, and return on equity (ROE). We used panel data on Japanese listed companies during the sample period from financial year 1999 to financial year 2009. We obtained the analytical result that there is a trend whereby the larger the asset size of overseas bases, the larger the volume of exports and the higher corporate value rises when the Japanese Yen depreciates.

In addition, comparing the results during the period from financial year 1999 to financial year 2009 before the Lehman Shock with those during the subsequent period from financial

year 2010 to financial year 2015, we found that the impact on corporate value increased somewhat from financial year 2010 to financial year 2015 with depreciation of the Japanese Yen. However, taking into account the fact that the Japanese Yen largely depreciated, the impact was small. It is also suggested that some companies promoted mitigating the impact of changes in exchange rate on exports. Our analysis made clear that the larger the asset size of overseas bases, the larger the impact of changes in exchange rate on equity capital and equity capital to total assets. The impact has been accumulated with considerable negative effect on companies where the Japanese Yen depreciated rapidly in a short period. In addition, we found that depreciation of the Japanese Yen tends to raise ROE because the numerator (net profits/losses) of ROE has larger positive effect on the ROE. On the other hand, the denominator (equity capital) of ROE also increases at the same time. Accordingly, it is necessary to consider that the positive effects of the numerator (net profits/losses) are partially offset by the negative effects of the denominator (equity capital). In particular, it is necessary to pay attention to the finding that its impacts are accumulated over time and the accumulated impacts can reduce the ROE when the Japanese Yen continues to depreciate slightly over time as well as when the Japanese Yen depreciates significantly in a short period.

As Japanese companies are expected to expand overseas bases in the future, it is also supposed that the impact of changes in exchange rate on companies' performances will further increase. Even though Japanese companies use overseas bases to mitigate the impact of changes in exchange rate on their exports, they are faced with the problem of the increasing impact of changes in exchange rate on their overseas bases. These analytical results suggest that it is necessary for companies to consider the influences of the exchange rate on companies' performance to make decisions on expanding their exports and/or overseas bases from the viewpoint of not only its influence on exports and other trade activities but also its influence on overseas bases when we investigate the impact of changes in exchange rate on companies' performances.

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