

THE SIGNIFICANCE OF THE TURN OF THE MONTH EFFECT: REVISITED

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ABSTRACT

This study examines the significance of the monthly anomaly in stock returns known as the “turn-of-the month” effect and the monthly in CRSP equal and value-weighted indices, and in the S&P/TSX Composite index. Furthermore, I analyze the CRSP equal and value-weighted indices to determine whether excess returns can be generated from exploiting the turn-of-the month or first-half anomalies.

I find returns around the turn of the month, are significantly different from returns from the remainder of the month in both CRSP indices as well as in the S&P/TSX Composite index. Additionally, while excess returns can be generated from switching strategies using the turn-of-the month and the first-half of the month in the CRSP value-weighted index, the same is not true for the equal-weighted index. However, statistical analysis reveals that in both indices, the turn of the month and first-half of the month strategies generate superior risk-adjusted returns while providing diversification benefits.

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DEDICATION

To my dearest family and friends, who have provided me with much more support and encouragement than anyone could ask for, throughout my studies.

To Ajbinder Sull and Aman Bhangu, for their continual support, the memories, and making the time fly by.

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1 INTRODUCTION

There have been many studies devoted to the investigation of seasonal anomalies. Evidence of seasonal anomalies date back to Watchel (1942) who first documented the January effect, where unusually high returns were evidenced by stocks during the month of January. Rozeff and Kinney (1976) also noted similar results, and Keim (1983), Roll (1983), and Reinganum (1983) found that the high January returns were particularly evidenced amongst small firms and especially during trading days in early January.

The Weekend effect is another popular seasonal anomaly. Thaler (1987) notes that M.J. Fields, in 1931 first noted that prices rose abnormally on Saturdays. Thaler also documents Frank Cross (1973) who studied returns on the S&P 500 and found high returns on Fridays and low returns on Mondays. However, the best known study was by French (1980) who also documented daily returns from the S&P 500 where the Monday return was negative for the full period (1953 – 1977) and for every 5-year subperiod. The Monthly effect was first documented and analyzed by Robert Ariel (1987). Ariel examined what he described as a curious anomaly that was a monthly effect in stock returns, from analysis of stock return data from the New York Stock Exchange (NYSE) stocks from CRSP (Center for Research in Security Prices) equally-weighted and value-weighted index returns spanning 1963 to 1981. He found that considerable excess returns were observed in days surrounding the turn of the month (TOM) and during the first half (FH) of the month.

This more recently explored seasonal anomaly has since grown popular due to the excess returns possible from trading strategies that can be easily exploited from its implementation.

Section 2 examines a review of selected literature regarding previous studies, beginning with the first analyses of the monthly effect, followed by validation, international evidence, and exploitations by examining returns from differing strategies. Section 3 outlines data and methodology for the purposes of this paper in which I test for significance, and the application of a trading rule, and section 4 examines the results and discusses their implications, with possible explanations.

2 LITERATURE REVIEW

Discovery and Validation

Evidence of the monthly effect in stock returns was first analyzed by Robert Ariel (1987). In reporting the monthly effect, he defined the trading month as the last day of the previous month (day -1) and included the rest of the month except the last day (e.g. Nov 30 to Dec-30). He then divided each month evenly in half (discarding the odd “middle” trading day), into the first half (“FH”) and last half (“LH”). Ariel’s findings were that the mean daily return from the first half of each trading month significantly exceeded the mean daily return from the last half of the month, with highly significant t -statistics of 6.07 and 4.34 for stock return data from the CRSP equally-weighted and value-weighted indices, respectively. Ariel also found that the mean-returns during the last half (LH) were near zero. In addition, he found the cumulative returns of the nineteen-year period to be astounding:

	Equally-weighted index	Value-weighted index
First half of trading month	2552.40%	565.40%
Last half of trading month	-0.25%	-33.80%
Nineteen years	2545.90%	339.90%

From Ariel (1987)

In validating his results, Ariel (1987) discounted the well-researched “January effect,” in particular, the small-firm effect outlined by Roll (1983), where he found that the last trading day of December plus the first four trading days of January accounted for 38% of the annual return of the equally-weighted index over the value-weighted index.

To exclude the presence of the January effect, Ariel (1987) tests the mean nine-day cumulative returns from the FH and last half (LH) of trading months (except January) for both the equally-weighted index and the value-weighted index, and found that the differences between the FH and LH returns were still significant, with *t*-statistics of 3.68 and 3.92, respectively. More importantly, Ariel breaks down the FH of the month into the Turn-of-the-month (TOM), defined as the days -1 to $+4$, from the rest of the first half (FH), $+5$ to $+9$, which are described as the “second week..” Additionally, he describes the rest of the month (non-TOM days) as the ROM.

To further validate his results, Ariel examined the possibility of a dividend effect, by testing the CRSP total return. By conducting the same test as done with the January effect, this time adding the return of the FH of the second month (the month in which, according to Ariel, dividend payments most concentrated), the *t*-statistic of 3.30 still conveys a significant difference. Additionally, in testing for the potential of an ex-dividend tax effect, it was found that even with an assumption of a 6% dividend yield (0.5% monthly); the difference observed between the FH and LH returns was more than twice that of the assumption, at 1.008% per month.

Lakonishok and Smidt (1988) questioned Ariel’s choice to include the last day of the prior month (day -1) as part of the trading month, because Ariel’s justification, that

the return of on the last trading day of the month is high, required examination of the data.

To test against a possible data-snooping bias, Lakonishok and Smidt (1988) themselves analyzed several different seasonal anomalies on a different, 90-year dataset from 1897 to 1986, on the Dow Jones Industrial Average (DJIA), a price-capitalized index of 30 major NYSE company stocks. Unlike Ariel (1987), they defined the first half of the month as days 1 to 15, and the last half as the remaining days of the month.

Perhaps most remarkable in their findings was that unlike Ariel, they did not find a significant difference between FH and LH for any of 10 sub-periods within the 90-year dataset. Thus, out of sample testing could not reject their null hypothesis that the two halves of the month have equal rates of return. Furthermore, Lakonishok and Smidt observe that for the entire 90-year period, the highest return of any half-month (FH or LH) actually occurred in the last half of December, which they attribute to the widely held notion of Wall Street “window dressing.” They also note that Robert Ariel’s evidence of higher mean returns during the FH may be partly attributed to the result of idiosyncratic characteristics of the period within which Ariel (1987) draws its data from, and partly due to including the last trading day as part of the first half of the month.

Conversely, Lakonishok and Smidt do find a strong TOM effect during days -1 to $+3$ (a 4-day variant of Robert Ariel’s TOM), where the index rose 0.473%, versus the actual total monthly average of 0.349%. Thus the DJIA returns outside of the TOM gain (the remainder of the month, or ROM) were actually negative. Furthermore, the results were significant at the 0.1 percent level. Lakonishok and Smidt (1988) also found that

the results were consistent across major subperiods tested, and were still significant when the January effect was removed from the analysis.

Hensel and Ziemba (1996) used another dataset, 65 years of the S&P 500 between 1928 and 1993. Their findings from this value-weighted index indicated significantly higher returns from trading days -2 to $+3$, another variant of the TOM from Ariel (1987), and that the majority of the monthly return occurred at the turn of the month. In a breakdown by decade (1930s – 1990s) they reveal that trading days -1 , $+2$ and $+3$ had significantly higher mean returns than the average, for 4 of the 6 decades, and for the entire 65-year period.

In a 1994 study, Hensel et al. examined the average daily returns from the cash versus the futures market for the S&P 500, by the trading day of the month, for a 1982 to 1993 dataset. They found that the futures market, which anticipates the TOM on days -4 to $+2$, had significant results only for day $+2$, but had positive returns for days -4 to $+4$. However, they did not run a similar analysis for a larger time period.

Pham (2005) replicates Ariel (1987), in both by using the same time period (1963-1981) and by extending the data set to a different time period (1983-2003) of CRSP value and equal-weighted indices. He also examines data from the S&P/TSX Composite between 1977-2002. He extends Ariel (1987) by finding the average daily returns for different days of the month, ranging from trading days -9 to $+9$. This range encompasses Ariel's definition of the FH (-1 to $+9$), LH (-9 to -2) and the TOM (-1 to $+4$). In both datasets, he found that the average daily returns were the highest over the TOM, followed by the FH, and then the overall mean (-9 to $+9$), with LH providing negative returns in both cases.

For the S&P/TSX Composite dataset, Pham (2005) found similar results, with the highest mean return for the TOM, followed by FH (with approximately half the return of the TOM), then the Overall mean with LH last and negative. Table 2.2 displays the results below.

Cumulative Returns for the S&P/TSX Composite Index	
Category	1977 - 2002
First Half of the Month (-1 to +9)	774.92%
Last Half of the Month (-9 to -2)	-41.05%
Turn of the Month (-1 to +4)	789.17%
Second Week (+5 to +9)	-1.60%

From Pham (2005)

Cumulatively, Pham found that the best returns over the 1963 – 2003 period from the CRSP equal and value-weighted indices were from the FH rather than the TOM. However, this is mainly because the FH has 10 trading days of returns relative to the 5 days from the TOM. These results are displayed in tables 2.3a and 2.3b.

Cumulative Returns for the CRSP equally-weighted index			
Category	1963 - 1981	1982 - 2003	1963 - 2003
First Half of the Month (-1 to +9)	1998.62%	3736.06%	80467.39%
Last Half of the Month (-9 to -2)	-19.92%	180.24%	124.41%
Turn of the Month (-1 to +4)	598.34%	1725.93%	12651.21%
Second Week (+5 to +9)	200.52%	110.25%	531.84%

Cumulative Returns for the CRSP value-weighted index			
Category	1963 - 1981	1982 - 2003	1963 - 2003
First Half of the Month (-1 to +9)	569.66%	435.61%	3486.79%
Last Half of the Month (-9 to -2)	-43.69%	53.96%	-13.30%
Turn of the Month (-1 to +4)	240.12%	449.58%	1769.24%
Second Week (+5 to +9)	96.89%	-2.54%	91.89%

From Pham (2005)

Additionally, although the best returns were found to result from the FH in the 1963 – 2003 dataset were from the CRSP equal-weighted index, the TOM cumulative returns were greater than the FH returns for the S&P/TSX Composite Index for the years of 1977 – 2003. Thus slightly different trading strategies may be prudent for the different indices.

International Evidence

To examine the turn-of-the-month effect in worldwide equity markets, Ziemba and Hensel (1994) found that the TOM effect does occur in many large equity markets in other countries. They also found that, from a 1949 – 1988 dataset of the Nikkei 225 Index, a variant of the TOM, where the dates were -5 to $+2$, generated significant positive returns.

Cadsby and Ratner (1991) examine the TOM effect in worldwide markets, in particular, in the U.S. (CRSP equal and value-weighted indices), Canada (TSE equal-weighted index), UK (FT500 index), Australia (All Ordinaries index), Switzerland (SBC Industrials index), West Germany (Commerz-bank index), Japan (Nikkei), Hong Kong (Hang Seng index), Italy (Banca Commerciale) and France (Compagnie de Change General) indices. They use the standard -1 to $+4$ trading days as the TOM period.

Although the time periods were far-ranging and inconsistent (only 1983-1988 for the UK, but 1962-1987 for the US), Cadsby and Ratner did report significant TOM effects (at the 1% level) for Canada, Switzerland and West Germany; and (at the 5% level) for the UK and Australia.

Conversely, they found that they could not reject their null hypothesis (no difference between TOM and the rest-of-the-month) for Japan, Hong Kong, Italy and France. They do note that Ziemba (1989) points out that for Japan, the TOM happens over a different sequence of days. Cadsby and Ratner continued their analysis by discounting the January effect, using a similar approach as in Ariel (1987) from their analysis and still found significant results in every country where a significant effect was found before, with the exception of Australia.

Kunkel et al. (2003) examined the stock market indices from 19 countries for the TOM pattern in daily stock returns, and again found significance from their dataset. They found that the 4-day TOM accounted for an average of 87% of total returns in the 16 countries where the TOM effect was found to exist. Furthermore, they assert that these countries accounted for 77% of the foreign market capitalization value.

In that study, Kunkel et al. (2003) analyzed the daily closing prices from the indices of 19 countries from August 1988 to July 2000, and used returns from datasets with a minimum of 6 years historical returns. They also note that the capitalization value of these 19 countries represented some 86% of the world's equity value (as of December 1998).

To validate their results, Kunkel et al. (2003) used an OLS dummy variable regression model that compared the TOM returns relative to the ROM returns. Subsequently, they perform a three-way ANOVA model that examined the TOM period while controlling for both monthly and yearly seasonalities. A nonparametric Wilcoxon signed rank (WSR) test, which performs a paired-difference test and controls for any

seasonal monthly, or January effect was also used. The analyses showed that a TOM effect pattern exists in 16 of 19 countries over the full 1988 to 2000 period.

Trading Strategies Explored

Ziembra and Hensel (1996) extended their research using the same dataset as in previous studies and found that the TOM returns were significantly higher than the average mean return. They then continued onto outline the merits of an investment strategy if funds were invested in the S&P 500 during either the TOM or the FH of the month, and then in cash for the remainder of the month. This trading rule is compared with other buy-and-hold investments – namely the S&P500 and small-cap funds.

In the results of the 1996 study, Ziembra and Hensel found that returns from the TOM, FH and the ROM all were significantly different from the total monthly average return.

Table 2.4
Average Daily Returns and T-Values for the S&P 500
(February 1928 to June 1993)

Trading Days	Average Daily Return (%)	T-Value
All Days	0.0186	0
TOM	0.1236	5.94*
FH	0.0703	4.13*
ROM	-0.0235	-3.71*

* Asterisk denotes significant *t*-values for returns significantly different from the average (at the 5% level) using a one-tailed *t*-test. *From Ziembra and Hensel (1996)*

In addition, the investment strategy applied examined the growth from a \$1 investment in February 1928 to June 1993 in four holdings: 1) Large-capitalization (S&P

500), 2) Small-cap (bottom 20% of the NYSE, capitalization weighted), 3) TOM + 0.8 Cash, and 4) FH + 0.6 Cash.

The last two strategies are structured such that the \$1 is invested in the market for the turn-of-the-month or the first-half, then in cash for the remainder of the month. Ziemba and Hensel use these figures based on the assumption that these strategies are in cash for 80% and 60% of the month, respectively.

Investment Strategy	Monthly Average Return (%)	Monthly Standard Deviation	Yearly Average Return (%)	Yearly Standard Deviation	Growth of \$1 Investment
Large-Cap	0.79	5.80	9.50	20.11	\$ 439.13
Small-Cap	0.96	8.71	11.53	30.18	\$ 1,483.63
TOM + 0.8 Cash	0.84	2.54	10.13	8.79	\$ 758.36
FH + 0.6 Cash	0.92	3.64	11.06	12.62	\$ 1,290.97

From Ziemba and Hensel (1996)

As seen in the table, growth of a \$1 investment is highest in the Small-Cap fund, but followed closely by the FH invested fund. The TOM fund return is roughly half of that of the Small-Cap. All three outdistance the Large-Cap fund return by a considerable margin. It should be noted that the TOM return is the aggregate return of only 5 trading days, and the FH is the aggregate return of 10 days, whereas the whole month ranges from 20 – 22 days. Thus the TOM-plus-cash and FH-plus-cash strategies are impressive on the basis of their comparable returns from only a fraction of active trading days. Additionally, by noting the differences in standard deviation, on a risk-adjusted basis, the TOM-plus-cash and FH-plus-cash strategies are clearly mean-variance superior to the Large-cap and Small-cap holdings.

Ziembra and Hensel continued their analysis with a correlation matrix, to argue for diversification benefits from their strategy. They find that the TOM and FH (plus cash) strategies have relatively low correlations with large and small-cap stocks (0.46 and 0.38 respectively for TOM, and 0.67 and 0.57 respectively for FH), which suggest diversification benefits over traditional portfolios holding the market. For example, the Large-cap and Small-cap returns had a correlation of 0.86.

Kunkel and Compton (1998) extend the work of Ziembra and Hensel (1996) by implementing a “switching” strategy within a retirement account (thus achieving tax-free growth). They find that by holding funds over the turn of the month in a broad based stock market account and switching into a cash account provides excess returns with lower volatility than just holding the stock account.

Kunkel and Compton (1998) used retirement fund data from the TIAA-CREF stock account (the office of the Teachers Insurance and Annuity Association-College Retirement Equities Fund). Interestingly, they examine and compare the dataset from the CREF account from April 1988 to December 1997, as well as returns from the Dow Jones Industrial Average and the S&P500 for the same period. Their analysis found that all the Average Daily Returns (with the exception of trading day -1 for the DJIA) were significantly greater than zero (the null hypothesis) based on T-values generated at the 5% level for a one-tailed test.

By computing the Average Daily Returns (%) and their standard deviations for the DJIA, S&P500, and the CREF stock account, Kunkel and Compton (1998) found highly significant (at the 1% level) differences between TOM and the ROM Average Daily Returns for each.

Furthermore, the study examines the effect of exploiting their switching strategy. Overall, between the years of 1988 to 1997, the switching strategy generated a higher return than the buy-and-hold for the S&P 500 Index.

Pham (2005) also explores the possibility of a trading strategy where an investor would long the Canadian market during the TOM, and switch over to a cash-equivalent account for the remainder of the month. The exact same strategy could also be applied to the CRSP equal or value-weighted indices.

Explanations for the Turn of the month effect

Several studies have been published that help to explain why there are excess risk-adjusted returns on the market portfolio from investing in the market only for the days of the turn of the month.

Thaler (1987) provides an interesting commentary on the monthly effect in stock returns. He alludes to price movements that are related to customs that determine the flow of funds into and out of the market. He also alludes to “window dressing” amongst institutional investors, where investment managers clean up their portfolios, to keep themselves from explaining poorly performing investments.

Lakonishok et al (1991) explore the concept of “window dressing” further, and identify “selling losers” as the most common form of window dressing by portfolio managers. But they also acknowledge that funds sell poorly performing stocks disproportionately to their holdings on a quarterly basis, which raises further questions about the quarterly effect relative to the TOM effect. Interestingly, Lakonishok et al. also note that in their sample, the average fund employed a contrarian strategy, which

suggest that their institutional investors' trading strategies may help reduce the volatility of stock prices.

Ogden (1990) attempts to further explain the TOM effect, and hypothesizes that the standardization of payments in the United States causes a concentration of cash flows at the turn of each month, which explains the subsequent rise in stock returns. He argues that the end of the month is a payoff date for accrued real wages, dividends, interest and principal payments, and other liabilities. The resulting logic is that when investors have short-term investable funds, they prefer securities maturing at the end of the calendar month to securities maturing at other times of the month, because shorter-term securities are rolled over to provide funds to pay end-of-month obligations, and thus provide greater interest rate risk and transaction costs. The resulting demand for securities causes the surge in prices.

He continues on to argue that the monetary policy of the Federal Reserve System has an important effect on stock returns. Ogden's logic is that investors commit more funds to the markets at times in which aggregate, economy-wide liquid profits are large, and less in the opposite situation. As monetary policy affects the growth of liquidity in the economy, it is also likely to affect expected liquid profits. He tested the hypothesis over a 216-month period between 1969 and 1986, with CRSP value and equal weighted index against the Federal funds spread, the difference between the Federal funds rate and the short-term Treasury bill rate. He found that the difference of the mean returns for the turn of the month for trading days of high liquid profits versus trading days of low liquid profits is positive and significant. Ogden finds that mean returns on both the equal and value-weighted index are significantly positive for turn-of-month trading days in easy-

money months. Conversely, he did not observe significant results for either index in stringent money months. Ogden argues that these are consistent with the turn-of-the-month liquidity hypothesis.

The timing of corporate earnings announcements has also been used as a possible explanation for the turn of the month effect. Penman (1987) conducted a study whereby he analyzed corporate earnings announcements over a 54-year period from 1928 to 1982. He found that earnings accompanied by positive changes in stock prices tend to occur at the beginning of the quarter.

Zhao, Liano and Hardin III (2004) examined the TOM effect in light of presidential cycles in the U.S. They analyzed TOM returns from the S&P500, the Dow Jones Industrial Average (DJIA), and the NASDAQ composite index against temporal subperiods within an administration's rule, and by party affiliation. However, their findings only support the hypothesis that TOM returns are higher in the second half of a presidential cycle, mainly due to fiscal and administrative policies that increase household liquidity prior to elections. This finding does support Ogden's (1990) study, described above, in which he asserts that administrative is a major initiating factor for the increased turn of the month returns.

Thus, these studies indicate that strategies that may potentially exploit the TOM effect should be further explored to determine if excess returns could be generated. Additionally, further examination should be conducted to determine if there are benefits of diversification or risk-adjusted benefits from exploiting the TOM effect versus buy and hold strategies.

3 DATA AND METHODOLOGY

I replicate Pham (2005) by utilizing the CRSP value-weighted and equally-weighted stock index returns for the period December 31, 1962 to December 31, 2005 and extend the study further by determining the significance of the findings by implementing a dummy variable regression. By calculating the t -statistics (and p -values), I will accept or reject the null hypotheses that there is no difference between the mean values between the TOM returns and the daily returns of the equal or value-weighted indices. To run the above regression the equation below is utilized:

$$R_t = a + b\tau_t + \varepsilon_t \quad (1)$$

Where:

R_t = the return of the market at time t

a = the average return on the non-TOM day (or ROM)

b = The return of the TOM day minus the return on the non-TOM day.

τ = a dummy regression variable, where it equals 0 for a ROM day, and 1 for a TOM day.

I also replicate Pham (2005) by calculating the average daily returns for the FH and TOM for the equal and value-weighted indices for the period above, as well as for the subperiods from December 31, 1962 to December 31, 1982, and from January 1, 1983 to December 31, 2005. This is an extension on the Pham (2005) dataset, which incorporated data only up to December 30, 2003. A trading rule will then be applied to the TOM and FH returns for the above indices, whereby a switching strategy is used. The trading rule assumes that \$1 is invested in the market for the trading days of the

TOM, and in a risk-free investment¹ for the rest of the month, and then switched back to the market for the next TOM trading days. A similar strategy is used for the FH, where the \$1 is invested in the market for the FH of the month and in the risk-free asset for the remainder of the month. Ziemba and Hensel (1996) assume that cash would be in the market for the TOM for 80% of the month, and for the FH, for 60% of the month. But by calculating the actual percentages of trading days that fall within the TOM and the FH, it is found that the investment would be invested in cash for 76.24% and 52.48% for the TOM and the FH, respectively. Though Lakonishok and Smidt (1988) observed that the FH effect does not hold when taken out-of-sample, results of a trading rule were also explored as an extension to Pham (2005).

Additionally, portfolio betas and Jensen's alpha statistics will be used to determine if the investment within the TOM will generate diversification benefits and positive risk-adjusted returns relative to the market portfolio. Jensen's alpha can be calculated below, in a form that allows for a regression and determination of a *t*-value:

$$r_p - r_f = \alpha_p + \beta_p(r_m - r_f) + \varepsilon \quad (2)$$

Where:

- α = Jensen's alpha measure
- β_p = the beta of the portfolio
- r_p = the return on the portfolio
- r_m = the return on the market
- r_f = the riskfree rate

Finally, I will also perform another extension on Pham (2005) on the stock returns for the TSX/S&P Composite index for the period January 31, 1977 to December 30, 2002. The methodology and hypotheses tested for this dataset will be the same as noted above, and *t*-statistics and their corresponding p-values will be used to gauge the

¹ The riskfree rate is obtained from the Fama-French factors from the Kenneth French data library: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

significance of the TOM returns versus the returns from the TSX/S&P Composite index. Because these returns do not exclude dividends, a trading rule will not be applied to this dataset.

4 RESULTS

Table 4.1 indicates the results of the dummy variable regression. I find that during the period of 1963-2005, and during the sub-periods of 1963-1982 and 1983-2005, returns from the turn of the month are significantly different from those of the daily returns from the market, both for the equally-weighted and value-weighted indices.

For the CRSP value-weighted index, I find that for the overall 1963-2005 period, the intercept for the non-TOM variable (the predicted value for this control group) is close but not quite significant, with a t -value of 1.932 ($p = 0.0534$). The same result is true for the subperiods of 1963-1981 and for 1982-2005, where lower t -values are observed. More importantly, the TOM coefficient (b) is highly significant with a t -value of 5.413 ($p < 0.00001$) for the overall period, and also for the two subperiods, with t -values of 4.197 ($p = 0.00003$) and 3.663 (0.00025), respectively.

For the CRSP equally-weighted index, I find that the overall period yields highly significant results for the intercept, with a t -value of 5.938 ($p < 0.00001$), and the subperiods of 1963-1981 and 1982-2005 also generate significant t -values, of 2.983 ($p = 0.00287$) and 5.345 ($p < 0.00001$), respectively. Significant results are generated for the slope coefficient, with t -values of 9.532 for the overall period, and 5.893 and 7.845 (all $p < 0.00001$) for the subperiods, respectively. The significant results for the TOM coefficient indicate that there is a significant difference between the returns observed at the turn of the month relative to the daily returns from the respective indices.

Results observed from the dummy variable regression involving the dataset from the returns (excluding dividends) of the S&P/TSX Composite index were similar, though with an insignificant t-value for the intercept, 0.074 ($p = 0.9411$). The TOM result, however, indicates that there is a highly significant difference between the TOM returns and the daily returns of the composite index, with a t-value of 6.067 ($p < 0.00001$).

Table 4.1			
Results from the dummy variable regressions using the given formula ($R_t = \alpha + \beta\tau_t + \varepsilon_t$, see <i>Data and Methodology</i>), involving the CRSP Value and Equally weighted indices, and for the S&P/TSX Composite index, with computed t-statistics and corresponding p-values. R-squared values are also displayed, with F-statistic results from an Analysis of Variance.			
(I) Value-weighted index			
	12/31/1962 to 12/31/2005	12/31/1962 to 12/31/1981	12/31/1981 to 12/31/2005
Intercept (non-TOM)	0.00019	0.00009	0.00027
t-stat	1.932	0.732	1.887
(implied p-value)	(0.05337)	(0.46430)	(0.05926)
TOM	0.00108	0.00107	0.00107
t-stat	5.413	4.197	3.663
(implied p-value)	(< 0.00001)	(0.00003)	(0.00025)
R-squared	0.0027	0.0037	0.0022
F-statistic	29.30	17.61	13.42
Significance F	< 0.00001	0.00003	0.00025
(II) Equal-weighted index			
	12/31/1962 to 12/31/2005	12/31/1962 to 12/31/1981	12/31/1981 to 12/31/2005
Intercept (non-TOM)	0.00047	0.00036	0.00057
t-stat	5.938	2.983	5.345
(implied p-value)	(< 0.00001)	(0.00287)	(< 0.00001)
TOM	0.00155	0.00144	0.00163
t-stat	9.532	5.893	7.485
(implied p-value)	(< 0.00001)	(< 0.00001)	(< 0.00001)
R-squared	0.0083	0.0073	0.0092
F-statistic	90.86	34.73	56.03
Significance F	< 0.00001	< 0.00001	< 0.00001

Table 4.1 (continued)	
(III) S&P/TSX Composite index	
	01/31/1977 to 12/30/2002
Intercept (non-TOM)	0.00012
<i>t</i> -stat	0.074
(implied <i>p</i> -value)	(0.94114)
TOM	0.00024
<i>t</i> -stat	6.067
(implied <i>p</i> -value)	(< 0.00001)
R-squared	0.0052
F-statistic	36.81
Significance F	< 0.00001

Tables 4.2a and 4.2b reveal the results of the applied switching strategy between the TOM plus a cash equivalent earning the riskfree rate, and the FH and the cash equivalent, in the CRSP value-weighted and equal-weighted indices.

The results between the two indices are striking. In table 4.3a we see predictable results, comparable to the previous study done by Hensel and Ziemba (1996). In this CRSP value-weighted index, investing in the TOM-plus-cash results in the best return, with a compounded annual growth rate of 12.14%, well above the 10.72% compounded annual growth rate earned from the buy-and-hold strategy. The FH-plus-cash returns were also displayed, as an extension of Pham (2005), and at 12.07%, also generated greater returns than the buy-and-hold strategy.

The positive and significant Jensen's alpha measure of 0.020% (*t*-value = 5.36) suggest that on a risk-adjusted basis, investing in the TOM-plus-cash switching strategy does produce slight excess returns over the buy and hold strategy. Furthermore, the portfolio beta between the switching strategy for the TOM-plus-cash and the value-

weighted index was computed to be only 0.2395, which suggests further benefits for those investors seeking to diversify their portfolio, while still generating excess returns relative to the index. The same can be said for the FH-plus-cash strategy, which also generated a positive and significant (t -value = 3.32) Jensen's alpha, at 0.014%. It should be noted that the dataset for regression for the Jensen's alpha was from 1-Jul-1963 to 31-Dec-2005 (instead of 1-Jan-1963 to 31-Dec-2005). This was due to unavailability of reliable data prior to July 1963.

The trading rule applied for the CRSP Value-weighted index								
Value of \$1 invested				1963 to 2005	1-Jul-1963 to 31-Dec-2005			
	31-Dec-62 to 31-Dec-81	30-Dec-81 to 31-Dec-2005	31-Dec-62 to 31-Dec-2005	Compounded Annual Growth Rate	Portfolio Beta	Jensen's Alpha* (%)	Jensen's Alpha*: t -statistic	
TOM + 0.7624*Rf	\$ 7.36	\$ 15.61	\$ 137.78	12.14%	0.2395	0.020	5.34	
FH + 0.5248*Rf	\$ 11.29	\$ 9.97	\$ 133.79	12.06%	0.4576	0.014	3.32	
Buy and Hold	\$ 3.46	\$ 17.05	\$ 79.61	10.72%				
Rf (Riskfree rate)	\$ 2.20	\$ 2.49	\$ 10.17	5.54%				

The trading rule applied for the CRSP Equal-weighted index								
Value of \$1 invested				1963 to 2005	1-Jul-1963 to 31-Dec-2005			
	31-Dec-62 to 31-Dec-81	30-Dec-81 to 31-Dec-2005	31-Dec-62 to 31-Dec-2005	Compounded Annual Growth Rate	Portfolio Beta	Jensen's Alpha* (%)	Jensen's Alpha*: t -statistic	
TOM + 0.7624*Rf	\$ 16.04	\$ 57.60	\$ 997.76	17.42%	0.2381	0.014	3.892	
FH + 0.5248*Rf	\$ 37.18	\$ 77.64	\$ 3,001.35	20.47%	0.3194	0.046	11.55	
Buy and Hold	\$ 23.32	\$ 272.87	\$ 6,658.55	22.72%				
Rf (Riskfree rate)	\$ 2.20	\$ 2.49	\$ 10.17	5.54%				

*Jensen's alpha was calculated using a regression using market and riskfree data from 1-Jul-1963 to 31-Dec-2005. The trading rule applied is a switching strategy whereby funds are invested in the market for the TOM and FH, and into a cash-equivalent holding earning the riskfree rate for the remainder of the month. See *Data and Methodology*.

For the CRSP equal-weighted index in Table 4.3b, contrary and astonishing results are observed. While the TOM-plus-cash portfolio does generate a very high

compounded annual growth rate of 17.42%, it is dwarfed by the 22.72% compounded annual growth rate observed within the buy-and-hold strategy. Though an impressive \$998 could have been earned from investing in the TOM-plus-cash portfolio over the 43-year overall period, nearly seven times more could be earned from investing in the buy-and-hold strategy! The FH-plus-cash portfolio also generates significantly (economically) greater returns than the TOM-plus-cash portfolio, with a 20.47% compounded annual growth rate, and the value of a \$1 investment grows to over \$3000 using this strategy.

Also remarkable is the positive and significant result generated by Jensen's alpha measure of 0.014% (t -value = 3.89), from which we can observe that on a risk-adjusted basis, the TOM-plus-cash portfolio does still generate small but significant excess returns on a buy-and-hold investment in the market, in this case, the value-weighted index. Similar to the beta observed from the regression in 4.2a, the low beta of 0.2381 for the switching strategy in the equal-weighted index suggests considerable diversification benefits are achieved by using the described portfolio. Similar results are also observed from the FH-plus-cash portfolio, where a positive and highly significant Jensen's alpha measure of 0.046% is observed (t -value = 11.55). Thus we see that the TOM-plus-cash switching strategy is not as different (though still significantly different) from the equal weighted index as the value-weighted index. The opposite is seen from the FH-plus-cash strategy, which is logical, considering that the FH generates more value than the TOM in the equal-weighted index. Additionally, a low beta of 0.3194 is observed, which lends credibility to the FH-plus-cash portfolio as a superior risk-adjusted alternative to the buy-and-hold strategy that also provides diversification from indexed equity holdings.

5 CONCLUSION

Although the efficient market hypothesis proposes that stock returns cannot be predicted based on past price behaviour, several studies have been published which give light to the possibilities of seasonal anomalies, some of which can be exploited to generate excess returns on the market. This study has explored the anomaly of the monthly effect, and specifically examined the significance of turn of the month returns in the U.S. and Canadian historical market data. A dummy variable regression was conducted for returns around the turn of the month in the CRSP equal and value-weighted indices between the years of 1963 to 2005, and for the years of 1977-2004 for the S&P/TSX Composite.

Findings revealed that the returns round the turn of the month are significantly different from the total daily returns for both the CRSP equal and value-weighted indices between the overall period from 1963 to 2005, as well as in subperiods of 1963-1981 and 1982-2005. Similar results were found for the dummy variable regression of the S&P/TSX Composite, where turn-of-the month returns were significantly different from the total daily returns. Though dividends were not excluded from the S&P/TSX Composite returns, the high t-values are unlikely to change drastically should they be removed, and remains an ideal question for further study.

A trading rule was applied in which a switching strategy would be employed, where funds would be invested in the CFSP equal and value-weighted indices over the

turn of the month, and in a cash-equivalent holding earning the riskfree rate for the remainder of the month, for the entire 1963-2005 period. The same strategy was also applied for the first half of the month, though for comparison purposes only.

Results show that in the value-weighted index, the TOM-plus-cash investment and the FH-plus-cash strategy both generate excess returns on the buy-and-hold strategy, while also providing excess returns on a risk-adjusted basis, which were found by using the Jensen's alpha measure. Conversely, for the equal-weighted index, it was found that while the buy-and-hold strategy and the FH-plus-cash strategy both generate excess returns on the TOM-plus-cash strategy. Additionally, calculation of the Jensen's alpha indicated that excess risk-adjusted returns were generated from the TOM-plus-cash and the FH-plus-cash portfolios.

For both indices, the TOM-plus-cash portfolios were determined to have very low betas with their respective indices, suggesting that this strategy may well have a place within the portfolios of many investors who desire a risk-adjusted excess return on the market while also providing diversification benefits. Also, the betas generated from the FH-plus-cash portfolios were less than 0.50. It appears that the betas for each portfolio correspond to the proportion of trading days in the market.

This and other studies have validated the significance of the turn of the month effect for U.S. and Canadian indices. However, many questions remain as to the validity of its exploitation in markets outside of the U.S. For example, does the trading rule described here generate excess returns (or excess risk-adjusted returns) in the Canadian or other international markets? Additionally, though many studies have

attempted to explain the cause of the turn of the month effect, additional studies could help validate these hypotheses. Many avenues for further research remain.

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