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Equity Returns at the Turn of the Month

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The turn-of-the-month effect in U.S. equities is found to be so powerful in the 1926–2005 period that, on average, investors received no reward for bearing market risk except at turns of the month. The effect is not confined to small-capitalization or low-price stocks, to calendar year-ends or quarter-ends, or to the United States: This study finds that it occurs in 31 of the 35 countries examined. Furthermore, it is not caused by month-end buying pressure as measured by trading volume or net flows to equity funds. This persistent peculiarity in returns remains a puzzle in search of an answer.

Lakonishok and Smidt (L&S 1988) appear to have been the first to document a turn-of-the-month effect in equity returns, with the turn of the month beginning on the last trading day of the month and ending on the third trading day of the following month. Using the Dow Jones Industrial Average, they found that the four days at the turn of the month accounted for all of the positive return to the DJIA in the 90-year period of 1897–1986. Specifically, in this period, the average cumulative return over the four-day turn of the month was 0.473 percent whereas for the full month, the average cumulative return was 0.349 percent, indicating that returns were, on average, negative over the remaining days of the month. Because the turn-of-the-month effect was not their primary concern, L&S did not explore this pattern in depth.

We took up the task of examining the turn-of-the-month effect in detail in the study reported here. For the U.S. market, we used CRSP daily returns for the 80-year period of 1926–2005. As Schwert (2003) noted, return patterns that appear during a particular time period often disappear once they have been discovered or, upon closer scrutiny, turn out not to have existed to begin with. Therefore, and given that the L&S study ends with 1986, an obvious starting point for our analysis was the 19-year period that has transpired since the end of the period they examined. We found that the pattern in returns during the 1987–2005 period is remarkably similar to the pattern in the earlier period.

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Having established that the turn-of-the-month pattern has persisted in the U.S. equity market during the recent two decades, we turned to the more consequential task of investigating returns during the 80-year interval of 1926–2005 to determine whether the pattern is attributable to certain sets of stocks—small-capitalization or low-price stocks. We then carried out a variety of tests to determine whether the effect results primarily from returns at the turn of the year or at calendar quarter-ends, whether higher risk at the turn of the month can explain the pattern, and whether U.S. Treasury securities and corporate bonds exhibit a turn-of-the-month pattern. In addition, we considered whether the volume of trade or the net flow of funds to equity mutual funds supports Ogden's (1990) hypothesis that the turn-of-the-month effect is caused by "regularity in payment" dates, which we call the "payday hypothesis."

We also looked for a turn-of-the-month pattern in other countries for hints as to whether the pattern is universal or results from some peculiarity in the U.S. trading structure. As we show, the turn-of-the-month effect is not confined to the United States.

Prior Studies

We are not the first to expand upon the L&S study. Nearly contemporaneous with L&S was a study by Jacobs and Levy (1988) examining several calendar-year effects, including the January, the holiday, and the day-of-the-week effects. They reported that the turn-of-the-month effect occurred in the 1897–1986 period. Hensel and Ziemba (1996) examined a strategy in which a portfolio was invested in the S&P 500 Index over the turn of the month and invested in U.S. T-bills over other days. They reported that this strategy outperformed a strategy of buying and holding the S&P 500 by 0.63 percentage points per year in the 1928–93 interval. Similarly, Kunkel and Compton

(1998) found that a strategy of switching into the CREF (College Retirement Equities Fund) equity account over the turn of the month and into a TIAA (Teachers Insurance and Annuity Association) money market fund over other days achieved a return of 2.1 percentage points per year greater than a simple strategy of buying and holding equities.

In contrast to these findings, Maberly and Waggoner (2000) examined prices of S&P 500 futures in the 1982–99 period and concluded that the turn-of-the-month effect disappeared after 1990. Their findings raise the question of whether the effect is observable in the post-1987 era.

Aggregate Market Returns at the Turn of the Month

To conduct our analysis, we used CRSP value-weighted (VW) and equal-weighted (EW) market indices. **Figure 1** shows average stock market returns for the 1987–2005 period by day of the month for the VW and EW indices. Day –1 is the last trading day of the prior month, Day +1 is the first trading day of the month, Day +2 is the second trading day of the month, and so on.

Figure 1 shows that returns at the turn of the month during this period were unusually high relative to returns on other days. As one moves away from the turn of the month on the *x*-axis, average returns diminish; some days even have negative average returns. The unusually high returns at the turn of the month could be construed as beginning with Day –2. For consistency with prior studies, however, we consider the turn of the month as encompassing Day –1 through Day +3. Regardless of when the turn of the month is determined to begin, daily returns are obviously not evenly distributed throughout the month and the turn of the month received an outsized portion of the equity returns during the 1987–2005 period.

Figure 1. Average Daily VW and EW Market Returns for Last and First 10 Trading Days of the Month, 1987–2005

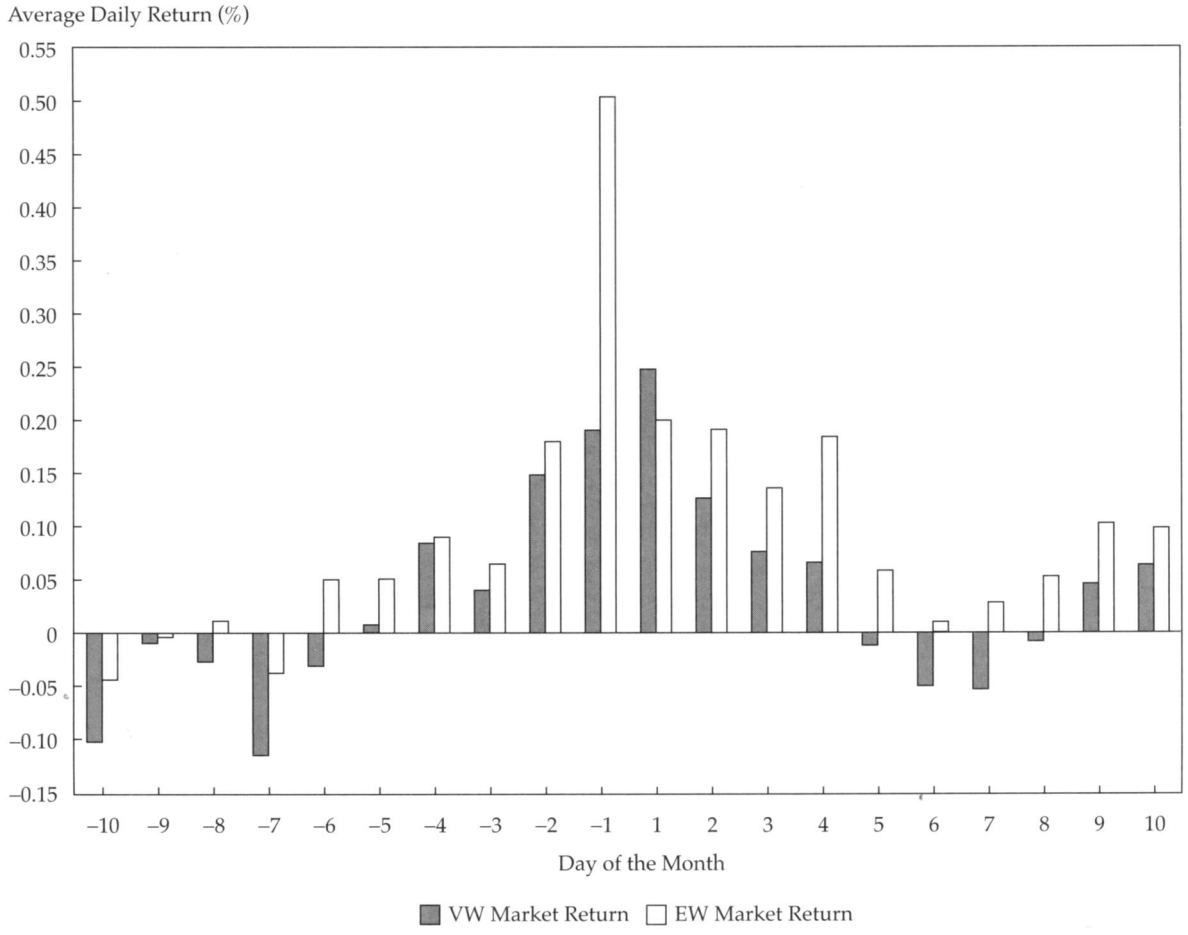


Table 1 gives the numerical values for the turn-of-the-month effect for three time periods: 1987–2005, 1926–1986, and 1926–2005. Because we have used the format of Table 1 throughout, we will describe it here in detail. The first four columns report the mean daily return for Days –1, +1, +2, and +3. Column 5 gives the mean daily return for the four-day turn-of-the-month interval (Day –1 through Day +3). Column 6 gives the mean daily return for all other days of the month. The final column gives the difference between the mean daily return for the turn-of-the-month interval and the mean daily return for all other days.

The *t*-statistic in the last column tests the hypothesis that the mean return over the turn of the month is significantly different from the mean return over all other days. This statistic will be the focus of attention in drawing inferences about the significance of the turn-of-the-month effect.

Note from Panel A of Table 1 that the mean daily return over the four-day turn-of-the-month interval for the 1987–2005 (post-L&S) period is 0.15 percent for VW returns; over the other 16 trading days of the month, the mean daily return is shown as zero (it would be negative at –0.001 percent if three decimal places were shown). For EW returns

Table 1. Daily VW and EW U.S. Stock Market Returns at the Turn of the Month, 1926–2005

Period	Day –1	Day +1	Day +2	Day +3	Day (–1, +3)	Other Days	Difference
CRSP VW Market Returns							
A. January 1987–December 2005							
Mean daily return (%)	0.19	0.25	0.13	0.08	0.15	–0.00	0.15
t-Statistic	2.99	3.73	1.84	1.21	4.35	–0.07	3.78
Positive (%)	63	63	59	55	66	58	61
B. January 1926–December 1986							
Mean daily return (%)	0.17	0.09	0.18	0.21	0.16	0.01	0.15
t-Statistic	5.01	2.43	4.83	5.62	8.50	0.98	7.07
Positive (%)	63	59	65	62	68	55	62
C. January 1926–December 2005							
Mean daily return (%)	0.18	0.12	0.17	0.18	0.16	0.01	0.15
t-Statistic	5.83	3.97	5.10	5.53	9.60	0.87	8.06
Positive (%)	63	60	64	60	68	56	62
CRSP EW Market Returns							
D. January 1987–December 2005							
Mean daily return (%)	0.50	0.20	0.19	0.14	0.25	0.05	0.20
t-Statistic	9.34	4.02	3.48	2.89	7.58	2.84	6.01
Positive (%)	85	68	67	62	79	65	75
E. January 1926–December 1986							
Mean daily return (%)	0.28	0.19	0.20	0.24	0.22	0.05	0.17
t-Statistic	6.91	5.35	5.21	6.11	9.98	3.57	7.39
Positive (%)	69	62	64	65	72	61	64
F. January 1926–December 2005							
Mean daily return (%)	0.33	0.20	0.20	0.22	0.23	0.05	0.18
t-Statistic	9.96	6.51	6.19	6.73	12.29	4.40	9.23
Positive (%)	73	63	65	64	73	62	67

Notes: Day –1 is the last trading day of the prior month. Days +1, +2, and +3 are the first three trading days of the month. Day (–1, +3) is the interval beginning with the last trading day of the month and ending with the third trading day of the following month. "Other Days" refers to trading Day –10 through Day –2 before the end of the month and trading Day +4 through Day +10 after the beginning of the month. The *t*-statistic tests the hypothesis that the average return in the row above the *t*-statistic is not significantly different from zero. "Positive (%)" is the percentage of observations in which the daily return in the top row of the panel (or subpanel) is greater than zero.

for the period shown in Panel D, the mean daily return over the turn of the month is 0.25 percent; over all other days, it is 0.05 percent. With *t*-statistics of 4.35 (VW) and 7.58 (EW) for the turn-of-the-month data, both the VW and EW mean turn-of-the-month returns are significantly greater than zero. With a *t*-statistic of –0.07, the VW mean return for all other days is not significantly different from zero; the EW mean return for all other days is significant with a *t*-statistic of 2.84. Importantly, for both VW and EW returns, the differences between the mean daily turn-of-the-month return and the mean daily return for all other days are highly significant, with *t*-statistics of 3.78 (VW) and 6.01 (EW).

A further interesting statistic is the percentage of differences that is positive—that is, the percentage of months in which the mean daily turn-of-the-month return is greater than the mean daily return for all other days. For VW returns given in Panel A, the difference is positive in 61 percent of the months; for EW returns given in Panel D, the difference is positive in 75 percent of the months. Given a null hypothesis of 50 percent positive differences and using a binomial test, we conclude that both of these percentages are significant (*z*-statistics of 3.18 and 7.55, respectively).

We also split the 19-year 1987–2005 interval into two equal subperiods (tabulated results not reported here) and found turn-of-the-month effects in both periods for both VW and EW returns. When VW returns were used, the difference between the mean turn-of-the-month return and the mean return over all other days for 1987 through mid-1996 was 0.17 percentage points, with a *t*-statistic of 3.63. From mid-1996 through December 2005, it was 0.14 percentage points, with a *t*-statistic of 2.00.

Panels A and D of Table 1 show that, unlike many of the anomalies studied by Schwert (2003), the turn-of-the-month effect in U.S. equity returns did not disappear following its discovery more than 20 years ago. Contrary to the conclusion of Maberly and Waggoner (2000), we found the turn-of-the-month effect to be powerful during the 1987–2005 period.

For comparison with L&S, we provide in Panels B and E of Table 1 results for the 1926–1986 time period. Comparison of Panels A and B with Panels D and E shows that, for both VW and EW returns, the average daily turn-of-the-month returns and the average daily returns for all other days for the 1926–86 period are nearly identical to the corresponding statistics for the 1987–2005 period. Furthermore, for both VW and EW returns, the difference between the average daily turn-of-the-month return and the return for all other days is highly significant, with *t*-statistics of 7.07 (VW) and 7.39 (EW).

The final statistic from Panels B and E to consider is the percentage of differences that is positive. When VW returns were used, this statistic is 62 percent, and when EW returns were used, it is 64 percent. Both are significantly different from 50 percent.

Panels C and F of Table 1 give the daily returns and summary statistics for the full time period of 1926–2005, and **Figure 2** shows the VW and EW returns by day of the month. Not surprisingly, the turn-of-the-month effect is pronounced during the full 80-year period.

Nevertheless, as with any study of stock returns, there may be concerns about the robustness of the results. One concern may be that the results are caused by a few outlier observations. To check this possibility, we deleted the 1 percent of the observations that included the most extreme returns.[1] We then recalculated the statistics for the 1926–2005 period (tabulated results not reported here). The average returns and the *t*-statistics were nearly unchanged after the deletions of extreme observations. The VW (EW) mean daily turn-of-the-month return was 0.16 percent (0.22 percent), in comparison with a mean daily return of 0.01 percent (0.05 percent) for all other days.

A second concern may be that standard *t*-tests of statistical significance are not appropriate for the data used here. Connolly (1989) argued that standard *t*-tests are upwardly biased in analyses of large samples of equity returns. He proposed and demonstrated the use of a GARCH (generalized autoregressive conditional heteroscedasticity) model in such circumstances. We applied Connolly's proposed methodology (tabulated results not reported here) by testing the model

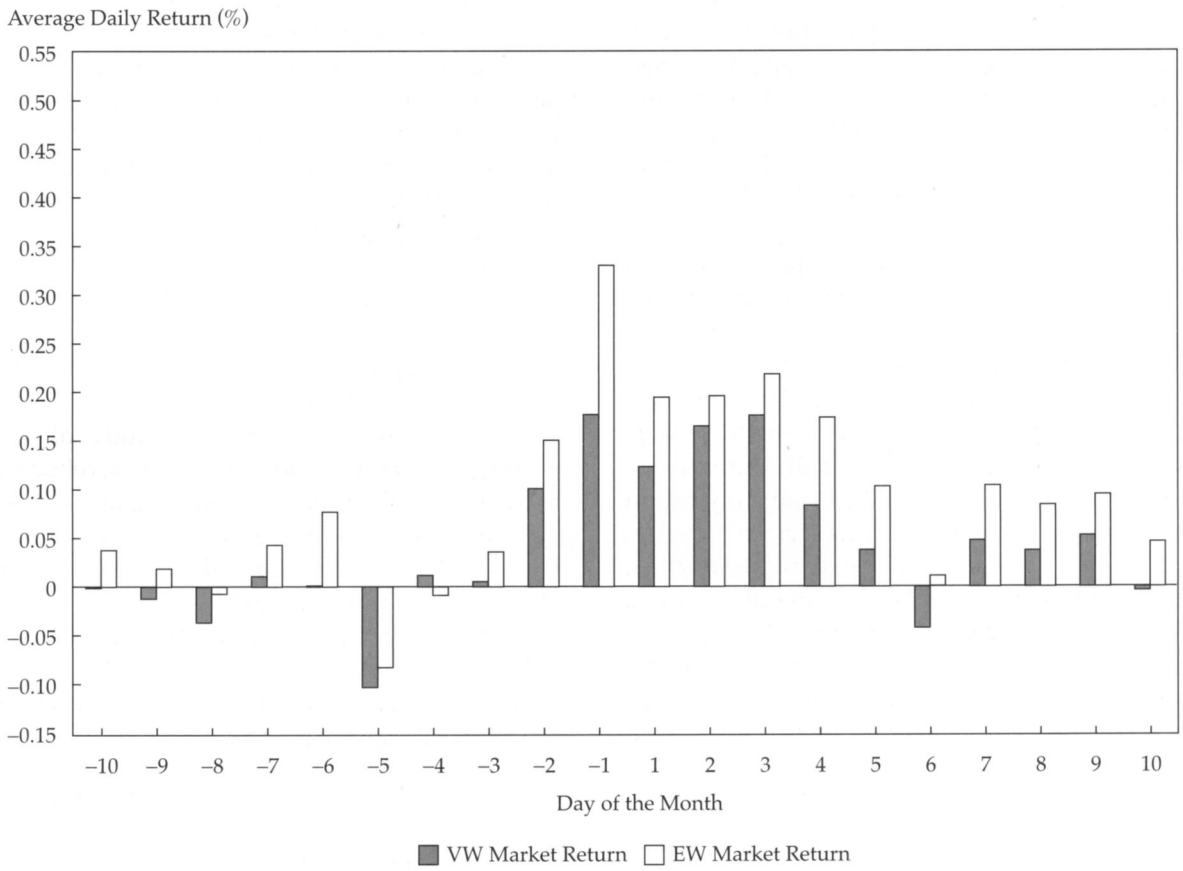
$$R_t = A + B(TOM_t) + e_t,$$

where R_t is the return on day t and TOM_t is a dummy variable that takes the value of 1 if a day is a turn-of-the-month day and 0 otherwise, against the constant-mean model,

$$R_t = A + e_t.$$

The likelihood ratio test of the two models has a χ^2 distribution with 1 degree of freedom. Under the GARCH (1, 1) specification, the likelihood ratios when using the VW and EW indices are 1,729.854 (VW) and 155.4726 (EW). The χ^2-tests rejected the null hypothesis of a constant mean at the 0.001 level of significance.

Figure 2. Average Daily VW and EW Market Returns for Last and First 10 Trading Days of the Month, 1926–2005



A Closer Look

Having established that the turn-of-the-month effect has not dissipated since its discovery 20 years ago and that its persistence and significance do not result from a few extreme observations or a flawed empirical methodology, we undertook an examination of whether it is caused by a particular market segment or market peculiarity. We first examined the effect in stocks sorted by market capitalization and price. We then considered whether the effect is more pronounced either at turns of the month that coincide with turns of the year or at turns of the month that coincide with turns of the quarter. Finally, we studied volatility (i.e., standard deviation) of returns by day of the month.

Size. The first of these analyses was motivated by studies reporting that small-cap stocks significantly outperform large-cap stocks.[2] The question was whether the turn-of-the-month effect occurs only in small-cap stocks.

Panels A and B of **Table 2** report VW returns for the turn of the month and for all other days for indices composed of, respectively, the largest decile and the smallest decile by market capitalization of CRSP equities for the 1926–2005 period. These data indicate that the turn-of-the-month effect occurs in both small- and large-cap stocks but is more pronounced in the small-cap portfolio. For large-cap stocks, the average daily turn-of-the-month return is 0.15 percent; the average return over all other days is only 0.01 percent. The difference between the two is significant (t-statistic of 7.81). For small-cap stocks, the mean turn-of-the-month return is 0.25 percent whereas the mean return for all other days is 0.03 percent. This difference also is highly statistically significant (t-statistic of 8.54).

This analysis demonstrates that the turn-of-the-month effect is not simply a variation of the high returns historically earned by small-cap stocks. Regardless of market capitalization, U.S. equities earn the bulk of their returns over the four days beginning one day prior to and ending three days after the end of the month.

Price. Our examinations of stocks sorted by price and by whether the turn of the month coincides with the turn of the year were motivated by studies

Table 2. Daily VW U.S. Stock Returns at the Turn of the Month for Various Categories of Stock, 1926–2005

Category	Day –1	Day +1	Day +2	Day +3	Day (–1, +3)	Other Days	Difference
A. Large-cap portfolio (largest decile of stocks by market cap)							
Mean daily return (%)	0.16	0.12	0.17	0.18	0.15	0.01	0.14
t-Statistic	5.15	3.73	5.21	5.46	9.35	0.81	7.81
Positive (%)	61	59	62	60	66	55	61
B. Small-cap portfolio (smallest decile of stocks by market cap)							
Mean daily return (%)	0.33	0.32	0.16	0.23	0.25	0.03	0.23
t-Statistic	8.23	7.29	3.96	4.76	9.35	1.81	8.54
Positive (%)	66	58	56	59	65	55	61
C. Stocks with prices greater than $5.00							
Mean daily return (%)	0.21	0.16	0.21	0.21	0.19	0.04	0.15
t-Statistic	6.87	5.25	6.35	6.50	11.73	4.55	8.22
Positive (%)	64	60	66	62	71	61	62
D. Stocks with prices less than or equal to $5.00							
Mean daily return (%)	0.41	0.28	0.15	0.29	0.27	0.03	0.24
t-Statistic	7.46	5.09	2.73	5.26	8.82	1.94	7.53
Positive (%)	64	56	55	58	63	54	60
E. Non-December-to-January turns of the month							
Mean daily return (%)	0.16	0.13	0.14	0.19	0.15	0.00	0.15
t-Statistic	5.01	4.14	4.11	5.51	8.84	0.01	7.86
Positive (%)	62	61	63	61	68	55	63
F. December-to-January turns of the month only							
Mean daily return (%)	0.34	0.03	0.51	0.06	0.23	0.10	0.13
t-Statistic	4.90	0.24	3.53	0.70	3.90	3.84	1.87
Positive (%)	75	49	74	53	65	65	56
G. Quarter-end turns of the month							
Mean daily return (%)	0.12	0.11	0.27	0.14	0.16	0.02	0.14
t-Statistic	2.48	1.94	4.83	2.86	5.41	1.18	4.12
Positive (%)	61	57	67	58	64	57	61
H. Non-quarter-end turns of the month							
Mean daily return (%)	0.21	0.13	0.11	0.20	0.16	0.00	0.16
t-Statistic	5.33	3.51	2.84	4.73	7.93	0.27	6.99
Positive (%)	64	61	63	61	70	55	62

Note: See the notes to Table 1.

showing that stocks in general perform well after the turn of the year and that this superior performance is concentrated among low-price stocks.[3]

Panels C and D of Table 2 give VW returns for portfolios sorted by price as of 31 December of each year. Panels A and B of **Table 3** give EW returns for the same sets of stocks. These data indicate that the turn-of-the-month effect occurs among both high- and low-price stocks and for both VW and EW indices. It is perhaps not surprising, given the correlation between stock price and total market capitalization, that the effect is more pronounced among low-price stocks. Nevertheless, the effect is also strong among high-price stocks. For example, for the VW returns, the mean daily turn-of-the-month return for high-price stocks is 0.19 percent, versus 0.04 percent for all other days. The *t*-statistic for the difference between the two is 8.22. For low-price stocks, the mean VW turn-of-the-month return is 0.27 percent whereas the mean return over all other days is 0.03 percent. This difference, too, is highly significant (*t*-statistic = 7.53). Panels A and

Table 3. Daily EW U.S. Stock Returns at the Turn of the Month for Various Categories of Stock, 1926–2005

Category	Day –1	Day +1	Day +2	Day +3	Day (–1, +3)	Other Days	Difference
A. Stocks with prices greater than $5.00							
Mean daily return (%)	0.30	0.18	0.21	0.22	0.23	0.06	0.17
t-Statistic	9.56	6.12	6.62	7.00	12.94	5.39	8.83
Positive (%)	73	63	67	65	74	64	65
B. Stocks with prices less than or equal to $5.00							
Mean daily return (%)	0.37	0.30	0.17	0.19	0.25	0.01	0.24
t-Statistic	7.52	5.83	3.84	4.17	8.26	0.44	8.22
Positive (%)	65	56	55	57	61	51	58
C. Non-December-to-January turns of the month							
Mean daily return (%)	0.27	0.13	0.14	0.20	0.18	0.04	0.14
t-Statistic	7.96	4.49	4.35	5.71	9.86	3.11	7.27
Positive (%)	71	62	64	64	72	61	65
D. December-to-January turns of the month only							
Mean daily return (%)	1.06	0.87	0.84	0.47	0.81	0.20	0.61
t-Statistic	7.91	6.98	6.18	4.92	9.96	6.12	7.43
Positive (%)	93	80	79	69	90	76	86
E. Quarter-end turns of the month							
Mean daily return (%)	0.43	0.29	0.36	0.25	0.33	0.06	0.27
t-Statistic	6.94	4.93	6.33	5.15	8.91	3.41	7.04
Positive (%)	73	64	68	63	75	63	71
F. Non-quarter-end turns of the month							
Mean daily return (%)	0.28	0.15	0.11	0.20	0.18	0.05	0.14
t-Statistic	7.22	4.36	3.03	4.78	8.64	3.06	6.19
Positive (%)	73	63	63	64	73	61	65

Note: See the notes to Table 1.

B of Table 3 show that the results for high- and low-price stocks when EW returns were used are quite similar to those calculated for VW returns.

The clear conclusion is that the turn-of-the-month effect is different from the low-price effect reported elsewhere.

Turn of the Year. Panels E of Table 2 and C of Table 3 give market returns for all turns of the month *except* the December-to-January turn (i.e., these data exclude the turn of the year). Panels F of Table 2 and D of Table 3 present the results for December-to-January turns of the month (i.e., those turns that coincide with turns of the year). The turn-of-the-month effect is present both in non-December-to-January turns and in December-to-January turns. For example, for the VW returns in Table 2, the average daily turn-of-the-month return for all non-December-to-January turns is 0.15 percent whereas the mean daily return for all other days of these months is 0.00 percent. The *t*-statistic for the difference is 7.86. The results for EW returns in Table 3 are quite similar. Clearly, the turn-of-the-month effect is not simply a result of unusual returns at the turn of the year.

Although there is a distinct turn-of-the-month effect at the December-to-January turn, the magnitude of the effect is different from that of the non-December-to-January turns. First, consider the VW returns for December-to-January turns in Panel F of Table 2. The mean daily return is 0.23 percent. For all other days of these months, the mean return is 0.10 percent. The *t*-statistic for the difference is only 1.87. Thus, in general, returns during December and January are high, but they are even higher at the December-to-January turn of the month. These high returns reflect the well-known high January returns documented in prior studies.[4]

High January returns have historically been concentrated among small-cap stocks. This factor is manifest in the EW returns of Table 3, Panel D, where the mean return for the December-to-January turn of the month is 0.81 percent. In contrast, the mean return is 0.20 percent over the other days of

these months. The *t*-statistic for the difference is 7.43. (Note that a major component of the high turn-of-the-year effect in this period occurred on Day –1 with an extraordinarily high one-day EW return of 1.06 percent.)

Turn of the Quarter. Bernhardt and Davies (2005) and Carhart, Kaniel, Musto, and Reed (2002) reported that calendar quarter-ends often have high daily returns. They attributed this effect to fund managers deliberately trading at above-market prices near the close of the market at calendar quarter-ends so as to boost the mark-to-market performance of their funds. They reported that quarter-ends have especially high returns and found this evidence to be consistent with their argument. So, we considered whether the turn-of-the-month effect is merely a manifestation of this artificial price boosting by fund managers at the end of reporting quarters. If so, the turn-of-the-month effect should be more pronounced for turns of the month that occur at quarter-ends.

To explore this possibility, we sorted turns of the month into calendar quarter-ends and non-quarter-ends and repeated our analyses. The results are given in Panels G and H of Table 2 for VW returns and Panels E and F of Table 3 for EW returns. The turn-of-the-month effect occurs at quarter-ends, but it is not merely a quarter-end phenomenon. Indeed, Table 2 shows that when VW returns were used, the average turn-of-the-month return for non-quarter-ends (Panel H) turned out to be identical to the mean return for quarter-ends (Panel G). Additionally, for VW returns, the difference between the mean turn-of-the-month return at quarter-ends and on all other days (0.14 percentage points) is nearly identical to the difference between the mean turn-of-the-month return and the return for all other days at non-quarter-ends (0.16 percentage points). And both are highly statistically significant.

For the EW returns in Table 3, the results are slightly different. The turn-of-the-month effect definitely occurs both at quarter-ends and non-quarter-ends, and for both, it is highly statistically significant. The difference between the mean turn-of-the-month return and the mean return over all other days, however, is much larger at quarter-ends than at non-quarter-ends. Much, but not all, of this difference can be traced to the very high return that occurred on the last trading day of the year that shows up in Panel D of Table 3.

Overall, the evidence does not indicate that the turn-of-the-month effect is attributable to fund managers dressing up their quarter-end returns.

Volatility. Our analysis of volatility of returns was motivated by traditional asset-pricing theory, which posits a positive relation between risk and return, where risk is measured as standard deviation of return. We thus considered whether higher risk at the turn of the month explains the high turn-of-the-month returns. To test this idea, we calculated the standard deviation of returns by day of the month for the VW and EW portfolios. That is, we calculated the standard deviation of returns for all Day –10 returns, all Day –9 returns, and so on for each day of the month for the 1926–2005 period.

This analysis (tabulated results not shown here) shows that volatility is not unusually high at turns of the month. Indeed, if anything, volatility of returns is somewhat lower over the four-day turn-of-the-month period than over other days. For example, using VW returns, we found the average daily standard deviation of returns over the turn of the month to be 0.98 percent and the average standard deviation of returns over all other days to be 1.02 percent. Thus, higher volatility of returns does not explain higher turn-of-the-month returns.[5]

Non-U.S. Turn-of-the-Month Returns

We have shown that the turn-of-the-month effect is pervasive for various categories of U.S. stocks and does not appear to be explained by volatility of returns, but the possibility remains that the effect is caused by some peculiarity of U.S. trading mechanics. To address this possibility, we turned to analysis of other equity markets.

We used data from Thomson Datastream; for a country to be included in our analysis, we required that Datastream have a reliable daily market index for the country beginning no later than 1 January 1990. The 34 countries listed in **Table 4** satisfied that criterion.[6] From each country index, we used the entire time series of available daily data to calculate day-of-the-month returns. The beginning date for each country is given in the corresponding panel of Table 4; the ending date of the data for each country is 31 January 2006.

We will not go through the details of each country here, but arguably, a turn-of-the-month effect can be found in every country except Colombia; that is, in every country but Colombia, the average daily turn-of-the-month return is higher than the average return over all other days. That finding is, by itself, remarkable. When we used a stiffer standard—the *t*-statistic for the difference between the mean turn-of-the-month return and the mean return for all other days—we found a *t*-statistic greater than 1.95 in 28 of the country markets. In an additional two

Table 4. Daily Stock Market Returns for 34 Non-U.S. Countries at the Turn of the Month Ending on 31 January 2006

Country	Day –1	Day +1	Day +2	Day +3	Day (–1, +3)	Other Days	Difference
All 34 non-U.S. countries							
Mean daily return (%)	0.21	0.18	0.17	0.12	0.16	0.02	0.14
t-Statistic	2.71	1.99	2.28	1.50	3.64	0.57	3.08
Positive (%)	58	55	56	54	61	53	59
Argentina, January 1988							
Mean daily return (%)	0.64	0.46	0.11	0.28	0.35	0.23	0.11
t-Statistic	2.10	2.33	0.44	1.37	2.72	3.43	0.98
Positive (%)	50	50	52	53	53	59	55
Australia, January 1973							
Mean daily return (%)	0.19	0.04	0.17	0.10	0.12	0.01	0.11
t-Statistic	4.08	0.86	3.59	1.91	4.89	0.60	3.97
Positive (%)	60	51	56	57	59	52	57
Austria, January 1973							
Mean daily return (%)	0.09	0.17	0.16	0.09	0.12	0.01	0.10
t-Statistic	1.67	3.58	3.82	2.10	4.44	0.43	3.80
Positive (%)	61	57	58	55	60	46	61
Belgium, January 1973							
Mean daily return (%)	0.13	0.05	0.10	0.09	0.09	0.01	0.08
t-Statistic	3.39	1.21	2.41	2.29	3.94	0.74	3.26
Positive (%)	57	55	58	54	60	54	58
Canada, January 1973							
Mean daily return (%)	0.16	0.14	0.17	0.10	0.14	0.00	0.13
t-Statistic	3.99	3.41	4.04	2.51	6.20	0.21	5.34
Positive (%)	63	56	60	55	65	51	61
Chile, July 1989							
Mean daily return (%)	0.26	0.17	0.20	0.27	0.22	0.04	0.19
t-Statistic	4.48	2.42	2.64	3.92	4.86	1.48	4.24
Positive (%)	66	57	62	61	65	52	64
Colombia, January 1985							
Mean daily return (%)	0.17	–0.03	0.05	0.03	0.05	0.07	–0.02
t-Statistic	3.25	–0.52	0.85	0.32	1.08	2.65	–0.42
Positive (%)	58	52	51	55	52	56	53
Denmark, January 1974							
Mean daily return (%)	0.19	0.12	0.23	0.05	0.14	0.01	0.13
t-Statistic	1.62	2.91	5.47	1.19	3.97	1.09	3.50
Positive (%)	56	61	61	55	64	52	62
Finland, March 1988							
Mean daily return (%)	0.45	0.13	0.17	0.20	0.22	0.00	0.23
t-Statistic	4.11	1.16	1.19	1.52	3.74	–0.13	3.39
Positive (%)	64	52	56	56	62	55	60
France, January 1973							
Mean daily return (%)	0.08	0.04	0.09	0.11	0.07	0.03	0.05
t-Statistic	1.59	0.78	1.53	1.77	2.42	1.65	1.46
Positive (%)	53	53	56	52	59	57	54
Germany, January 1973							
Mean daily return (%)	0.15	0.15	0.21	0.14	0.16	–0.01	0.17
t-Statistic	3.20	2.86	3.84	2.83	5.95	–1.01	5.76
Positive (%)	55	59	63	59	65	51	64

(continued)

Table 4. Daily Stock Market Returns for 34 Non-U.S. Countries at the Turn of the Month Ending on 31 January 2006 (continued)

Country	Day –1	Day +1	Day +2	Day +3	Day (–1, +3)	Other Days	Difference
Greece, January 1988							
Mean daily return (%)	0.27	0.56	0.42	0.17	0.34	0.00	0.34
t-Statistic	2.46	3.40	3.47	1.48	4.82	–0.15	5.06
Positive (%)	59	60	57	51	66	50	68
Hong Kong, January 1973							
Mean daily return (%)	0.21	0.11	0.16	0.05	0.12	0.01	0.11
t-Statistic	2.70	1.18	1.89	0.44	2.32	0.22	2.21
Positive (%)	60	55	59	54	64	55	60
Indonesia, April 1990							
Mean daily return (%)	0.13	0.10	0.15	0.16	0.13	–0.02	0.15
t-Statistic	1.26	0.75	1.22	1.27	2.00	–0.62	2.17
Positive (%)	54	51	52	54	57	52	54
Ireland, January 1973							
Mean daily return (%)	0.12	0.10	0.08	0.09	0.09	0.02	0.07
t-Statistic	2.21	1.72	1.48	1.64	2.75	1.36	1.97
Positive (%)	55	53	54	55	57	53	57
Italy, January 1973							
Mean daily return (%)	0.29	0.09	–0.05	–0.08	0.06	0.04	0.02
t-Statistic	5.52	1.39	–0.70	–1.31	1.72	1.93	0.55
Positive (%)	62	51	47	49	57	53	52
Japan, January 1973							
Mean daily return (%)	0.25	0.07	0.08	–0.05	0.08	0.00	0.08
t-Statistic	4.89	1.10	1.47	–0.93	2.77	0.22	2.33
Positive (%)	65	51	54	49	59	52	57
Malaysia, January 1986							
Mean daily return (%)	0.14	0.05	0.17	0.10	0.11	0.02	0.08
t-Statistic	2.15	0.37	1.76	1.11	1.87	0.82	1.41
Positive (%)	60	52	58	58	54	58	51
Mexico, January 1988							
Mean daily return (%)	0.19	0.19	0.14	0.29	0.22	0.07	0.14
t-Statistic	1.77	1.75	1.37	2.97	3.90	2.25	2.27
Positive (%)	54	53	55	56	63	58	58
Netherlands, January 1973							
Mean daily return (%)	0.11	0.18	0.18	0.05	0.12	0.01	0.12
t-Statistic	2.13	3.18	3.33	0.93	4.63	0.50	4.04
Positive (%)	57	56	58	55	61	52	59
New Zealand, January 1988							
Mean daily return (%)	0.14	0.02	0.27	0.07	0.11	–0.02	0.13
t-Statistic	2.22	0.27	3.57	0.98	3.32	–0.98	3.63
Positive (%)	59	50	60	50	62	53	57
Norway, January 1980							
Mean daily return (%)	0.19	0.23	0.11	0.10	0.15	0.01	0.13
t-Statistic	2.74	3.10	1.30	1.27	3.64	0.72	3.07
Positive (%)	56	58	55	52	61	56	60
Philippines, September 1987							
Mean daily return (%)	0.35	0.20	0.06	0.18	0.19	0.02	0.18
t-Statistic	3.68	1.54	0.64	1.93	3.46	0.51	3.05
Positive (%)	60	53	53	57	57	53	55

(continued)

Table 4. Daily Stock Market Returns for 34 Non-U.S. Countries at the Turn of the Month Ending on 31 January 2006 (continued)

Country	Day –1	Day +1	Day +2	Day +3	Day (–1, +3)	Other Days	Difference
Portugal, January 1990							
Mean daily return (%)	0.06	0.07	0.08	0.15	0.09	0.00	0.09
t-Statistic	1.01	0.87	1.26	2.54	2.35	–0.22	2.38
Positive (%)	58	50	56	53	60	54	60
Singapore, January 1973							
Mean daily return (%)	0.18	0.15	0.15	0.06	0.12	–0.01	0.13
t-Statistic	2.78	1.88	2.21	0.93	3.35	–0.47	3.39
Positive (%)	63	52	51	52	57	49	59
South Africa, January 1973							
Mean daily return (%)	0.22	0.12	0.26	0.23	0.20	0.02	0.18
t-Statistic	3.65	1.76	4.41	3.21	5.94	1.01	4.97
Positive (%)	60	53	60	60	63	58	58
South Korea, September 1987							
Mean daily return (%)	0.38	0.69	0.05	0.09	0.29	–0.04	0.33
t-Statistic	2.67	4.68	0.46	0.69	3.86	–1.23	3.98
Positive (%)	59	62	53	55	60	46	61
Spain, March 1987							
Mean daily return (%)	0.14	0.22	0.17	0.02	0.14	0.01	0.13
t-Statistic	2.01	2.29	2.13	0.30	3.21	0.27	2.53
Positive (%)	54	61	60	51	62	55	58
Sweden, January 1982							
Mean daily return (%)	0.20	0.30	0.29	0.18	0.24	0.01	0.23
t-Statistic	2.68	3.72	3.71	2.01	5.55	0.31	4.97
Positive (%)	56	61	61	54	66	53	64
Switzerland, January 1973							
Mean daily return (%)	0.07	0.21	0.16	0.04	0.12	0.00	0.12
t-Statistic	1.77	4.34	3.75	0.99	4.94	0.21	4.40
Positive (%)	54	62	59	58	65	52	64
Taiwan, September 1987							
Mean daily return (%)	0.29	0.04	0.10	0.16	0.12	0.00	0.12
t-Statistic	2.29	0.22	0.79	0.97	1.59	–0.11	1.59
Positive (%)	55	52	52	54	57	48	55
Thailand, January 1987							
Mean daily return (%)	0.10	0.43	0.33	0.09	0.22	–0.02	0.25
t-Statistic	0.89	2.98	2.38	0.66	2.85	–0.58	2.81
Positive (%)	54	53	57	52	60	52	60
Turkey, January 1988							
Mean daily return (%)	0.61	0.40	0.62	0.44	0.49	0.10	0.38
t-Statistic	3.45	1.95	3.11	2.12	4.48	1.94	3.17
Positive (%)	56	52	56	56	61	55	59
United Kingdom, January 1969							
Mean daily return (%)	0.07	0.11	0.12	0.15	0.11	0.01	0.10
t-Statistic	1.55	2.13	2.75	3.18	4.35	0.41	3.38
Positive (%)	55	54	57	56	63	49	60

Notes: Daily returns calculated beginning with the earliest available date. See also the notes to Table 1.

countries, the *t*-statistic is greater than 1.50, and for both of them, the numerical value of the difference is large although not statistically significant. For example, for Taiwan, the mean turn-of-the-month return is 0.12 percent whereas the mean return over all other days is 0.00 percent, but the *t*-statistic for the difference is only 1.59. Those countries that do not exhibit a meaningful turn-of-the-month effect are Argentina, Colombia, Italy, and Malaysia. In contrast, in many countries, the effect is extraordinarily large. For example, in Greece, the four-day turn-of-the-month return is 0.34 percent whereas the average daily return is 0.00 percent over all other trading days.

Remarkably, the turn-of-the-month effect appears to be a global phenomenon. This finding rules out those factors that are unique to the United States as explanations of the effect.

Bill and Bond Returns

Equity returns are often thought of as providing a risk-free rate plus a spread above that rate to compensate for risk. Our analysis of standard deviation of returns indicated that the turn-of-the-month effect is not the result of higher risk as measured by that traditional metric. But we wondered whether it is the result of an increase in interest rates at the turn of the month.

To consider this possibility, we examined daily return data for U.S. 90-day T-bills, 10-year T-bonds, and investment-grade and high-yield corporate bonds. Our analysis is similar in spirit to the analysis carried out by Jordan and Jordan (1991), who found no daily pattern in returns to the Dow Jones Composite Index in the 1963–86 period. To calculate daily returns for T-bills and T-bonds, we used data from the U.S. Federal Reserve Board website. For T-bills, data were available for 1954–2005; for 10-year T-bonds, data were available for 1962–2005. We used Lehman Brothers index data from Datastream to calculate realized returns for U.S. investment-grade corporate bonds and U.S. high-yield corporate bonds. For investment-grade bonds, data were available for 1989–2005; for high-yield bonds, data were available for 1998–2005.[7]

Table 5 gives turn-of-the-month returns and returns for all other days for bills and bonds. The results are, at best, ambiguous. As shown in Panel A, realized returns for the 90-day T-bill exhibit a negative turn-of-the-month effect. That is, the mean return over the four-day turn-of-the-month interval is mildly negative, but it is statistically significantly less than the mean return for all other days: The mean daily turn-of-the-month return is –0.001 percent, whereas the return for all other days is 0.0002 percent. The *t*-statistic for the difference is –2.54.

Table 5. Average Daily U.S. Interest Rates at the Turn of the Month for Various Time Periods Ending with December 2005

Index	Day –1	Day +1	Day +2	Day +3	Day (–1, +3)	Other Days	Difference
A. Three-month T-bill, 1954–2005							
Mean daily return (%)	–0.000	–0.004	–0.002	0.001	–0.001	0.000	–0.001
t-Statistic	–0.61	–3.72	–1.64	1.31	–2.45	0.57	–2.54
Positive (%)	43	41	44	49	49	47	48
B. 10-year T-bond, 1962–2005							
Mean daily return (%)	0.057	0.013	0.027	0.029	0.034	–0.011	0.045
t-Statistic	3.26	0.12	1.36	1.56	1.19	–2.08	1.57
Positive (%)	48	43	48	45	54	45	55
C. Lehman Brothers U.S. Corporate Bond Index, 1989–2005							
Mean daily return (%)	0.079	–0.023	0.044	–0.002	0.025	–0.005	0.030
t-Statistic	2.83	–0.83	2.06	–0.11	1.91	–0.92	2.16
Positive (%)	57	48	59	48	56	47	56
D. Lehman Brothers U.S. Corporate High-Yield Index, 1998–2005							
Mean daily return (%)	–0.064	0.054	0.042	0.032	0.016	0.000	0.014
t-Statistic	–1.21	0.91	1.97	1.49	0.67	0.00	0.65
Positive (%)	42	47	52	55	54	50	49

Notes: The 90-day T-bill rates are the realized returns for a 90-day constant-maturity Treasury (CMT) bill. The 10-year T-bond rates are the realized returns for a 10-year CMT bond. See also the notes to Table 1.

In contrast, the returns for 10-year T-bonds, as shown in Panel B, exhibit a positive turn-of-the-month effect, although it is not quite significant at traditionally accepted levels. The mean daily turn-of-the-month return is 0.034 percent, whereas the mean return for all other days is –0.011 percent. The *t*-statistic for the difference is 1.57.

Investment-grade corporate bonds (Panel C) evidence a reasonably strong positive turn-of-the-month effect. The mean daily turn-of-the-month return is 0.025 percent. In comparison, the mean daily return over all other days is –0.005. This difference is statistically significant (*t*-statistic = 2.16). High-yield corporate bonds (Panel D) exhibited a mild positive turn-of-the-month effect in this period; the mean daily return over the turn of the month was 0.016 percent in comparison with a mean return over all other days of 0.000 percent, but the *t*-statistic is only 0.65. Note, however, that the time series for the high-yield index encompasses only 1998–2005.

In short, we found some evidence of a turn-of-the-month effect in interest rates. Given that the security with the longest time series, T-bills, shows a negative turn-of-the-month effect, however, and that the T-bill rate is typically thought of as closest to a short-term risk-free rate, it would be difficult to make a case that the turn-of-the-month effect in equities is caused by a marketwide increase in investors' base-rate required return at the turn of the month.

The Payday Hypothesis

Ogden (1990) proposed that the turn-of-the-month effect occurs because investors, at least in the United States, receive the bulk of their compensation from wages, dividends, and interest earnings at month-ends. He referred to these as "liquid" profits. He proposed that the turn-of-the-month effect occurs when people attempt to invest at the turn of the month. We refer to this as the "payday hypothesis."

We undertook two tests of the payday hypothesis. The first involved daily NYSE trading volume. The second involved the daily flow of funds to and from equity mutual funds.

Trading Volume. If the payday hypothesis explains the turn-of-the-month effect, then trading volume should be higher, at least on average, over the turn of the month than over all other days.

To determine whether trading volume is higher at the turn of the month, we used CRSP data to analyze daily NYSE trading volume in shares and in dollars.[8] For this analysis, we calculated daily standardized volume: For each 20-day period surrounding the end of each month in the 1926–2005 period, we calculated average NYSE volume in shares and in dollars. We then divided the daily volume for each of these 20 days by the average volume of the 20-day interval to get the standardized volume for that day. For each day relative to the turn of the month, we calculated the average of these standardized volumes for the entire 1926–2005 time period. That is, we calculated the average standardized volume for Day –10, Day –9, and so forth.

We found no evidence of higher volume at the turn of the month. If anything, turn-of-the-month volume is lower than volume on other days. The mean standardized daily volume, in shares and in dollars, over the turn-of-the-month interval was 0.98 in the 1926–2005 period, whereas it was 1.02 over all other days.[9] Indeed, Day –1, which regularly provided the biggest "kick" to the turn-of-the-month return, had the second lowest standardized volume of all trading days in the period studied, and Day +1 had the lowest standardized volume.

Flow of Funds into Mutual Funds. Many individuals hold common stock shares indirectly through institutional investment funds. Individuals may also have a fraction of their compensation directly deposited into a retirement account with an institutional investor. If wages, dividends, and interest payments are concentrated at month-ends and if the net flow of these is what causes the turn-of-the-month effect in equity returns, we would expect net flows to equity mutual funds also to exhibit a turn-of-the-month pattern.

To consider whether the data support this proposition, we examined daily net flows to equity funds by day of the month. We used daily net fund flows from TrimTabs Investment Research for the period February 1998 (the month in which the data begin) through December 2005. The TrimTabs data track daily net flows for 1,694 individual funds from 86 fund families that represent approximately 20 percent of total dollars invested in mutual funds.

To begin, we considered whether the turn-of-the-month effect in equity returns occurred during the time period for which we had TrimTabs data. In general, we found the differences between the average daily turn-of-the-month return and the return for all other days to be similar to those for the full 1926–2005 time period. When we used VW returns, we found the difference to be 0.15 percentage points for the 1926–2005 period and 0.12 percentage points for the 1998–2005 period. For EW returns, the difference was 0.16 percentage points for both periods.

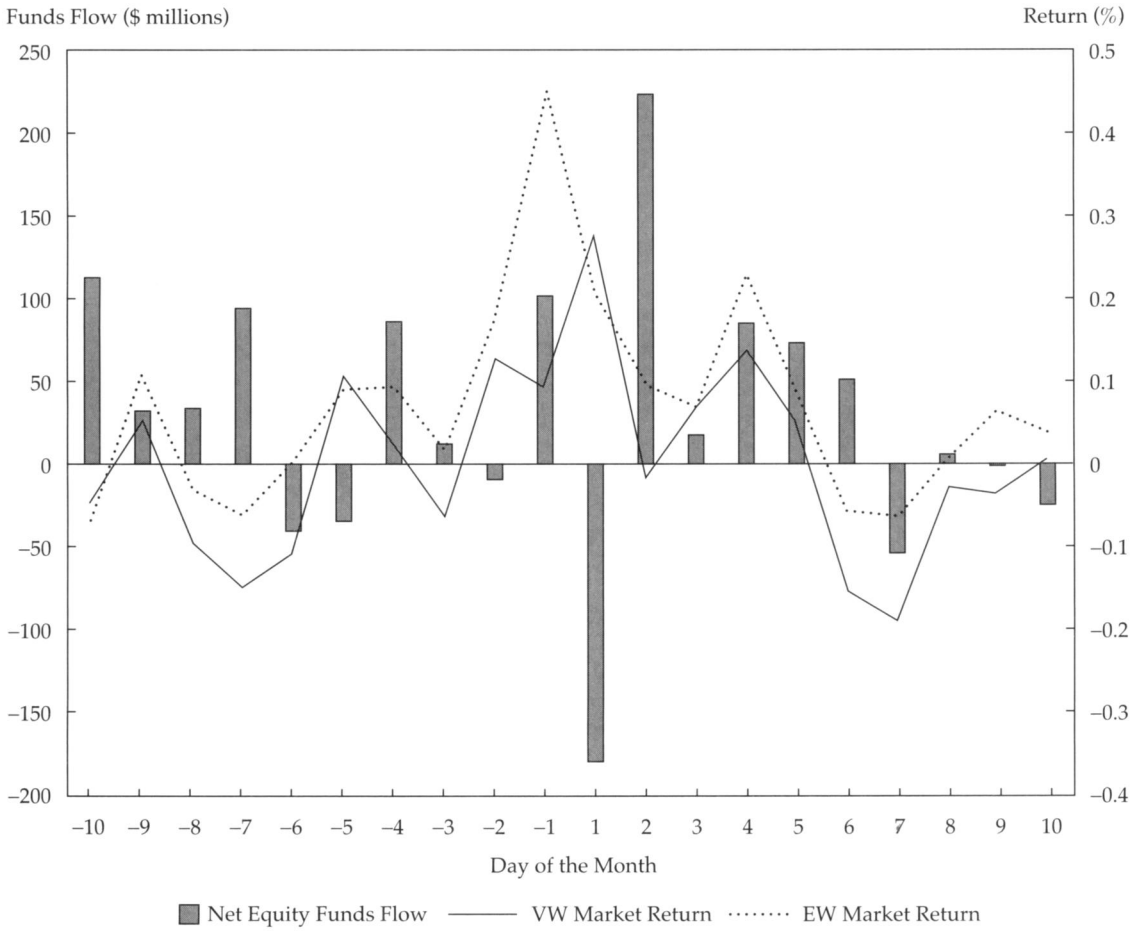
We next considered net fund flows into equity mutual funds for the turn-of-the-month intervals and for all other days. **Figure 3** shows the dollar amount of daily net funds flow by day of the month together with the VW and EW returns. If a payday effect is causing the turn-of-the-month effect in equity returns, net equity funds flow should be high at the turn of the month. Because cash deposited with a mutual fund is received throughout the day and may not be invested until the following day, whether the net flow should be contemporaneous with or should lead turn-of-the-month returns is not clear. Regardless, we would expect to observe three or four consecutive days with a large positive net funds flow. That is not what Figure 3 shows. Rather, the net flow on Day –2 is negative, and the net flow on Day –1 is positive; it is negative on Day +1 and positive on Days +2 and +3. No pattern in net funds flow to equity mutual funds is discernible to support the payday hypothesis.

In summary, neither of our tests could rule out that the turn-of-the-month pattern is the result of a payday effect in equity returns but neither of them provided any support for it either.

Conclusion

Lakonishok and Smidt (1988) coined the phrase the "turn-of-the-month effect" to describe the unusually high returns earned by DJIA equities over the four-day interval beginning with the last trading day of the month and ending three days later. Their study covered the years 1897–1986. We found that the turn-of-the-month effect was pronounced in the recent two decades as well. So, when we combine our findings with those of Lakonishok and Smidt, the result is that for the 109-year period of 1897–2005, on average, *all* of the positive return to equities occurred during the turn-of-the-month interval. Thus, on average, over the other 16 trading days of the month, investors received no reward for bearing market risk.

Figure 3. Daily Net Funds Flow to Equity Mutual Funds, February 1998–December 2005



Source: Tracked by TrimTabs.

We explored this turn-of-the-month effect in detail by using CRSP daily data for the period 1926–2005. We found that the turn-of-the-month effect is not confined to small-cap or low-price stocks; it is not confined to calendar year-ends or calendar quarter-ends; it is not caused by higher volatility of returns at the turn of the month; it is not related to an increase in the risk-free rate or interest rates in general at the turn of the month; and it is not confined to the United States—we found it in 30 of the 34 non-U.S. countries that we considered. Furthermore, the effect is apparently not caused by a concentration of share buying at the turn of the month; we found that trading volume is no higher at the turn of the month than on other trading days and that the net flows of funds to equity mutual funds are not systematically higher at the turn of the month than during other days of the month. These last two results in combination with the results from other countries argue against the effect being a payday effect.

The turn-of-the-month effect in equity returns continues to be a puzzle in search of a solution. Historically, seasonalities in asset returns have been labeled "anomalies." At some point, however, a persistent anomaly becomes the norm. The turn-of-the-month effect in equity returns appears to have persisted for more than 100 years. Perhaps, it is the norm.

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This article qualifies for 1 CE credit.

Notes

1. Specifically, because the sample included 228 months of data, we deleted 20 observations—the five months with the highest and the five months with the lowest turn-of-the-month mean returns and the five months with the highest and the five months with the lowest "Other Days" mean returns.
2. Banz (1981); Basu (1977); Chan, Chen, and Hsieh (1985); Reinganum (1981).
3. Jones, Lee, and Apenbrink (1991); Conrad and Kaul (1993); Ball, Kothari, and Shanken (1995); Baytas and Cakici (1999); Haug and Hirschey (2006); Sias (2007).
4. Rozeff and Kinney (1976); Roll (1983); Chan (1986); Haugen and Lakonishok (1988); Jacobs and Levy (1988); Chen and Singal (2003); Haug and Hirschey (2006); Sias (2007).
5. We also found that the size, book-to-market, and momentum factors of Fama and French (1993) and Carhart (1997) do not exhibit a turn-of-the-month pattern. These results, and others, are reported in an unpublished version of this paper that is available on the authors' websites.
6. Datastream lists 39 countries with daily index data starting on or before 1 January 1990. Of these, we omitted (in addition to the United States) the following four: Bangladesh because the index had the same level each day in 2002–2004, Jordan because of infrequent trading, Nigeria because the data stop with 1996, and India for infrequent trading in years before 1994.
7. The specifics of how the returns were calculated are available in a longer and more detailed paper on the authors' websites.
8. We did not include NASDAQ volume because NASDAQ double-counts some or all volume.
9. Mean standardized daily volume is daily volume divided by average daily volume. If the daily volume is exactly equal to the average daily volume, the number is 1.00.

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