Turn of the Month Effect in the New Zealand Stock Market[†]

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Abstract:

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. This Turn of the Month effect is robust to various stock characteristics, such as the size of the company and the trading activity of the stock, after controlling for year- and firm-level fixed effects and is robust over time, i.e. before and after the Global Financial Crisis. We examine various explanations for the Turn of the Month effect, such as dividend payments, window dressing and price pressures, but none of these explain the observed Turn of the Month effect. Hence, this effect remains a market anomaly that can potentially be exploited in a trading strategy.

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1. Introduction

Since the early days of financial markets, people have been trying to identify patterns in stock prices that can be used for profitable trading strategies.[1] However, it was not until the introduction of the Efficient Markets Hypothesis (Fama, 1970) that a clear benchmark was set for academics to assess whether patterns would be classified as normal (i.e. consistent with the Efficient Market Hypothesis) or abnormal behavior. Hence following the introduction of the Efficient Market Hypothesis, many academics have tried to refute it by providing evidence against it. One line of research that aims to do this is the literature on market anomalies. These market anomalies are patterns or observations that are hard to reconcile with the notion of efficient markets and whose existence is hard to explain.

Prior literature has documented many types of anomalies around the world. Among these is a group defined as calendar anomalies, e.g. the January Effect, Day of the Week Effect, and the pre-Holiday Effect. While many of these anomalies have received considerable attention, one of these calendar anomalies, referred to as the Turn of the Month Effect, has received relatively little attention. The Turn of the Month effect was first documented by Ariel (1987), who showed that stock returns differ for the first and second half of the month. Since then, several studies have confirmed this anomaly in the US and various international markets. However, very little is known about the Turn of the Month anomaly in the NZ stock market. Hence, this paper aims to fill this gap by being the first comprehensive study on the Turn of the Month effect in New Zealand.

[1]One of the earlier rigorous efforts was by Charles Dow (1857-1902), whose Dow theory lay the foundation for technical analysis.

In this paper, we examine the Turn of the Month effect in the NZ stock market. In line with other international studies, we document 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, and this effect is prevalent among all stocks in the market. The anomaly could potentially be exploited in a trading strategy. For instance, when we consider a strategy that invests in the NZX50 for the last three days of the month and in the risk-free rate during the other days, we find that it has a far superior risk-return trade-off (a return of 9.68% p.a. with a standard deviation of 3.82%) compared with a trading strategy that takes the reverse position (a return of 2.54% p.a. with a standard deviation of 10.42%).[2] We further find that the Turn of the Month effect is robust to various stock characteristics, such as size of the company and trading activity of the stock, and is remains after controlling for year- and firm-level fixed effects. Hence, the Turn of the Month effect is not driven by firm characteristics. We also show that the Turn of the Month effect is robust over time by splitting the sample around the Global Financial Crisis.

The existing literature has offered several arguments to explain the existence of the Turn of the Month effect, and most of these are related to a pattern in cash flow in and out of the stock market. The first argument is that companies may time their distributions (dividend payments) towards the end of the month, and if this is the case, then these dividend payments (money that to a large extent would be reinvested in the stock market) can cause a monthly cyclical pattern. Another argument is based on window dressing of mutual funds, who near the end of the month may need to disclose their holdings, and in an effort to hide their actual trading strategy may trade more actively towards the end of the month. Finally, because of a regularity in payment systems, where e.g. salaries and other distributions are timed towards the end of the calendar

[2]Admittedly, transaction costs would reduce profitability of the strategy, but it could be exploited by investment funds by timing share purchases and sales keeping this pattern in mind.

month, one could expect a positive cash flow into the stock market towards the end of the month. Hence there could be a positive price pressure in financial markets that can cause positive stock returns towards the end of the month. We assess the degree to which these three arguments can explain the Turn of the Month effect in New Zealand, and find that none of these explain it. Hence, the Turn of the Month effect in New Zealand remains an anomaly.

The remainder of this paper is organized as follows. In Section 2, we discuss some of the existing literature on the Turn of Month effect, and provide a detailed discussion on the arguments put forth to explain the Turn of the Month effect. In Section 3, we discuss the data we employ in this study. Section 4 presents the results documenting the existence of the Turn of the Month effect, and provides tests for the various arguments that may explain the Turn of the Month effect. Finally, in Section 5 we conclude.

2. Literature Review

In this section, we provide some background information on the Turn of the Month anomaly. We start by discussing some literature on the Turn of the Month effect, and show that little research has been done documenting this effect exists for the New Zealand market. Subsequently, we discuss some potential explanations that have been raised in the literature for the Turn of the Month effect. These explanations motivate the empirical tests we conduct in the remainder of the paper.

2.1. Turn of the Month Effect

Since the early days of empirical finance research, various market anomalies have been documented. Some of these anomalies relate to so-called calendar time anomalies, which relate

to systematic patterns in stock returns that recur over regular time intervals. Some of the most widely known calendar time anomalies are the January effect (Rozeff and Kinney, 1976; Keim, 1983; and Gultekin and Gultekin, 1983), i.e. the observation that returns in January tend to be higher than in other months of the year, and the day-of-the-week effect (Cross, 1973; French, 1980; Gibbons and Hess, 1981), i.e. returns tend to be depressed on Mondays. There are a few other calendar time anomalies that have been persistently documented as well. The holiday effect (e.g. Lakonishok and Schmidt, 1988; and Ariel, 1990) is the anomaly where stock returns tend to have abnormally large returns prior to holidays, while the Halloween effect is the anomaly where stock returns are substantially lower during summer months (May through October) than during winter months (November through April) (see e.g. Bouman and Jacobsen, 2002). These studies document strong evidence of persistent seasonal patterns in stock returns over substantial periods of time, and, in several cases these patterns are hard to explain by rational arguments or attributable to data mining.

A calendar time anomaly that has received less attention is the Turn of the Month effect. The first study to document the Turn of the Month effect is Ariel (1987) who shows that returns on days immediately before and during the first half of the month are positive, on average, while returns during the second half of the calendar month are indistinguishable from zero. Since Ariel (1987), several other studies have confirmed the existence of the Turn of the Month effect both in the US and international markets. For instance, Laskonishok and Smidt (1988) focus on the Dow Jones Industrial Average (DJIA) from 1897 to 1986 and find that the mean daily returns of the four-day period (from the last trading day of the month to the first three trading days of the next month) significantly exceed the average monthly return. Jaffe and Westerfield (1989) are the first to provide international evidence on the Turn of the Month effect and consider four stock markets (Australia, Canada, Japan and the United Kingdom). They find

only weak evidence on the existence of a Turn of the Month effect in international markets, with only Japan displaying a significant Turn of the Month effect. This evidence on the presence of the Turn of the Month effect in Japan was later confirmed by Ziemba (1991). Other studies also document evidence of the existence of the Turn of the Month anomaly in international markets. For instance, Barone (1990) finds evidence for a Turn of the Month effect in the Italian stock market, showing that returns on the 30th and 31st calendar day of the month are noticeably higher. Recently, Kayacetin and Lekpek (2016) examined the Turkish equity market and find strong evidence of a Turn of the Month effect from days T-1 to T+2 (T being the turn of the month).

Several more recent studies have adopted the approach of targeting a large group of international markets to find evidence for the Turn of the Month anomaly. Kunkel, Compton, and Beyer (2003) focus on a sample of 19 countries and find a clear Turn of the Month effect with significant positive return clusters in the period T-1 to T+3 in Europe, North America, South Africa and the Far East. McConnell and Xu (2008) examine 34 countries and find a Turn of the Month effect for the T-1 to T+3 period in every country except Colombia (their sample includes New Zealand). Most recently, Etula et al. (2016) document that the Turn of the Month effect occurs at different times of the month, and attribute this difference to the length of the settlement period in the respective market (i.e. markets with shorter settlement periods usually observe the Turn of the Month effect later in the month). They also include New Zealand in their sample.

Overall, several studies have documented a significant Turn of the Month effect in various markets around the world. However, the Turn of the Month effect has received considerably less attention than other calendar anomalies. The evidence of the Turn of the Month effect in

New Zealand is also very limited. In addition, there seems to be little consensus in the literature on when exactly the Turn of the Month effect manifests itself. Hence, this paper fills this gap by providing a comprehensive analysis of the Turn of the Month effect in the New Zealand stock market.

2.2. Potential Explanations for the Turn of the Month Effect

In the previous subsection, we discussed various empirical studies that have documented the Turn of the Month effect. Although no study has provided conclusive evidence for why the Turn of the Month effect is observed, this subsection discusses some potential explanations that have been provided by the literature.

The first argument that can explain the Turn of the Month effect is based on the systematic capital flow in and out of the stock market, which can result in a temporary price pressure. One example of these potential price pressures arises from the monthly cycle of income distributions to individuals. As Ogden (1990) points out, standardization of payment systems results in a habit for lenders to make payments on the last business day of the calendar month, which can result in a concentrated flow of funds into the stock market around the end of the month. Indeed, many individuals receive salary, dividends or other income towards the end of the month. Some of these distributions will be invested in the stock market, resulting in a price pressure around the turn of the month. For instance, Barone (1990) and Ziemba (1991) argue that payment of salaries increases stock demand around the turn of the month. Dzhabarov and Ziemba (2010) likewise argue that in the US, many funds are transferred into assets on day -1 of the month (salaries and debt payments). As investment companies need to invest these funds into the market, there is a positive capital inflow to the market around the turn of the month.

The second potential explanation for the Turn of the Month effect is based on window dressing (i.e. funds may alter their investment portfolio at times when they need to disclose their holding to investors). The end of the month is a period when funds may be required to disclose their holdings. Thus, funds may increase their trading activity around the end of the month, which could contribute to the Turn of the Month effect. Indeed, Lakonishok and Smidt (1988) argue that institutional investors tend to sell poorly performing stocks and buy well performing stocks around the turn of the month. Barone (1990) also raised the portfolio-rebalancing hypothesis, where due to the pressure of publishing their performance results, institutional investors increase their trading frequency towards the end of the month to boost their portfolio returns or investment performance. Ziemba (1991) also suggests that window dressing occurs one day before month end.

Another possible explanation for the Turn of the Month effect is also related to activities of institutional investors. Etula et al. (2016) argue that institutional investors need to sell assets in advance of making cash distributions to investors that are timed at the end of the month. Since most markets have a T+3 settlement period (i.e. the purchase of an asset will financially be settled 3 days after the transaction), an institutional investor needs to sell at the latest four days prior to the end of the month, to make a cash distribution at the start of the new month. They argue that the selling pressure up to four days prior to the turn of the month can explain a positive return just prior to the turn of the month (as the selling pressure disappears four days before the end of the month).

The above mentioned arguments provide some potential explanations for why the Turn of the Month effect may exist. While it is not the aim of this paper to find a definitive explanation for the Turn of the Month effect, we do consider whether the above mentioned arguments can

explain the Turn of the Month effect in New Zealand. Specifically, to assess whether the Turn of the Month effect can be attributed to dividend payment, we conduct our analysis for time series based on both total returns (including dividend distributions) and capital gains (without dividends). To assess whether the Turn of the Month effect is related to window dressing, we consider institutional fund holdings, and assess whether the Turn of the Month effect is larger when the stock is held more by mutual funds. Finally, to assess whether the Turn of the Month effect is driven by institutional trading activity, we examine whether order imbalance (net buying minus selling in stocks) can explain the Turn of the Month effect.

3. Data

In this section, we discuss the data employed in our study. We start by discussing the index- and stock-level data which are used to test the presence of the Turn of the Month effect. We then discuss the intraday data as well as the institutional holdings data used when constructing various market quality proxies. These proxies are employed to test possible explanations for the Turn of the Month effect as discussed in the previous section.

The sample period considered in this study is from 1 January 2001 to 31 July 2017, with a total of 4,166 trading days. We start by collecting data on the New Zealand stock market. Specifically, we collect index-level data for the NZX50, NZX All and the exchange traded fund tracking the NZX50 Portfolio Index (FNZ) from DataStream.[3] We use these series to construct daily returns of the NZ stock market. Apart from market data, we also collect daily stock price

[3]We obtain both total return (RI) and price indexes (PI). The difference between the two is that the RI assumes that dividends are re-invested whereas the PI does not.

data. We consider all stocks listed on the NZX over the sample period, covering a total of 188 stocks.

In addition to daily data, we also collect transaction-level data for all NZ-listed stocks from Thomson Reuters Tick History maintained by the Securities Industry Research of Asia Pacific. These data are used to compute bid-ask spreads and daily order imbalances which we use in the regression analysis to explain the Turn of the Month effect. Specifically, we collect transaction prices, volume and bid and ask quotes. We identify buyer- and seller-initiated trades using trade identification method of Lee and Ready (1991), by comparing trade price with the standing midquote. If trade price is higher (lower) than the midquote, the trade indicator takes a value of 1 (-1). For trades at the midquote, we use the so-called tick rule.[4] From these data, we can construct measures of daily order imbalance (the difference between buyer- and seller-initiated trades) to reflect buying/selling pressure in the market. We construct two measures of order imbalance, one based on the number of trades, i.e. trade order imbalance, and one based on traded volume, i.e. volume order imbalance. These variables are used to test whether trading pressure contributes to the Turn of the Month effect.

Finally, we also obtain information on institutional portfolio holdings from Morningstar. Specifically, we collect monthly holdings data that are disclosed by NZ actively managed funds. These data are available for the period September 2010 to February 2017. We focus on funds that have a NZ equity allocation, hence this includes NZ equity funds and balanced funds, and funds with international allocations but some proportion in NZ equities. We exclude funds of funds as their holdings are already considered through the underlying funds. In total, there

[4]If trade price is higher than the previous price, the trade indicator takes a value of 1. If trade price is lower than the previous price, the trade indicator takes a value of -1. If trade price equals the previous price, we assign a value of 0.

are 134 NZ funds that fulfill this criteria. We use this dataset to construct our institutional ownership proxies, such as the number of funds and percentage holdings. These variables are used to test our hypothesis on whether institutions play a role in the TOM effects.

4. Results

In this section, we present our results. We start by documenting evidence of the Turn of the Month effect in New Zealand using market-level data. We document that a trading strategy that invests in the market during the last three days of the month and is in the risk-free rate on other days performs substantially better than a reverse strategy that invest in the market on all days except the last three days of the month and in in the risk-free rate on the last 3 days of the month. We then turn to stock-level data and document the same phenomenon at the stock level. Finally, we use regression analysis to investigate potential drivers.

4.1 Market-Level Performance

We start our analysis by focusing on market-level data and examine the performance of a trading strategy that takes a position in the stock market during the last three days of the month and a position in the risk-free rate on other days. We refer to this strategy as the Turn of the Month (TOM) strategy. Specifically, our strategy can be expressed as follows,

$$R_t^{TOM} = w_t R_t^M + (1 - w_t) r_t^f, \quad (1)$$

where R_t^{TOM} is the return on the turn of the month strategy, R_t^M is the return on the market index, and r_t^f is the risk-free rate. The weight, w_t, is equal to one for the last three trading days

of the calendar month, and zero otherwise. For the market index, we consider the NZX50, NZXAll and the FNZ. For the risk-free rate we use the 90-day Bank Bill.

In Figure 1, we plot the cumulative returns of the TOM Strategy, along with the cumulative return on the market index and the strategy that reverses the TOM strategy (i.e. long in the market on all days except the turn of the month and in the risk-free rate during the last three days of the month – we refer to this as the Rest of the Month (ROM) strategy). All returns are based on total return indexes and thus reinvest dividends. As can be seen from this figure, the TOM strategy has the best performance over the sample period, and also has the lowest degree of price fluctuations. The buy-and-hold strategy in the market index also yields a positive return over the sample period, but comes with a substantially higher degree of price fluctuations compared with the TOM strategy. This is particularly observed in the period covering the Global Financial Crisis, which resulted in a substantial decline in the NZX50 index, but had virtually no effect on the performance of the TOM strategy. Figure 1 also plots the performance of the ROM strategy. As can be seen from the performance of the ROM strategy, being in the market on all days except the last three days of the month, results in a substantially lower performance than the TOM or buy-and-hold strategy. This suggests that the lion share of the market risk premium is earned on only three days of the calendar month. The ROM strategy also reveals that being in the market for all days except the last three days of the month results in taking on most of the market risk as the majority of the price fluctuations observed in the market index are present in the ROM strategy, not in the TOM strategy.

INSERT FIGURE 1 HERE

To more formally compare the performance of the TOM strategy, we report various performance statistics in Table 1. The top three rows of Panel A document the results for the three series plotted in Figure 1. In line with Figure 1, we observe that the TOM strategy has the highest overall performance of 9.68% p.a. compared with 8.87% of the NZX50 (Total Return Index) and 2.54% for the ROM strategy. Although the returns of the TOM strategy and the buy-and-hold return for the NZX50 index are quite similar, their risk levels (standard deviation) are quite different, 3.82% for the TOM strategy versus 11.10% for the NZX50. This results in a Sharpe Ratio that is substantially larger for the TOM strategy than for the NZX50 Index (1.30 versus 0.37), while the ROM strategy has a negative Sharpe Ratio suggesting that an investment in the risk-free security performs better than the ROM strategy. In addition to the TOM strategy having the highest level of return for the lowest level of risk, we also observe that the skewness of the TOM strategy is positive, while skewness for both the NZX50 and ROM strategy is negative, hence the TOM strategy not only comes with the best return-risk trade off, but also provides a positively-skewed return distribution. Finally, we observe that the TOM strategy also performs best in terms of Max Drawdown (the largest price drop observed during the sample period) and the percentage of days with positive returns.

INSERT TABLE 1 HERE

The statistics observed in the first three rows of Panel A provide strong evidence for the presence of the Turn of the Month anomaly in the New Zealand market. The first question we aim to address is whether the Turn of the Month anomaly is driven by dividend payments of firms. Specifically, if firms time their dividend payments towards the end of the calendar month, then we could expect to see more positive (total) returns on these days. To assess this explanation, we implement the same TOM strategy, but instead of using the total return index,

we focus on the strategies using the price index, which measures only capital gains. Since dividends are not reinvested in the price index, we would expect the Turn of the Month effect to disappear if it is driven by dividends. As can be seen from the next two rows in Panel A, the TOM strategy still has very strong performance characteristics versus the ROM strategy, with a Sharpe Ratio exceeding one, positive skewness and a low Max Drawdown and large percentage of days with positive returns. The ROM strategy, on the other hand, is a loss-making strategy if dividends are not considered, but carries virtually all of the market risk.

Another question we need to address is whether the Turn of the Month effect is only observed among the stocks in the NZX50 index or is present in the market as a whole. Panel B documents the results for the TOM strategy based on the NZX All share index. As can be seen, while the average return on the NZX All share index is larger than the TOM strategy, the TOM strategy still has superior performance characteristics in terms of Sharpe Ratio, Skewness, Max Drawdown, and percentage of days with positive returns. The ROM strategy performs slightly better in this larger universe of stocks, although its Sharpe Ratio is still negative. Again, when we consider whether dividends drive the Turn of the Month effect, we observe that the TOM strategy is still considerably better than the ROM strategy, suggesting that the Turn of the Month effect is not driven by a cyclicality in dividend payments.

Finally, we assess whether the TOM strategy is also present in the FNZ, the ETF that tracks the NZX50 Portfolio Index.[5] Panel C shows that we also find evidence of the Turn of the Month Effect in the FNZ, although the performance statistics for the FNZ are not as good as those for the NZX50 index. However, the fact that the TOM strategy yields superior performance

[5]We note that this analysis is based on FNZ data since its inception date on 15 December 2004, and thus covers a shorter time period. Hence, these statistics should not be compared with those based on the NZX50 and the NZX All share index.

statistics suggests that the Turn of the Month anomaly could be exploited by implementing a trading strategy in the FNZ.[6]

Figure 2 plots the daily returns of the stock market indexes and ETFs for the different days of the month. As can be seen across all figures, the returns during the TOM period (days T-3 to T-1) are highly positive. In contrast, the returns during the rest of the month follows no particular pattern. The behavior during the month-end period seems to be driven primarily by the NZX50 stocks (Figure 2b), whereas the non-NZX50 stocks show weaker trend (Figure 2c). Figure 2d further shows that the month-end positive returns are also observable for the FNZ. This finding again suggests that the TOM strategy is also implementable through the market-tracking ETF.

INSERT FIGURE 2 HERE

4.2.Trading activities around TOM and ROM windows

As documented in the previous section, there is strong evidence for the presence of the Turn of the Month anomaly in the New Zealand market. Hence, we focus our attention on the period close to the end of the month. Specifically, we follow Etula et al. (2016) and use [T-3, T-1] as the TOM period and the remaining days [T-23, T-4] as the ROM period. Table 2 reports various trading activity metrics around these periods. We report the average daily activity over the sample period 1 January 2001 to 31 July 2017. The t-statistic (in brackets) in the first and second column test the hypothesis that the average daily returns equal zero, while the t-statistic in the last column tests whether the difference between TOM and ROM equals to zero.

[6]However, for such a strategy to work we would need to account for trading costs (brokerage, bid-ask spread and market impact). The results we document in this study are before we factor in those costs.

INSERT TABLE 2 HERE

Panel A of Table 2 shows a significant TOM effect across all NZ stocks, stocks in the NZX50, stocks outside the NZX50, and the FNZ. Across all stocks, average daily returns are higher in the TOM period compared with the ROM period (the average daily returns for all stocks are 0.104% and 0.008%, respectively, and the difference of 0.096% is significant at the 1% level). This difference is more pronounced for the stocks in the NZX50 where the TOM effect is stronger at 0.121% per day. It is interesting to observe that the FNZ also exhibits a significant TOM effect similar to stocks of 0.125% per day.

Table 2 also provides the summary statistics of the trading characteristics of NZX stocks and the comparison between the TOM and ROM periods. The first variable, Turnover, (reported in Panel B) is calculated by dividing trading volume by total number of shares outstanding. Panel B shows that, in general, there are only small differences in turnover during the TOM and ROM periods, which is significant only in the all stock and the non-NZX50 stock universe. This suggests that for NZX50 stocks, trading activity is not materially different on the different days of the month.

In addition to turnover, we also use two variables to describe the order flow into the market. The first (%OIBT) is the difference in buyer- and seller-initiated trades divided by the total number trades (reported in Panel C) while the second (%OIBV) is the difference in buyer- and seller-initiated trading volume divided by the total volume (reported in Panel D). From both panels, we observe that there are significant differences in order flow during the TOM and ROM periods. However, the pattern we observe is the reverse of what is expected from a price

pressure argument. Specifically, the results show that, on average, more buying activity takes place during the ROM period than during the TOM period, and thus that the buying pressure is lower (and in several cases even negative) for the last few days of the month. This suggests that the Turn of the Month effect in the New Zealand market is not driven by a price pressure effect. To further justify this finding, we conduct formal assessments of the price pressure argument in the next section.

4.3 Explaining the TOM effect

4.3.1 Baseline Regression

In this section, we continue with a more formal analyses of what drives the Turn of the Month effect in the New Zealand stock market, and examine the three main arguments raised in Section 2: the dividend effect; window dressing; and price pressures. To test these three arguments, we first set up a baseline model to confirm the presence of the Turn of the Month effect. We then test the prior explanations by including different variables into the baseline regression model. For each of these analyses, we focus on NZX50 stocks as they exhibit the strongest TOM effect as suggested in Table 2.[7]

We start with a baseline model of the following form:

$$R_{i,t} = \alpha + \beta_0 TOM_{i,t} + \beta_1 Size_{i,t} + \beta_2 Turnover_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where $R_{i,t}$ is the daily excess stock return, $TOM_{i,t}$ is a dummy variable which equals to 1 if day t falls within the period [T-3,T-1] and 0 otherwise, $Size_{i,t}$ is the log of firm size on day t,

[7]We also conduct our analysis using all NZ listed stock and confirm that the results reported in this paper hold. These results are available upon request.

and $Turnover_{i,t}$ is the daily asset turnover (volume of shares divided by the number of shares outstanding).

INSERT TABLE 3 HERE

Panel A of Table 3 reports the regression results for the full sample period (January 2001-July 2017). The coefficient for the TOM dummy is positive and significant at 0.11% per day, confirming the previous result that the NZX50 stocks exhibit a significant TOM effect. It is also consistent with Etula et al. (2016) who find a positive TOM effect in the NZ stock market. In Panel B, we control for firm size, turnover, as well as year and firm fixed effects. Even after controlling for these variables, the coefficient for the TOM variable remains unchanged, suggesting that the TOM effect is independent of size and liquidity effects, and is not driven by specific years or companies in the sample. The regression alpha, however, becomes significantly negative after controlling for various market factors. This suggests that after controlling for firm characteristics, the average excess return on other days of the month are negative, on average. In Panels C and D, we split the sample into two sub-periods, before and after the Global Financial Crisis (GFC) to assess whether our results are robust over time. The results show that the TOM effect is present and of equal magnitude before and after the GFC.

4.3.2 Dividend Payments and the TOM effect

We first test whether the dividend hypothesis can help explain the TOM effect. As companies may concentrate their dividend payments at specific times during the month, the TOM effect may be driven by this cyclicality in income distributions. To test this hypothesis, we use a dummy variable for dividend payment and add it as an additional control variable to Equation (2) as follows:

$$R_{i,t} = \alpha + \beta_0 TOM_{i,t} + \beta_1 Size_{i,t} + \beta_2 Turnover_{i,t} + \beta_3 Div_{i,t} + \varepsilon_{i,t}, \quad (3)$$

where $Div_{i,t}$ is a dummy variable to describe the month when the dividend distribution is made to shareholders. Equation (4) allows us to test whether dividend payments drive the TOM effect. Specifically, if the TOM variable becomes insignificant, it suggests that the dividend payment hypothesis explains the upmarket performance around the turn of the month. The results of this regression are reported in Table 4.

INSERT TABLE 4 HERE

The first column of Table 4 shows the results for the full sample period. There are two main results from this panel. First, the coefficient for the cash dividend payment dummy variable is significantly negative (-0.08%), indicating that prices of stocks actually decline during the month when dividend distributions are made, consistent with the dividend distribution theory of Miller and Modigliani (1961). Second, the coefficient for the TOM effect remains positive and significant with a magnitude that is comparable to the one reported in Table 3, indicating that the TOM effect is not driven by dividend payments. We again split the sample into two sub-periods surrounding the GFC. We find that the results remain consistent during these two sub-periods. Based on this evidence, we rule out the cash dividend hypothesis as an explanation of TOM effect in the New Zealand stock market.

4.3.3 Window Dressing and the TOM effect

We next examine the second possible explanation based on window dressing. The window dressing hypothesis suggest that the TOM effect may be driven by the trading strategy of

mutual funds. The requirements to disclose performance statements to investors may cause institutional investors to adjust their portfolio holdings at month-end, i.e. selling off loser stocks and purchasing winners, or selling lesser known stocks while buying known stocks. This may contribute to the formation of the TOM pattern. To address this issue, we use institutional holdings data over the period September 2010 and February 2017 to construct two different explanatory variables. The first variable is the (log) the number of funds that hold the respective stock in their portfolio, $\#Funds_{i,t}$. The second variable is the percentage ownership held by institutions for the respective stock, $\%holdings_{i,t}$. If the window dressing hypothesis drives the TOM effect then we expect to observe a stronger TOM effect for stock held by more funds and stocks heavily owned by funds. The regressions are specified as follows:

$$R_{i,t} = \alpha + \beta_0 TOM_{i,t} + \beta_1 Size_{i,t} + \beta_2 Turnover_{i,t} + \beta_3 Div_{i,t} + \beta_4 \#Funds_{i,t} + \beta_5 TOM_{i,t} * \#Funds_{i,t} + \varepsilon_{i,t} \quad (4)$$

$$R_{i,t} = \alpha + \beta_0 TOM_{i,t} + \beta_1 Size_{i,t} + \beta_2 Turnover_{i,t} + \beta_3 Div_{i,t} + \beta_4 \%Holdings_{i,t} + \beta_5 TOM_{i,t} * \%Holdings_{i,t} + \varepsilon_{i,t} \quad (5)$$

Equations (4) and (5) assess whether the larger proportion of firm value held by institutions leads to window dressing and market manipulation, and coefficients β_4 and β_5 indicate whether such relation exists between fund holdings and excess returns. We report the results in Panel A of Table 5.

INSERT TABLE 5 HERE

The first column of Panel A shows the regression results of Equation (4) on how funds' holdings affect the TOM pattern. The coefficient estimate for the number of funds holding the stock is negative but insignificant. However, its interaction with the TOM dummy variable is positive and marginally significant, indicating that the TOM effect is amplified when a stock is hold by more funds. This suggests that there is some evidence in support of the window dressing hypothesis. The second column of Panel A shows the results of Equation (5). The coefficient estimates for $\%Holdings$ and its interaction with TOM dummy variable are insignificant, suggesting that the proportion of stock ownership held by institutions does very little in explaining stock returns as well as the TOM effect. Hence, overall we find only very limited evidence in support of the window dressing hypothesis.

4.3.3 Price Pressures and the TOM effect

We further assess whether price pressures can explain the TOM effect. We do this by examining whether intraday trading activity can explain the TOM effect. Specifically, we explore whether there are more investors buying than selling stocks around the end of the month, and whether this pressure results in increased prices and positive returns. To this end, we use two variables to describe market liquidity, one for the percentage order imbalance in trades (total number of buys minus sells, divided by the total number of trades) and another for order imbalance in trading volume (total volume purchased minus total volume sold, divided by the total volume traded).

To test the effect of price pressure on the TOM effect, we add the measures of trading activity and their interactions with the TOM dummy to our regression equations, i.e.,

$$R_{i,t} = \alpha + \beta_0 TOM_{i,t} + \beta_1 Size_{i,t} + \beta_2 Turnover_{i,t} + \beta_3 Div_{i,t} + \beta_4 OIBT_{i,t} + \beta_5 TOM_{i,t} * OIBT_{i,t} + \varepsilon_{i,t}, \quad (6)$$

$$R_{i,t} = \alpha + \beta_0 TOM_{i,t} + \beta_1 Size_{i,t} + \beta_2 Turnover_{i,t} + \beta_3 Div_{i,t} + \beta_4 OIBV_{i,t} + \beta_5 TOM_{i,t} * OIBV_{i,t} + \varepsilon_{i,t,} \quad (7)$$

where $OIBT_{i,t}$ is the percentage order imbalance in trades, and $OIBV_{i,t}$ is the percentage order imbalance in volume. We report the results of the above regressions in Panel B of Table 5.

When we consider the order imbalance in trades, we observe that excess purchases relative to sales are associated with positive stock returns as expected. However, the interaction variable with the TOM dummy is insignificant, suggesting that order imbalance does not explain the Turn of the Month effect. The results for the order imbalance in volume are in line with this: on its own accord there is a positive relation between buying pressure and stock returns, but the interaction is insignificant. This again suggest that price pressure around the turn of the month does not explain the Turn of the Month effect.

6. Conclusion

In this paper, we examine the Turn of the Month effect in the NZ stock market. In line, with other international studies, we document 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, and this is prevalent among all stocks in the market. We further find that the Turn of the Month effect is robust to various stock characteristics, such as size of the company and trading activity of the stock, and is still observed after controlling for year and firm-level fixed effects. Hence,

the Turn of the Month effect is not driven by firm characteristics. We also show that the Turn of the Month effect is robust over time by splitting the sample around the Global Financial crisis.

We examine three potential explanations for the Turn of the Month effect, the dividend effect, window dressing, and price pressures, but find that none of these are satisfactory explanations. Hence, as in other markets, the Turn of the Month effect remains an anomaly in the New Zealand stock market, and hence can potentially be exploited in a trading strategy.

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Table 1. Performance of the Turn of the Month Trading Strategy

This table reports the returns of various Turn of the Month trading strategies. We report the average returns, standard deviation and Sharpe ratio (annualised). Also reported are the skewness of the returns series, the maximum loss possible from following the strategy (*Max Drawdown*), and the percentage of days with positive returns (*%positive*). The sample period is from 1 January 2001 to 31 July 2017.

Strategy	*Returns*	*Std. dev.*	*Sharpe*	*Skewness*	*Max Drawdown*	*%positive*
Panel A: NZX50						
Passive strategy	8.87%	11.10%	0.373	-0.590	-45.75%	55.42%
TOM strategy	9.68%	3.82%	1.297	0.680	-4.61%	95.15%
ROM strategy	2.54%	10.42%	-0.209	-0.640	-50.33%	60.27%
TOM strategy (no div)	8.68%	3.84%	1.031	0.486	-5.04%	94.82%
ROM strategy (no div)	-1.88%	10.43%	-0.633	-0.649	-53.67%	59.00%
Panel B: NZXAll						
Passive strategy	10.43%	10.39%	0.550	-0.584	-45.48%	55.69%
TOM strategy	9.27%	3.56%	1.276	0.794	-4.09%	95.20%
ROM strategy	4.41%	9.76%	-0.031	-0.632	-48.51%	60.49%
TOM strategy (no div)	8.18%	3.59%	0.964	0.523	-4.53%	94.79%
ROM strategy (no div)	-0.14%	9.79%	-0.496	-0.641	-52.35%	59.12%
Panel C: FNZ						
Passive strategy	6.99%	16.93%	0.134	-0.008	-33.01%	43.15%
TOM strategy	7.66%	6.63%	0.444	1.487	-6.15%	92.40%
ROM strategy	2.44%	15.58%	-0.146	-0.073	-21.90%	50.76%
TOM strategy (no div)	5.15%	6.83%	0.063	1.062	-4.96%	91.99%
ROM strategy (no div)	3.78%	17.02%	-0.056	-0.016	-30.03%	41.55%

Table 2. Trading activities around TOM and ROM windows

This table reports various measures of market activity around the Turn of the Month (TOM) window [T-3, T-1] and the Rest of the Month (ROM) window [T-23, T-4] for the sample period 1 January 2001 to 31 July 2017. Turnover is computed as the average daily volume traded divided by the number of shares outstanding. %OIBT is calculated as the difference buyer- and seller-initiated trades divided by the total number trades. %OIBV is calculated as the difference buyer- and seller-initiated trading volume divided by the total volume. Figures in parenthesis are the t-statistics. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	TOM		ROM		TOM-ROM	
Panel A: Comparison of average daily returns around TOM windows						
All NZ stocks	0.104%***	[10.86]	0.008%**	[2.08]	0.096%***	[9.26]
NZX50 stocks	0.121%***	[12.11]	0.016%***	[3.91]	0.105%***	[9.75]
Non-NZX50 stocks	0.056%**	[2.43]	-0.017%*	[-1.69]	0.073%***	[2.91]
FNZ	0.125%**	[2.28]	0.000%	[-0.02]	0.125%**	[2.14]
Panel B: Comparison of average turnover around TOM windows						
All NZ stocks	0.115%***	[111.61]	0.118%***	[265.44]	-0.003%***	[-2.96]
NZX50 stocks	0.132%***	[102.12]	0.132%***	[244.95]	0.000%	[0.42]
Non-NZX50 stocks	0.068%***	[48.43]	0.071%***	[110.07]	-0.003%*	[-1.94]
FNZ	0.107%***	[16.26]	0.119%***	[38.93]	-0.012%	[-1.60]
Panel C: Comparison of average %OIBT around TOM windows						
All NZ stocks	-0.55%*	[-1.85]	0.59%***	[4.87]	-1.14%***	[-3.55]
NZX50 stocks	1.32%***	[4.26]	2.06%***	[16.45]	-0.74%**	[-2.21]
Non-NZX50 stocks	-5.71%***	[-8.09]	-4.30%***	[-13.72]	-1.41%*	[-1.82]
FNZ	5.47%*	[1.78]	6.50%***	[5.24]	-1.03%	[0.31]
Panel-D: Comparison of average %OIBV around TOM windows						
All NZ stocks	-0.0006%***	[-3.03]	0.0001%*	[1.73]	-0.0008%***	[-3.45]
NZX50 stocks	0.0001%	[0.26]	0.0008%***	[8.77]	-0.0007%***	[-2.93]
Non-NZX50 stocks	-0.0030%***	[-5.27]	-0.0020%***	[-9.33]	-0.0010%**	[-2.06]
FNZ	-0.0009%	[-0.55]	-0.0001%	[-0.19]	-0.0008%	[0.46]

Table 3. Multivariate Assessment of the TOM effect

This table reports the result of the panel regression of Equation (2). The dependent variable is the return on individual stocks that are constituents of the NZX50 index. *TOM* is a dummy variable which equals to 1 if returns fall during the end-of-month period [T-3, T-1] and zero otherwise. *Size* is the log(market capitalisation). *Turnover* is the Trading volume in shares divided by the number of shares outstanding. We control for year and firm-level fixed effects. We report t-statistics in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	Panel A: Jan 2001–Jul 2017	Panel B: Jan 2001-Jul 2017	Panel C: Jan 2001-Dec 2008	Panel D: Jan 2009-Jul 2017
Intercept	0.0002***	-0.0045***	-0.0096***	-0.0062***
	[3.91]	[-5.10]	[-7.03]	[-4.79]
TOM	0.0011***	0.0011***	0.0010***	0.0011***
	[9.75]	[9.78]	[5.51]	[8.17]
Size		0.0009***	0.00185***	0.0011***
		[7.71]	[7.31]	[5.68]
Turnover		0.2593***	0.3071***	0.2496***
		[9.38]	[7.54]	[6.02]
Year Effects	No	Yes	Yes	Yes
Firm Effects	No	Yes	Yes	Yes
# of observations	182,061	182,061	75,566	106,495
Adjusted R-squared	0.05%	0.32%	0.46%	0.32%

Table 4. Dividend payments and the TOM effect

This table reports the panel regression results for the impact of dividend payments on the TOM effect. The dependent variable is the return on individual stocks that are constituents of the NZX50 index. *TOM* is a dummy variable which equals to 1 if returns fall during the end-of-month period [T-3, T-1] and zero otherwise. *Size* is the log(market capitalisation). *Turnover* is the trading volume in shares divided by the number of shares outstanding. *Div* is a dummy variable which equals 1 for month with dividend payment and 0 otherwise. We control for year and firm-level fixed effects. We report t-statistics in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	Panel A: Jan 2001–Jul 2017	Panel B: Jan 2001-Dec 2008	Panel C: Jan 2009-Jul 2017
Intercept	-0.0043***	-0.0094***	-0.0059***
	[-4.89]	[-6.93]	[-4.60]
TOM	0.0011***	0.0010***	0.0011***
	[9.82]	[5.53]	[8.20]
Size	0.0009***	0.0018***	0.0011***
	[7.59]	[7.41]	[5.55]
Turnover	0.2598***	0.3079***	0.2501***
	[9.39]	[7.56]	[6.03]
Div	-0.0008***	-0.0009***	-0.0006***
	[-5.22]	[-3.66]	[-3.51]
Year Effects	Yes	Yes	Yes
Firm Effects	Yes	Yes	Yes
# of observations	182,061	75,566	106,495
Adjusted R-squared	0.34%	0.47%	0.33%

Table 5. Window Dressing, Price Pressures and the TOM effect

This table reports the panel regression results for the impact of institutional holdings to test the window dressing hypothesis (Panel A) and order imbalance to test the price pressure hypothesis (Panel B) on the TOM effect. The period considered is from September 2010 to February 2017 for Panel A and from January 2001 to July 2017 for Panel B. The dependent variable is the return on individual stocks that are constituents of the NZX50 index. *TOM* is a dummy variable which equals to 1 if returns fall during the end-of-month period [T-3, T-1] and zero otherwise. *Size* is the log(market capitalisation). *Turnover* is the trading volume in shares divided by the number of shares outstanding. *Div* is a dummy variable which equals 1 for month with dividend payment and 0 otherwise. *#Funds* is the number of funds holding the specific stock. *%Holdings* is the percentage ownership of institutions of the stock. *OIBT* is the percentage order imbalance in trades (buyer-initiated trades minus seller-initiated trades over total trades), whereas *OIBV* is the percentage order imbalance in volume (buyer-initiated volume minus seller-initiated volume over total volume). We control for year and firm-level fixed effects. We report t-statistics in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	Panel A: Sep 2010 – Feb 2017		Panel B: Jan 2001 – Jul 2017	
$Intercept$	-0.0075***	-0.0073***	-0.0046***	-0.0047***
	[-4.58]	[-4.69]	[-4.33]	[-4.41]
TOM	0.0007*	0.0013***	0.0011***	0.0011***
	[1.72]	[6.43]	[9.76]	[9.86]
$Size$	0.0013***	0.0013***	0.0009***	0.0009***
	[5.22]	[5.37]	[7.87]	[7.96]
$Turnover$	0.1945***	0.1948***	0.2371***	0.2388***
	[4.51]	[4.52]	[8.51]	[8.57]
Div	-0.00002	-0.00004	-0.0007***	-0.0007***
	[-0.12]	[-0.20]	[-4.66]	[-4.84]
$\#Funds$	-0.0001			
	[-0.69]			
$TOM * \#Funds$	0.0002*			
	[1.71]			
$\%Holdings$		-0.0015		
		[-1.45]		
$TOM * \%Holdings$		0.0018		
		[0.62]		
$OIBT$			0.0022***	
			[26.34]	
$TOM * OIBT$			0.0003	
			[1.42]	
$OIBV$				2.0916***
				[17.99]
$TOM * OIBV$				0.4471
				[1.61]
Year Effects	Yes	Yes	Yes	Yes
Firm Effects	Yes	Yes	Yes	Yes
# of observations	94,194	94,194	170,064	170,064
Adjusted R-squared	0.36%	0.36%	0.82%	0.58%

Figure 1. Stock index cumulative returns

This figure plots the cumulative returns of various trading strategies. *NZX50* is the strategy of investing in the market and holding the market portfolio. *TOM* is the strategy of investing in the market during the last three trading days of the month [T-3, T-1] and in the risk-free rate (NZ 90-day bank bill) on other days. *ROM* is the strategy of investing in the market during any day of the month (except for the last three trading days) and in the risk-free rate on the last three trading days.

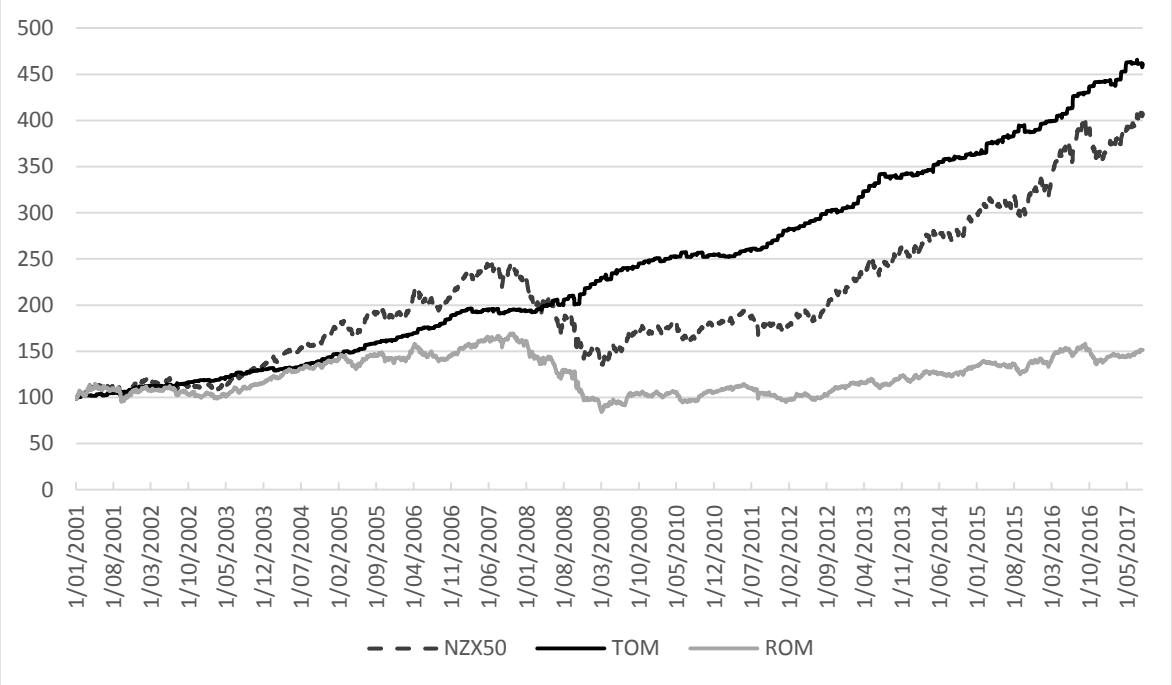

Figure 2. Daily Index Returns

The figures below plot the daily returns of the market indexes and the NZ stock market ETF. On the left axis is the average daily returns and on the bottom axis is the number of days prior to month end [T-23, T-1]. The sample period is from 1 January 2001 to 31 July 2017.

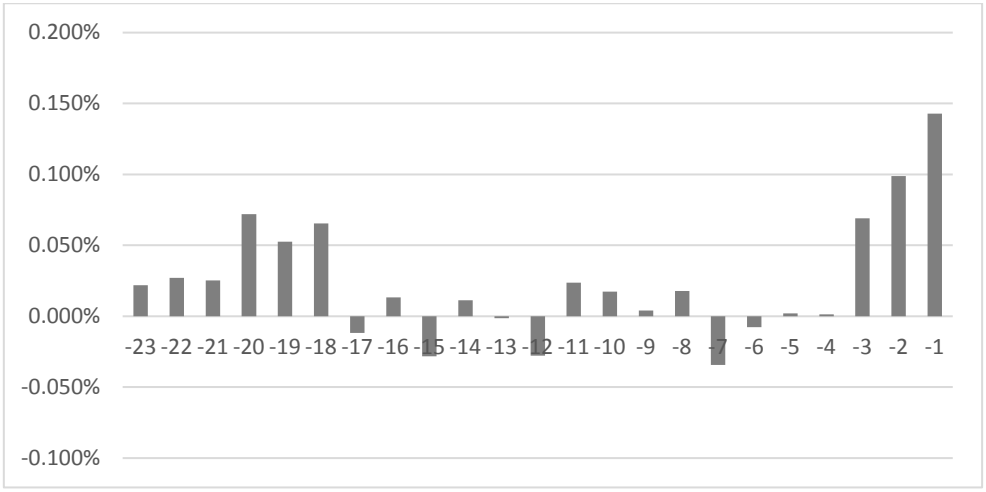

Figure 2a. NZXAll daily returns

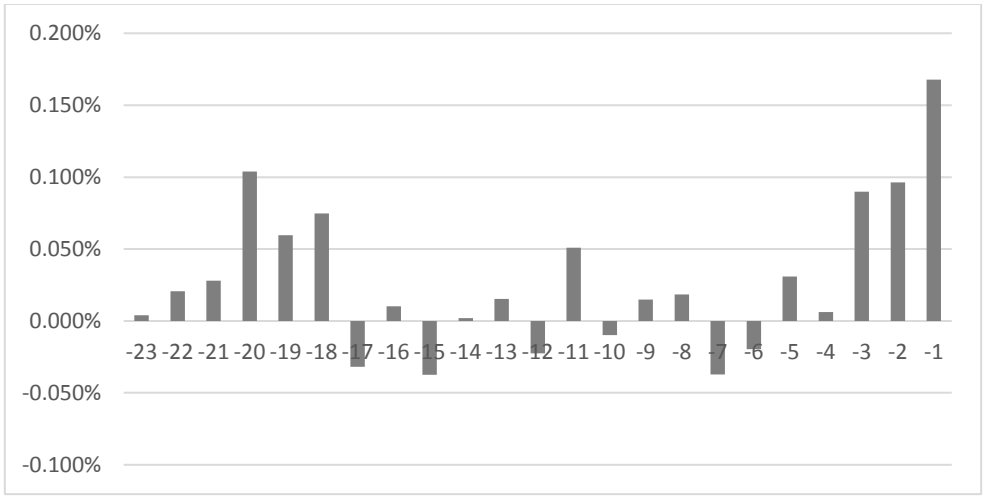

Figure 2b. NZX50 daily returns

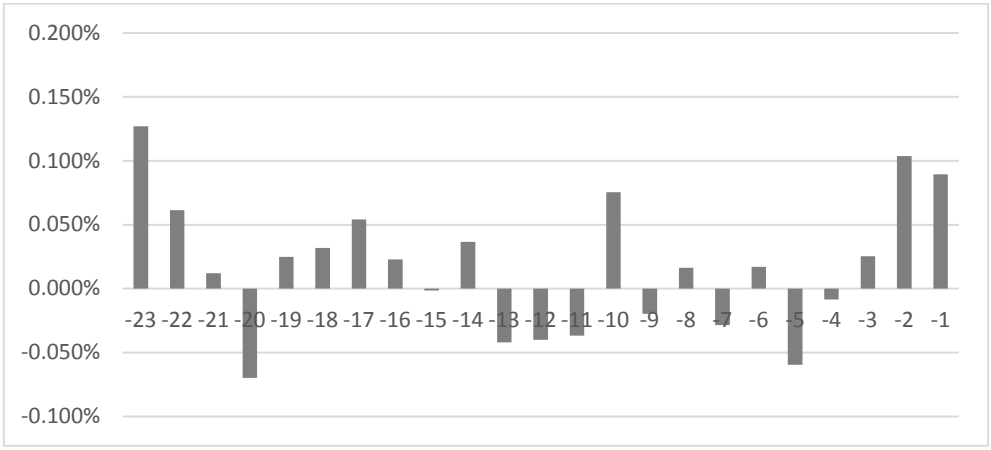

Figure 2c. Non-NZX50 daily returns

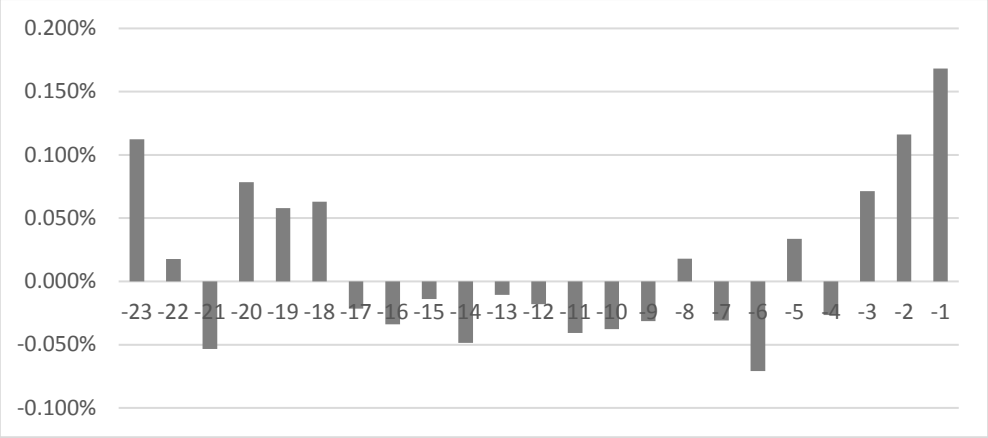

Figure 2d. FNZ daily returns