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Discussion Paper Series

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"Sell in May Effect" versus "Dekansho-bushi Effect"

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Abstract

We report on a seasonal pattern that has persisted in the Japanese stock market for more than half a century: mean stock returns are significantly positive for months during the first half of the calendar year and significantly negative for months during the second half. Dubbed the "Dekansho-bushi effect," this seasonality is independent of other known calendar anomalies, such as the so-called January effect. The Dekansho-bushi effect should be distinguished from the "sell in May effect," since Japanese stocks perform well in June and poorly in November and December. The Dekansho-bushi effect varies in magnitude among firms and is particularly significant among small firms with low book-to-market ratios. Nonetheless, the effect exists, regardless of a company's size or book-to-market ratio.

JEL classification: G14
Key words: Anomaly; Calendar Anomaly; Seasonality; Japanese Stock Market

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1. Introduction

Japanese stocks tend to earn significantly positive mean returns during the first half of the year and significantly negative mean returns during the second half, relative to the market's annual performance. We call this seasonality the "Dekansho-bushi effect," after a traditional Japanese ballad; [4] the performance pattern matches what the folksong advocates: fund managers, like the farmers in the ballad, should work only the first half of the year and spend the remainder in leisure. During the 59-year time span studied, 39 periods that contributed to the market's cumulative advance occurred during the first half of the year, while the market retreated during the second half. The impact of this effect on stock returns was considerable. During 1950–2008, the widely quoted Nikkei 225 (which is price-weighted) showed a cumulative gain of 3,887.4% for a buy-and-hold strategy during the first half-year and a mere gain of 102.2% for the second half. As measured by the Tokyo stock price index (TOPIX, Japan's most popular value-weighted index), the disparities between these two strategies were even more dramatic—a gain of 3,900.6% and a mere 69.7%, respectively.[5]

Researchers of financial markets in several countries have documented a growing number of empirical regularities that appear to be inconsistent with the efficient market hypothesis, which states that information pertaining to the past history of stock returns should not be useful in predicting future price changes. Empirical studies reveal various January dependencies in the U.S. stock market. Reinganum (1983) found that small stocks outperform large stocks in January, and Ticnic and West (1984) found that high-beta stocks outperform low-beta stocks in January. Other studies report anomalous calendar dependencies in stock returns. French (1980) found that returns on Mondays are lower and Fridays are higher (in what is termed the "weekend effect"). Ariel (1990) found that returns on the days before holidays are higher (the so-called holiday effect). Ariel (1987) reports that there is a "monthly effect" on stock returns: stocks are higher in the first half of the month and flat during the second half. As for empirical evidence regarding the Japanese stock market, Kato and Schallheim (1985) report that the "January effect" is indeed at work there, and Sakakibara (1994) confirms the presence of the weekend effect in the index call options market. Bouman and Jacobsen (2002) report the "sell in May" effect in 36 of the 37 countries in their sample, including Japan.

The findings reported in this paper add to this list of regularities that are

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[4] *Dekansho-bushi* is a well-known folk song traditionally sung by farmers since the Edo era (1603–1868) in the Sasayama district, located in western Japan. It celebrates a lifestyle of laboring only during the first half of the year and spending the rest of the year in leisure.

[5] The return over each half-year is defined as the sum of one plus the monthly return over that period.

independent of previously reported seasonal patterns. In particular, our findings are not related to the well-known January effect, because the current study's analysis results remain robust even when January is excluded from the sample months. Although the Dekansho-bushi pattern is similar to that of calendar anomalies reported by Bouman and Jacobsen (2002), the Japanese stock market performs in a manner different from what is described as "Sell in May and go away."[6] On the basis of our observation of 25 reference portfolios of similar size and book-to-market ratios, most Japanese stocks perform well until June but lag from July to the end of the year. This reflects the "Twain effect," which suggests that October is a dangerous month in terms of stock prices, but by no means the only one.

The study of such patterns often follows a path in which the popular press mentions a supposedly profitable trading rule, which in turn prompts a scholarly inquiry. The regularity reported in this paper, however, followed a different path: the subject seasonality was first documented in our working paper in Japanese and then reported in the popular Japanese press, suggesting that the pattern in question has not been well known among investors in the Japanese stock market.[7]

This paper is organized as follows. Section 2 reports several tests whose results show the existence of a half-year pattern in Japanese stock market returns. Section 3 discusses the results and considers possible biases that could be responsible for the observed effect. Section 4 concludes the paper.

2. The half-year pattern in Japanese stock index returns

a) Monthly returns of various indexes

To represent the returns accruing to stocks, the following tests employ the Nikkei NEEDS Financial Quest to obtain the returns of the value-weighted TOPIX and the price-weighted Nikkei 225 index, the two most commonly quoted Japanese stock indexes. In addition, we obtained the Tokyo Stock Exchange 1st section Arithmetic Stock Price Average and the Nikkei All Stock Average. The data span the years 1950–2008 (708 months) for both TOPIX and Nikkei 225.

The data portrayed in Table 1 and Figure 1 indicate the superiority of the trading environment in Japan in the first half of the year, compared to the second half. When

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6 According to the saying, the month signals the start of a bear market, so investors are better off selling their stocks in May and holding cash. The adage ends thus: "… but buy back on St. Leger Day." St. Leger Day refers to the day when a horse race is run at Doncaster in England every September.

7 The half-year seasonality in the Japanese stock market was first reported by our working paper on September 29, 2003; subsequently, the first article mentioning Japanese stock market seasonality appeared in the popular *Nihon Keizai Shimbun* on January 15, 2009.

each trading year was divided evenly into two halves, the mean monthly return for the first half was significantly more than the mean monthly return for the second half. Indeed, the first-half monthly means were found to be positive, while the second-half monthly means were negative in some indexes. The *t*-statistics for the difference in the mean monthly returns for the two populations were 1.910 for the price-weighted index and 2.168 for the value-weighted index. Figure 1 is a graphic representation of Table 1, which shows the statistics for the entire period under study. For both TOPIX and Nikkei 225, we calculated the mean monthly return since January 1950; this period includes Japan's post-war high-growth period. Other indexes cover the maximum period, as long as the data are available. The Tokyo Stock Exchange 1st section Arithmetic Average is the simple average index of listed stocks in the Tokyo Stock Exchange, 1st section. The Nikkei All Stock Index, meanwhile, is the capitalization weighted index of all listed stocks in Japan, not limited to the Tokyo Stock Exchange but excluding JASDAQ. The Russell/Nomura Japan index is the capitalization weighted index of all listed stocks; of all the indexes, it covers the largest number of stocks (i.e., 98% of listed stocks). Nomura/Russell Japan calculates its index based on float-adjusted market capitalization.[8]

Basically, the Japanese economy has undergone a high-growth trajectory since the end of World War II: the Nikkei 225 rose from 109.91 to 38,915.87, and the TOPIX increased from 12.66 to 2,881.37, at the end of 1989. The stock market started declining in the beginning of 1990 and has continued to remain sluggish to this day. In the period comprising January 1990 to December 2008—when the Japanese economy suffered a dramatic decline in the stock and property markets and subsequent prolonged deflationary pressure—the Nikkei 225 plummeted from 37,188.95 to 8,859.56, and the TOPIX similarly dropped from 2,737.57 to 859.24.[9] In retrospect, 1990 marks the turning point of the Japanese economy.

As seen in Table 1, for all indexes during the entire period, the *t*-statistic was statistically significant, thereby showing that the mean monthly return for the first half of the trading years significantly exceeded the mean monthly return for the second half. Most notably, for all indexes during the post-1990 period, the mean monthly return for the first half of the trading years was positive, while that for the second half was negative; the differences between the means in this sub-sample period, however, were

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[8] The market capitalization of each stock is calculated as its price × number of shares outstanding × (1 – stable share holdings ratio). This adjustment underweights the performance of less-tradable stocks while overweighting highly liquid stocks. For calculation details, please see www.russell.com/indexes/data/russell_nomura/russell_nomura_indexes.asp.

[9] During this period, the commercial property market index issued by the Ministry of Land, Infrastructure, Transport, and Tourism declined from a peak of 271.6 to 76.8.

not always statistically significant. It is worth noting that during a dramatic bear-market period—that is, when every single one of the indexes plummeted to less than one-third of their respective peaks—investing only during the first half of each year produced positive mean monthly returns.

(Table 1 here)

(Figure 1 here)

b) χ^2 test and the impact of cumulative return

The first half of the trading years offered a better trading environment and differed significantly from the second half over our sample period. We tested the sensitivity of these conclusions as follows: we divided each trading year so that equal numbers of trading months appear in each half-year. The cumulative return over each half-year was defined as the sum of one plus the monthly return over that period. We call this cumulative return a "buy and hold return" (BHR). If the returns for all months of the trading year are drawn from a single distribution, then the probability that the BHR for the first half of a trading year will exceed that for the second half of that same trading year should be 0.5. Therefore, the null hypothesis stated that the expected frequency of higher first-half-year returns would be equal to half the number of years in the test period.

Table 2 reports the test statistics resulting from a comparison of this expectation with the observed results. For the price-weighted index (Nikkei 225), first-half cumulative returns exceeded those of the second half in 39 of 59 years, and the χ^2 test statistic was 6.119. For the value-weighted index (TOPIX), the first-half cumulative returns exceeded those of the second half in 38 of 59 years, and the χ^2 test statistic was 4.898. Thus, for both indexes, the null hypothesis was rejected at the 1% significance level. Besides, the expected frequency of higher first-half-year returns among the three other indexes was not equal to half the number of years in the test period.

Table 2 also reports the test statistics for the difference in means. For the price-weighted index, the mean first-half BHR (i.e., six-month BHR) was 7.64%; this was larger than the second six-month BHR of 2.68%, although the difference was statistically insignificant ($p = 0.112$). Likewise, for the value-weighted index, the corresponding means of the first and second six-month BHRs were 7.56% and 2.34%, respectively. Thus, the null hypothesis of equal BHR was rejected at the 10% siginificance level ($p = 0.086$).

(Table 2 here)

The cumulative impact of the different monthly mean returns over the 59-year time span is profound. The BHR from investing in the price-weighted index during only the first half of all trading years was 3,887.44%, while the comparable BHR for investing in the second half was 102.15%. Likewise, for the value-weighted index, the first and second-half BHRs were 3,900.63% and 69.65%, respectively.

The financial impact of following a Dekansho-bushi strategy—that is, holding stocks during only the first half of each trading year and hedging the position by selling the index in the second half—is enormous. During the period preceding the peak of the stock market (January 1950–December 1989), such a strategy would have yielded a cumulative return of 4,753.56% for the price-weighted index and 3,548.38% for the value-weighted index. Even during the period following the bubble burst (January 1990–December 2008), during which the market lost more than 70% of its value, the Dekansho-bushi strategy would have lost 17.85% for the price-weighted index and earned 9.65% for the value-weighted index. Given the magnitude of the bear market, these numbers are surprising.

These differences between mean stock returns in the first and second halves of trading years were not due to outliers, as can be seen from the frequency histogram of those returns (Figure 2). Identical numbers of trading months comprised each of the two populations, so the distributions were directly comparable. The extreme tails of the two distributions were similar; the difference in means was due to a slight shift in the overall distributions of the two populations.

(Figure 2 here)

To visually demonstrate the magnitude of the Dekansho-bushi strategy, we present a trading simulation on the Nikkei 225 futures market. We collected the closing prices of Nikkei 225 futures traded on the Osaka Stock Exchange since 1988, when the stock index futures market was created in Japan for the first time. We assumed that any investor who follows the Dekansho-bushi strategy buys at the closing price of the Nikkei 225 March futures contract on the first trading day of January 1989 and rolls the long position until the last trading day of June of the same year. We ignored futures commissions and interest rate income on the margin balance. Since Nikkei 225 expires every three months—namely, in the second week of March, June, September, and December every year—the investor rolls over the position twice in the first half of the year: from the March contract to the June contract, sometime before the second week of

March, and from the June contract to the September contract, before the second week of June. We assumed that the rollover had taken place when the open interest of the current futures contract exceeded that of the subsequent one.

Figure 3 describes the time-series margin balance of 100 as of January 1989. For comparison, we added the equivalent time-series margin balance from when an investor follows the "reverse Dekansho-bushi" strategy—namely, to trade long on the first trading day of July and hold the position until the last trading day of December. As 1989–2008 was a disastrous period for the equity index in Japan, all strategies will reduce the initial margin over time; however, the Dekansho-bushi strategy allowed investors to retain more than 90% of their initial margin at the end of 2008, while the reverse Dekansho-bushi and "full investment" strategies each lost two-thirds of it.

(Figure 3 here)

3. Possible biases

a) Composite change and new listing effect

There is the possibility that Nikkei 225, as a price-weighted average, may be heavily influenced by the price movement of small stocks. Further, the repetitive index composite change in Nikkei 225 may derive some impact that drives the index to move in a manner that *looks like* a seasonal pattern. The TOPIX, being value-weighted, is less susceptible to such change, but could still be potentially affected by the seasonal pattern of new listings. For example, if a large capitalization stock were frequently listed on the Tokyo Stock Exchange 1st section in the first half of the year, the index could perform well in the first half of the year, thanks to the increase in the total market capitalization.

To avoid such biases, we constructed an index of stocks that traded continuously between 1978 and 2008.[10] The equal-weighted calculation of this newly created index generated a mean monthly return of 2.14% in the first half of the years examined and –0.61% in the second half of those years. The difference in the mean was significant at the 1% CI (*t*-value 4.64). The value-weighted average of this new index also showed a significant Dekansho-bushi effect," but to a lesser extent (*t*-value 2.39). The mean monthly return of the first half of the years was 1.10%, while that of the second half was –0.14%. This difference may be attributable to the fact that the Dekansho-bushi effect" is more pronounced among small stocks.

b) Sell in May effect

Bouman and Jacobsen (2002) report on market seasonality in the Japanese stock market. They concluded that Japanese stock market seasonality is part of a global "sell in May effect." In general, the stock market returns of 37 countries they investigated tended to be below the mean in all months from May through October, although the results tended to be mixed for July. In order for the "sell in May effect" to hold, some poor performance should be seen in May and June. The adage that starts with "sell in May and go away" ends thus: "but buy back on St. Leger Day." Because "St. Leger Day" refers to the date of a horse race run at Doncaster in England every September, the saying suggests that the market will perform poorly in May, June, July, August, and September.

We have documented that the Japanese stock market behaves in a way different from what this saying implies. For this purpose, we created 25 reference portfolios based on size and book-to-market ratios, each of which is reconstituted in August of every year. These portfolios were formed in two steps. First, in August of year t, we

[10] Due to a lack of data, the sample is restricted to this period.

ranked all Tokyo Stock Exchange and JASDAQ firms in our population on the basis of market capitalization. Size quintiles were then created, based on these rankings for all Tokyo Stock Exchange 1st section firms. Second, within each size quintile, firms were sorted into quintiles on the basis of their book-to-market ratios in year t – 1.[11] The returns on the 25 reference portfolios were calculated using equal-weighted averages over the 1978–2008 period.[12] Thus, a reference portfolio with size and book-to-market attributes of 1–1 indicated that the stocks in that category were small and growth stocks. Likewise, the 5–5 reference portfolio contained large and value stocks.

As Figure 4 shows, most reference portfolios performed well in the first half of the year, but returns suddenly declined in the second half. Across all reference portfolios, there was a clear manifestation of the Dekansho-bushi effect.

(Figure 4 here)

c) Size and value effects

Nikkei NEEDS Financial Quest provides Russell/Nomura-style indexes created by the Nomura Research Institute, a think-tank based in a Japanese brokerage house. Russell/Nomura-style indexes are based on value/growth and size; using these indexes, "size effect" and "value effect" can be estimated with respect to seasonal dependencies. Due to a lack of data, however, mean monthly returns from 1980 were estimated on the basis of sampling. During the 1980–2008 period, value-firm returns exceeded growth-firm returns (value effect), and small-firm returns exceeded large-firm returns (size effect) during both the first and second halves of the trading years. Both size effect and value effect exist in the pre-1990 period (sub-period I, 1980–1989) and the post-1990 period (sub-period II, 1990–2008). The differences between the means for the first and second halves of the trading years were statistically significant in the sample of small firms, but were insignificant in the sample of large firms. Table 3 indicates the details of the each group's mean returns and *t*-statistics in testing the null hypothesis that the mean monthly returns during the first and second halves of the trading years were equal.

During the full period, the Dekansho-bushi effect prevailed among the stocks of both middle- and small-size groups, regardless of book-to-market ratios. In the large-size groups, both value stocks and growth stocks showed stronger performance

11 We follow Barber and Lyon's (1997) methodology for creating a reference portfolio. Due to the number of stocks in our population, we employed a quintile rather than decile classification. Further, we reconstituted in August each year, since the majority of shareholder meetings in Japan are held in May and June.

12 Due to a lack of data, reference portfolio returns were calculated in this period.

during the first half of trading years. Only value stocks, however, showed the Dekansho-bushi effect to a statistically significant degree. It is noteworthy that performance during the first half of the trading years was better than that of the second half, regardless of the sub-period or sample groups based on company size or book-to-market ratio. Figures 5, 6, and 7 graphically represent Table 3.

(Table 3 here)

(Figure 5 here)

(Figure 6 here)

(Figure 7 here)

d) January effect

The Dekansho-bushi effect may merely be a manifestation of the "January effect." Keim (1983), Roll (1983), and Reinganum (1983) each noted a tendency for the stocks of small firms to earn significant excess returns in January, with much of the effect concentrated in the first few days of the month. Kato and Schallheim (1985), furthermore, confirm the January effect in the Japanese stock market. To determine whether the Dekansho-bushi effect reflects nothing more than unusually high mean returns in January, we studied mean monthly returns excluding January. Table 4 reports the results based on the Russell/Nomura index, which offers indexes based on size (top, middle, and small) and book-to-market ratios (value and growth). For the total Russell/Nomura index, the mean of the five monthly returns for the first half-year (excluding January) and the mean of the six monthly returns for the second half-year were 1.01% and –0.19%, respectively (*t*-statistic for difference of the means = 2.020; implied p = 0.044).[13] Comparable figures for the Russell/Nomura value index and growth index were 1.38% and –0.16% (t = 2.596; implied p = 0.010), and 0.64% and –0.25% (t = 1.411; implied p = 0.159), respectively.

The effect of excluding January from the monthly means was appreciable and in the direction predicted by the January effect. For all three sub-indexes based on size, the means of monthly returns during the first and second half-years were lower when January was excluded. Even with January excluded, however, the Dekansho-bushi effect was still found in the remaining months, as evidenced by differences between the

[13] P-values were calculated based on a two-tailed test.

means in the first and second half-years; these differences remain statistically significant. Hence, the observed differences in the mean returns for the first and second halves of the trading years are caused by something other than the unusually high returns that occur in early January.

(Table 4 here)

e) Behavioral explanation

We ask why the reported seasonal pattern has existed in Japan for most of the post-war era. A possible explanation is offered by the behavioral perspective. As Hirshleipher and Shumway (2003) report, sunshine affects people's psychological mood and could thus affect how they evaluate future prospects, financial and otherwise. Individuals in a good mood make more optimistic choices. A highly robust effect is that individuals in a good mood make more positive evaluations of many things, such as life satisfaction, past events, people, and consumer products (see, for example, Wright and Gordon 1992) and the survey of Bagozzi, Gopinath, and Nyer 1999).

From this perspective, there are many events that may well make Japanese people more optimistic throughout the first half of the year. January begins the calendar year, and the optimism prompted by a feeling of a "fresh start" is commonly seen worldwide. This feeling may be especially strong in Japan (Nezlek et al. 2008) Like Christmas for Westerners, *Oshogatsu* (New Year) is an important yearly event for Japanese, who commonly take long vacations around this holiday. April 1 starts the fiscal year for most Japanese corporations and public institutions, and throughout the country, classrooms and offices fill with fresh faces. Meanwhile, the outdoors is filled with the scent and beauty of cherry blossoms, which also symbolize a fresh start. Toward the end of the month, a series of national holidays called Golden Week begins[14]—another happy time in Japan.[15]

As a proxy for optimism among investors, we collected margin balance data for the period 1995–2008.[16] Figure 8 shows the average month-over-month percentage changes of shares bought on margin during this period. The monthly rate of shares

[14] The current National Holiday Laws set nine official holidays, of which four are concentrated in a single week spanning from late April to early May.

[15] Obviously, the feeling of a "fresh new start" is just one example of a factor that can influence one's mood and that investors may be able to control by paying attention to the sources of their mood. On any given day, one might be able to identify myriad other possible influences, such as uncomfortable new shoes, a broken air conditioner, the triumph of a child in school, or the success of a popular local sports team.

[16] The Tokyo Stock Exchange does not disclose margin-related balance data before 1995. Accordingly, our proxy calculation for sentiment is limited to the period after disclosure restrictions were lifted.

bought on margin was calculated by dividing the cumulative number of shares bought on margin during a month by the cumulative number of shares bought on margin during the previous month. As Figure 8 illustrates, investors tend to cumulate their margin buy positions during the first half of the year. The rate of margin purchase decreases in the July–August summer period. From September to year end, margin investors tend to unload their positions.

(Figure 8)

A substantial portion of outstanding shares on the Tokyo Stock Exchange is owned by corporations. Therefore, to substantiate the argument that psychological bias on the part of individual investors is behind the observed seasonality in the Japanese stock market, we collected data on the margin trading volumes under "on margin transactions" of individuals disclosed by the Tokyo Stock Exchange. We then calculated the total number of shares bought on margin minus the total number of shares sold on margin by individuals each month during 1978–2008. Figure 9 shows the differences between each month and the average of all months (Jan.–Dec.) during this period.

It appears that investors were optimistic during the first half of the year but "grew sober" during the second half. Although the causality mechanism remains unclear, it may be that the Dekansho-bushi effect is the result of investor behavior triggered by psychological influences.

(Figure 9)

4. Conclusion

The purpose of this paper was to report the existence of a seasonal pattern in the Japanese stock market that is longstanding but only recently discovered. This phenomenon has not been part of market practitioners' street lore; the Japanese popular press reported its existence only after we published our academic working paper in Japanese. We call this half-year seasonality the "Dekansho-bushi effect," after the famous Japanese traditional folk song that advocates the lifestyle of laboring only in the first half of the year and spending the second half in leisure.

The magnitude of this effect is significant. During the 59 years studied, every cumulative market advance occurred during the first half of the trading years, with the second half of those trading years contributing negatively.

Various explanations for this Dekansho-bushi effect have been considered. One of

them is the possibility that it is confounded by the previously reported January effect and size effect; when tested, however, these failed to explain the empirically observed calendar regularity of stock returns. Another one is the possibility that it is because the indexes tested are prone to index composite change or new exchange listings; when tested with our created index of currently traded stocks, however, these failed to explain seasonality. The Dekansho-bushi effect could be interpreted as a part of the already documented "sell in May" effect on the global equity market; however, our closer examination revealed that the seasonal pattern in the Japanese market is rather unique and cannot be identified with what "sell in May" implies.

We conjecture that this Dekansho-bushi effect may well be related to psychological factors prompted by events in the Japanese calendar. Happy events during the first six months of the year lift the spirits of the Japanese people, especially naïve individual investors. This may lead investors to evaluate prospects more optimistically early in the year. They then spend the second half of the year with more sober dispositions, which has the effect of tightening investment wallets and suppressing stock prices.

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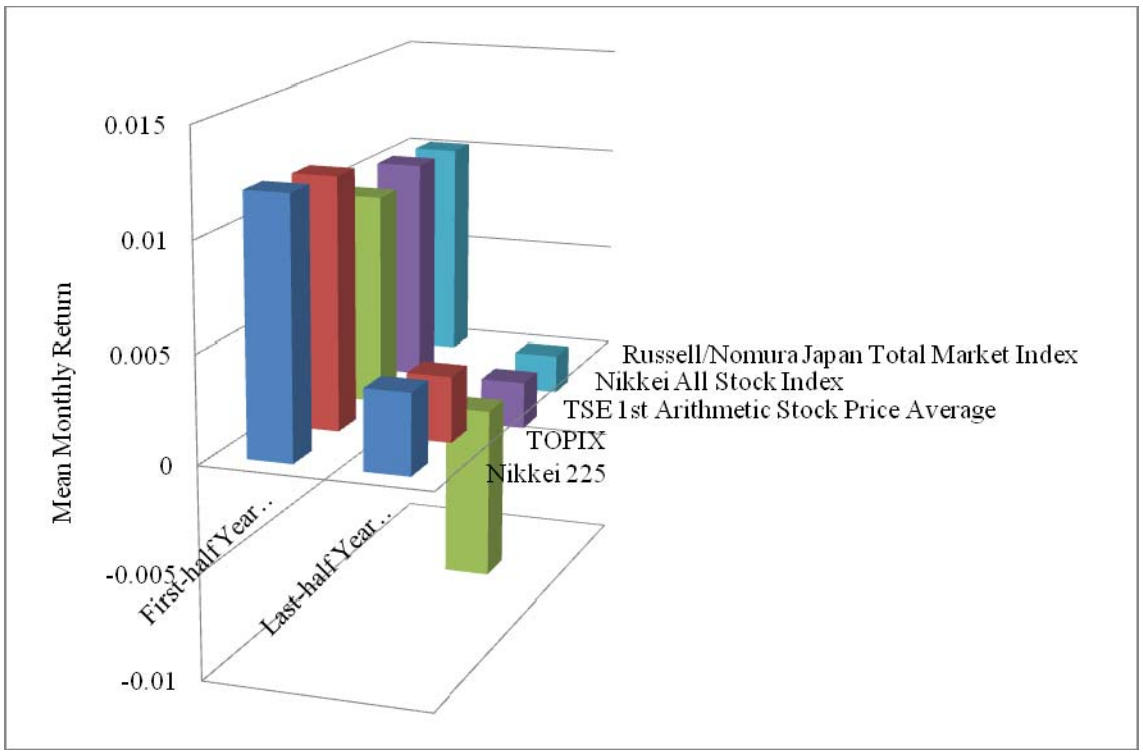
Table 1: Mean monthly returns for five indexes.

	Period	First-half year (Jan.-Jun.)		Last-half year (Jul.-Dec.)				
		Monthly return	Std.dev.	Monthly return	Std.dev.	diff.	t-statistic	p-value
	Entire period							
Nikkei 225	1950/1 - 2008/12	0.012	0.056	0.004	0.059	0.008	1.910	0.056
TOPIX	1950/1 - 2008/12	0.012	0.051	0.003	0.056	0.009	2.168	0.031
TSE 1st Arithmetic Stock Price Average	1978/1 - 2008/12	0.010	0.048	-0.008	0.003	0.018	3.357	0.001
Nikkei All Stock Index	1981/1 - 2008/12	0.010	0.052	-0.002	0.056	0.013	2.144	0.033
Russell/Nomura Japan Total Market Index	1980/1 - 2008/12	0.010	0.050	-0.002	0.055	0.012	2.136	0.033
	Period before the crash of 1990							
Nikkei 225	1950/1 - 1989/12	0.018	0.053	0.010	0.053	0.008	1.663	0.097
TOPIX	1950/1 - 1989/12	0.016	0.049	0.009	0.052	0.007	1.596	0.111
TSE 1st Arithmetic Stock Price Average	1978/1 - 1989/12	0.018	0.035	0.009	0.034	0.009	1.495	0.137
Nikkei All Stock Index	1981/1 - 1989/12	0.025	0.045	0.012	0.039	0.013	1.549	0.124
Russell/Nomura Japan Total Market Index	1980/1 - 1989/12	0.021	0.041	0.012	0.038	0.010	1.348	0.180
	Period after the crash of 1990							
Nikkei 225	1990/1 - 2008/12	0.000	0.059	-0.009	0.070	0.009	1.017	0.310
TOPIX	1990/1 - 2008/12	0.002	0.054	-0.009	0.062	0.012	1.506	0.134
TSE 1st Arithmetic Stock Price Average	1990/1 - 2008/12	0.005	0.054	-0.019	0.062	0.024	3.083	0.002
Nikkei All Stock Index	1990/1 - 2008/12	0.004	0.054	-0.009	0.062	0.013	1.656	0.099
Russell/Nomura Japan Total Market Index	1990/1 - 2008/12	0.004	0.053	-0.009	0.061	0.013	1.745	0.082

(Note) Choice of periods depends on data availability for each index from Nikkei NEEDS Financial Quest.

Figure 1: Mean monthly returns for five indexes.



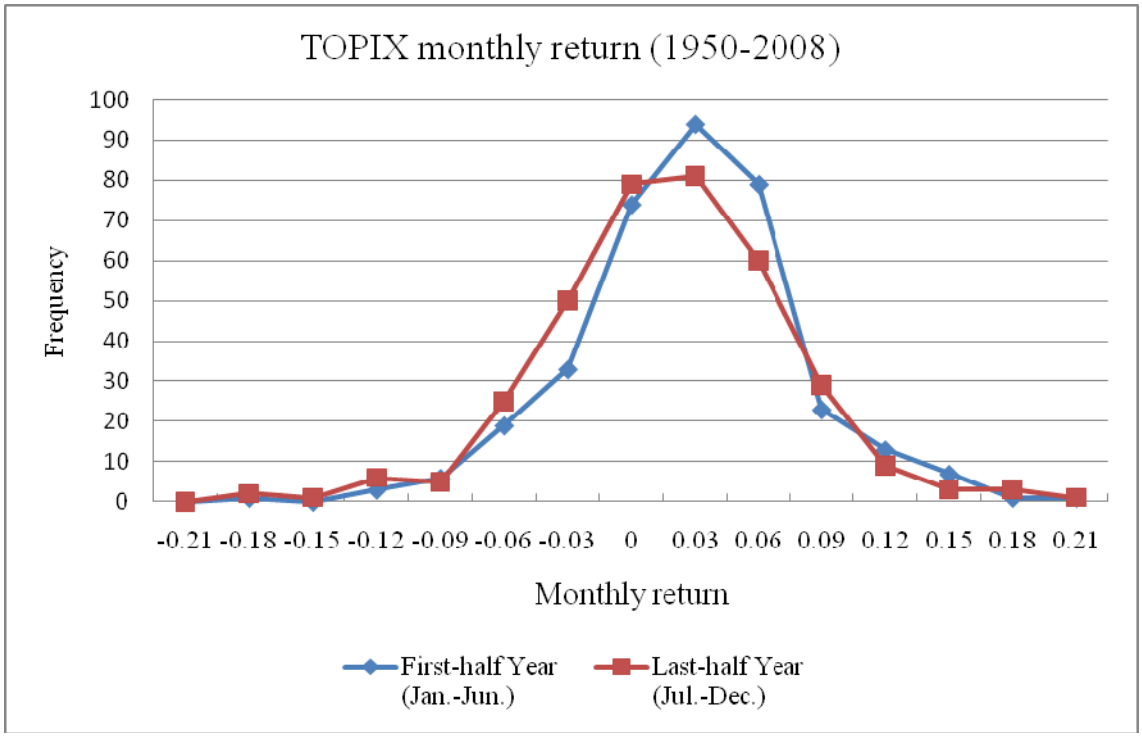
(Note) Mean monthly returns were calculated during sample periods that differed from index to index. The choice of periods depends on the data availability for each index from Nikkei NEEDS Financial Quest.

Table 2: χ^2 test.

	Period	First-half year (Jan.-Jun.)		Last-half year (Jul.-Dec.)					frequency of higher first-half year returns	χ^2
		Six-month BHR	Std.dev.	Six-month BHR	Std.dev.	diff.	t-statistic	p-value		
Nikkei 225	1950 - 2008	0.0764	0.159	0.0268	0.177	0.050	1.600	0.112	39/59**	6.119
TOPIX	1950 - 2008	0.0756	0.154	0.0234	0.177	0.052	1.734	0.086	38/59**	4.898
TSE 1st Arithmetic Stock Price Average	1978 - 2008	0.0632	0.144	-0.0419	0.169	0.105	2.638	0.011	21/31**	3.903
Nikkei All Stock Index	1981 - 2008	0.0666	0.152	-0.0067	0.184	0.073	1.622	0.111	19/28*	3.571
Russell/Nomura Japan Total Market Index	1980 - 2008	0.0922	0.156	-0.0036	0.173	0.096	2.214	0.031	19/29*	2.793

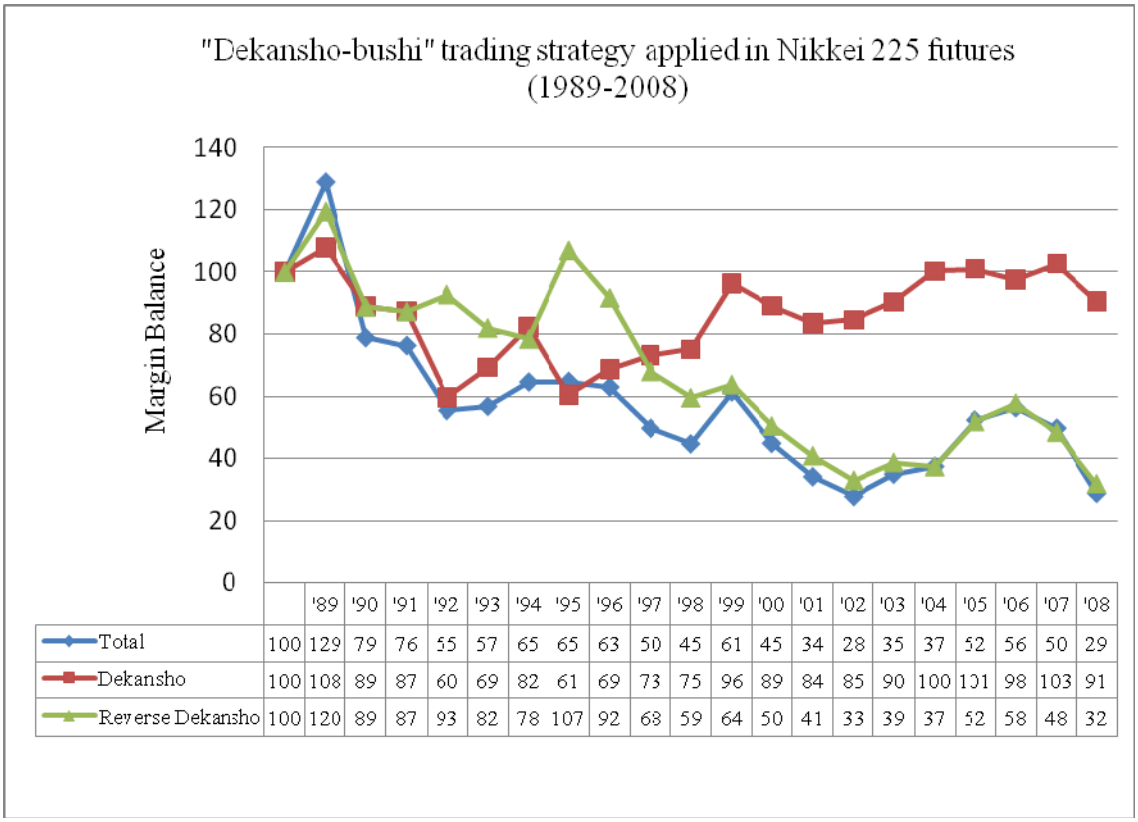
(Note) The null hypothesis states that the expected frequency of higher first-half-year returns is equal to half the number of years in the test period. The six-month BHR was defined as return over each half-year, as the sum of one plus the monthly returns over that period. * and ** indicate significance at the 10% and 5% levels, respectively.

Figure 2: Histograms of monthly return frequencies for the value-weighted index (TOPIX).



(Note) Intervals were 3% wide; each point represents the indicated number of monthly observations with returns falling within that interval. The sub-populations were derived by splitting the year in half at the end of June, so that equal numbers of trading months fell in each half.

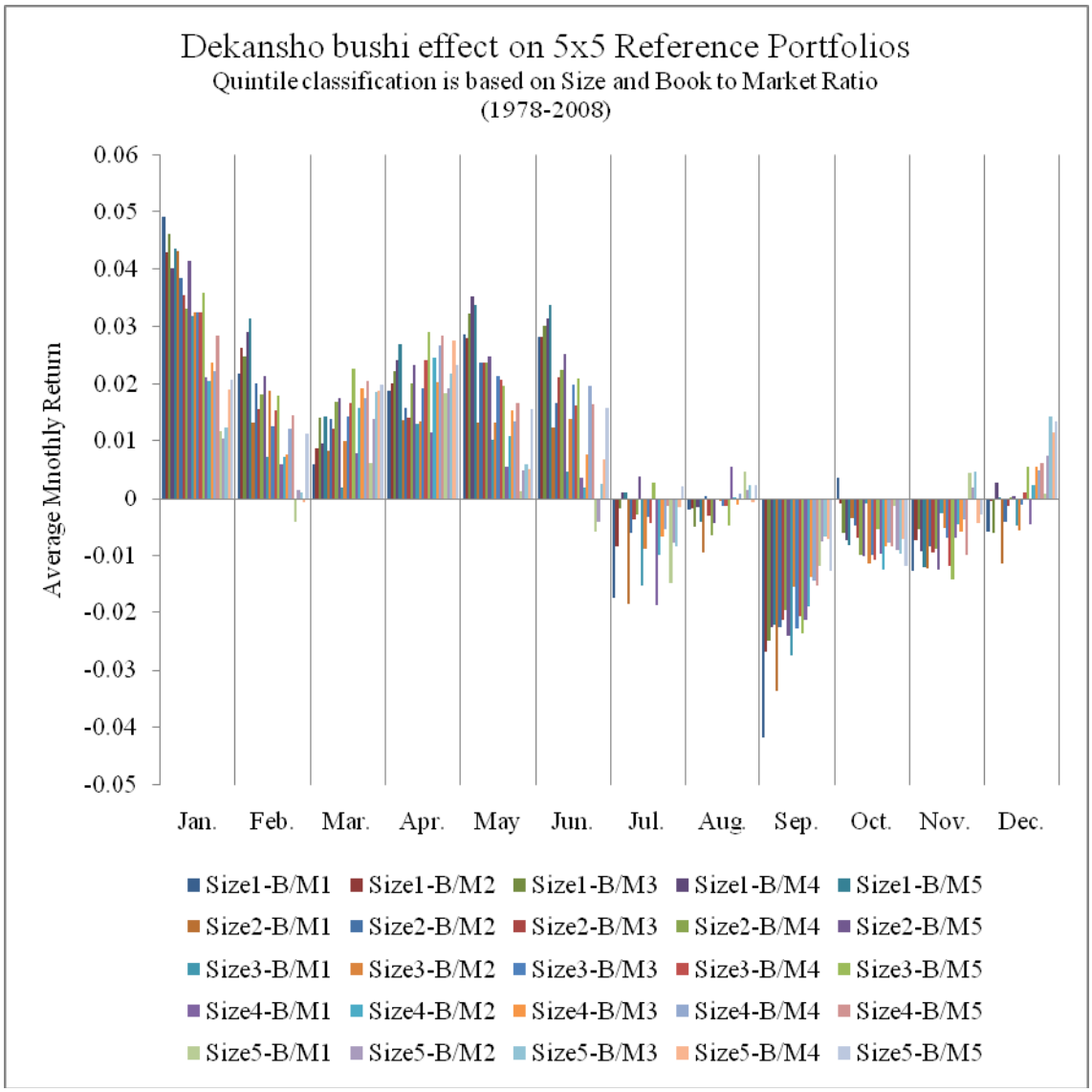
Figure 3: The “Dekansho-bushi” trading strategy applied to Nikkei 225 futures.



	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08
Total	100	129	79	76	55	57	65	65	63	50	45	61	45	34	28	35	37	52	56	50	29
Dekansho	100	108	89	87	60	69	82	61	69	73	75	96	89	84	85	90	100	101	98	103	91
Reverse Dekansho	100	120	89	87	93	82	78	107	92	68	59	64	50	41	33	39	37	52	58	48	32

(Note) “Total” indicates the balance of margin account overtime, which has a value of 100 at January 1989 assuming the investor rolls it over every three months. “Dekansho” is the result of a certain trading strategy: long-trade the Nikkei 225 futures at the end of the last trading day of December and sell the position at the last trading day of June in the following year. “Reverse Dekansho” indicates the opposite.

Figure 4: “Dekansho-bushi effect” on reference portfolios



(Note) Japanese stock market seasonality manifests as the “Dekansho-bushi effect,” rather than the “sell in May effect.” Each of the 25 reference portfolio returns was calculated for the period between 1978 and 2008. Size1-B/M1 represents stocks that are small-size growth firms. Size5-B/M5 corresponds to large-size value firms.

Table 3: Mean monthly returns for size-based portfolios and value-growth portfolios.

Russell/Nomura Japan Index		First-half Year (Jan.-Jun.)		Last-half Year (Jul.-Dec.)				
Size	Book-to-market	Mean monthly return	Std. dev.	Mean monthly return	Std. dev.	diff.	t-statistic	p-value
Panel A: 1980/1～2008/12 (n=348)								
Total	Total	0.0102	0.0500	-0.0019	0.0551	0.0120	2.136	0.033
	Value	0.0144	0.0525	-0.0016	0.0534	0.0160	2.816	0.005
	Growth	0.0061	0.0505	-0.0025	0.0600	0.0085	1.431	0.153
Top	Total	0.0074	0.0551	0.0004	0.0598	0.0070	1.142	0.254
	Value	0.0115	0.0573	0.0011	0.0600	0.0105	1.663	0.097
	Growth	0.0040	0.0557	-0.0002	0.0636	0.0042	0.659	0.510
Middle	Total	0.0121	0.0494	-0.0023	0.0546	0.0144	2.575	0.010
	Value	0.0152	0.0542	-0.0023	0.0539	0.0175	3.027	0.003
	Growth	0.0080	0.0490	-0.0024	0.0607	0.0104	1.753	0.080
Small	Total	0.0177	0.0541	-0.0083	0.0580	0.0260	4.315	0.000
	Value	0.0206	0.0554	-0.0074	0.0563	0.0280	4.680	0.000
	Growth	0.0129	0.0562	-0.0093	0.0645	0.0223	3.437	0.001
Panel B: 1980/1～1989/12 (n=120)								
Total	Total	0.0215	0.0407	0.0118	0.0383	0.0097	1.348	0.180
	Value	0.0270	0.0446	0.0138	0.0403	0.0132	1.698	0.092
	Growth	0.0158	0.0399	0.0095	0.0409	0.0063	0.854	0.395
Top	Total	0.0188	0.0530	0.0131	0.0514	0.0057	0.599	0.550
	Value	0.0242	0.0561	0.0155	0.0559	0.0087	0.852	0.396
	Growth	0.0137	0.0529	0.0111	0.0527	0.0026	0.271	0.787
Middle	Total	0.0243	0.0379	0.0109	0.0348	0.0135	2.025	0.045
	Value	0.0293	0.0460	0.0128	0.0387	0.0165	2.121	0.036
	Growth	0.0185	0.0352	0.0084	0.0396	0.0101	1.474	0.143
Small	Total	0.0248	0.0338	0.0101	0.0354	0.0146	2.313	0.022
	Value	0.0292	0.0362	0.0121	0.0363	0.0171	2.585	0.011
	Growth	0.0198	0.0363	0.0081	0.0390	0.0118	1.710	0.090
Panel C: 1990/1～2008/12 (n=228)								
Total	Total	0.0042	0.0534	-0.0090	0.0611	0.0133	1.745	0.082
	Value	0.0078	0.0553	-0.0097	0.0577	0.0175	2.336	0.020
	Growth	0.0009	0.0547	-0.0088	0.0673	0.0097	1.191	0.235
Top	Total	0.0014	0.0554	-0.0063	0.0629	0.0077	0.986	0.325
	Value	0.0049	0.0570	-0.0065	0.0609	0.0114	1.456	0.147
	Growth	-0.0011	0.0567	-0.0062	0.0680	0.0051	0.611	0.542
Middle	Total	0.0056	0.0535	-0.0093	0.0615	0.0149	1.944	0.053
	Value	0.0078	0.0568	-0.0103	0.0590	0.0181	2.360	0.019
	Growth	0.0024	0.0542	-0.0081	0.0687	0.0105	1.283	0.201
Small	Total	0.0139	0.0620	-0.0180	0.0650	0.0319	3.794	0.000
	Value	0.0160	0.0629	-0.0177	0.0620	0.0338	4.081	0.000
	Growth	0.0093	0.0641	-0.0185	0.0730	0.0278	3.059	0.002

(Note) Panel A reports the mean cumulative return comparison for size-based portfolios (Top, Middle, and Small) for the entire period. Within each size category, the portfolio was subdivided into value and growth, based on book-to-market ratios. Panel B reports the returns of each portfolio during the sub-period before 1990. Panel C reports the returns of each portfolio during the sub-period after 1990.

Figure 5: Dekansho-bushi effect on stocks in three size categories.

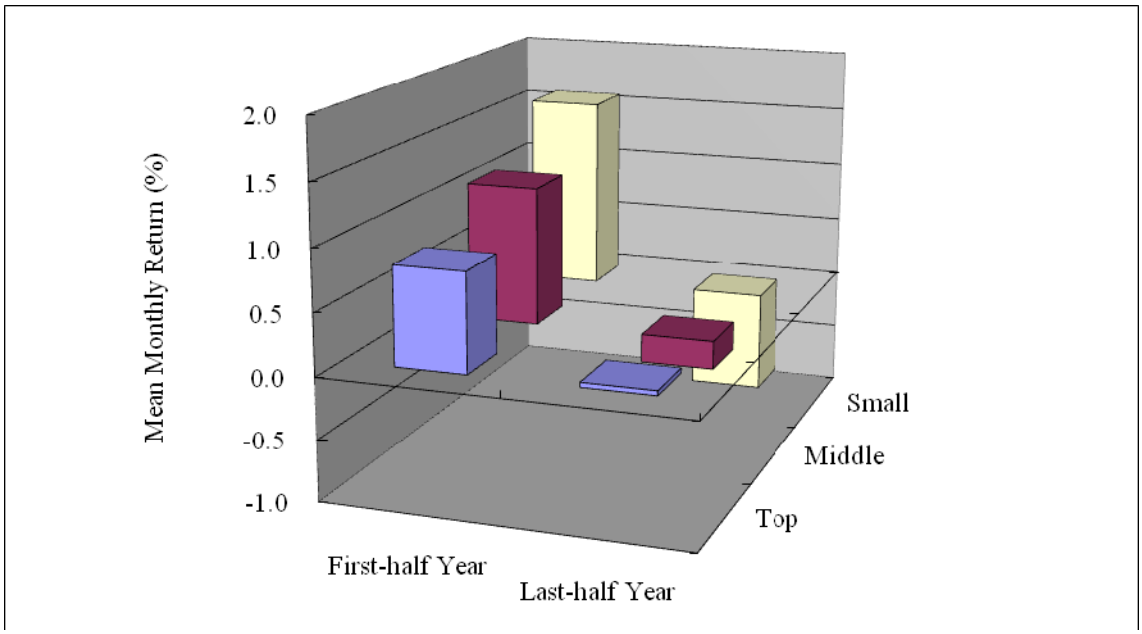


Figure 6: Dekansho-bushi effect on high book-to-market ratio stocks (growth stocks) and low book-to-market ratio firms (value stocks).

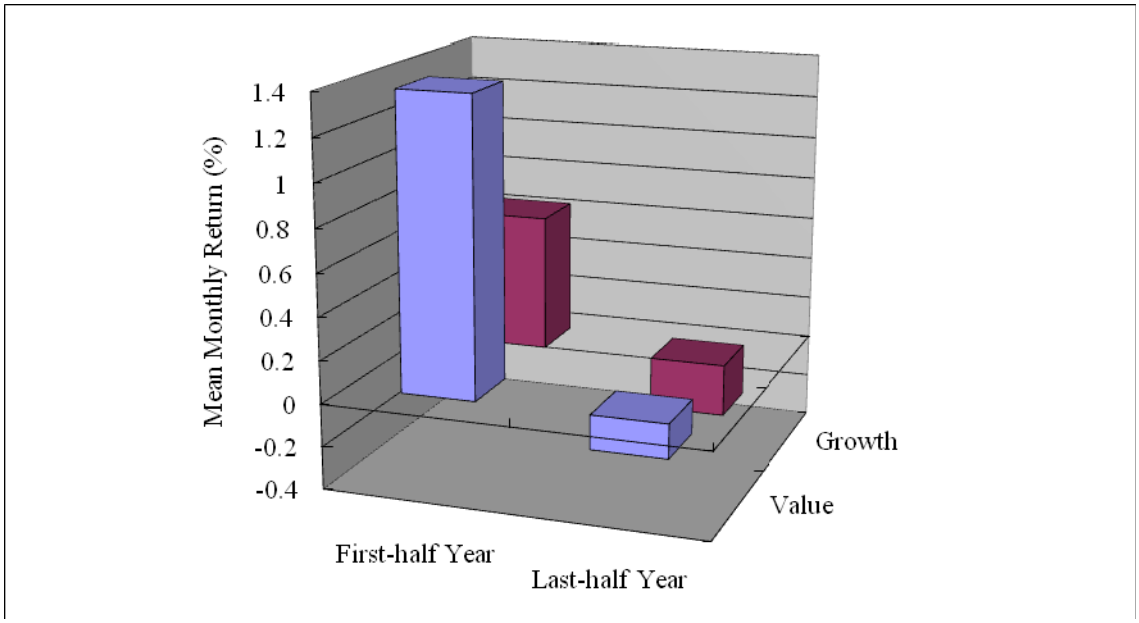


Figure 7: Dekansho-bushi effect on six different categories

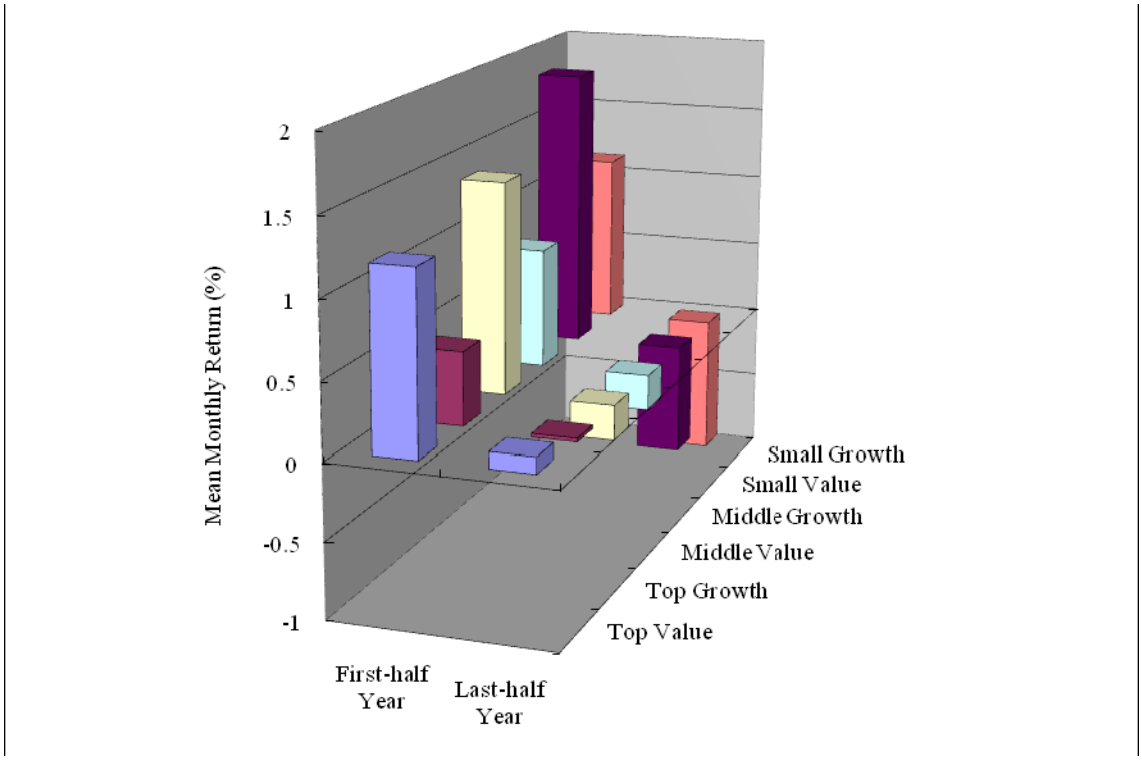
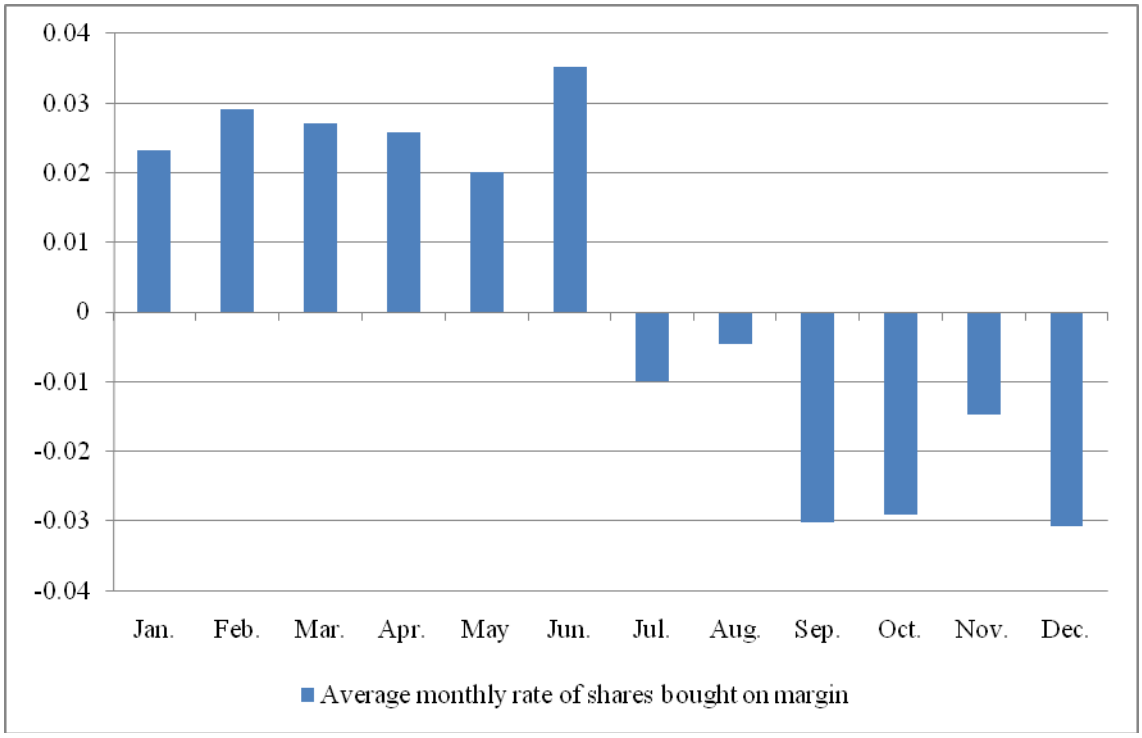


Table 4: Mean monthly returns excluding January for size-based portfolios and value-growth portfolios.

Russell/Nomura Japan Index		First-half Year (Feb.-Jun.)		Last-half Year (Jul.-Dec.)				
Size	Book-to-market	Mean monthly return	Std. dev.	Mean monthly return	Std. dev.	diff.	t-statistic	p-value
Panel A: 1980/2～2008/12 (n=319)								
Total	Total	0.0101	0.0498	-0.0019	0.0551	0.0120	2.020	0.044
	Value	0.0138	0.0524	-0.0016	0.0534	0.0155	2.596	0.010
	Growth	0.0064	0.0505	-0.0025	0.0600	0.0089	1.411	0.159
Top	Total	0.0081	0.0554	0.0004	0.0598	0.0077	1.182	0.238
	Value	0.0119	0.0584	0.0011	0.0600	0.0108	1.620	0.106
	Growth	0.0048	0.0556	-0.0002	0.0636	0.0050	0.743	0.458
Middle	Total	0.0114	0.0489	-0.0023	0.0546	0.0137	2.342	0.020
	Value	0.0141	0.0532	-0.0023	0.0539	0.0164	2.719	0.007
	Growth	0.0080	0.0495	-0.0024	0.0607	0.0104	1.652	0.100
Small	Total	0.0159	0.0526	-0.0083	0.0580	0.0242	3.868	0.000
	Value	0.0187	0.0536	-0.0074	0.0563	0.0261	4.220	0.000
	Growth	0.0114	0.0559	-0.0093	0.0645	0.0207	3.033	0.003
Panel B: 1980/2～1989/12 (n=110)								
Total	Total	0.0182	0.0410	0.0118	0.0383	0.0065	0.856	0.394
	Value	0.0243	0.0453	0.0138	0.0403	0.0105	1.284	0.202
	Growth	0.0120	0.0401	0.0095	0.0409	0.0025	0.318	0.751
Top	Total	0.0164	0.0543	0.0131	0.0514	0.0033	0.328	0.744
	Value	0.0229	0.0583	0.0155	0.0559	0.0074	0.675	0.501
	Growth	0.0104	0.0536	0.0111	0.0527	-0.0007	-0.071	0.943
Middle	Total	0.0208	0.0385	0.0109	0.0348	0.0099	1.418	0.159
	Value	0.0257	0.0459	0.0128	0.0387	0.0129	1.598	0.113
	Growth	0.0151	0.0365	0.0084	0.0396	0.0067	0.914	0.363
Small	Total	0.0199	0.0329	0.0101	0.0354	0.0098	1.486	0.140
	Value	0.0242	0.0353	0.0121	0.0363	0.0120	1.755	0.082
	Growth	0.0152	0.0357	0.0081	0.0390	0.0072	0.997	0.321
Panel C: 1990/2～2008/12 (n=209)								
Total	Total	0.0059	0.0536	-0.0090	0.0611	0.0149	1.853	0.065
	Value	0.0084	0.0552	-0.0097	0.0577	0.0181	2.300	0.022
	Growth	0.0035	0.0552	-0.0088	0.0673	0.0122	1.419	0.157
Top	Total	0.0037	0.0557	-0.0063	0.0629	0.0100	1.204	0.230
	Value	0.0061	0.0578	-0.0065	0.0609	0.0126	1.522	0.129
	Growth	0.0019	0.0567	-0.0062	0.0680	0.0080	0.916	0.361
Middle	Total	0.0065	0.0531	-0.0093	0.0615	0.0157	1.955	0.052
	Value	0.0079	0.0560	-0.0103	0.0590	0.0182	2.276	0.024
	Growth	0.0042	0.0549	-0.0081	0.0687	0.0123	1.412	0.160
Small	Total	0.0138	0.0606	-0.0180	0.0650	0.0318	3.633	0.000
	Value	0.0158	0.0610	-0.0177	0.0620	0.0335	3.920	0.000
	Growth	0.0093	0.0641	-0.0185	0.0730	0.0278	2.900	0.004

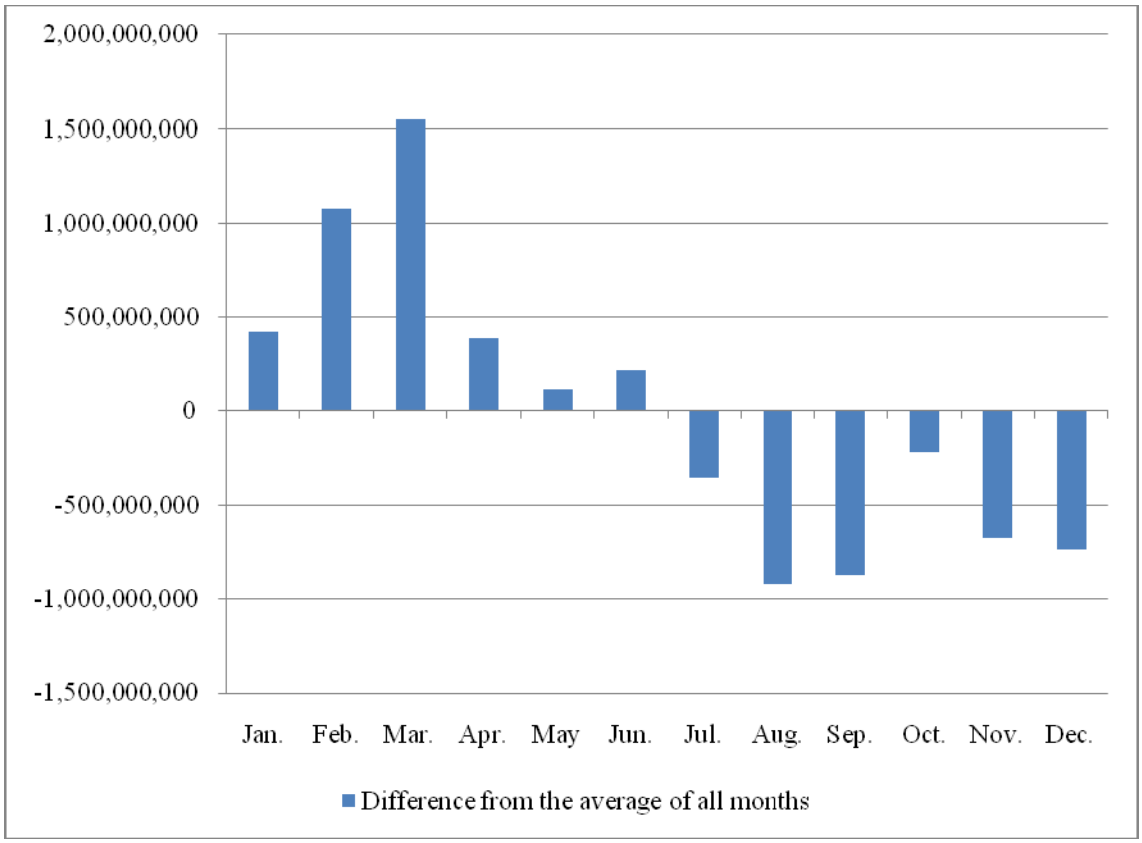
(Note) Panel A reports the mean cumulative return comparison of size-based portfolios (Top, Middle, and Small) for the entire period. In each of the size categories, the portfolio was subdivided into value and growth, depending on book-to-market ratio. Panel B shows the return of each portfolio during the sub-period before the bubble burst. Panel C shows the return of each portfolio during the sub-period after the bubble burst.

Figure 8: Average monthly rate of shares bought on margin between 1995 and 2008.



(Note) The monthly rate of shares bought on margin was calculated by dividing the cumulative number of shares bought on margin during a month by the cumulative number of shares bought on margin during the previous month.

Figure 9: Average number of net shares traded “on margin transactions” to that of individuals, between 1978 and 2008.



(Note) The figures indicate the number of shares bought on margin minus the shares sold on margin by individual investors. The graph shows the deviation from the average net number of shares traded by individuals throughout the sample period.