The Turn-of-the-Month Anomaly in the New Zealand Stock Exchange

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A dissertation submitted to
Auckland University of Technology
in fulfilment of the requirements for the degree of
Master of Business (MBus)

2017

Faculty of Business, Economics and Law

Abstract

The turn-of the-month (TOM, hereafter) effect refers to the phenomenon of stock returns being higher during the first few trading days of each month. This study aims to investigate the presence of the TOM effect in the New Zealand Stock Exchange and also attempts to find out why such an anomaly exists and whether it is caused by the trading activities of institutional investors. More specifically, we examine the Turn of the Month effect in the New Zealand stock market, and find that the returns on the last 3 days of the calendar month are, on average, positive and significantly higher than on other days of the month. Furthermore, we examine three competing theories proposed by the prior literature, namely cash-driving, window dressing, and market manipulation. There are two main findings in this study. First, our evidence suggests a significant TOM effect within the large firms listed in NZX. Also, our study rules out the cash-driving theory as the reason for the TOM effect, but lends some weight to other theories, implying that the TOM anomaly may be driven by the trading activities of mutual funds.

Key words: turn-of-month, stock, anomaly, New Zealand, funds, cash-driving, trading, institutional investors

Contents

Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signature_____   **Date** __04/04/2018_____

Acknowledgements

I am grateful to my supervisors, Dr. Jun Chen and Professor Alireza Tourani-Rad, for their patience and valuable advice. They have encouraged me to improve my work and complete this dissertation.

I am very thankful to Professor Bart Frijns for his useful suggestions and comments in this dissertation.

I would also like to acknowledge Alison Warren as my Proof-reader who provided very valuable comments and feedbacks in writing.

1. Introduction

Prior literature has intensively examined many types of return anomalies around the global stock markets. Among these, a group defined as calendar effects is present around the world, such as January Effect, Weekly Effect, Holiday Effect, and TOM Effect. Such stock return patterns are observed based on the past stock price and on a particular date of the calendar. For instance, the January Effect refers to the pattern that stock returns in January are significantly larger than those during the remaining eleven months (see e.g. Rozeff and Kinney, 1976; Keim, 1983; Gultekin and Gultekin, 1983). The Monday Effect is defined as the daily return on Monday being significantly negative whereas the average returns of other weekdays remain positive (see e.g. Cross, 1973; French, 1980; Gibbons and Hess, 1981; Keim and Stambaugh, 1984; Jaffe and Westerfield, 1989). The Holiday Effect means that the stock prices tend upwards a few days before a public holiday (Barone, 1990).

Another major anomaly, Turn-of-Month (the TOM) effect, forwarded by Ariel (1987), shows returns are positive and negative at the first and last half of the month, respectively. We will focus on the TOM effect in New Zealand through this dissertation.

Generally, there is very little research on return anomalies in the New Zealand stock market and they show the monthly pattern where the positive or negative returns are fixed for particular months. For example, Li and Liu (2010) provide limited research on monthly patterns [1] in New Zealand. To our knowledge, there is no study to investigate the TOM effect in New Zealand, especially regarding what factors derive such an anomaly. This study will employ the stock prices of the New Zealand market to investigate whether there is a significant TOM effect or not. Furthermore, we attempt to identify the explanations of the TOM effect by building the link between institutional investors and the TOM effect in New Zealand.

Ariel (1987) first reports the TOM effect using the data from the Centre for Research in Security Prices (CRSP) in the US. Following his findings, several researchers provide evidence that the TOM effect exists in different countries. For example, two papers, Laskonishok and Smidt (1988) and Jeff and Westerfield (1989), investigate different stock markets, and find a negative return occurs prior to the turn-of-month, and the positive return occurs post the turn-of-month. Unlike the January

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[1] The positive or negative returns are fixed for particular months.

effect or the weekly effect, where the return anomalies exist in a specific month or day, the occurrence days of the TOM abnormal return are adjusted over time, and different stock markets have different affected days. For example, both Liu (2013) and Dzhabarov and William (2010) found the occurrence days of the TOM effect moved earlier due to anticipation of the TOM effect; in addition, Maberly and Waggoner (2000) and Nikkinen, Sahlstrom, and Aijo (2007) reported that the TOM effect vanished at a specific time. The TOM pattern has changed in the last three decades, where the return reverse day is no longer the last trading day of the month, and has moved to the third or fourth day before the last day of the month. To explain this adjustment of TOM, we employed the trading rules that could lead to a specific TOM pattern in the New Zealand stock markets.

While New Zealand has a well-established stock market; the research on stock anomalies is limited. Li and Liu (2010) examine the monthly seasonality in New Zealand and find the stock returns rise or drop in specific months. Although Etula, Rinne, Suominen, and Vaittinen (2015) use the NZX 50 to test the TOM effects, there is no in-depth discussion on the TOM effect in the New Zealand market yet. Based on the market and time properties of the TOM effect, we employed the New Zealand stock market data to find its unique TOM pattern. This study uses the daily S&P/NZX 50 index returns and its individual stock returns between 2004 and 2017. We find a clear TOM pattern in New Zealand. The average daily return experienced a slight decrease at day T-6 to day T-3[2], and the excess return reversed to positive from day T-2, which continued for three days till the last trading day of the month. The robustness test shows the effect of TOM before the Global Financial crisis in 2008 was larger than recent years. Furthermore, the decile-related pattern shows large firms have a more significant TOM pattern. The result from the New Zealand market indicates a unique TOM pattern exists at present.

An avenue of research for the reasons for the turn-of-the-month effects has focused on the link between this anomaly and the transactions carried out especially by mutual funds, hedge funds, and institutional investors. The prior literature has proposed three theories to explain the turn-of-the-month effect. The first is the "cash driving" theory. This theory argues the anomaly is there since mutual funds or pension funds need plenty of cash to meet the payment of dividend or redemption at a specific time. In other words,

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[2] Day T represents the last trading day of the month, T-3 represents the third trading day before the Day T.

these institutions or investment companies have huge cash payments or distributions at the end of each month. However, they do not normally hold all the cash required to meet such cash demand. They are willing to sell their stocks at lower price immediately prior to the due date to enable them to make their payments in a timely manner. Their liquidity is increased immediately by their transactions and this leads to a fixed return pattern around the month-end. The second theory is "window dressing" where institutional investors or funds managers sell or purchase stocks around the end of the month to avoid performance bias; this trading strategy increases the liquidity of the stock market and induces a monthly pattern of returns. Finally, the third theory, referred to as "market manipulating", suggests that large companies or institutional investors attempt to manipulate the trend of prices in different ways in order to gain excess return or better performance. For example, many companies interfere with the stock price by releasing good or bad news at particular time. This manipulative behaviour may cause the turn-of-the-month effect in stock markets to some extent.

Following the previous investigations into the TOM effect, we use the trading activities of institutional investors to observe whether the TOM pattern is caused by the large investors in New Zealand. Firstly, comparing the stock returns around the cash payment due date and the returns of remaining days can explain whether the cash demands of institutional investors cause the TOM effect. Secondly, we add two independent variables: the number of funds which hold the stocks in their portfolio and the percentage of firm value held by funds. We use them to investigate whether the TOM effect is related to the trading activities of institutional investors. Furthermore, we carry out a robustness test for two sub-sample periods, before the Global financial crisis in 2008 and post-crisis, to observe the changes in the TOM effect.

This dissertation fills the gap about the TOM effect in New Zealand. The first task is to identify whether the TOM effect exists in the New Zealand market, and whether the TOM pattern relates to the capitalisations of stocks. Another major task is to point out what factors may lead to the TOM effect in the New Zealand market. The rest of this study is organised as follows: Section 2 introduces the extant research on the TOM effect from previous studies, and outlines the main motivations of this paper; the next section will introduce the data source and methodology. The empirical results show a clear case of the TOM effect in the New Zealand market.

2. Literature Review

2.1 Stock market anomalies

2.1.1 The TOM pattern internationally

Since Ariel (1987) first documented the TOM effect in the US stock market, the investigations of the TOM effect around the world have been reported continually. Based on Ariel's result, that the average return of stocks remains positive only for the first part of the month, several studies observe the TOM effect in different countries. Laskonishok and Smidt (1988) employed the Dow Jones Industrial Average (DJIA) from 1897 to 1986 to investigate the TOM effect in the US. They found the mean daily return of the four-day period (from the last trading day of the month to the first three trading days of the next month) significantly exceeds the average monthly return. The TOM effect in the Italian stock market, reported by Barone in 1990, shows the end-of-month returns on 30th and 31st are noticeably higher. The different cultural patterns and trading rules in Japan stimulate a different TOM pattern, where the first higher return period occurs on day T-5 to T+2, and another higher return period falls into [T+5, T+9] (Ziemba, 1991). Recently, Kayactein and Lekpek (2016) examined an emerging market and found strong evidence of a TOM effect in Turkish equity returns: the mean daily return is 0.46% in the period from the day T-1 to day T+2, and the return of the remaining days is 0.09%.

Due to their different cultures and trading policies, the diversified trading strategy drives unique anomalous patterns in different countries. Some studies tackle the problem from an international perspective to observe the difference between TOM patterns. Jaffe and Westerfield (1989) compare the four stock markets from different countries and find little evidence supporting Ariel (1987)'s result of a monthly pattern in the US, but strong evidence supporting a "last day of the month effect"[3] in Japan. Kunkel, Compton, and Beyer (2003) employed both parametric and nonparametric statistical tests to identify a TOM effect in 19 countries; they find a clear TOM effect with a significant positive returns cluster in trading days of T-1 to T+3 only occurs in Europe, North America, South Africa and the Far East. Recently, McConnell and Xu (2008) employed 34 countries' indexes to observe the TOM effect in those countries. They found a TOM effect in every country except Colombia; however, the unstable numerical value of the difference between the TOM period and non-TOM period

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[3] The return anomaly at last trading day of the month.

illustrates that the effect is very different in the 34 markets. And the newest study by Etula, Rinne, Suominen, and Vaittinen in 2015 shows the TOM effect happens at a different time depending on the length of settlement period: the markets with shorter settlement periods usually leading to a later TOM effect, such as Germany and Hong Kong. On the other hand, countries like Australia and UK have an earlier TOM effect as they have longer settlement periods. Based on the previous studies, we defined the test window as the three days before the end of the month to first few trading days of the month.

2.1.2 A dynamic TOM pattern

The TOM effect is where a regular return changes around the end of the month; however, the affected window is not stable, as it moves over time. The literature provided evidence of the dynamic TOM pattern. For instance, the TOM window was defined as the last and first three trading days of the month. Cadsby (1992) tested the TOM window in his study and found no evidence to support the existence of a TOM pattern in Japan, Hong Kong, Italy or France. However, Etula, Rinne, Suominen, and Vaittinen (2015) employed an extended sample period and found all these four markets to be affected by the TOM pattern. Interestingly, a few studies announced that the TOM effect had disappeared during some periods in the US, but recent studies found that the TOM window did not disappear, but merely experienced a slight adjustment in pattern. Maberly and Waggoner (2000) examined the price for both S&P 500 futures and S&P 500 spot market: they found that the TOM effect only existed before 1900, and subsequently disappeared. Similarly, Nikkinen, Sahlstrom, and Aijo (2007) examined the index of the S&P 100 stock market, and state the TOM effect and return anomaly disappeared due to the macroeconomic news releasing. However, the TOM pattern has not disappeared. Many studies suggest that most of them just underwent a variation to the effect window. The investigation by Dzhabarov and Ziemba (2010) on S&P 500 stocks for the period 1993-2009 indicates that the TOM effect still exists, but the affected days have slightly changed. And Liu (2013) employed the S&P 500 index funds to find that the TOM effect has remained active in recent years, but the occurrence days (starting from day -4) changed to an earlier time period (day -5 and -6), and the prior TOM period has significantly higher cumulative and average returns than other time periods. The TOM effect changes due to the continuous changes to monetary and macroeconomic policies. It may disappear or be enhanced during any specific time period.

The previous literature shows the dynamic TOM pattern for different countries. Although New Zealand has a well-established stock market, the unique TOM pattern for the NZ market has not been identified previously. Our dissertation investigates the TOM pattern using the most recent sample period, analyses the decile results, and provides more TOM deciles in large and small stocks in New Zealand. Furthermore, depending on the research by McConnell and Xu (2008), where the large capitalisation stocks have more significant TOM patterns than small stocks have in CRSP[4], we separate all New Zealand stocks into five deciles by market value to investigate the different TOM patterns within those five deciles' stocks.

2.2 Explanations for the TOM effect

What could possibly drive the TOM effect? A number of explanations have been proposed. Not only the individual investors or small traders contribute to this pattern but the trading activities of institutional investors also could contribute to the TOM effect. For individual or small investors, Dzhabarov and Ziemba (2010) reported that a part of salaries or debt payments transferred from employers on day -1 are invested in the stock market, which provides the liquidity and buying pressure during the first few days of the month. Not just individual traders cause the TOM effect: most of the studies discussed the behaviour of large traders or institutional investors, which prompted the TOM effect significantly. As Etula, Rinne, Suominen, and Vaittinen (2015) stated, the biggest net buyer is institutional investors at the end of the month and on the first few days of the month, which accelerates the stock price going up. And the net sales on day T-8 to T-4 significantly relate to the return reversals around the TOM period. Based on the previous literature, we adopt the three main motivations for institutional investors, which are cash driving, window dressing, and market manipulations.

2.1.1 Cash driving

Most of the literature treats cash driving as a prime explanation of the TOM effect. Both individual investors and institutional investors may induce the TOM pattern by cash driving. As for individual traders, they receive salaries, investment dividends or other financial income at the end of the month, and extra liquidity will be present at the beginning of the month if they invest this fund into stock market. For example, Barone (1990) states that the payment of salaries for individual investors increased stock demand around the TOM period. In addition, Ziemba (1991) points out that a part of the

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[4] CRSP represents the Centre for Research in Security Prices in US stock market

story explaining the TOM effect is that people have funds to invest in the stocks when they receive their salary and stock account statements around the end of the month. Although individuals' trading behaviour is a contributing factor to the TOM effect, it cannot be the sole explanation for it. Based on the analysis of TOM effect and liquidity, Booth et al., (2001) point out that the increase in returns and liquidity at the turn of the month is not only affected by small traders and small investors, but large traders or institutional investors, who have played a larger role in explaining the TOM effect than small traders. We discuss the TOM effect in this dissertation based on the trading behaviour of institutional investors.

Due to the huge cash demand for mutual funds or pension funds at the end of the month, liquidity and volatility increase at the same time, which induces an abnormal return. As Ogden (1987) documents, the standardisation of payment systems produces a preferred habit[5] for lenders typically to make a payoff on the last business day of each calendar month, which provides a concentrated flow of funds for the stock market around the end of the month. In other words, monetary policy affects the growth of liquidity; the expected liquidity affects the TOM return; and thus, monetary policy is related to the TOM effect. Similarly to Ogden's conclusion, Ziemba (1991) stated that, once the employee stock holding plan and mutual funds receive money around the turn of the month, they will take part of the liquid profits in stocks, which accelerates the price volatility and induces the TOM effect. In addition, Wiley and Zumpano (2009) investigated the real estate investment trusts (REITs) and concluded that the dramatic rise in institutional holdings can account for a part of the TOM effect, though it is not as large as previously suspected. Recently, Maher and Parikh (2013) suggested that institutional investors or mutual funds contribute substantially to the TOM effect in the Indian stock market, as they try to boost their investment performance by cash deployment at the end of the month.

Although much of the literature proposes that cash driving has a significant impact on the TOM pattern, there are a few studies reporting an opposing opinion. They claim that cash-driving cannot explain the TOM effect on its own. For example, Ariel (1987) documents that the concentration of dividend payments in the first half of the month does not induce the monthly effect in S&P 500 index. And Lakonishok and Smidt (1988) argue that the dividend pattern adjustment does not lead to any changes in the monthly

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[5] Preferred habitat hypothesis refers to employees with automatic contribution plans investing their salary into an investment account; if institutional investors invest it directly, extra liquidity is provided around the turn of month.

return anomaly, which indicates that the dividend payment is not enough to explain the TOM effect. McConnell and Xu (2008) state that the cause of the TOM effect is a puzzle: neither month-end buying pressures relating to cash payments nor risk-free rate increasing can explain it. The previous studies contribute mixed ideas about the cash driving theory. In this dissertation, we will combine the dividend payment due date with the TOM window to illustrate whether cash driving is partly stimulating the TOM effect in New Zealand.

2.2.2 Window dressing

Window dressing is another explanation from prior studies for the TOM effect. The trading activities of fund managers are limited to portfolios' investment targets, but not all portfolios may be able to meet their targets. Thus, fund managers will increase their trading frequency around the end of the month to satisfy their promised returns, which partly stimulates the TOM effect. The prior studies also explain how the window dressing theory stimulates the TOM effect. For example, Lakonishok and Smist (1988) and Barone (1990) document that pension funds managers or institutional investors trying to avoid a downward bias in their portfolios will tend to sell off the stocks with underperforming returns and buy well-performing stocks around the TOM period. In addition, Barone (1990) raised the portfolio-rebalancing hypothesis: due to the pressure of publishing their performance results, institutional investors increase their trading frequency at the end of the month to boost their portfolio returns or investment performance. Ziemba (1991) also suggested that portfolio window dressing by major institutional investors occurs on a day before month end, but sale pressure may increase earlier, a few days before. Wiley and Zumpano (2009) examined the REITs and provide some evidence to support the window dressing hypothesis raised by Lakonish and Smidt (1988): in order to avoid a financial performance bias, some institutional investors will increase their trading frequency before the end of the month. This trading behaviour not only decreased the downward risk in their investments, but also gained them excess returns and better investment performance. Studies on the TOM effect show abundant evidence of window dressing. Although the prior research states the TOM effect is partly caused by the window dressing theory, there is limited evidence to support this theory in the New Zealand market. In this study, we will employ the components held by mutual funds to test whether window dressing is sufficiently significant to stimulate the TOM effect in the New Zealand stock market.

2.2.3 Market manipulation

Another explanation for the presence of TOM effect is market manipulation. In order to control the stock price and avoid unexpected volatility, large companies may use their information as a tool to interfere with the normal stock trading. Penman (1987) investigates the relationship between return anomaly and the timing of news releases by firms, where firms tend to release positive earnings news or good information during the first half of the month; however, bad news may be delayed to the latter half. The positive news in the first half of the month will push the stock price upward, and the negative news in latter half will decrease the stock price. Therefore, firms rely on the timing of news releases to manipulate the stock price, which may contribute to the monthly pattern. Additionally, McNichols (1988) reports that discretionary disclosure causes less extreme negatives of price when the earning reports are released; therefore, firms prefer to suppress bad news until reporting deadlines and disseminate good news earlier. Due to the common reporting deadlines set by the regulator, a cluster of negative earnings reports is delivered to the market before the due date, which may increase the price volatility and stimulate the TOM pattern. Some institutional investors or funds try to control stocks by decreasing the price for lower cost and raise the stock price for higher profit. In order to identify whether stock market manipulation stimulates the TOM effect, we will include the percentage of firm value held by institutional investors to help us investigate this theory.

Although many studies investigate the TOM effect around the global financial markets and provide explanations of this effect, there is a lack of an in-depth research about the New Zealand market. Based on the three theories from prior studies about the reasons for the TOM effect, we propose three hypotheses to help explain the TOM effect in New Zealand:

1) The cash demands for institutional investors during the pre-TOM period contribute to the TOM effect.
2) Window dressing stimulates the TOM pattern.
3) Market manipulation or information driving induce the TOM pattern.

Our main contribution is to identify whether there exists a significant TOM effect in the New Zealand stock market, and if so, whether such anomaly is driven by the trading activities of institutional investors or not.

3. Data and Methodology

3.1 Data sources

The data in this study is collected from two sources. First, we collect the S&P/NZX 50 Index[6] and the price of all the stocks that existed during the period from January 2004 to June 2017 from DataStream. Five data types of 305 stocks were collected, including official closing price (P), market value (MV), the total number of ordinary shares (NOSH), the value of all trades on each day (VA) and the number of shares traded on each day (VO). In addition, we use the 90-day bank bills as the risk-free rate to calculate the excess returns. The S&P/NZX 50 Index is helpful in investigating whether the TOM pattern is significant in the weighted stocks; the price of all stocks and their market value provide more details about size or decile-based TOM patterns. Second, we will collect data about cash payment and institutional investors. Cash payment data includes the due date of dividend or other cash payments by New Zealand mutual funds; institutional investors or funds information contains the holdings of component stocks in their portfolios and the portfolio trading activities. The main source of the second part is the funds' websites and Morningstar.

3.2 Index and stock price returns

The first objective of this study is to examine the TOM pattern in the S&P/NZX 50 Index and the trading stocks in the New Zealand market. In order to achieve that, we will calculate the return and excess returns for the NZX 50 index, all NZ stocks and non-NZX 50 stocks using the following equations:

$$\text{Return} = \ln (\text{Price}_t / \text{Price}_{t-1}) \tag{1}$$

$$\text{Excess Return}_t = \text{Index}_t - \text{Risk-free Rate}_t \tag{2}$$

$$\text{Excess Return}_{i,t} = \text{Stock Return}_{i,t} - \text{Risk-free Rate}_{i,t} \tag{3}$$

3.3 Turn-of-the-month pattern discovery

In general, the TOM is defined as the period from the last few trading days to the first few trading days of the month. In this study, we define T as the last trading day of the month, T-1 as the day before the month-end day and T+1 as the first trading day of the month. The Turn-of-month period is represented as TOM [T-3, T+1]; remaining days are represented as ROM (Rest of Month) period. And then, we will investigate the

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[6] The S&P/NZX New Zealand Indices are calculated using a base-weighted aggregate methodology.

time-series pattern among the average daily excess returns of the index and all existing stocks across the months during the sample period. Doing so allows us to observe the trading days which are affected by TOM in the New Zealand stock market. Furthermore, we divide all stocks into five deciles: decile 1 represents the smallest market value stocks; decile 5 shows the largest market value stocks. This process provides more size-related information on the TOM effect, which is useful in investigating the impacts of large and small stocks on this return-anomalous seasonality.

Table 1

General statistics on NZX50 Index and all NZ stocks across five market value deciles

	Number of observations	Mean	Median	S.D	Skewness	Kurtosis
Index	3521	-0.005073% (1.107401)	0.011917%	0.663646%	-0.4677199	5.5907803
All stocks	100665	-0.021840% (-0.858680)	-0.017343%	2.587351%	-0.6224863	165.0015303
Decile 1	18999	-0.064577% ** (-1.817122)	-0.009100%	4.898475%	-0.5131370	64.3852568
Decile 2	20141	-0.010416% (-0.721906)	-0.008872%	2.047663%	0.4909900	37.9223221
Decile 3	20075	0.016770% * (1.499318)	-0.008605%	1.584765%	0.0710715	24.4643015
Decile 4	20141	0.004982% (0.517829)	-0.008361%	1.365335%	0.8832561	24.0488321
Decile 5	21309	0.013838%* (1.384005)	-0.008241%	1.459544%	-0.087768	6.763845555

Notes: This table shows the general statistics on the daily returns of NZX50 index, all stocks and all five deciles. The sample period is from January 2004 to June 2017. The third column shows the mean returns of all data and the underline numbers are the t-statistic test results with the null hypothesis is that the mean return equals to zero. *, **, and *** denote statistical significance for a two-tailed t-test at the level of 10%, 5%, and 1%, respectively.

Table 1 is the summary of statistics for the daily returns on the index, all stocks, and all decile stocks. The statistical description shows the average returns of all observations during the sample period, which will be used as the reference for comparison analysis. From the return differences with the TOM period, we will observe the impact level of the TOM effect on the monthly returns.

Furthermore, in order to observe whether the returns within the TOM days are significantly different from other trading days of the month or not, we will calculate the Average Daily Returns (ADRs) of both TOM and ROM periods for NZX50 Index, all individual stocks, and non-NZX 50 stocks. Based on the ADRs tests, we will observe

the return contributions of TOM and ROM on the monthly return. The comparisons of average return contribution and monthly return contribution will show the impact degree of the TOM on New Zealand stock market.

3.4 Cash-driving analysis

The second part of this study is to test whether the turn-of-the-month effect is related to trading activities of institutional investors. As previous studies demonstrated, when the dividend due date is closing, cash demand is increasing, which prompts the funds or institutional investors to sell some stocks. The selling pressure caused by cash demand may contribute to the TOM effect at the month-end. We will test if such an anomaly is related to the due dates of cash payments for institutional or funds managers in New Zealand, using the following equation:

$$\text{DER}_{\text{stock } i,t} = \alpha + \beta_0 \text{INDEX}_{i,t} + \beta_1 \text{Dum}_1 + \beta_2 \text{Firm Size}_{i,t} + \beta_3 \text{Turnover Ratio}_{i,t} + \varepsilon_{i,t} \qquad (4)$$

$$\text{DER}_{\text{stock } i,t} = \alpha + \beta_0 \text{INDEX}_{i,t} + \beta_1 \text{Dum}_1 + \beta_2 \text{Dum}_2 + \beta_3 \text{Firm Size}_{i,t} + \beta_4 \text{Turnover Ratio}_{i,t} + \varepsilon_{i,t}$$

$$(5)$$

The dependent variable is the daily excess returns of stocks. The set of independent variables includes daily abnormal returns of the index and two dummy variables. D_1 denotes a dummy variable, which equals to one when returns within the end-of-month [T-3, T+1], equal to zero otherwise. Dummy 2 describes the month of cash dividend, which equals to one if a month when cash dividend payment due, equal to zero otherwise. The firm size is the logarithm of market capitalisation. The turnover ratio is generalised by trading volume on each day and number of shares outstanding[7]. The coefficients of regression will provide some evidence as to whether the cash-driving theory can help explain the turn-of-month effect in New Zealand.

3.5 Window dressing and market manipulation analysis

The third part of the study aims to check whether window-dressing and market manipulation can help describe this anomaly in New Zealand. In advance, we separated the sample period into two sub-periods by the Global Financial Crisis in 2008, which helped us to observe the impact level of TOM in different periods. Based on the holdings of institutional investors' portfolios, we will identify those stocks held by institutional investors. Then, we will run the regression (Equation 5) again but we include the number of funds as another independent variable, which shows the number

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[7] Equation of turnover ratio: Turnover = Trading volume / Number of share

of funds that hold the stocks in their portfolios. The coefficients will clarify whether funds' trading activities have significant influence in different time periods. The specification is as follows:

$$\text{DER}_{\text{stock } i,t} = \alpha + \beta_0 \text{INDEX}_{i,t} + \beta_1 \text{Dum}_1 + \beta_2 \text{Dum}_2 + \beta_3 \text{Logarithm}^8{}_{\text{stock } i,t}$$

$$+ \beta_4 (\text{TOM} * \text{Logarithm}_{\text{stock } i,t})^9 + \beta_5 \text{Firm size}_{i,t} + \beta_6 \text{Turnover ratio}_{i,t} + \varepsilon_{i,t}$$

$$(6)$$

Additionally, we replace the Logarithm $_{\text{stock } i,t}$ by the percentage of firm value holding by all funds. The combination of two dummy variables and independent variables will help us to explain the correlation of stocks trading and the TOM effect. The specification is as follows:

$$\text{DER}_{\text{stock } i,t} = \alpha + \beta_0 \text{INDEX}_{i,t} + \beta_1 \text{Dum}_1 + \beta_2 \text{Dum}_2 + \beta_3 \text{Percentage}^{10}{}_{\text{stock } i,t}$$

$$+ \beta_4 (\text{TOM} * \text{Percentage}_{\text{stock } i,t})^{11} + \beta_5 \text{Firm size}_{i,t} + \beta_6 \text{Turnover ratio}_{i,t} + \varepsilon_{i,t}$$

$$(7)$$

If the turn-of-the-month effect is driven by either window-dressing or market manipulation theory, we should observe the coefficients of dummy variables having significant relationship to stock returns.

Overall, the first part will provide the TOM effect in New Zealand, the second and third part will help us to understand whether the trading activities of institutional investors or funds are relevant to the inducement of the TOM effect in New Zealand.

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[8] Logarithm value of number of funds which hold the stocks in their portfolio.
[9] Logarithm value of number of funds which hold the stocks in their portfolio during the end-of-month [T-3, T+1].
[10] Percentage of firm value hold by all the funds.
[11] Percentage of firm value hold by all the funds during the end-of-month [T-3, T+1].

4. Empirical Results and Discussion

4.1 Turn-of-the-month effect in the New Zealand market

4.1.1 The TOM pattern in NZ

Our study launches by investigating the average daily returns around the month-ends. In order to observe the TOM pattern around the month-end, we plot the excess daily returns through the month. The three panels of figure 1 describe the monthly pattern of three objectives: Panel A, Panel B and Panel C represent the monthly pattern of all NZ stocks, NZX 50 stocks and non-NZX 50 stocks respectively. As figure 1 shows, the excess returns are positive on the last trading day of the month for these three observations, which tend to decrease at the month-beginning. Due to the components of NZX 50 Index stocks being weighted stocks in the New Zealand market, the panel C (non-NZX 50 stocks) shows a slight difference from the others. First, the excess returns are positive among the last four days and first two days of the month in Panel A(all NZ stocks) and Panel B(NZX 50 stocks), but only the last two trading days remain a positive value in Panel C(non-NZX 50 stocks). Second, the negative returns fall into day T-6 and T-5 in Panel A, but in Panel C that continued for 5 days from T-6.

Apparently, the TOM effect exists in the New Zealand stock market, the results in Panel C is quite different from the others. These quit differences on the monthly pattern may be induced by the difference between components of NZX50 Index stocks and all stocks. NZX 50 includes the 50 weighted stocks in New Zealand stock market, which, if not updated in a timely fashion, lead to a data bias. However, all stocks' monthly pattern, including all the stocks existing during the sample period, could represent the market movement appropriately. Most of the non-NZX 50 stocks are medium with small capitalisation, and their trading frequency and trading volume are lower than the weighted stocks, leading to an indistinct TOM pattern.
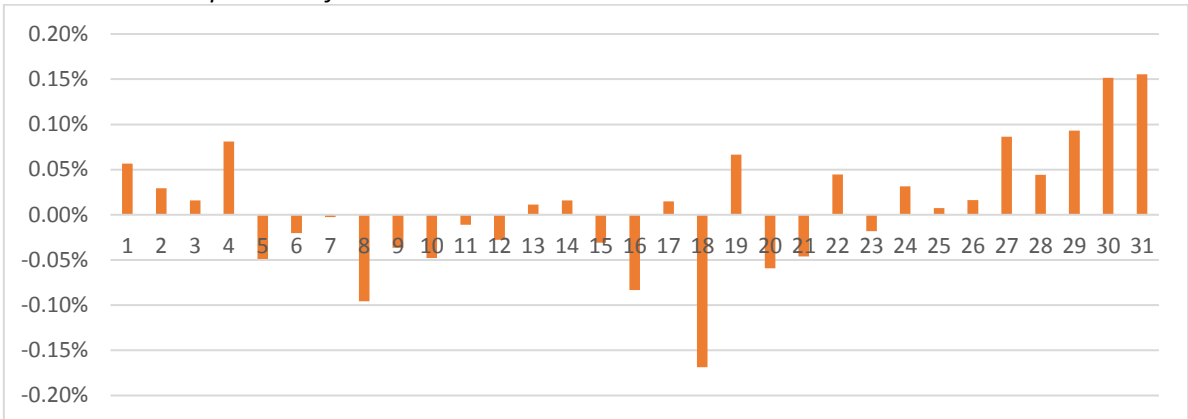
Figure 1
The excess returns across the month.
Panel A. All Stocks in New Zealand Stock market
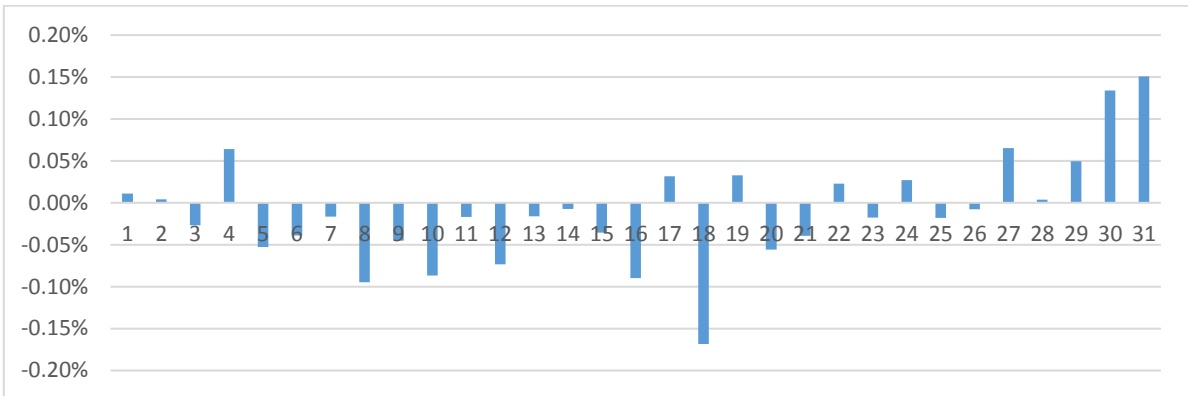
Panel B. The Components of the NZX 50 Index

Panel C. The Non- NZX 50 stocks
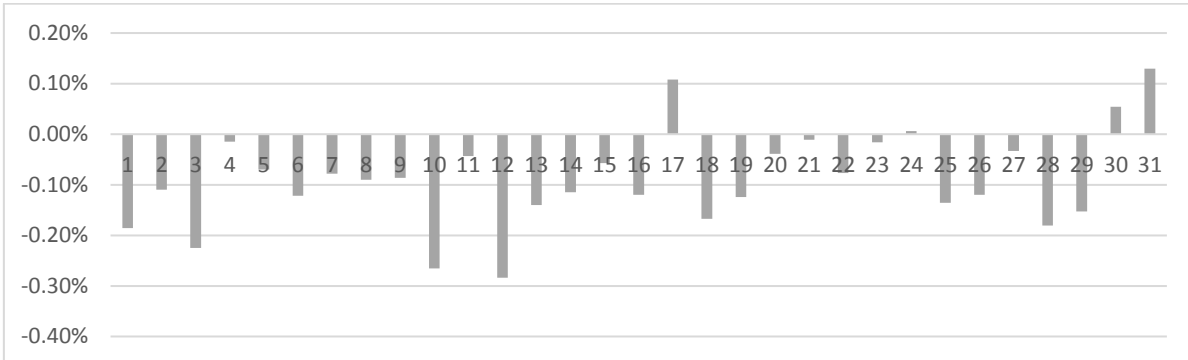
Note: This figure plots the average excess daily returns of all NZ stocks, NZX50 Index stocks, and Non-NZX 50 stocks across the month over the period from January 2004 to June 2017. The excess returns generated by Excess Return = R_i- Rf_i, where R_i and Rf_i are the stock return and risk free rate respectively. Panel A plots the excess returns of all stocks in New Zealand market. Panel B plots the excess returns of the components of the NZX 50 index. Panel C plots the excess returns of all stocks except the components of the NZX 50 index.

To obtain an accurate TOM pattern in New Zealand, we engaged in decile analysis. Referring to the market capitalisation, we divided all NZ stocks into five deciles according to the market capitalization, where Decile 1 represents the monthly pattern of the smallest stocks and decile 5 is the largest stocks. This process provides a clear TOM effect in different size of stocks.

As Panel A shows, the return reversal occurs on last trading day of the month in the first decile, the negative returns remained for three days before the last trading day, especially where the average return of day T-1 decreased 1.07%. Although the TOM effect exists in decile 1, the positive return at month-end is not significant. Panel B plots a strong return reverse about decile 2 stocks. Before the last trading day of the month, all decile 2 stocks experienced a tiny decrease except day T-2, but the last trading day has a significant return reversal from -0.12% to 0.53%. The TOM pattern of middle cap stocks (Panel C) is represented in decile 3; although the positive returns in this decile are not as large as decile 2 has, the negative return on day T-3 is significant. Panel D shows the second largest stocks in the New Zealand stock market. Similarly to the previous studies, which suggest that the return reverse moves to the earlier day in the US stock market, there is a clear adjusted TOM pattern in this decile. The daily average return is negative from the sixth to third days before the end of the month, and then it reverses to positive on day T-3. Panel E represents the largest stocks. The significant positive returns occur on last two trading days at the month-end, which is 0.14% and 0.27% respectively. In addition, the return reverse is not significant around the TOM period, but the returns of early TOM experienced a significant decrease.

Comparing these five panels, the large firms (Panel D and Panel E) remain with a standard TOM pattern, where the last few trading days experienced a return increasing and the return tends to decrease at the beginning days of the month. However, the small or medium firms only have a positive value on day T-1, and the other days are mixed. This result provided more evidence for large firms with high trading frequency having a more significant TOM effect.

Figure 2. The decile-based TOM effect (excess returns).
Panel A. Decile 1. (Smallest stocks)
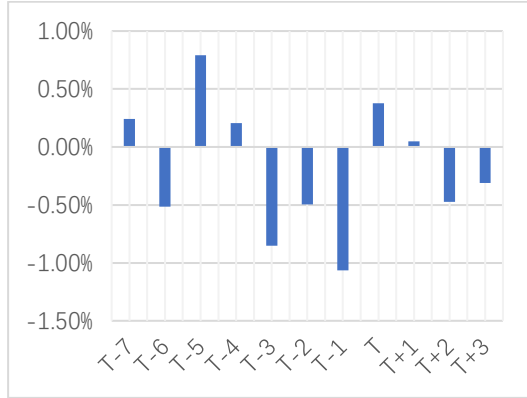
Panel B. Decile 2.
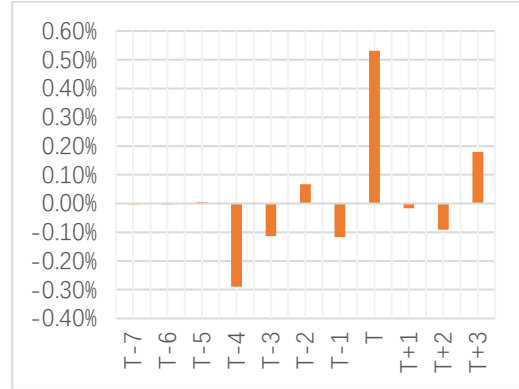
Panel C. Decile 3.
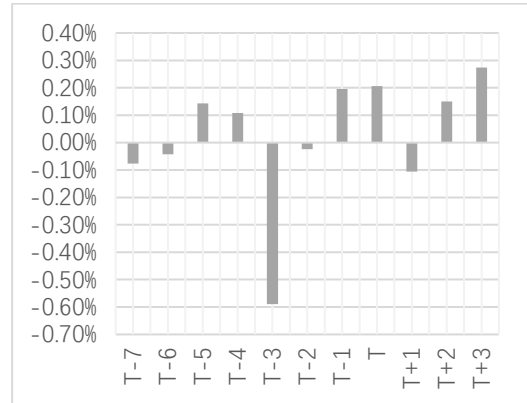
Panel D. Decile 4.
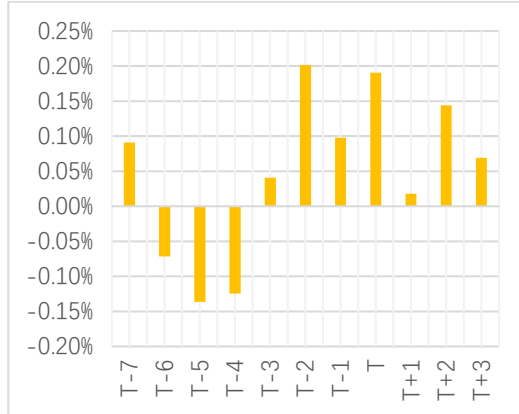
Panel E. Decile 5. (Largest stocks)
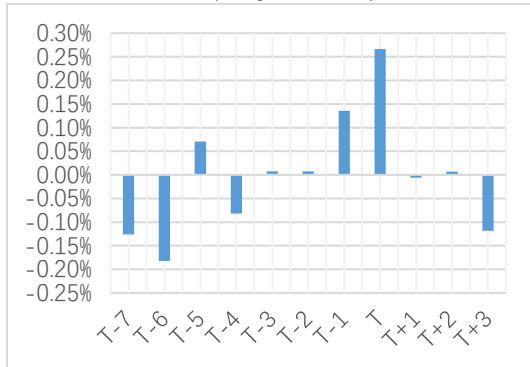
Notes: This figure shows daily average returns of decile-related stocks around the TOM period (T-7 to T+3). Sample period from January 2004 to June 2017. Panel A represents the daily average returns of decile 1, which includes the smallest stocks. Panel B is the returns of decile 2 including the second smallest stocks. Panel C, Panel D and Panel E shows the daily average returns of decile 3, decile 4 and decile 5, which represent the medium stocks, second largest stocks and largest stocks respectively. The returns are the log returns of daily closing prices, daily average returns are the average returns of each decile among each observation day.

Considering these two figures, we not only observe the TOM effect in the New Zealand stock market, but also the decile-related analysis provide more details about the large firms and small firms. The largest stocks pattern (Panel E) and second largest stocks pattern (Panel D) have an obvious TOM effect around the month-end: the negative returns occur in the early TOM period; the significant positive returns appear after the return reverse day (T-3). Although the last trading day of the month (day T) shows significant positive returns in both small and medium stocks, there is an unstable pattern prior to the TOM period. The index return pattern in Figure 1 and the large stocks return in Figure 2 illustrate that, among the weighted stocks, there exists a clear TOM effect. The next part will provide more evidence about the returns between the TOM period and the non-TOM period.

4.1.2 A TOM and ROM comparison

Etual et al. (2016) use [T-3, T+1] as the TOM window to compare the return difference between the TOM period and ROM (rest of month). Following their study, we define the TOM period as the turn-of-month window [T-3, T+1], and the rest of the month window defined as the ROM period. Table 2 gives the average daily returns of the TOM period and the ROM period from June 2004 to December 2016.

Table 2
Average daily returns during each window

	TOM		ROM		TOM-ROM (Difference)	
NZX50 Index	0.000607	***	-0.00015	***	0.00076	***
	[6.68]		[-3.03]		[7.49]	
all NZ stocks	0.000233	**	-0.00026	***	0.00049	***
	[2.25]		[-4.64]		[4.21]	
non-NZX50 stocks	-0.00112	*	-0.00081	***	-0.00031	
	[-3.22]		[-3.58]		[0.74]	

Notes: Following Etula et al. (2016), TOM is defined as the turn-of-month window [T-3, T+1], and ROM is defined as the rest of month window. This table shows the average daily returns of index, all NZ stocks and non-NZX50 stocks. The first and second columns indicate the return of the TOM period and the ROM period, and the third column shows the return difference between TOM and ROM. The underline number is the t-statistic test results with the null hypothesis where the returns and return difference are equal to zero. *, **, and *** denote statistical significance for a two-tailed t-test at the level of 10%, 5%, and 1%, respectively.

The t-statistic in the first and second columns tests the hypothesis that the average daily returns equal zero, and the difference between TOM and ROM equal to zero is tested by last

column. The three observations - NXZ 50 index, all NZ stocks and non-NZX 50 stocks - will help us to identify whether the large stocks have a more significant TOM effect. The average daily returns in the NZX 50 index are significantly different from zero for both TOM period and ROM period, the positive return (0.0607%) in TOM and negative return (-0.015%) in ROM represent. The TOM period has a higher return contribution on the monthly return than the ROM period has. The TOM-ROM shows the difference between these two windows is significantly different with zero at the 99% level. Similarly to the index results, the average daily returns of all NZ stocks are positive (0.0233%) in the TOM period and negative (-0.026%) in the ROM period, representing the higher return contributions of TOM on monthly return. And the difference between these two windows is significantly different with zero at the 99% level. However, the returns of non-NZX 50 stocks are negative for both the TOM period (-0.112%) and the ROM period (-0.081%), and the return difference is not significantly different with zero. The largest t-value and smallest t-value in NZX 50 index and non-NZX 50 stocks shows the large stocks have a more significant TOM effect in the New Zealand market.

4.2 TOM effect and institutional investors

4.2.1 Cash driving tests

Most of the studies discuss whether cash-driving stimulates the TOM effect. We define the cash payment due date as the control variable to observe whether it impacts the returns of the TOM period. In doing so, we use the returns within the end of the month [T-3, T+1] as the dummy variable and daily excess returns as the dependent variable to regress the equation at first (Table 3). Besides examining the full sample period of NZX 50 stocks, all NZ stock and non-NZX 50 stock, we also divided the whole period into two as Panel B (sub-sample period from January 2004 to December 2008) and Panel C (sub-sample period from January 2009 to June 2017) based on the Global Financial Crisis in 2008, which shows how the recession affects the TOM pattern in New Zealand.

Table 3

Variables	Panel A. Full sample period (2004.01-2017.06)						Panel B. Sub-sample period (2004.01-2008.12)						Panel C. Sub-sample period (2009.01-2017.06)					
	NZX50 stocks		All NZX stocks		non-NZX50 stocks		NZX50 stocks		All NZX stocks		non-NZX50 stocks		NZX50 stocks		All NZX stocks		non-NZX50 stocks	
Intercept	-0.0037	***	-0.0045	***	-0.0080	***	-0.0071	***	-0.0096	***	-0.0155	***	-0.0062	***	-0.0074	***	-0.0198	***
	[-5.6]		[-6.48]		[-4.44]		[-4.37]		[-6.61]		[-4.59]		[-5.19]		[-6.27]		[-4.56]	
TOM (Dummy 1)	0.0008	***	0.0006	***	-0.0002		0.0009	***	0.0006	***	-0.0001		0.0006	***	0.0005	***	-0.0003	
	[7.25]		[4.73]		[-0.5]		[5.52]		[3.41]		[-0.25]		[4.84]		[3.16]		[-0.51]	
Firm size	0.0010	***	0.0012	***	0.0022	***	0.0021	***	0.0027	***	0.0044	***	0.0012	***	0.0014	***	0.0035	***
	[7.07]		[8.18]		[5.32]		[6.84]		[8.07]		[4.83]		[5.47]		[6.58]		[5.17]	
Turnover	0.2934	***	0.3428	***	0.6709	***	0.3712	***	0.4177	***	0.6111	**	0.2583	***	0.3095	***	0.7683	***
	[7.44]		[8.17]		[3.68]		[6.51]		[6.6]		[2.55]		[4.36]		[5.07]		[2.73]	
Year Effects	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Firm Effects	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Number of observations	168,848		206,302		37,454		63,223		82,072		18,849		105,625		124,230		18,605	

Note: This table shows the regression with dummy variables. Panel A regresses the whole sample period; Panel B regresses the period of Pre-Global Financial Crisis; and Panel C shows the Post-Global Financial Crisis. Dependent variable is the daily excess returns of all NZX stocks, NZX 50 stocks and non-NZX 50 stocks. Dummy 1 describes the TOM period, which is equal to one when returns within the end-of-month [T-3, T+1], equal to zero otherwise. Firm size is the logarithm of market capitalisation, and the turnover ratio is trading volume divided by number of shares outstanding. The underline number is the t-statistic test results under the null hypothesis (the intercept or beta are not different with zero). *, **, *** denotes statistical significance for a two-tailed t-test at the 10%, 5%, 1% level respectively.

Equation 4: $DER_{stock\ i,\ t} = \alpha + \beta_0\ INDEX_{i,\ t} + \beta_1\ Dum_1 + \beta_2\ Firm\ size_{i,\ t} + \beta_3\ Turnover\ ratio_{i,\ t} + \varepsilon_{i,\ t}$

Panel A of Table 3 is the coefficients of the full sample regression. The coefficients of TOM in NZX 50 stocks, all NZ stocks and non-NZX 50 stocks are 0.0008 (t = 7.25), 0.0006 (t = 4.73) and -0.002 (t = -0.5) respectively, which indicated the TOM effect exists in three objectives among the sample window.

Next, we add the cash dividend payment due date as the second dummy variable to repeat the last regression (Table 4). The changes of coefficients provided the details about whether cash driving is an explanation for the TOM pattern in three objectives.

Table 4

Variables	Panel A. Full sample period (2004.01-2017.06)						Panel B. Sub-sample period (2004.01-2008.12)						Panel C. Sub-sample period (2009.01-2017.06)					
	NZX50 stocks		All NZX stocks		non-NZX50 stocks		NZX50 stocks		All NZX stocks		non-NZX50 stocks		NZX50 stocks		All NZX stocks		non-NZX50 stocks	
Intercept	-0.0036	***	-0.0044	***	-0.0079	***	-0.0071	***	-0.0096	***	-0.0156	***	-0.0061	***	-0.0072	***	-0.0196	***
	[-5.51]		[-6.4]		[-4.43]		[-4.36]		[-6.6]		[-4.6]		[-5.05]		[-6.12]		[-4.53]	
TOM (Dummy 1)	0.0008	***	0.0006	***	-0.0002		0.0009	***	0.0006	***	-0.0001		0.0006	***	0.0005	***	-0.0003	
	[7.28]		[4.76]		[-0.49]		[5.53]		[3.42]		[-0.24]		[4.88]		[3.2]		[-0.49]	
Month of cash dividend (Dummy 2)	-0.0005	***	-0.0006	***	-0.0013	*	-0.0002		-0.0003		-0.0009		-0.0006	***	-0.0008	***	-0.0018	*
	[-2.89]		[-3.36]		[-1.81]		[-0.69]		[-1.1]		[-0.97]		[-2.86]		[-3.29]		[-1.69]	
Firm size	0.0009	***	0.0012	***	0.0022	***	0.0021	***	0.0027	***	0.0044	***	0.0012	***	0.0014	***	0.0036	***
	[7.03]		[8.16]		[5.34]		[6.83]		[8.07]		[4.85]		[5.41]		[6.54]		[5.19]	
Turnover	0.2937	***	0.3433	***	0.6756	***	0.3714	***	0.4183	***	0.6165	**	0.2584	***	0.3096	***	0.7674	***
	[7.45]		[8.18]		[3.71]		[6.51]		[6.61]		[2.57]		[4.36]		[5.08]		[2.73]	
Year Effects	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Firm Effects	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Number of observations	168,848		206,302		37,454		63,223		82,072		18,849		105,625		124,230		18,605	

Note: This table shows the regression with dummy variables. Panel A regress the whole sample period; Panel B regress the period of Pre-Global Financial Crisis; and Panel C shows the Post-Global Financial Crisis. Dependent variable is the daily excess returns of all NZX stocks, NZX 50 stocks and non-NZX 50 stocks. Dummy 1 describes the TOM period, which equal to one when returns within the end-of-month [T-3, T+1], equal to zero otherwise. Dummy 2 describes the month of cash dividend, which equal to one if a month when cash dividend payment due, equal to zero otherwise. Firm size is the logarithm of market capitalization, and the turnover ratio is trading volume divided by number of shares outstanding. The underline number is the t-statistic test results under the null hypothesis (the intercept or beta are not different with zero). *, **, *** denotes statistical significance for a two-tailed t-test at the 10%, 5%, 1% level respectively.

Equation 5: $DER_{stock\ i,t} = \alpha + \beta_0\ INDEX_{i,t} + \beta_1\ Dum_1 + \beta_2\ Dum_2 + \beta_3\ Firm\ size_{i,t} + \beta_4\ Turnover\ ratio_{i,t} + \varepsilon_{i,t}$

Panel A of Table 4 involved the cash payment due date as the control variable (Dum_2) to investigate the cash-driving factors. When the dummy variable added to the equation, a new value of β_1 will illustrate the impacts of it. Therefore, the difference of β_1 in Equation 4 and Equation 5 shows how the cash dividend payments explain the TOM effects. The coefficients of the second dummy variables are -0.0005 (t = -2.89), -0.0006 (t = -3.36) and -0.0013 (t = -1.81), which indicated a negative relation with excess returns. Nevertheless, comparing the results of Table 3 and Table 4, we find the coefficients of TOM remaining the same value (0.0008, 0.0006 and -0.0002). Although we involved the control variable in cash driving test, the coefficients still remain a same value, which indicates the cash dividend payments as the control variable have weak impacts on the TOM patterns. The constant coefficients of the first dummy variable reflected the finding that the explanation of the TOM pattern excludes cash driving in New Zealand over the full sample period.

Similarly to the full sample period, the coefficients of the two sub-sample periods still maintain the original value when the control variable is added (0.0009, 0.0006, -0.0001 in first sub-sample period and 0.0006, 0.0005, -0.0003 in second sub-sample period). However, when we compare the coefficients of these two sub-sample periods, we find the TOM effect tends to weaken after the Global Financial Crisis, where the coefficients of NZX 50 stocks falls from 0.0009 (t = 5.52) to 0.0006 (t = 4.84). Furthermore, the positive coefficients of firm size and turnover in three panels indicate the positive relationship with excess daily returns.

Over the full sample period and two sub-sample periods, the constant coefficients of the first dummy variable (TOM) excluding cash driving as an explanation of this anomaly in NZX 50 stocks, all NZ stocks and non-NZX 50 stocks.

4.2.2 Trading Activities of Funds and Institutional Investors

The window dressing and market manipulation hypothesis reveals that the TOM effect is driven by the trading strategy of funds or large investors. The pressures from reporting and return statements to outsiders force them to adjust their portfolio components at month-end, which accelerates the formation of the TOM pattern. To address this issue, we integrate two different independent variables based on the cash driving test. The logarithm of the number of funds which hold the stock in their portfolio added to the regression helps us to observe the

impacts of funds' portfolios on excess returns - the combination of the TOM period and logarithm value of funds held make this impact on the TOM pattern more visible (Table 5). Besides the funds' portfolio test, we bring the percentage of firm value held by all funds into the cash driving regression. Due to the larger proportion of firm value held by funds increasing the risk of stock being manipulated, the coefficients of this variable will help us to observe whether a relationship exists between the funds and excess returns (Table 6). Through investigating the firm value during the TOM window, the impact of this variable on TOM period could be Assessed.

The regression results of Table 5 reveal how the funds' holdings affect the excess return and TOM pattern. The coefficients of logarithm in the full sample period (Panel A) are -0.0002 (t = -2.04), -0.0003 (t = -3.28) and -0.0007 (t = -0.46) for NZX 50 stocks, all NZ stocks and non-NZX 50 stocks respectively, which indicates a negative relationship between excess return and number of funds which hold the stocks in their portfolio; the coefficients of TOM*logarithm, showing the funds' holdings effects in the TOM period, are -0.00003 (t = -0.340), 0.0003 (t = 0.25) and -0.00042 (t = -0.22). Although the impact of this variable is not significant around the month-end, the coefficients of the first dummy variable (TOM) experienced an adjustment by additional independent variables when we trace back to Table 4. To some extent, the slight adjustments in the first dummy variable illustrate the number of funds' holdings invoking the TOM pattern in New Zealand. The two sub-sample periods reveal a more significant adjustment about the coefficients of the first dummy variable (TOM) when the new independent variable (logarithm value of funds' holdings) is added. In Panel B (before the recession in 2008), the coefficients of TOM adjust from 0.0009 (NZX 50 stocks), 0.0006 (all NZ stocks) and -0.0001 (non-NZX 50 stocks) in Table 4 to 0.0008 (NZX 50 stocks), 0.0008 (all NZ stocks) and 0.0001 (non-NZX 50 stocks) in Table 5. In Panel C (after the recession in 2008), the coefficients of TOM adjust from 0.0006 (NZX 50 stocks), 0.0005 (all NZ stocks) and -0.0003 (non-NZX 50 stocks) in Table 3 to 0.0005 (NZX 50 stocks), 0.0002 (all NZ stocks) and -0.0008 (non-NZX 50 stocks) in Table 5. The coefficients' modifications of the full sample period and two sub-sample periods indicate the number of funds which hold the stock in their portfolio is related to the TOM pattern in New Zealand.

Table 5

Variable	Panel A. Full sample period (2004.01-2017.06)						Panel B. Sub-sample period (2004.01-2008.12)						Panel C. Sub-sample period (2009.01-2017.06)					
	NZX50 stocks		All NZX stocks		non-NZX50 stocks		NZX50 stocks		All NZX stocks		non-NZX50 stocks		NZX50 stocks		All NZX stocks		non-NZX50 stocks	
Intercept	-0.0052 [-2.98]	***	-0.0060 [-3.29]	***	-0.0296 [-2.27]	**	-0.0151 [-3.10]	***	-0.0147 [-3.01]	***	-0.0396 [-1.71]	*	-0.0076 [-5.10]	***	-0.0088 [-5.38]	***	-0.0329 [-2.46]	**
TOM (Dummy 1)	0.0008 [2.83]	***	0.0006 [1.89]	*	-0.0005 [-0.27]		0.0008 [1.44]		0.0008 [1.44]		0.0001 [0.03]		0.0005 [1.46]		0.0002 [0.46]		-0.0008 [-0.35]	
Month of cash dividend (Dummy 2)	-0.0004 [-2.02]	**	-0.0005 [-2.23]	***	-0.0012 [-0.43]		-0.0010 [-1.42]		-0.0010 [-1.55]		0.0029 [0.69]		-0.0003 [-1.44]		-0.0004 [-1.60]		-0.0015 [-0.48]	
Logarithm (Number of funds)	-0.0002 [-2.04]	***	-0.0003 [-3.28]	***	-0.0007 [-0.46]		-0.0009 [-2.43]	**	-0.0009 [-2.49]	**	0.0532 [0.78]		-0.0001 [-1.24]		-0.0003 [-2.41]	**	-0.0005 [-0.34]	
TOM*logarithm (Number of funds)	-0.00003 [-0.34]		0.00003 [0.25]		-0.00042 [-0.22]		0.00052 [0.82]		0.00064 [1.03]		0.00810 [1.20]		0.00004 [0.31]		0.00014 [1.01]		-0.00062 [-0.30]	
Firm size	0.0016 [6.61]	***	0.0017 [6.51]	***	0.0070 [4.22]	***	0.0044 [4.72]	***	0.0043 [4.64]	***	0.0060 [1.02]		0.0017 [6.03]	***	0.0020 [6.43]	***	0.0076 [4.34]	***
Turnover	0.1947 [3.96]	***	0.1966 [3.92]	***	0.2331 [0.40]		0.2617 [2.79]	***	0.2561 [2.74]	***	-0.2279 [-0.21]		0.1726 [2.87]	***	0.1784 [2.90]	***	0.3204 [0.50]	

Table 5 (Continued)

	Panel A. Full sample period (2004.01-2017.06)			Panel B. Sub-sample period (2004.01-2008.12)			Panel C. Sub-sample period (2009.01-2017.06)		
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	168,848	206,302	37,454	63,223	82,072	18,849	105,625	124,230	18,605

Note: This table shows the regression with dummy variables. Panel A regresses the whole sample period; Panel B regresses the period of Pre-Global Financial Crisis; and Panel C shows the Post-Global Financial Crisis. Dependent variable is the daily excess returns of all NZX stocks, NZX 50 stocks and non-NZX 50 stocks. Dummy 1 describes the TOM period, which is equal to one when returns within the end-of-month [T-3, T+1], equal to zero otherwise. Dummy 2 describes the month of cash dividend, which is equal to one if a month when cash dividend payment due, equal to zero otherwise. Logarithm (Number of funds) is the logarithm value of the Number of funds which hold the stock in their portfolios. TOM*Logarithm (Number of funds) represents the logarithm value of the Number of funds within the end of the month [T-3, T+1]. Firm size is the logarithm of market capitalisation, and the turnover ratio is trading volume divided by number of shares outstanding. The underline number is the t-statistic test results under the null hypothesis (the intercept or beta are not different with zero). *, **, *** denotes statistical significance for a two-tailed t-test at the 10%, 5%, 1% level respectively.

Equation 6: $DER_{stock\ i,\ t} = \alpha + \beta_0\ INDEX_{i,\ t} + \beta_1\ Dum_1 + \beta_2\ Dum_2 + \beta_3\ Logarithm^{12}_{stock\ i,t} + \beta_4\ (TOM * Logarithm_{stock\ i,\ t})^{13} + \beta_5\ Firm\ size_{i,\ t} + \beta_6\ Turnover\ ratio_{i,\ t} + \varepsilon_{i,\ t}$

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[12] Logarithm value of number of funds which hold the stocks in their portfolio.
[13] Logarithm value of number of funds which hold the stocks in their portfolio during the end-of-month [T-3, T+1].

Based on the cash driving analysis, the last regression (Table 6) in this study adds the percentage of firm value held by all funds as the independent variable to test whether the firms are controlled by funds to enhance the excess return. The percentage of firm value held by funds within the TOM window reveals the relationship between the TOM pattern and stock manipulation. In the full sample period (Panel A), although the coefficients of percentage of firm value -0.0016 (t = -1.37), -0.0013 (t = -1.09) and 0.0081 (t = 1.01) are not significant, the percentage of firm value within the TOM period significantly relate to the excess returns, where the coefficients are -0.00404 (t = -2.65), -0.00446(t = -2.59) and -0.00752(t = -0.71). Tracing back to the coefficients of the first dummy variable in Table 4, there is an obvious modification. The value changed from 0.0008 (NZX 50 stocks), 0.0006 (all NZ stocks) and -0.0002 (non-NZX 50 stocks) in Table 4 to 0.0010 (NZX 50 stocks), 0.0009 (all NZ stocks) and -0.0003 (non-NZX 50 stocks) in Table 5. Additionally, the coefficients of the two sub-sample periods (before and after the recession in 2008) experienced a modification as well. The strong relationship between percentage of firm value held by funds and excess daily return and the coefficients adjustments on both full sample period and two sub-sample periods illustrate the new independent variable (percentage of firm value) stimulates the TOM pattern in New Zealand. In this research, we employ the percentage of firm value to test the window dressing and market manipulation hypotheses, which is not sufficient to support it. Further research is need to enrich the last two explanations.

Table 6

Variable	Panel A. Full sample period (2004.01-2017.06)						Panel B. Sub-sample period (2004.01-2008.12)						Panel C. Sub-sample period (2009.01-2017.06)					
	NZX50 stocks		All NZX stocks		non-NZX50 stocks		NZX50 stocks		All NZX stocks		non-NZX50 stocks		NZX50 stocks		All NZX stocks		non-NZX50 stocks	
Intercept	-0.0047	***	-0.0051	***	-0.0304	***	-0.0160	***	-0.0156	***	-0.0323		-0.0076	***	-0.0087	***	-0.0342	**
	[-2.78]		[-2.87]		[-2.34]		[-3.28]		[-3.19]		[-1.32]		[-5.16]		[-5.38]		[-2.56]	
TOM (Dummy 1)	0.0010	***	0.0009	***	-0.0003		0.0014	***	0.0014	***	0.0028		0.0009	***	0.0008	***	-0.0007	
	[5.79]		[5.08]		[-0.16]		[3.70]		[3.80]		[0.92]		[4.53]		[3.67]		[-0.39]	
Month of cash dividend (Dummy 2)	-0.0004	**	-0.0005	**	-0.0010		-0.0010		-0.0011		0.0015		-0.0003		-0.0004		-0.0012	
	[-1.97]		[-2.04]		[-0.34]		[-1.46]		[-1.59]		[0.36]		[-1.53]		[-1.52]		[-0.39]	
Percentage of firm value	-0.0016		-0.0013		0.0081		0.0008		0.0005		-0.0213		-0.0021	*	-0.0016		0.0106	
	[-1.37]		[-1.09]		[1.01]		[0.14]		[0.10]		[-0.84]		[-1.77]		[-1.25]		[1.22]	
TOM*Percentage of firm value	-0.00404	***	-0.00446	***	-0.00752		-0.01256		-0.00893		0.01222		-0.00305	*	-0.00345	*	-0.00675	
	[-2.65]		[-2.59]		[-0.71]		[-1.25]		[-0.92]		[0.35]		[-1.84]		[-1.88]		[-0.61]	
Firm size	0.0015	***	0.0015	***	0.0069	***	0.0044	***	0.0043	***	0.0047		0.0017	***	0.0019	***	0.0076	***
	[6.57]		[6.06]		[4.26]		[4.70]		[4.62]		[0.72]		[6.26]		[6.35]		[4.44]	
Turnover	0.1928	***	0.1944	***	0.1435		0.2605	***	0.2547	***	-0.4366		0.1724	***	0.1775	***	0.2994	
	[3.92]		[3.88]		[0.36]		[2.78]		[2.73]		[-0.39]		[2.87]		[2.88]		[0.46]	

Table 6 (Continued)

	Panel A. Full sample period (2004.01-2017.06)			Panel B. Sub-sample period (2004.01-2008.12)			Panel C. Sub-sample period (2009.01-2017.06)		
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	168,848	206,302	37,454	63,223	82,072	18,849	105,625	124,230	18,605

Note: This table shows the regression with dummy variables. Panel A regresses the whole sample period; Panel B regresses the period of Pre-Global Financial Crisis; and Panel C shows the Post-Global Financial Crisis. Dependent variable is the daily excess returns of all NZX stocks, NZX 50 stocks and non-NZX 50 stocks. Dummy 1 describes the TOM period, which is equal to one when returns within the end-of-month [T-3, T+1], equal to zero otherwise. Dummy 2 describes the month of cash dividend, which is equal to one if a month when cash dividend payment due, equal to zero otherwise. Percentage of firm value status the percentage of firm value hold by all the funds. TOM*Percentage of firm value represents the percentage of firm value held by all the funds within end-of-month [T-3, T+1]. Firm size is the logarithm of market capitalisation, and the turnover ratio is trading volume divided by number of shares outstanding. The underline number is the t-statistic test results under the null hypothesis (the intercept or beta are not different with zero). *, **, *** denotes statistical significance for a two-tailed t-test at the 10%, 5%, 1% level respectively.

Equation 7: $DER_{stock\ i,\ t} = \alpha + \beta_0\ INDEX_{i,\ t} + \beta_1\ Dum_1 + \beta_2\ Dum_2 + \beta_3\ Percentage^{14}_{stock\ i,\ t} + \beta_{4\ (}TOM * Percentage_{stock\ i,\ t})^{15} + \beta_5\ Firm\ size_{i,\ t} + \beta_6\ Turnover\ ratio_{i,\ t} + \varepsilon$

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[14] Percentage of firm value held by all the funds.
[15] Percentage of firm value held by all the funds during the end-of-month [T-3, T+1].

5. Conclusion

In this dissertation, we employ the daily data of S&P/NZX 50 index and all New Zealand stocks to investigate the TOM pattern.

Using the daily data of S&P/NZX 50 index and daily price of all New Zealand stocks from January 2004 to June 2017, we find evidence of the TOM effect in New Zealand: a significant positive return occurs on the last two trading days. In detail, the decile-related analysis illustrates the stocks with large market value have a more significant TOM pattern, where the return reverse occurs on day T-3 and the positive returns continued for five days till T+2. Additionally, the TOM and ROM comparison for the NZX 50 index, all NZ stocks and non-NZX 50 stocks shows positive return contributions of the TOM period in monthly return and negative return contributions of ROM period in monthly return.

To address the reasons of this return anomaly, we use the funds data as the further independent variables. Based on the four regressions with dummy variables and independent variables, empirical results provided some explanations of the TOM effect for the New Zealand stock market. Firstly, when we add the cash payment due date as the control variable, the returns of the TOM period still remain the same value, which excludes cash driving partly contributing to the TOM effect. Secondly, we include the funds data into our regression attempt to analyse the relationship between institutional investors and the TOM effect. When we add the number of funds which hold stocks in their portfolio as the independent variable, the results show a negative effect in the TOM's return. And when we add the percentage of firm value held by funds as the independent variable, we obverse a positive effect in TOM's return. The results of these two regressions indicate the TOM effect has a strong relationship with the trading activities of funds that contain the stocks in their portfolio, and we find that they are related to the TOM pattern. In addition, the result of the robustness test shows the TOM effect before the Global Financial Crisis in 2008 is more significant than in recent years.

Our results contribute to the literature by recognising the TOM return anomaly in the New Zealand stock market. In addition, our findings exclude cash driving as the cause, and provide evidence regarding trading activities of funds. Due to the insufficient data, the explanations of window dressing and market manipulation dose not proven thoroughly. More research is needed to provide more details about how the trading activities of institutional investors stimulate the TOM effect in New Zealand.

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