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The calendar structure of the Japanese Stock Market

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Abstract

We report the Japanese stock market seasonality persisting for more than thirty years. The average return for stocks is significantly positive for months during the first half of calendar year, and significantly negative for months during the last half of calendar year. This 'Dekansho-bushi effect' is independent of other known calendar anomalies such as the January effect. 'Dekansho-bushi effect' exists regardless of the size and book to market ratio[1].

1. Introduction

Researchers have been documenting a growing number of empirical regularities appear to be inconsistent with the Efficient Market Hypothesis which states that the past history of stock returns should not be useful for predicting future price changes. Findings in this paper add to the list of those regularities. The study of such regularities has often followed a path in which a supposedly profitable trading rule is mentioned in the popular press and that mention is followed by a scholarly inquiry. The regularity reported in this paper follows a different path. The seasonality to be discussed was first documented in our working paper and then mentioned in a popular Japanese press, which indicates that the pattern in the Japanese stock market has not been well- known among practitioners.

Japanese stocks appear to earn significantly positive average returns during the first half of the year and significantly negative average returns during the second half of the year relative to the full year performance of the market. During the thirty eight year span studied, twenty four of the market's cumulative advance occurred during the first

[1] Dekansho-bushi is a well-known folk song traditionally sung by farmers in Sasayama district, western part of Japan, in Edo era. It virtually advocates the life style that laboring only the first half of the year and spend the rest of the year in frolic.

half of the year, the second half contributed negatively to the cumulative gain. The impact of this effect on stock returns is not subtle; the first half year cumulative buy and hold return during 1971-2008 of the most popular value-weighted index (TOPIX) is 950.3% as opposed to the average negative last half cumulative buy and hold return of -44.9%. Our finding is isolated from the commonly known "January effects" because the result remains robust using the sample months excluding January.

Past empirical studies in the U.S. reveal various January dependencies in stock returns. Keim (1983) and Reinganum (1983) find that small stocks outperform large stocks in January, and Tinic and West (1984) find that high-beta stocks outperform low-beta stocks in January. Other studies report anomalous calendar dependencies in stock returns. French (1980) finds that returns on Mondays are lower and Fridays are higher (weekend effect). Ariel (1990) documents that returns on the days before holiday is higher (holiday effect). Ariel (1987) report that there is monthly effect on stock returns; stocks are higher in the first half of the month and flat during the second half of the month. For the empirical evidence in the Japanese stock market, Kato and Schallheim(1985) report January effect is at work and Sakakibara(1994) confirms weekend effect in the index call options market.

In section 2, several tests are reported, which show the existence of a half year pattern in the Japanese stock market returns. In section 3, the results are discussed and possible biases that might induce the observed effect are considered. Concluding remarks are given in section 4.

2. The half year pattern in returns

a) Monthly returns

The following tests employ Nikkei NEEDS Financial Quest and Nomura Aurora Data Line to obtain the value-weighted (TOPIX) and price-weighted stock index (Nikkei 225 Stock Average) returns, both of which are two most commonly quoted Japanese Stock Indexes, to represent the returns accuring to 'stocks'. The data span the years 1971 through 2008, 456 months.

Table-1 and Figure-1 both indicate the superiority of trading environment in the first half of the year. If each trading year is divided evenly in half, the mean monthly return from the first half of trading years significantly exceeds the mean monthly return from the last half of trading years: The t-statistics for the difference of the mean monthly returns from the two populations are 2.129 and 2.601 for the price-weighted and

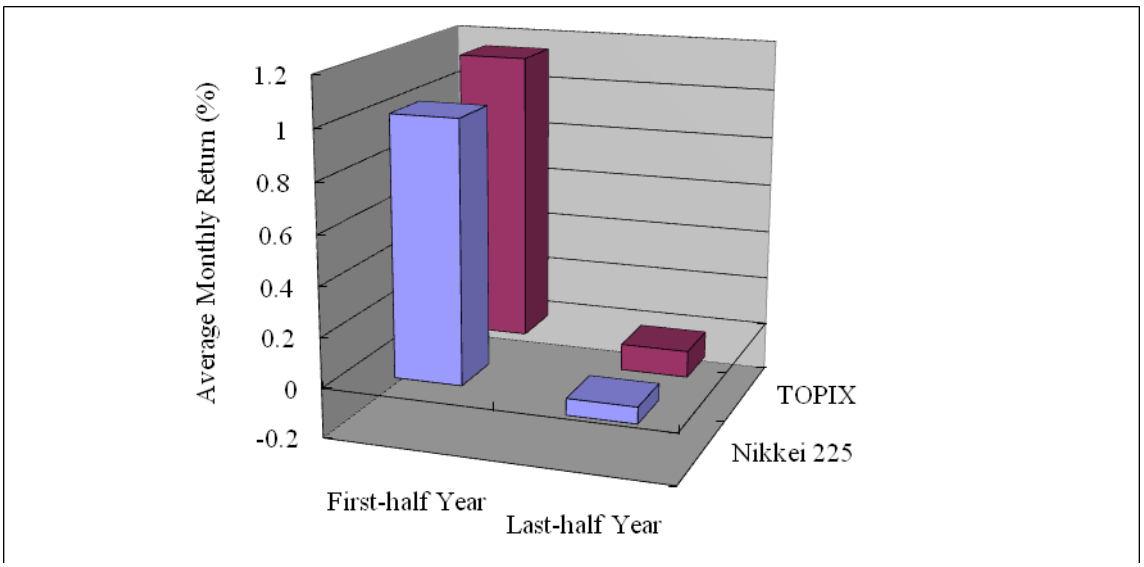
value-weighted indexes, respectively; moreover, the last-half monthly means are negative. The descriptive statistics on the sub-populations are given in the below rows in Table 1.

For the entire 1970-2008 period, for both indexes, the t-statistic is statistically significant, thereby showing that the mean cumulative return from the first half of trading years significantly exceeds the mean cumulative return from the second half of trading years. In each of the three sub-periods for both indexes, the point estimate of the mean return from the first half of trading years exceeds the point estimate of the mean return from the last half of trading years, and the t-statistic for the difference of the mean is significant at the 0.05 level in four of the six comparisons. Figure 1 is the graphical representation of Table 1.

Table 1: Mean monthly returns for price-weighted index and value weighted index

	period	First-half Year (JAN-JUN)		Last-half Year (JUL-DEC)				
		mothly return	standard deviation	mothly return	standard deviation	diff.	t-statistic	p-value
Nikkei 225	1971/1～2008/12	0.010	0.050	-0.001	0.059	0.011	2.129	0.017
TOPIX	1971/1～2008/12	0.012	0.048	-0.001	0.055	0.013	2.601	0.005
Nikkei 225	1971/1～1989/12	0.021	0.038	0.007	0.046	0.013	2.391	0.009
TOPIX	1971/1～1989/12	0.021	0.040	0.007	0.045	0.014	2.402	0.009
Nikkei 225	1990/1～2008/12	0.000	0.059	-0.009	0.070	0.009	1.017	0.155
TOPIX	1990/1～2008/12	0.002	0.054	-0.009	0.062	0.012	1.506	0.067

Figure 1



b) χ^2test

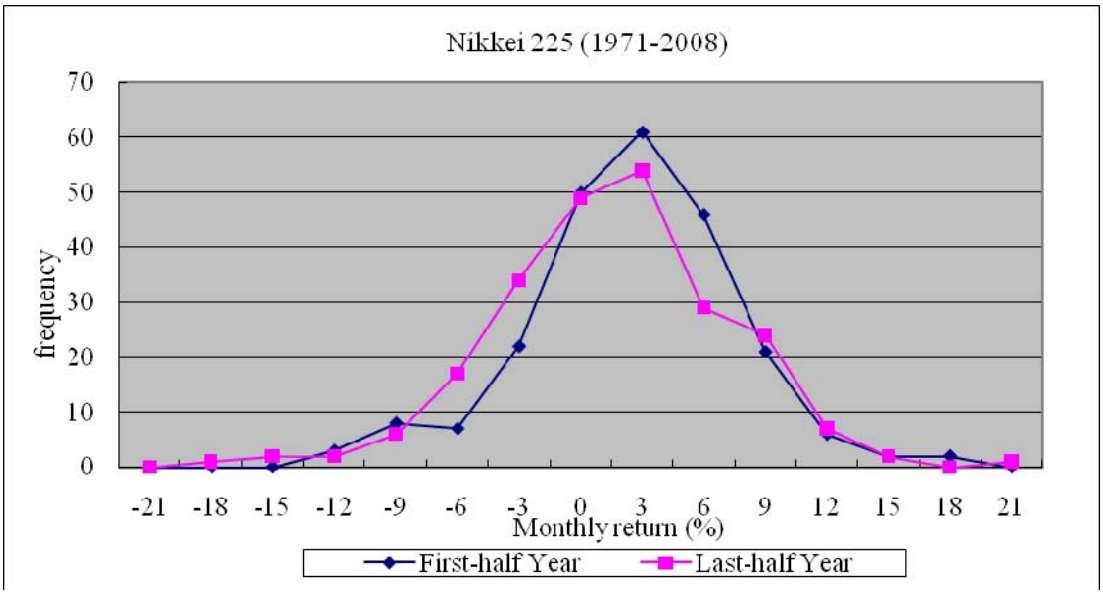
The difference-of-means test applied in table 1 presupposes a normal distribution of the cumulative half year stock returns. To check the sensitivity of the conclusion to this assumption the following test can be performed: Divide each trading year so that equal numbers of trading months appear in each half year. Define the cumulative return over each half-year as the product of one plus the monthly returns over that period. If the returns for all months of the trading year are drawn from a single distribution, then the probability that the cumulative return from the first half of a trading year will exceed the cumulative return from the second half of that same trading year should be 0.5. The test statistics comparing this expectation with the observed results are reported in table 2. For price-weighted index, in 25 years out of total 38 years, first half year cumulative return exceeds the second half, for value-weighted index, in 26 years out of 38, rejecting the null hypothesis for all confidence levels.

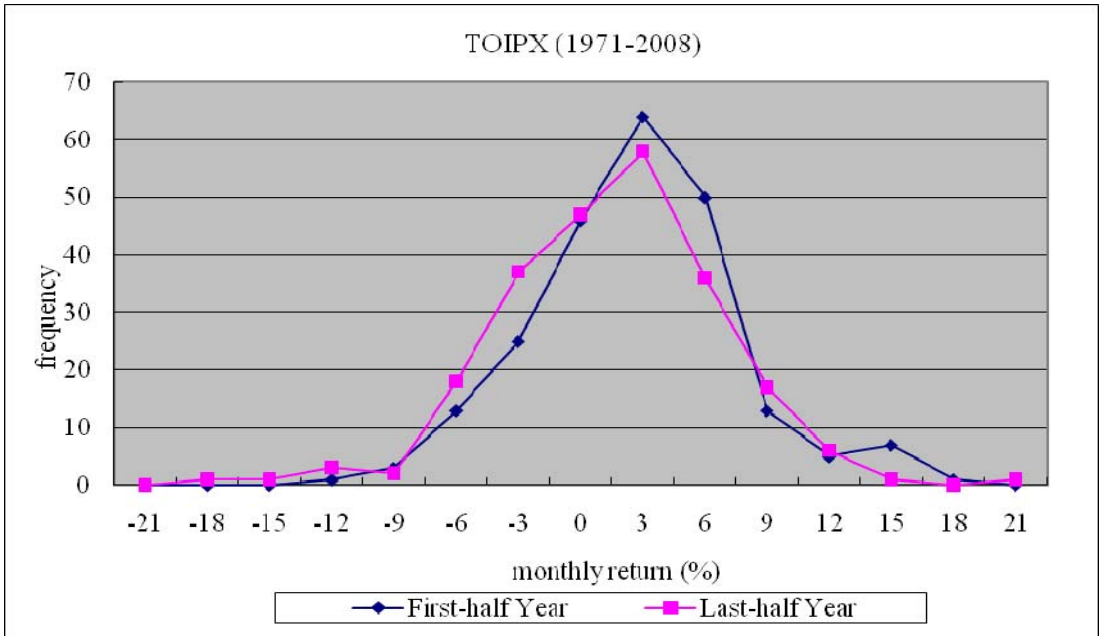
Table 2: χ^2test of first half of trading years exceed the last half of trading years

	period	First-half Year (1-6)		Last-half Year (7-12)					frequency of higher first-half year returns	χ^2
		six-month cumulative return	standard deviation	six-month cumulative return	standard deviation	diff.	-statistip-value			
Nikkei 225	1971/1～2008/12	0.067	0.155	-0.001	0.171	0.068	1.803	0.038	25	3.789
TOPIX	1971/1～2008/12	0.075	0.154	-0.001	0.177	0.076	1.984	0.026	26	5.158

These differences in average stock returns from months in the first and last halves of trading years are not due to outliers as can be seen from the frequency histogram of those returns in figure. 2. Identical numbers of trading months appear in each of the two populations so the distributions are directly comparable. The extreme tails of the two distributions appear similar. The differing means are due to a slight shift in the overall distributions of the two populations. The thirty three-year cumulative impact of the differing monthly mean returns is profound. The cumulative returns earned over these thirty eight years from investing in the price-weighted index during only the first half of all trading years is 681.2%, while comparable cumulative return from investing in the last half is-42.9%. Likewise, for the value-weighted index, the figures are 950.3% and -44.9% respectively.

Figure 2: Histograms of monthly return frequencies for the price-weighted (TOPIX) and value-weighted indexes (Nikkei 225). Intervals are 3% wide and each point represents the indicated number of monthly observations with returns falling in that interval. The subpopulations were derived by splitting the year in half at June so that equal numbers of trading months fall in each half. Top panel: Price-weighted index – First half year (six-month) cumulative mean 6.7% (s.d.15.5%). Last half year (six-month) cumulative mean -0.1% (s.d.17.1%). Bottom panel: Value-weighted index – First half year (six-month) cumulative mean 7.5% (s.d.15.4%). Last half year (six-month) cumulative mean -0.1% (s.d.17.7%).





3. Possible biases

a) Size effect and Value effect

Nomura Aurora Data Line provides Russell/Nomura style indexes created by Nomura Research Institute. They are based on value/growth and size. Using these indexes, size effect and value effect can be estimated with respect to the seasonal dependencies. However, due to the data availability, mean monthly returns are estimated sampling from 1980. During the 1980-2008 period value firm returns exceeded growth firm returns and small firm returns exceeded large firm returns during both the first half and the last half of trading years. This size effect and value effect both exist in the pre-bubble period (sub-period I, 1980-1989) and the post bubble period (sub-period II, 1990-2008). The difference of the mean for the first half and the last half of trading years are statistically significant in small size group samples but insignificant in large size group samples. Table 3 indicates the details of the each group mean returns and t-statistics to test the null hypothesis that the mean monthly returns during the first half and last half trading years are the same. Figure 3, Figure 4 and Figure 5 are the graphical representation of Table 3.

Table 3

Russell/Nomura Japan Index		period	First half Year (JAN-JUN)		Last half Year （JUL-DEC）				
size	Book-to-market		mothly returns	standard deviation	mothly returns	standard deviation	diff.	t-statistic	p-value
	total	1980/1～2008/12	0.010	0.050	-0.002	0.055	0.012	2.136	0.017
Total	value	1980/1～2008/12	0.014	0.053	-0.002	0.053	0.016	2.816	0.003
	growth	1980/1～2008/12	0.006	0.051	-0.002	0.060	0.009	1.431	0.077
	total	1980/1～2008/12	0.007	0.055	0.000	0.060	0.007	1.142	0.127
top	Value	1980/1～2008/12	0.012	0.057	0.001	0.060	0.010	1.663	0.049
	Growth	1980/1～2008/12	0.004	0.056	0.000	0.064	0.004	0.659	0.255
	total	1980/1～2008/12	0.012	0.049	-0.002	0.055	0.014	2.575	0.005
middle	Mid Value	1980/1～2008/12	0.015	0.054	-0.002	0.054	0.018	3.027	0.001
	Mid Growth	1980/1～2008/12	0.008	0.049	-0.002	0.061	0.010	1.753	0.040
	total	1980/1～2008/12	0.018	0.054	-0.008	0.058	0.026	4.315	0.000
small	Small Value	1980/1～2008/12	0.021	0.055	-0.007	0.056	0.028	4.680	0.000
	Small Growth	1980/1～2008/12	0.013	0.056	-0.009	0.064	0.022	3.437	0.000
	total	1980/1～1989/12	0.021	0.041	0.012	0.038	0.010	1.348	0.090
Total	value	1980/1～1989/12	0.027	0.045	0.014	0.040	0.013	1.698	0.046
	growth	1980/1～1989/12	0.016	0.040	0.010	0.041	0.006	0.854	0.197
	total	1980/1～1989/12	0.019	0.053	0.013	0.051	0.006	0.599	0.275
top	Value	1980/1～1989/12	0.024	0.056	0.015	0.056	0.009	0.852	0.198
	Growth	1980/1～1989/12	0.014	0.053	0.011	0.053	0.003	0.271	0.394
	total	1980/1～1989/12	0.024	0.038	0.011	0.035	0.013	2.025	0.023
middle	Mid Value	1980/1～1989/12	0.029	0.046	0.013	0.039	0.016	2.121	0.018
	Mid Growth	1980/1～1989/12	0.019	0.035	0.008	0.040	0.010	1.474	0.072
	total	1980/1～1989/12	0.025	0.034	0.010	0.035	0.015	2.313	0.011
small	Small Value	1980/1～1989/12	0.029	0.036	0.012	0.036	0.017	2.585	0.005
	Small Growth	1980/1～1989/12	0.020	0.036	0.008	0.039	0.012	1.710	0.045
	total	1990/1～2008/12	0.004	0.053	-0.009	0.061	0.013	1.745	0.041
Total	value	1990/1～2008/12	0.008	0.055	-0.010	0.058	0.017	2.336	0.010
	growth	1990/1～2008/12	0.001	0.055	-0.009	0.067	0.010	1.191	0.117
	total	1990/1～2008/12	0.001	0.055	-0.006	0.063	0.008	0.986	0.163
top	Value	1990/1～2008/12	0.005	0.057	-0.007	0.061	0.011	1.456	0.073
	Growth	1990/1～2008/12	-0.001	0.057	-0.006	0.068	0.005	0.611	0.271
	total	1990/1～2008/12	0.006	0.054	-0.009	0.062	0.015	1.944	0.027
middle	Mid Value	1990/1～2008/12	0.008	0.057	-0.010	0.059	0.018	2.360	0.010
	Mid Growth	1990/1～2008/12	0.002	0.054	-0.008	0.069	0.011	1.283	0.100
	total	1990/1～2008/12	0.014	0.062	-0.018	0.065	0.032	3.794	0.000
small	Small Value	1990/1～2008/12	0.016	0.063	-0.018	0.062	0.034	4.081	0.000
	Small Growth	1990/1～2008/12	0.009	0.064	-0.018	0.073	0.028	3.059	0.001

Figure 3: 'Dekansho-bushi effect' on three size categories

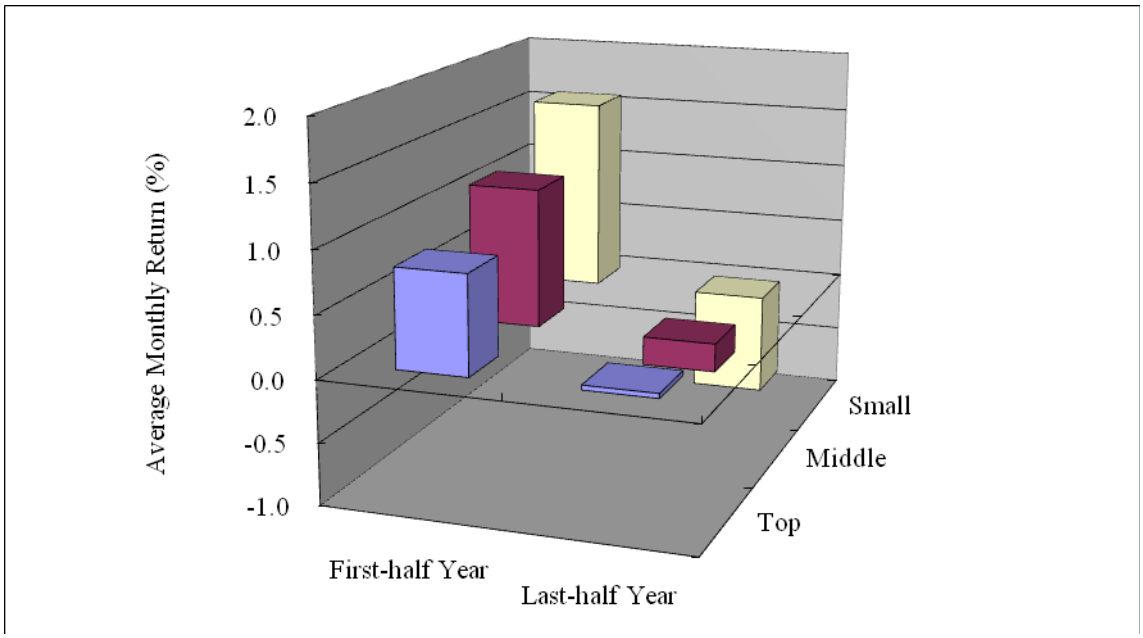


Figure 4: **'Dekansho-bushi effect' on high book to market ratio firms (growth firms) and low book to market ratio firms (value firms).**

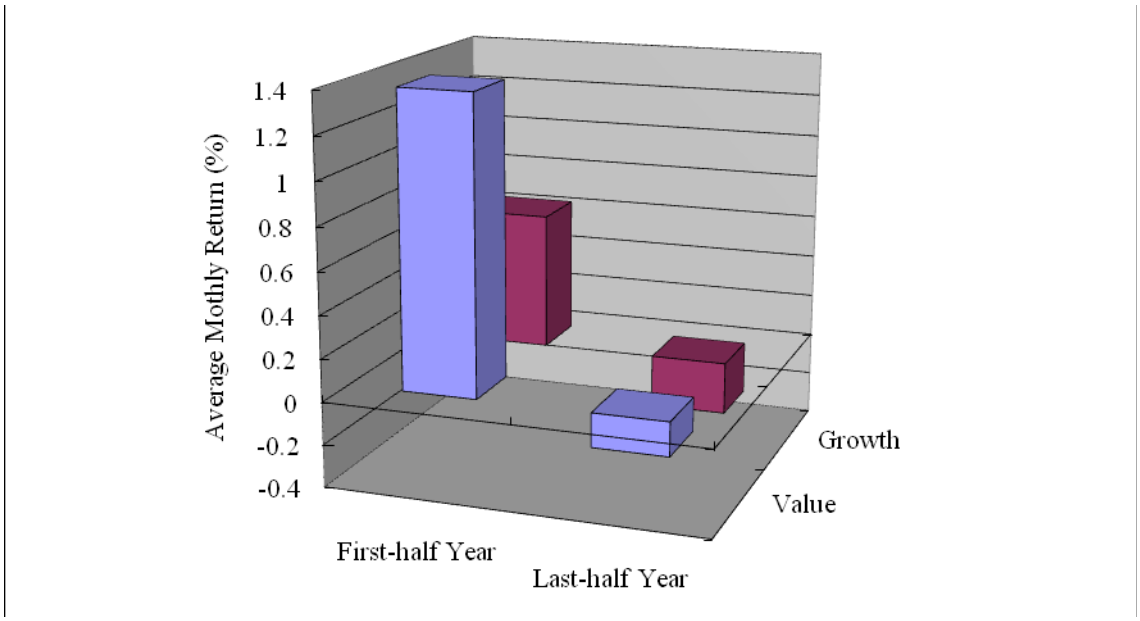
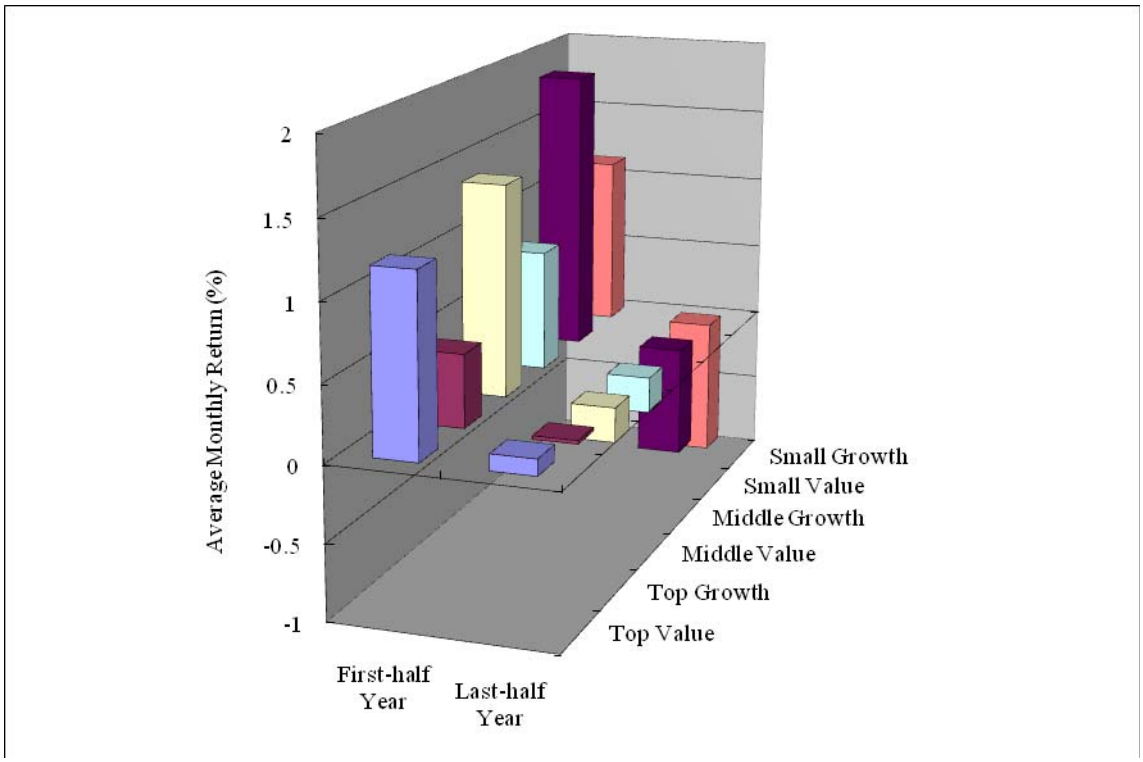


Figure 5: 'Dekansho-bushi effect' on six different categories



b) January Effect

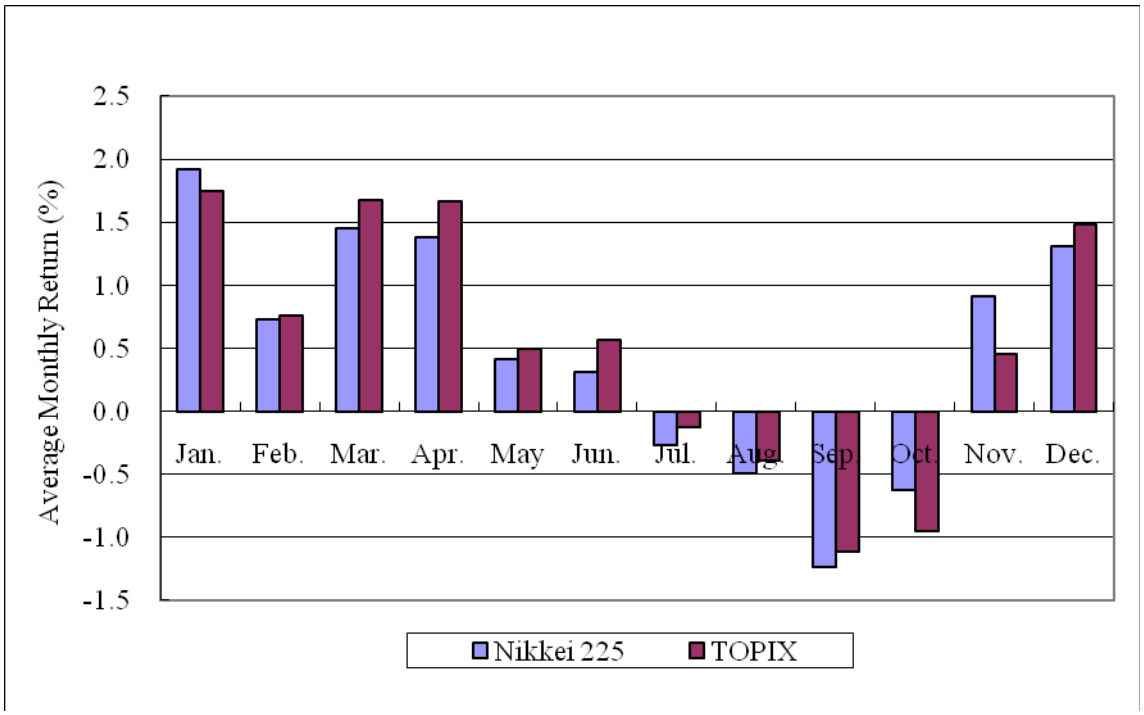
The 'Dekansho-bushi effect' may be merely another manifestation of the 'January effect'. Keim (1983), Roll (1983) and Reinganum (1983) have noted a tendency for the stocks of small firms to earn significant excess returns in January, with much of the effect concentrated in the first few days of the month. Kato and Schallheim(1985) confirms 'January effect' in the Japanese stock market. To see if the 'Dekansho-bushi effect' is reflecting nothing more than unusually high average returns in January, we study mean monthly returns excluding January. As shown in Table 4, for the Russell/Nomura value index, these mean five month returns excluding January and the second half of the year are 1.441% and -0.234% [t-statistic for difference of the means = 2.488, implied p = 0.007] .Comparable figures for the Russell/Nomura growth index excluding January are 0.666% and -0.275% [t= 1.32, implied p = 0.094]. The effect of excluding January on the monthly means are appreciable and in the direction predicted by the January effect; for both indexes; the means of both the first and the last half year monthly returns are lower when January is excluded. However, even when January is excluded, the 'Dekansho-bushi' effect is still present in the remaining months, as is evidenced by the differing first- and second-half means, and the difference is still statistically significant. Hence the observed difference in the mean returns from the first

and last halves of trading years is caused by something more than the unusually high returns at the beginning of January. Neither is the observed effect being induced by high returns during the first half of one or a few of the other months. In particular, the high return months are spread across February March, Aril, May and June. (see Figure 6)

Table 4

Russell/Nomura Japan Index		period (except for January)	First-half Year (JAN-JUN)		Last-half Year (JUL-DEC)				
size	Book-to-market		mothly returns	standard deviation	mothly returns	standard deviation	diff.	t-statistic	p-value
	total	1980/2～2008/12	0.010	0.050	-0.002	0.055	0.012	2.020	0.022
Total	value	1980/2～2008/12	0.014	0.052	-0.002	0.053	0.015	2.596	0.005
	growth	1980/2～2008/12	0.006	0.051	-0.002	0.060	0.009	1.411	0.080
	total	1980/2～2008/12	0.008	0.055	0.000	0.060	0.008	1.182	0.119
top	Value	1980/2～2008/12	0.012	0.058	0.001	0.060	0.011	1.620	0.053
	Growth	1980/2～2008/12	0.005	0.056	0.000	0.064	0.005	0.743	0.229
	total	1980/2～2008/12	0.011	0.049	-0.002	0.055	0.014	2.342	0.010
middle	Mid Value	1980/2～2008/12	0.014	0.053	-0.002	0.054	0.016	2.719	0.003
	Mid Growth	1980/2～2008/12	0.008	0.049	-0.002	0.061	0.010	1.652	0.050
	total	1980/2～2008/12	0.016	0.053	-0.008	0.058	0.024	3.868	0.000
small	Small Value	1980/2～2008/12	0.019	0.054	-0.007	0.056	0.026	4.220	0.000
	Small Growth	1980/2～2008/12	0.011	0.056	-0.009	0.064	0.021	3.033	0.001
	total	1980/2～1989/12	0.018	0.041	0.012	0.038	0.006	0.856	0.197
Total	value	1980/2～1989/12	0.024	0.045	0.014	0.040	0.010	1.284	0.101
	growth	1980/2～1989/12	0.012	0.040	0.010	0.041	0.002	0.318	0.375
	total	1980/2～1989/12	0.016	0.054	0.013	0.051	0.003	0.328	0.372
top	Value	1980/2～1989/12	0.023	0.058	0.015	0.056	0.007	0.675	0.250
	Growth	1980/2～1989/12	0.010	0.054	0.011	0.053	-0.001	-0.071	0.472
	total	1980/2～1989/12	0.021	0.038	0.011	0.035	0.010	1.418	0.080
middle	Mid Value	1980/2～1989/12	0.026	0.046	0.013	0.039	0.013	1.598	0.056
	Mid Growth	1980/2～1989/12	0.015	0.036	0.008	0.040	0.007	0.914	0.181
	total	1980/2～1989/12	0.020	0.033	0.010	0.035	0.010	1.486	0.070
small	Small Value	1980/2～1989/12	0.024	0.035	0.012	0.036	0.012	1.755	0.041
	Small Growth	1980/2～1989/12	0.015	0.036	0.008	0.039	0.007	0.997	0.160
	total	1990/2～2008/12	0.006	0.054	-0.009	0.061	0.015	1.853	0.033
Total	value	1990/2～2008/12	0.008	0.055	-0.010	0.058	0.018	2.300	0.011
	growth	1990/2～2008/12	0.003	0.055	-0.009	0.067	0.012	1.419	0.079
	total	1990/2～2008/12	0.004	0.056	-0.006	0.063	0.010	1.204	0.115
top	Value	1990/2～2008/12	0.006	0.058	-0.007	0.061	0.013	1.522	0.065
	Growth	1990/2～2008/12	0.002	0.057	-0.006	0.068	0.008	0.916	0.180
	total	1990/2～2008/12	0.006	0.053	-0.009	0.062	0.016	1.955	0.026
middle	Mid Value	1990/2～2008/12	0.008	0.056	-0.010	0.059	0.018	2.276	0.012
	Mid Growth	1990/2～2008/12	0.004	0.055	-0.008	0.069	0.012	1.412	0.080
	total	1990/2～2008/12	0.014	0.061	-0.018	0.065	0.032	3.633	0.000
small	Small Value	1990/2～2008/12	0.016	0.061	-0.018	0.062	0.034	3.920	0.000
	Small Growth	1990/2～2008/12	0.009	0.064	-0.018	0.073	0.028	2.900	0.002

Figure 6: Average Monthly Returns for the Price weighted Index and Value-weighted Index during 1971-2008



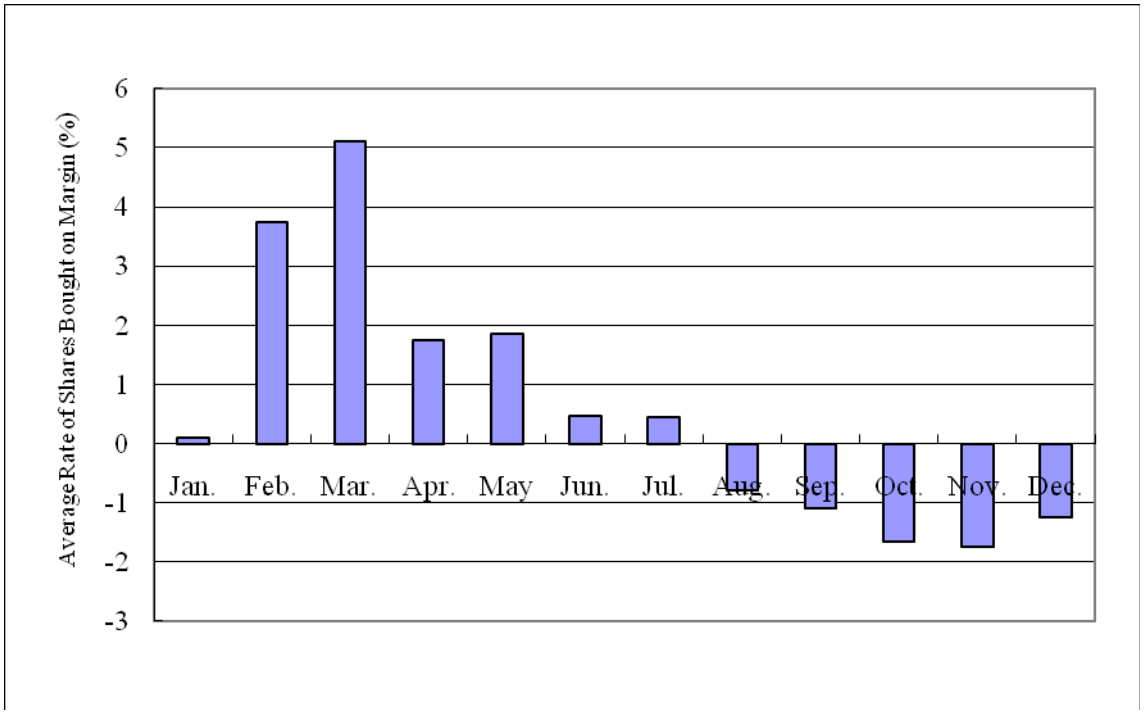
c) Behavioral Explanation

We ask why the reported seasonal pattern exists for more than thirty years. The possible explanation can be given from the behavioral point of view. As Hirshleifer and Shumway (2003) reports, sunshine affects people's psychological mood and that eventually affects how people evaluates future prospects. Individuals who are in good moods make more optimistic choices. A highly robust effect is that individuals in good moods have more positive evaluations of many sorts, such as life satisfaction, past events, people, and consumer products (see, e.g., Wright and Bower (1992), and the survey of Bagozzi, Gopinath, and Nyer (1999)). From this perspective, there are a number of events that people may well be optimistic in the first half of the year in Japan. January is the start of the calendar year and this fresh start mood is common with the rest of the world. March is the fiscal year-end and the majority of the corporations and public institutions close their books at 31st of March. In April, the cherry blossom season, everywhere from schools, universities, public offices to corporations are filled with freshmen. This feeling of fresh new start spreads over to Golden Week in early May[2].

[2] Obviously feeling of a fresh start is just one example of a mood-influencing factor that an investor may be able to discount for by paying attention to the sources of his mood. On a given day an individual who

In order to proxy for optimistic feeling of investors, we collect margin balance data for the period between 1972 and 2002. Figure 7 indicate that Average monthly rate of shares bought on margin during 1972-2002. Monthly rate of shares bought on margin is calculated by dividing the total market value traded on margin in a given month by the total market value changed hands in the same month. It appears as though investors get optimistic in the first half of the year and get sober in the last half of the year. Although the causality remains unclear, it may be possible that the 'Dekansho-bushi effect' is the result of investors' behavior triggered by psychological factors.

Figure 7: Average monthly rate of shares bought on margin during 1972-2002. Monthly rate of shares bought on margin is calculated by dividing the total market value traded on margin in a given month by the total market value changed hands in the same month.



4. Conclusion

The purpose of this paper is to point out the existence of the newly found seasonality in the Japanese stock market. This phenomenon has not been part of practitioner's streetlore as evidenced in the fact that a Japanese popular press reported the existence of the effect after our working paper was published in Japanese. We call this half year

pauses to consider may be able to identify other influences, such as uncomfortable new shoes, a broken air conditioner, the triumph of a child in school or of a popular local sports team.

seasonality as “Dekansho-bushi effect”, named after the famous traditional Japanese folk song that advocates the life style laboring only first half of a year and spending the rest of the year in frolic. The magnitude of this effect is by no means small. During the thirty eight years studied, all of the market’s cumulative advance occurred during the first half of trading years, with the last half of trading years contributing negatively. Moreover, the variation between high and low return months of the year induced by the half year effect is of roughly the same order of magnitude.

Various explanations for this ‘Dekansho-bushi effect’ have been considered, including the possibility that it is confounded with the previously reported January and small firm effects on stock returns, but none sufficed to explain the observed empirical regularity. We conjecture this ‘Dekansho-bushi effect is may well be related to the psychological factors. In Japan, April is the beginning of the fiscal year; various institutions from schools to corporations are filled with freshmen at this time of the year. January is the beginning of the calendar year and the fresh new start psychology is prevalent across the world including Japan. Since the first half of the year contains two of the new fresh start months, it affects the mood of the overall market and people may tend to evaluate future prospects more optimistically.

[2009.8.10 935]

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