

ECONOMIC IMPACTS OF RECEIVING INTERNATIONAL DESIGN AWARDS IN JAPAN

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Abstract: This paper intends to analyze the effect of design management on business performance quantitatively, focusing on firms receiving international design awards, which are supposed to represent their competitive design. First, we conduct a traditional performance study concerning stock and financial indices in Japan to offer the geographical complement to predecessors focusing on other areas. However, the findings from these methods are not always reliable because it entails methodological defects in itself. Thus, secondly, an event study is implemented in order to complement the results of the performance study. It can be said not only to hold a high level of reproducibility and objectivity, but also to help us exclude practically all the effects of factors other than design. We also conduct a performance study as for the same samples and investigate the results. Following the method of event study, we can conclude that effective design management has a positive impact on enterprise value.

Keywords: Design Award, Performance Study, Event Study

1. Introduction

1.1. Background

Since the early 1980s, as the knowledge society has come into existence, we have observed the increasing significance and presence of intangible assets in business management. One of the phenomena that distinctly represents this situation is the remarkable growth in the market-to-book ratio of S&P500 companies: it reached 5.3 in 2009 from 1.2 in 1975. This has urged business managers to pay more attention to intangible assets. However, owing to the ambiguous definition of what design is, there is still a great difficulty in identifying these intangible assets. As a result, proper management of it remains to be established.

The recent Japanese economy has been exposed to severe and perpetual convulsions: the “Lost Decade”, the global financial crisis since 2007 and the Great East Japan Earthquake in 2011. In order to retrieve Japanese competitiveness in the world market, it is widely believed

that manufacturing must be revived and unique technologies offering a competitive advantage developed. Such a revival would make research and development (R&D) more efficient and hold back deindustrialization. In addition, it has become more and more important in recent times to design “how” to make consumers recognize the value of goods instead of “what” goods are produced. In other words, designing consumer experiences has attracted increasing attention. It is true that design is not intellectual property in a technical sense, but people in industry have started to regard effective management of design as a means to achieve more profit and business growth.

The Japanese authorities have announced the Intellectual Property Strategic Program every year since 2003 and have focused on the significance of intellectual property. In particular, they have been encouraging what is called “intellectual creation cycle”, i.e., creation, protection and utilization. As competition from emerging economies

such as China and India intensifies, the importance of designing business has been often emphasized. One example is to construct a more advanced cycle, such as one that consists of planning business firstly, designing competitiveness to manage the plan secondly and, finally, obtaining the intellectual properties needed.

Though design has been traditionally thought to be an outward complement to the technical performance of products, necessary just to raise additional value, or as one of the components of a certain brand, good design contributes to larger profits by influencing a consumer's decision-making process about what to purchase. Design must be regarded as one of the most important resources to be managed in the modern economy. It is natural that there exist nowadays considerable studies which empirically confirm that utilizing design in business leads to improved operation, namely, better stock and financial performance.

However, as we will see later in detail, preceding studies focus on only those firms listed on European or U.S. market. There is actually no empirical research on the stock market in Japan, one of the countries ranked highly by the Current Competitive Index, or CCI, outlined in reports by the World Economic Forum. Although a number of predecessors identify what good design or a design-led firm is according to expert opinions, this procedure lacks reproducibility and objectivity. In addition, preceding methods to measure financial performance cannot distinguish effectively between the impact of design and that of other factors (Bryson and Rusten[1]).

1.2. Purpose and plan

We intend to achieve two goals in this paper. 1) We offer empirical data on relations between good design and business performance in the Japanese market, employing a traditional method to select design-led firms that has relatively high reproducibility and objectivity, thereby filling up lack of research in Japan. 2) We conduct a procedure to measure the economic effects of good design exclusively and quantitatively, while investigating the validity of methods themselves.

Although design has various aspects and is pluralistic concept, this study focuses on product design. We consider international awards for product design as the criteria to define what good design or a design-led firm is, thereby ensuring reproducibility and objectivity. In Section 1, we have introduced the background of this study and our purpose and plan. Section 2 will overview the preceding studies related to our subject. From Section 3 to 5, our own contribution will be presented. In Section 3, we will

compare the business performance of companies which have received international design awards, or design-awarded firms, with that of non-design-awarded firms, thus estimating quantitatively the impacts on business performance of design policies of companies, which international design awards are supposed to represent. This offers empirical data in Japan that are absent in the preceding studies. Section 3.1 compares an experimental portfolio of stocks of the design-awarded with that of the market portfolio for the Japanese stock market. The following Section 3.2 shows the comparison between the financial performance of the design-awarded companies and that of the non-design-awarded. In Section 4, we will prepare the common samples, which are available both for performance study and event study. Section 4.1 conducts stock performance study, Section 4.2 financial performance study, and Section 4.3 measures reactions in stock prices when a firm listed in the Japanese stock market is reported to receive an international award for product design, thereby estimating the influence of the news on stock prices quantitatively. In Section 5, we will examine the results of each section. The final section will mention possible further developments.

2. Preceding studies

There are some precedents studying the relationship between good design and business performance.

The Design Innovation Group at the Open University has implemented several research projects on the subject. Taking into consideration that the meaning of the words "good design" depends on situation, they regarded the winning of various awards for design as the indicator of a company producing good-design. Their comparison in a sector of plastics in the U.K. between a group of design-conscious companies receiving design awards and a group of companies sampled randomly revealed that while the former examined design from various and original points of view, such as "ergonomics", "fitness for use", "increased value", "making products that sell or make a profit" and "efficiency in production or use of materials" etc., the latter interpreted them stereotypically or in a narrow sense, like "shapes" or "visual appearances"[2]. In addition, they offered statistically significant outcomes that the design-conscious group performed better than representative samples in terms of returns on capital, profit margins, capital growth and not least turnover growths, stating "the better business performance of the design-conscious firms was not just a matter of chance." [3]

Fitch, one of the design consulting firms in the U.K., selected some listed companies from its clients and traced their stock prices for five years up to 1988. It concluded that the shares, bundled into a fund, had outperformed the S&P500 benchmark by a factor of nearly four. In other words, the fund marked growth of 350% while the market average achieved 90%. This was believed to suggest a positive relation between notable stock performances and design-led approaches[4].

Design Council investigated this further in the following year, using an identical procedure. The FTSE-quoted clients of six top U.K. design consultancies were monitored. The six funds performed between 5% and 28% better than the market index, the FTSE All-Share index, over the five years up to 1999. The joint fund of all 95 companies performed 10 points better than the FTSE index[4].

Hertenstein et al. classified 51 U.S. listed companies from four industries as firms with more-effective design or those with less-effective design according to opinions of nine members of the advisory council of the Design Management Institute and measured their financial performances by four kinds of index, i.e. growth rates, ratios related to sales, to assets and to stock market returns. Comparing the two groups, the indices of financial performance such as net sales, net incomes, net cash flows, cash flows from operating activities, EBITDA and total returns relative to the S&P500 were all normalized by the industry averages so as to exclude influences specific to the industries. As a result, they discovered that firms with more-effective design outperformed, to a statistically significant degree, in comparison with those with less-effective design. The study also found that the more-effective design group were inclined to decrease R&D to net sales contrary to the less-effectives, but that the stock market return of the former was nevertheless consistently above the industry average[5].

Gabrielsen et al. tested the hypothesis that there was a positive correlation between the quality of firm's design and financial performance. They had the experts evaluate the product design, the logo design and the web design of random sample of 25 of the 100 largest Danish firms and measured their finances. Their findings showed that product design had positive correlations with "net turnover mean over five years", "profit margin" and "growth rate" while logo design held negative correlations with "net asset, mean" and "return on investment mean over five years". It was asserted that their implication from this study should be that what mainly drove business performance among these three

types of design was product design and neither logo design nor web design could compensate for bad product design[6].

Burkhard and Zec compared the index composed of stocks of companies receiving Red Dot Design Award with the index of the market, EURO-STOXX-50, for the same period and concluded that from early 2003 to November 2007, the awarded firms had realized 305% growth while the market index had achieved 175%[7].

The New Zealand Institute of Economic Research insisted that a strong correlation existed between CCI rankings of countries and that of "design index" composed of five design-related indicators chosen from those indices adopted in the report estimating CCI. Those regarded as design indices were the extent of branding, capacity for innovation, uniqueness of product design, production process sophistication and the extent of marketing[8].

Bryson and Rusten implemented the same analysis as that described above, including "nature of competitive advantage" and "value chain presence" as additional indices related to design and showed that a strong linear relationship could be observed between the ranking of comprehensive competitiveness of countries calculated as CCI, and that of design index. In addition, eight of ten countries identified by CCI were also in the top 10 of the design index ranking, with the exceptions being France and Japan. They also explained historical processes of design development in the U.K., the U.S., Netherlands, Japan, Scandinavian countries and South Korea and stated "a group of design-led companies with high profit margins can be identified that develop and market their products to fit particular lifestyles and fashions. Nations have also been able to develop national design identities based around the projection of distinctive design styles," while noting "[t]he fuzziness of the design concept means that it is difficult to isolate, track and measure the impact of a corporate design-led strategy." [1]

3. Performance study on design

3.1. Measuring stock performance of design-awarded firms

(a) Selecting international design awards

Among various international design awards, we discuss the Red Dot Award and the iF Design Award, both of which are relatively often reported in Japan and provide sufficient number of samples for quantitative analysis. Good Design Award, or G-Mark, is excluded because the event dates on this award, i.e., the date when the award is

reported in a newspaper, are too densely set to conduct event study in Section 4.5.

(b) Samples

The sampled firms are those which have been awarded the “Red Dot Award: best of the best” or “iF product design award: Gold Award” during the period from 2001 to 2011 and are listed on the first section of the Tokyo Stock Exchange (TSE). Here we investigate daily data of stock prices (adjusted closing prices) of each company from January 2001 to December 2011. They are obtained from Yahoo! Finance (<http://table.yahoo.co.jp/t>). Firms for which stock data during the estimated period is lacking are omitted. If the designer of the awarded product is not its manufacturer itself, the stock price of the latter is considered. As a result, the sample is the 13 firms seen in Table 1.

Table 1. Design-awarded companies

| Company | Code | Award |
|--------------------|------|--|
| Brother Industries | 6448 | iF product design award: gold award |
| Canon | 7751 | iF product design award: gold award |
| Hitachi | 6501 | iF product design award: gold award |
| Omron | 6645 | iF product design award: gold award |
| Panasonic | 6752 | iF product design award: gold award |
| Pioneer | 6773 | iF product design award: gold award |
| Ricoh | 7752 | iF product design award: gold award |
| Ryohin Keikaku | 7453 | iF product design award: gold award |
| Sharp | 6753 | iF product design award: gold award |
| Shimano | 7309 | iF product design award: gold award |
| Sony | 6758 | red dot award: product design: best of the best, iF product design award: gold award |
| Toshiba | 6502 | iF product design award: gold award |
| Toyota Motor | 7203 | iF product design award: gold award |

Previous studies regard receiving a design award as a criterion to select design-led firms which manufacture well-designed products and consider the empirical relationship between good design and business performance. They do not aim to directly measure the effect of receiving design awards to business performance. Accordingly, here we conduct the selection of sample following the previous achievements.

(c) Examining procedure

i) Market portfolio

TOPIX is taken as the standard for estimating stock performance here. We obtain daily TOPIX data from January, 2001 to December, 2011. TOPIX is calculated as follows:

$$\frac{(\text{Market capitalization of all companies of the TSE's 1st section})}{(\text{Market capitalization on the standard date})} \times 100 \quad (1)$$

ii) Design portfolio

The 13 companies shown in Table 1 make up stock portfolio of design-awarded firms. We call it design portfolio. In order to get a suitable index for comparison

with TOPIX, we multiply their daily stock prices by the issued shares on December 31st 2011 and use this as their daily market capitalizations from January 2001 to December 2011.

(d) Findings

Fig.1 shows fluctuations of the market and the design portfolios. Both of their values are normalized with the values on January 4th 2001 taken as 100. It is evident that the performance of the design portfolio is consistently higher than that of the market portfolio.

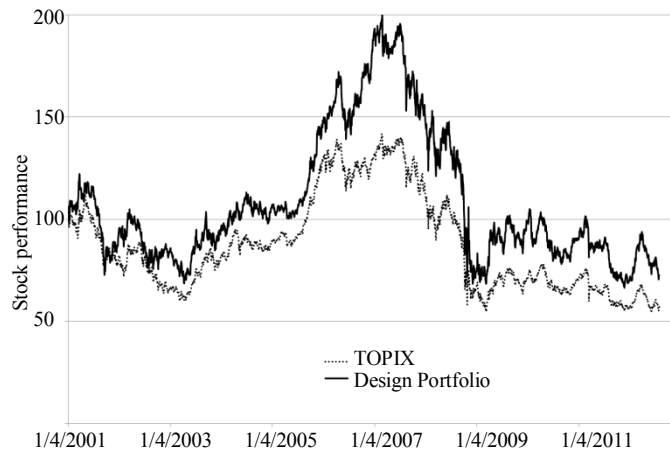


Figure 1. TOPIX and design portfolio

3.2. Measuring financial performance of design-awarded firms

(a) Samples

Here we investigate the financial performance of those 13 firms listed on Table 1. Their finances are compared with those of the firms which compete with the samples in the same business but do not receive international design awards. Categorization of industries is shown on Table 2. Though the unbalance in numbers of samples among industries might indicate the difference of consciousness of design among industries, this kind of industry specificity will be removed later in Section 3.2., (c).

(b) Indices of financial performance

We focus on two indices to examine financial performance: profit to sales ratio and cash flow to sales ratio. The former is calculated as earnings before interests, taxes, depreciation and amortization, or EBITDA, divided by sales, and the latter is cash flow from operation over sales. Operating profit with depreciation expense added is used as EBITDA here. These two indices are practically equivalent to those used in Hertenstein et al. [5], which analyzes financial performance of U.S. design-led companies. Cash flow is usually analyzed with respect to

liabilities to estimate liquidity or solvency risks. We assume, however, that design does not always have influence on liabilities and support the view in Hertenstein et al. [5], which insists “[f]rom a design perspective, return ratios relative to sales are relevant because effective product design is intended to enhance the volume of product sold, or the prices at which products can be sold.” (Hertenstein et al. [5]; 16) Hence, cash flow is divided by sales here. Annual data of these indicators for each firm are obtained from Nikkei Economic Electronic Database Systems 2010, or NEEDS 2010. The estimated period is from 2001 to 2010, not to 2011 due to availability of data. As for Shimano, Canon and Brother Industries, we are not able to obtain data in 2010, so the estimated period for the three is shortened by a year.

Table 2. Categorization of design-awarded companies

| Industry (Number of the companies) | Design-awarded company |
|------------------------------------|-----------------------------------|
| Communication Equipment (23) | Ricoh |
| Electric Equipment, NEC (33) | Brother Industries, Canon |
| Electric Industrial Controls (12) | Omron |
| General Electric (4) | Hitachi, Toshiba |
| Household Appliances (20) | Panasonic, Pioneer Sharp, Sony |
| Motor Vehicles (13) | Toyota Motor |
| Retail Stores, NEC (41) | Ryohin Keikaku |
| Transportation Equipment, NEC (6) | Shimano |

(Source: NEEDS 2010)

(c) Industry-relative modification

We first need to remove effects specific to industries so that we can compare the performance of the samples with the non-design-awarded firms, regardless of industry differences. That is, industry-relative modification of the indices is required for cross-industrial investigation.

The method of the modification is as follows. Let p_{ijk} be an index of financial performance of company i in industry j in k th year. $i=1, \dots, m$ represents sampled design-awarded firms and $i=m+1, \dots, n$ stands for non-design-awarded firms. Using the arithmetic mean μ_{jk} and the standard deviation σ_{jk} , we standardize p_{ijk} and convert it to z_{ijk} as shown in the following equation.

$$z_{ijk} = \frac{p_{ijk} - \mu_{jk}}{\sigma_{jk}} \quad (2)$$

Referring to Platt and Platt [9] and Platt and Platt [10], Hertenstein et al. [5] simply divides p_{ijk} by μ_{jk} to obtain an industry-relative index. This mathematical manipulation is not available when μ_{jk} is negative, because it reverses plus-minus sign of an original value. Though negative industrial average may be very exceptional in the U.S. economy in the 1990s which Hertenstein et al. [5] studies, it

is sometimes observed in Japan in the 21st century. Hence standardization is adopted to modify the indices here in spite of its complicatedness.

When we conduct the adjustment explained above, it is necessary that all firms which compose the population of the industry have continuous data from 2001 to 2010 (or to 2009, for the industry of Shimano, Canon and Brother Industries).

Take the null hypothesis, H_0 , as the statement saying “there is no difference between the financial performance of the design-awarded and that of the non-design-awarded”, and the alternative hypothesis, H_1 , as the one asserting “design-awarded firms show better financial performance than the non-design-awarded”. In order to test the hypotheses, we have operated one-sided t-test yearly in regard to $z_{ijk}(i=1, \dots, m)$ and $z_{ijk}(i=m+1, \dots, n)$.

(d) Findings

The results of the test are shown on Table 3. A black circle (●) indicates statistical significance of better performance of samples than that of non-design-awarded firms. A blank circle (○) represents higher arithmetic mean of adjusted indices of samples than that of the non-design-awarded. If neither of the above is confirmed, a cross (×) is put.

When we pay attention to profit to sales, there are seven times when design-awarded samples claim better performance than non-design-awarded firms. Among them, 2003 is the year when the better performance of the design-awarded can be regarded as statistically significant. Concerning cash flow to sales, the indices of samples are constantly higher than those of the non-design-awarded, and there are seven times when statistical significance is verified.

Table 3. Results of t-test of financial performance

| year | profit to sales | cash flow to sales |
|------|-----------------|--------------------|
| 2001 | ○ | ● |
| 2002 | ○ | ○ |
| 2003 | ● | ● |
| 2004 | ○ | ● |
| 2005 | × | ● |
| 2006 | ○ | ● |
| 2007 | ○ | ● |
| 2008 | ○ | ● |
| 2009 | × | ○ |
| 2010 | × | ○ |

4. Performance and event study on design

Our main purpose of this section is to offer empirical data in which factors of design are exclusively reflected. In order to do this, we use the econometric analysis and apply the method of event study[11]. In addition to this, another

performance study on what we name the Common Samples is conducted in the same manner as in previous sections in order to discuss a reasonable method of econometrics of design.

4.1. Selecting international design awards

Here, too, we discuss the Red Dot Award and the iF Design Award, both of which are relatively often reported in Japan and provide sufficient number of samples. Good Design Award is excluded because the event dates on this award, i.e., the date when the award is reported in a newspaper, are too densely set to conduct event study.

4.2. Common Samples

In order to conduct event study, it is necessary that all investors notice the events. We must reselect sample to meet this necessity. Following a general method of event study, we avail ourselves of newspaper articles reporting on receiving international design awards.

Companies listed on the first section of the TSE are taken as samples. A news release on what we take as an economic event must be the fastest report among the newspapers which often provide news about international design awards. The newspaper articles must also be available to search on the databases of NIKKEI TELECOM21 (<http://t21.nikkei.co.jp>). There are four newspapers that satisfy both requirements: Nikkan Jidosha Shimbun(NJS), Nikkan Kogyo Shimbun(NKS), Nikkei Marketing Journal(NMJ) and Nikkei Sangyo Shimbun(NSS). Thus, events of which the first reports are carried in newspapers other than those four, such as trade papers, are excluded. In a number of event study analyses, content and announcement day of an event are identified by the report in a newspaper on the assumption that the efficient-market hypothesis stands. We adopt the procedure explained above in accordance with the preceding studies, thereby assuming that the reports of the events we concentrate on are passed to investors both swiftly and broadly enough.

The investigated period here is from January 1st, 2001 to December 31st, 2011. The keywords used for searching are disjunctions of “Red Dot” and “iF” in both English and Japanese correspondents. Additionally, 1) an exact matching is required, 2) titles, texts, keywords and words for classification are searched, 3) query expansion for synonyms and 4) that for thesauri are disabled. Applying these filters, 256 search results are obtained.

From these we exclude events about companies which are not listed on the TSE unless their pure holding companies or full parent companies are listed. Companies

which had been listed on the TSE for less than 270 business days of the TSE before the event date are also excluded. This is because we set up the estimation window from $\tau=-20$ to $\tau=-270$ taking the event date as $\tau=0$, as explained later.

If the events happen densely, i.e., there are more events within three business days of the TSE before or after the announcement day of the event, all of those events are excluded for the sake of simplification.

As a result, 18 events of 16 companies remain, as shown on Table 4. Since there are no other events that result in large stock price moves and interrupt the results of the event study around the dates of the 18 events, we can safely conclude our event study is appropriate to estimating the effect of the events. Besides, note that each event affects a stock price independently in a very short term, which spares us from excluding Sony, which receives design awards many times. One of the purposes of this paper is to apply both the method of traditional performance study and of event study in order to measure an impact of receiving an international design award and then to investigate the two types of method for this kind of research. To achieve this, we try to estimate business performance of the 16 design-awarded companies in Table 4 by means of performance study in 4.3. and 4.4. Then 18 events of the 16 firms are investigated by means of event study in 4.5. Because the 16 companies are used as samples in all of these sections, they are called the Common Samples.

4.3. Measuring stock performance of design-awarded firms (the Common Samples)

(a) Samples

Stock performance of those listed on Table 4 is investigated here.

(b) Examining procedure

This is identical with that in Section 3.1., (c).

(c) Findings

Fig.2 shows that the performance of design portfolio is lower than that of market portfolio in general.

4.4. Measuring financial performance of design-awarded firms (the Common Samples)

(a) Samples

Financial performance of those listed on Table 4 except NEC Mobiling is investigated. This exception is because of the unavailability of data in NEEDS 2010. Because we are not able to obtain data of Kokuyo and Brother Industries in 2010, the estimated period for the two are shortened by a year.

Table 4. The Common Samples

| Company | Code | Event Date | Newspaper | Award |
|--------------------------------|------|------------|-----------|---------|
| Hitachi | 6501 | 3/19/2002 | NKS | iF |
| Komori | 6349 | 12/27/2002 | NSS | iF |
| IDEC | 6652 | 2/18/2003 | NKS | iF |
| Ryobi | 5851 | 7/10/2003 | NKS | red dot |
| Panasonic | 6752 | 3/23/2005 | NSS | iF |
| Kokuyo | 7984 | 4/12/2005 | NSS | iF |
| Sony | 6758 | 7/5/2005 | NSS | red dot |
| Hitachi Koki | 6581 | 2/24/2006 | NKS | iF |
| Hitachi Construction Machinery | 6305 | 1/22/2007 | NKS | iF |
| Omron | 6645 | 4/13/2007 | NSS | iF |
| Ricoh | 7752 | 3/10/2008 | NSS | iF |
| Toyota Industries | 6201 | 12/13/2008 | NJS | iF |
| Sony | 6758 | 3/4/2009 | NSS | iF |
| Clarion | 6796 | 9/24/2009 | NJS | iF |
| Sony | 6758 | 3/4/2010 | NSS | iF |
| Nikon | 7731 | 1/4/2011 | NSS | iF |
| NEC Mobiling | 9430 | 9/9/2011 | NMJ | red dot |
| Brother Industries | 6448 | 12/9/2011 | NKS | iF |

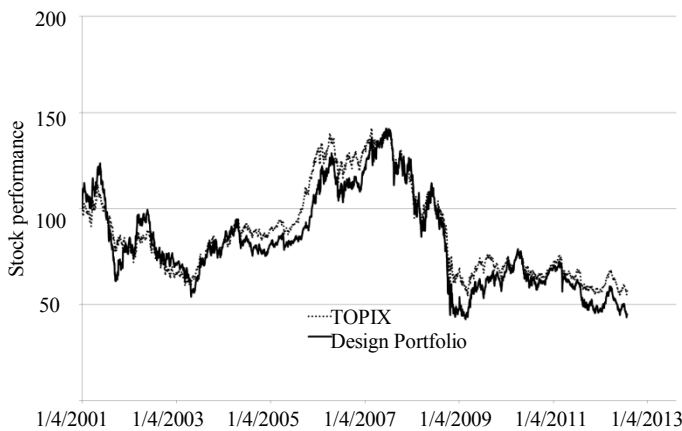


Figure 2. TOPIX and design portfolio (the Common Samples)

Table 5. Results of t-test of financial performance (the Common Samples)

| year | profit to sales | cash flow to sales |
|------|-----------------|--------------------|
| 2001 | × | ○ |
| 2002 | × | × |
| 2003 | × | ● |
| 2004 | × | × |
| 2005 | × | ○ |
| 2006 | × | ● |
| 2007 | × | ○ |
| 2008 | ○ | ○ |
| 2009 | × | × |
| 2010 | × | ● |

(b) Examining procedure

The method of measurement and testing we follow here has already been discussed above, in Section 3.2., (b) and 3.2., (c).

(c) Findings

Table 5 shows the results of the testing. The meanings of the signs are explained in Section 3.2., (d).

Focusing on profit to sales, we find nine occasions when performance of the design-awarded is worse than that of the non-design-awarded. Though samples show better

performance in 2008, this is not statistically significant. In regard to cash flow to sales, there are seven occasions when performance of the samples is better and three out of the seven are statistically significant.

4.5. Investigation by means of event study

(a) Identifying the event date

All events selected in 4.2. are news releases in morning editions. This means we can assume that those events were already known to investors in Japan before opening of the TSE. Also, trades in the TSE were available on the days when all the events happened. Hence, we can identify the reported date as the event date for every event selected in 4.2. In order to take into account all the stock price reactions around the reported date, every event window has a two-day long span[11,12].

(b) Normal returns

The market model is adopted here to estimate a normal return and the estimation window is the period of 250 days, which starts from 270 business days of the TSE prior to the event date. Let R_{it} be the stock return of company i on the t_{th} day and R_{mt} be the return of the market portfolio on the t_{th} day. The following equation gives the regression model of R_{it} on R_{mt} for the estimation window under a linearity assumption between the two.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \tag{3}$$

α_i and β_i are parameters to be estimated and ϵ_{it} is a disturbance which cannot be reduced to a normal return. Since each i is allocated to each event, not to each company, N should be considered to represent the total number of the companies.

Though weekly or monthly data are also available in event study, daily data are used here to get more accurate results[11,12]. We utilize TOPIX to calculate the return of the market portfolio. The returns on stocks of individual firms are calculated from the daily data (adjusted closing prices). All data are obtained from Yahoo! Finance.

(c) Abnormal returns

Equation (3) gives us estimated values of α_i and β_i , labeled as $\hat{\alpha}_i$ and $\hat{\beta}_i$, with ordinary least squares. Under the assumption that the estimation stands around the event date, we can further estimate the normal return of stock of the individual firm. The difference between this estimated normal return and the actual return gained around the event date is defined as an abnormal return, or AR.

$$AR_{it} = R_{it} - \left(\hat{\alpha}_i + \hat{\beta}_i R_{mt} \right) \tag{4}$$

Let τ_1 be the first and τ_2 be the last day of the event window. A cumulative abnormal return, CAR, which is

calculated as shown in equation (5), is useful to analyze the changes in stock returns of company i during the event window.

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i\tau} \quad (5)$$

Let L be the length of the estimation window, 250 days in this paper. The estimated variance of CAR , $\hat{\sigma}^2$, is obtained from equation (6).

$$\hat{\sigma}_i^2 = \frac{\sum_{\tau=-270}^{-21} (R_{i\tau} - \hat{\alpha} - \hat{\beta}R_{m\tau})^2}{L - 2} \quad (6)$$

Denote the null hypothesis, H_0 , as the assertion that the given event has no impact on mean or variance of returns and the alternative hypothesis, H_1 , as the one that the given event has a positive impact on mean of returns. A standardized cumulative abnormal return, $SCAR$, is defined as the following equation and its distribution holds t-distribution with $L - 2$ degrees of freedom for large samples. Accordingly, the expectation of $SCAR$ is zero, the variance of it is $(L - 2) / (L - 4)$.

$$SCAR_i(\tau_1, \tau_2) = \frac{CAR_i(\tau_1, \tau_2)}{\hat{\sigma}_i} \quad (7)$$

An average cumulative abnormal return, $ACAR$, which is calculated from CAR of every company i , offers the average change of returns of the samples during the event window.

$$ACAR_i(\tau_1, \tau_2) = \frac{\sum_{i=1}^N CAR_{i\tau}}{N} \quad (8)$$

The \overline{SCAR} can be described as the following equation (9). It is the average of N $SCAR$ s calculated from equation (7). We can test H_0 by observing the test statistic, J , which is standard normally distributed, since under H_0 , $SCAR$ is normally distributed with mean of zero and variance of $(L - 2) / N(L - 4)$ on stipulation that N event windows do not overlap.

$$\overline{SCAR}(\tau_1, \tau_2) = \frac{\sum_{i=1}^N SCAR_i(\tau_1, \tau_2)}{N} \quad (9)$$

$$J = \sqrt{\frac{N(L - 4)}{L - 2}} \overline{SCAR}(\tau_1, \tau_2) \quad (10)$$

Generally speaking, receiving a design award is an event which leads to the expectation of the increase in future profit by enhancing the volume of product sold or the prices at which products can be sold. This event study, hence, evaluates the effect which is produced by rational

estimation of investors about the changes of future profit and of enterprise value due to receiving a design award, not measuring the direct impact of a design award to business performance.

(d) Findings

In order to see the stock responses to news about receiving international design awards, we have measured $CAR(0, 1)$, regarding the day when the newspaper reports it ($\tau = 0$) and the next day as the event window. Main outcomes can be observed in Table 6 and the fluctuations of $ACAR$ s around the event dates are on Fig.3. The value of $ACAR$ on $\tau = -3$ is regarded as zero there.

As observed in Table 6, $ACAR(0,1)$ is 1.25%, in which the cumulative abnormal returns in two days, the day of the report on the international design award ($\tau = 0$) and the next ($\tau = 1$), are averaged. The standard deviation of $CAR(0,1)$ is 2.89%. The test statistics, J , is found to be so large, 2.97, that it is statistically significant to reject the null hypothesis, H_0 . Consequently, we can safely conclude that the event has a positive impact on stock return and the alternative hypothesis, H_1 , is supported. Meanwhile, Fig.3 depicts that there is no significant change in $ACAR(0,1)$ either before ($\tau = -3, -2$ and -1) or after ($\tau = 2, 3$ and 4) the event window ($\tau = 0, 1$). In other words, the effect of the event of receiving an international design award to a stock price concentrates in the two days.

Table 6. Descriptive statistics of CAR

| ACAR (0, 1) (%) | N | J | Standard deviation (%) |
|-----------------|----|------|------------------------|
| 1.25 | 18 | 2.97 | 2.89 |

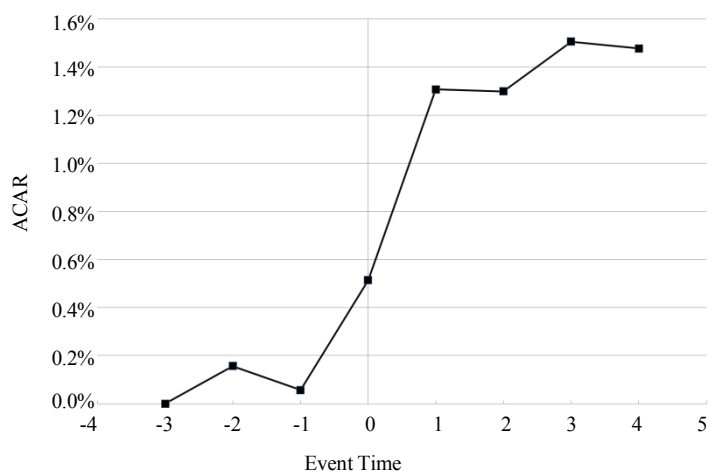


Figure 3. ACARs of events of receiving international design awards

5. Discussion

At first, we measured the performance of a stock portfolio composed of design-awarded firms listed in the first section of the TSE following a traditional method. As Fig.1 shows, the design-awarded firms marked higher performance than the market portfolio did. We also employed the same procedure to measure the performance of the samples seen in Table 4. These were picked up according to news releases of receiving awards, and obtained Fig.2, which depicts that the performance of the design-awarded is generally lower than that of market portfolio.

The opposing results seen in Fig.1 and Fig.2 suggest that this method may produce different outcomes every time we change the way of selecting samples from the design-awarded companies. This is not desirable for verifiable examination to estimate our hypothesis, in which design-awarded firms are generally supposed to show higher performance than the market portfolio under the condition of the same standard date and the same estimated period regardless of the method for selection. These two conflicting results provide us no conclusion about it.

Though we feel that the result in Fig.1 enhances and supports the understanding of the preceding studies, this method has some problems. We cannot exclude factors other than design when simply observing fluctuations of stock prices. Furthermore, there remains an arbitrary decision on setting the standard date, which may reverse the result completely. When analyzing the business cycle, for example, setting the standard on the day of the bankruptcy of Lehman Brothers can be reasonable because everyone agrees that is a decisive date for the entire economy. We do not have that kind of the particular date for the standard when investigating stock performance with regard to receiving international design awards. Considering those methodological defects, it is not reasonable to rely on this method to discuss business performance as to receiving design awards objectively. Hence, the investigation conducted here offers little reliable evidence of superior performance of design-awarded firms in the Japanese market.

Secondly, measurement of financial performance of the design-awarded samples listed in Table 1 was conducted in accordance with a traditional method. The comparison with regard to profit to sales ratio represented the generally better performance of the design-awarded than that of the non-design-awarded, though it could seldom be regarded as statistically significant. On the other hand, we could

confirm statistical significance for the most part in the right column of Table 3, i.e. better financial performance of the design-awarded in terms of cash flow to sales ratio. The findings here about these two indices are qualitatively consistent with what Hertenstein et al. [5] argues.

In contrast, Table 5 offered us somewhat unexpected views about this issue. This was a result of the investigation of samples listed on Table 4 by means of the same traditional method. Profit to sales ratios of the design-awarded firms were generally smaller than those of the non-design-awarded. Though we could roughly say that Table 5 showed larger cash flow to sales of the design-awarded in general, it was evident that the number of instances of statistical significance in the differential had decreased. Thus, while the analysis on cash flow to sales presented a rather consistent outcome with preceding studies, that on profit to sales clearly did not.

One may interpret the results described above as proof of a peculiar case from the point of view of economic geography. That is, there is an ambiguous or even negative effect from receiving an international design award in the Japanese market. However, before making such a conclusion, we first need to examine the selection of the method. Again, this way of analyzing financial performance mixes all the effects of messy factors other than design, as Bryson and Rusten [1] indicates. This might be the cause of the reversed results of Table 3 and Table 5. Financial performance study is a reasonable way to analyze the competitiveness of certain goods the firm sells in its entirety. But if the firm revises the advertisement or expands its production following the design award for the goods, those changes other than the factor of design will be included in the financial performance. Since those changes are typical of the design award, it is very difficult to concentrate on the effect of design itself, just one of the components of the commodity in the financial performance study. Hence, strictly speaking, the results of our financial performance study are not fully reliable as the evidence of the effect of the design award.

Finally, measuring stock price responses to the news release about receiving an international design award, we observed high level of abnormal returns, $CAR(0,1)$. This marked a 1.25% increase on average and hence sufficed statistical significance (Table 6, Fig.3).

As the event window for this event study is quite short, viz., only two days of the event date itself and the next, it is reasonable to maintain that there is practically no effect of factors other than design reflected in this change in stock

price. Here we can safely conclude that receiving an international design award is an event that increases an enterprise value estimated in terms of stock price.

As we have argued, most of the previous studies have applied inappropriate approaches of empirical data analysis to the relation between good design and business performance. The main imperfection of examining stock performance is its dependence on the arbitrary setting of the standard date. The analysis on financial performance, on the other hand, cannot exclude factors other than design.

Meanwhile, following the method of event study, we can achieve high levels of reproducibility and objectivity in selecting samples and also can remove all the arbitrariness about setting the standard date. On top of that, it can be said that this way of evaluation reflects design factor exclusively. These features lead us to insist that this method is a sophisticated and worthwhile way of investigating the economic impact of design quantitatively along with the traditional performance study. Having adopted this method of event study for the empirical analysis, this paper concludes that effective management of design assets, which the news release on international design awards is supposed to represent, contributes to increase in an enterprise value.

6. Further Development

We have observed the problems of the preceding studies and the effectiveness of event study on purpose to gauge the impact of design assets on an enterprise value. However, in order to calculate abnormal returns more precisely, we should take into consideration effects of nonsynchronous trading and nontrading and should also adjust the difference in market capitalization among sampled firms[12].

In addition, for all the prominence of event study in extracting a certain factor, it does not indicate in itself anything about how the extracted factor contributes to the increase in an enterprise value. This is true of performance study. These quantitative methods of study suggest no details of how business performance is affected by the feature of award or by respective design strategies in awarded companies, or of how investors' expectation is formed. These interesting points remain to be investigated.

In order to accumulate useful knowledge of empirical data of business performance, it is important to utilize both traditional methods and event study and relate them to one another as paying close attention to actual business activities.

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