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DO MONTHLY ANOMALIES STILL EXIST AS A PROFITABLE INVESTMENT STRATEGY: EVIDENCE BASED ON THE SINGAPORE STOCK MARKET

Abstract

The presence of various calendar anomalies in the stock markets is a well-documented fact. We focus our efforts through this study to reveal any semi-monthly anomaly or turn of the month anomaly hidden in the Singapore stock market, by analysing the FTSE Strait Times data during the period 1995 to 2015, using both the calendar day approach and trading day approach. The resulting analysis discloses some startling findings including the presence of a 'reverse' turn of the month anomaly. Significant semi-monthly anomaly is not present in the market, even though the mean percentage returns during the first and second half show high relative difference. Based on these findings, a profitable trading strategy evolves which is to purchase shares representative of the index during the turn of the month and to sell them during the first half of the month. This study widens the path for further research regarding these and similar anomalies in related markets around the world.

JEL Classification Codes: **G00.**

Keywords: Semi-monthly anomaly, Reverse turn of the month anomaly, calendar days, trading days, global mean return.

Introduction

Anomalies in stock market have been a topic of interest and detailed study for both academicians and practitioners over the years. Various studies about time efficiency have revealed different anomalies like turn of the month effect, semi-monthly pattern, seasonality (eg: January effect, April effect) and day of the week

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effect, to name a few. The above anomalies, which are patterns formed based on past prices, can be used to predict future prices. The knowledge of anomalies is advantageous since it helps informed investors to make a profit without taking additional risk.

The earliest studies regarding anomalies were done by Tooke (1824) and Kemmerer (1911) (Bentzen, 2009). According to Pettengill (2003), the earliest research can be traced back to the 1920s. Among the various anomalies, semi-monthly patterns kindle profound interest among the investors. The most popular among the semi-monthly patterns was a discovery made by Ariel (1987). Based on the analysis of US stock market, he recognised that the returns during the first half of the month were considerably higher than the earnings during the second half. Calling this 'monthly effect', he specified that the returns of stock were considerably positive for the days during and immediately before the first half of the month and nearly equal to zero during the second half of the month. In continuation of this study, the stock market returns of Canada, UK, Australia and Japan were analysed by Jaffe and Westerfield(1989), but noticed 'monthly effect' only in the Australian bourses. Japan showed a reverse monthly effect whereas the anomaly was weak in Canada and UK. Barone's (1990) study of the Italian market also resulted in findings similar to the Japanese market, ie, reverse monthly effect, with higher returns in the second half of the calendar month than the first half. In his study of stock market anomalies on ten Asia Pacific countries, Yakob, Beal and Delpachitra (2005) found evidence for monthly anomalies in six countries apart from the five countries that demonstrated day-of-the-week effect.

Lakonishok and Smidt (1988) brought to limelight the anomaly 'turn of the month effect', based on their study of US stock markets. They distinguished that the average daily returns during the ending and beginning days of a month are considerably higher than the returns for the rest of the month. Cadsby and Ratner (1992) found similar results for the majority of countries among the nine countries they explored for the presence of turn of the month effect. Hensel and William (1996) found results in support of the turn of the month effect in their study on US bourses during the period 1928 to 1993. In their analysis of stock market indices of 19 countries, Kunkel, Compton and Beyer (2003) discerned that in 15 among the 19 countries, the mean return during the turn of the month accounted for 87% of the monthly return. Mc Connell and Xu (2008), who analysed the daily US returns for the 80 year period 1926-2005 demonstrated the existence of a strong turn of the month (TOM) effect during their period of study, especially during the period 1987-2005 and attributed the entire excess returns in a month to the 4-day turn of the month interval. Reschenhofer (2010) who analysed the daily returns on the S & P 500 index from 1952 to 2010, perceived a strong presence of turn of the month effect during a major part of his period of study.

Wachtel (1942) put forth the 'January effect' based on his discovery that the returns during the first month of the year were considerably higher than the rest of the year in the American stock market. It is also known as the 'turn of the year' effect. The findings with respect to the US market were substantiated by Ariel (1987), Bentzen (2009) and Dzhabarov and Ziemba (2010). Similar results were found in other markets like Australia (Officer, 1975); Japan (Kato & Schalheim, 1985; Aggarwal, Rao & Hiraki, 1990; Hamori, 2001); UK (Lewis, 1989); Canada (Tinic & West, 1987); Italy (Barone, 1990); Hong Kong, Korea, Malaysia, Singapore, Philippines (Ho, 1990); Israel (Lauterbach & Ungar, 1992); Taiwan (Mougoue, 1996); Greece (Mills, Siriopoulos, Markellos & Harizanis, 2000) and Ireland (Lucey & Whelan, 2004).

Empirical studies in the United States have pointed towards day of the week effects (weekend effects). Research based on the US market by Cross (1973), French (1980), Gibbons and Hess (1981), Keim and Stambaugh (1984), Smirlock and Starks(1986)and Choa, Lintonb and Whang (2007) have upheld the 'Monday effect' which is the occurrence of significantly negative returns in the stock markets on Mondays. The studies by Hindmarch, Jentsch and Drew (1984), Jaffe and Westerfield (1985), Chang, Pinegar and Ravichandran (1993), Tong (2000), Cai, Li and Qi (2006), and Lim, Ho and Dollery (2010) have also pointed to the presence of Monday effect in various international markets. On the contrary, many research works have reported a reversing or declining weekend effect. (Kamara, 1997; Chen & Singal 2003; Marquering, Nisser & Valla. 2006; Doyle & Chen, 2007; Liu & Li (2010) and Worthington, 2010).

Majority of the studies in the past, especially recent studies, regarding anomalies have focused on the developed markets in the West. The findings will be more relevant and authoritative, if similar results could be found in capital markets which are distant from the West such as a developed economy in South East Asia like Singapore. Meanwhile, recent studies focused on Singapore pertaining to semi-monthly anomalies and turn of the month anomalies are not evident. As a pioneering step towards further such studies, we focus our efforts on excavating monthly anomalies in the Singapore stock market.

1. Objectives

This study specifically aim at finding:

- Any significant difference between the average daily earnings for the first half of the month and the second half (semi-monthly effect)
- Any significant difference between the average daily returns during the turn of the month and the rest of the month (turn of the month effect).
- The study will also focus on suggesting the trading strategies based on the results of the above.

2. Sample data and Time period

The most popular index which truly represents the performance of the Singapore stock market is the FTSE Strait Times Index, which represents the largest and most liquid companies in the market. FTSE Strait Times Index daily values during the period 1st April 1995 to 31st March 2015 have been used for the study. Adjusted daily index prices, corrected for capital adjustment (ie, stock splits, stock dividends and rights) have been used. The data is collected from the website www.sg.finance.yahoo.com. The details regarding the index have been obtained from the website www.ftse.com. The original data has been cross-checked with similar data provided on www.sgx.com and www.google.com/finance.

Past research presents a conflicting picture regarding the days to be included in a month. Ariel (1987), Kunkel et al(2003), Cai et al(2006) and Reschenhofer (2010) have incorporated trading days in a month while Ushad (2010) and Liu and Li (2010) have taken into account calendar days alone in their study. In order to avoid a conflict in the approach and to reiterate the findings made using either method, the analysis of the presence of semi-monthly anomalies and turn of the month anomalies are done using both calendar days approach and trading days approach.

The daily market return in percentage is calculated as:

$$R_t = \ln (P_t / P_{t-1}) \cdot 100 \quad (1)$$

where P_t is the price of the index on the day *t*, and P_{t-1} is the price of the index on the previous day *t*-1.

Based on the study of Ariel (1987), the trading days are decided as shown in Table 1. Ariel (1987) defines the first half of the month as days -1 to +9 and the last half of the month as days -9 to-2, whereas trading days -1 to +4 exhaustively builds up the turn of the month.

Table 1. Trading days comprising the two halves of a month and turn of the month

Period	Abbreviation	Trading days
First half of month	FH	-1 to +9
Last half of month	LH	-9 to -2
Turn of the month	TOM	-1 to +4

Source: own.

3. Descriptive Statistics and Analysis using calendar month approach

Mean return and standard deviation (SD) for the 31 calendar days are shown in Table 2. The data available consists of returns only in which trading occurred and avoids holidays. The total no: of observations over the period 1995 to 2015

are 5043. The global mean return is -0.01007. The highest mean calendar day return is on the 14th calendar day. It shows a relative percentage increase of 2384% over the global mean return and positive also. A look at the histogram in Figure1, detailing the mean returns for the calendar days, reveals that the returns are generally high and positive during the first half of the month, especially during the days 6 to 14. Also the returns are highly negative during the end of the month and on the first day of the month. The data for the entire calendar month, taken as one, shows high variation also.

Table 2. Mean and SD of percentage returns and No: of observations for calendar days

Day	**1**	**2**	**3**	**4**	**5**	**6**
No of observations	143	161	170	168	172	166
Mean	-0.34	0.07	0.00	-0.14	0.02	0.17
SD	1.29	1.11	1.20	1.34	1.31	1.36
Day	**7**	**8**	**9**	**10**	**11**	**12**
No of observations	164	166	160	165	170	171
Mean	0.10	-0.04	0.13	-0.03	0.15	0.11
SD	1.30	1.30	1.59	1.39	1.20	1.34
Day	**13**	**14**	**15**	**16**	**17**	**18**
No of observations	168	167	164	168	170	168
Mean	-0.10	0.23	0.08	-0.09	0.02	-0.13
SD	1.32	1.51	1.46	1.23	1.17	1.43
Day	**19**	**20**	**21**	**22**	**23**	**24**
No of observations	168	168	164	166	168	167
Mean	0.08	-0.03	0.08	0.04	0.02	-0.03
SD	1.14	1.26	1.17	1.18	1.26	1.02
Day	**25**	**26**	**27**	**28**	**29**	**30**
No of observations	155	169	166	167	155	154
Mean	-0.11	-0.18	0.05	-0.02	-0.16	-0.18
SD	0.99	1.07	1.66	1.12	1.17	1.10
Day	**31**					
No of observations	95					
Mean	-0.25					
SD	1.49					

Global mean return is -0.01, which is the average of the mean returns of all the 31 days.
Source: own.

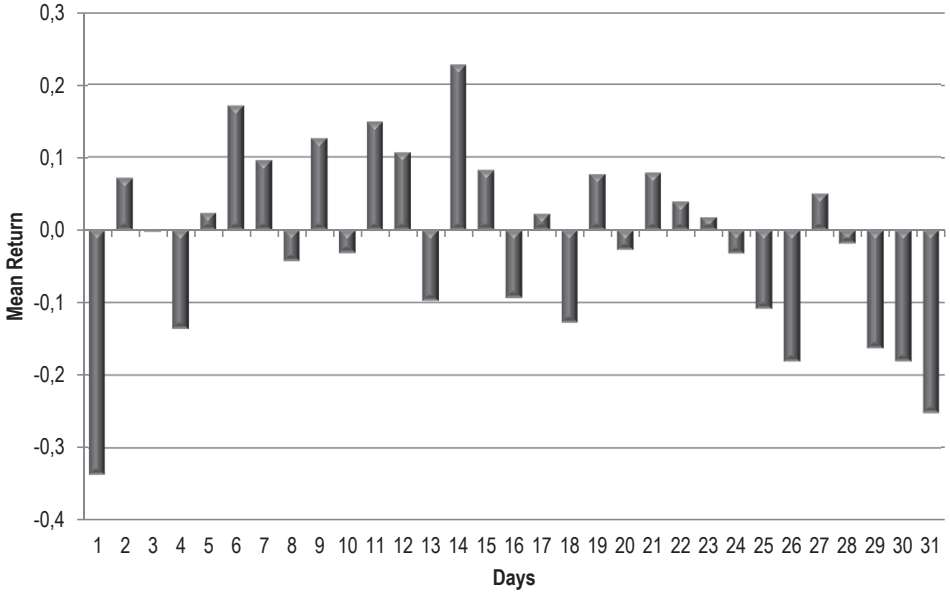

Figure 1. Mean of percentage returns in the calendar days of a month

Source: own.

4. Descriptive Statistics and Analysis using trading month approach

The data was also analysed using the concept of trading days put forward by Ariel (1987) to check for any monthly patterns in the Singapore market. Table 3 shows the mean percentage returns for the 9 trading days before and after the start of each month (-9 to-1 and 1 to 9). +1 is the first trading day of each month and -1 is the last trading day of the previous month. The trading days are limited to these 18 days in this study. Each daily percentage mean in the table is calculated from 238 observations.

The mean percentage returns are mostly negative during the trading days -1 to -9 in comparison to relatively positive data during the trading days 1 to 9. The data, as a whole, shows high variation, which is evident from the Figure 2. The absolute relative difference in percentage between the lowest and highest value is a grossly high figure of 12258%, which also supports the high variation in data. Just as in the calendar day approach, the returns are highly negative during the turn of the month.

Table 3. Mean and SD of percentage returns and No: of observations for trading days

Trading Days	Mean	Standard Deviation	No: of observations
-1	-0.20	1.57	238
-2	-0.13	1.05	238
-3	-0.09	1.14	238
-4	-0.01	1.19	238
-5	-0.03	1.03	238
-6	-0.06	1.18	238
-7	0.11	1.31	238
-8	-0.03	1.27	238
-9	-0.11	1.25	238
1	-0.18	1.26	238
2	0.04	1.18	238
3	-0.05	1.25	238
4	-0.02	1.30	238
5	0.17	1.41	238
6	0.00	1.40	238
7	0.10	1.48	238
8	0.00	1.32	238
9	0.12	1.19	238

Global Mean return is -0.022015 which is the average of the mean return of the trading days -9 to +9.
Source: own.

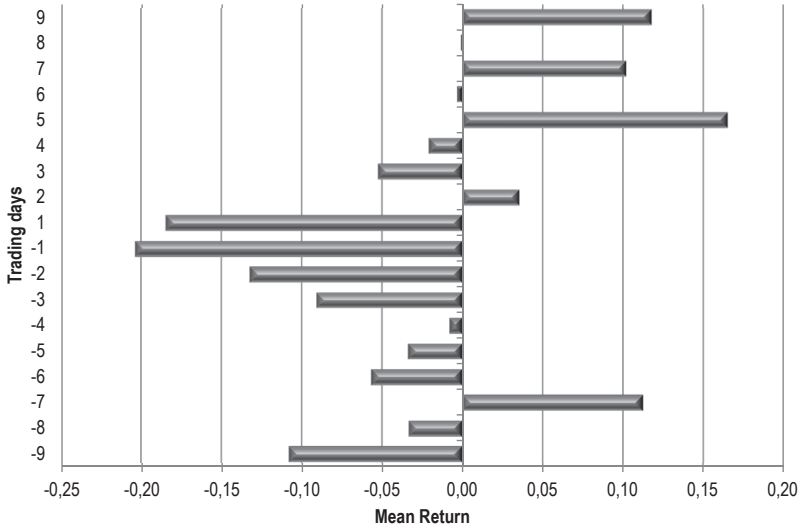

Figure 2. Mean of percentage returns in the trading days

Source: own.

4.1. Test of semi-monthly effect

4.1.1. Calendar Day approach

The semi-monthly effect is tested using both calendar and trading day returns. Null hypothesis for testing the semi-monthly effect in the calendar day approach is H_0: Mean daily returns for the first half of the calendar month is equal to the mean daily returns in the second half of the month.
H_a: Mean daily returns for the first half of the calendar month is not equal to the mean daily returns in the second half of the month.

T-test is used to test the hypothesis on the data, which comprises the first half returns and second half returns for a period of 20 years from 1995 to 2005. The result of the t-test, mean, standard deviation along with the no: of observations is shown in the Table4. The null hypothesis is not rejected based on the test at 5% level of significance. So the t-test ascertains that there is no significant difference between the average returns across the first half and the second half in the Singapore market during the period of study. So no monthly effect is present in this market, based on the calendar day approach.

Table 4. T-statistics at 5% significance level and related descriptive statistics for calendar days

Parameter	Average return across first half*	Average return across second half^
Mean	0.01	-0.03
Std.deviation	1.78	1.53
No: of observations	2560	2482
t-statistic	0.95	
t-critical at 5% significance level	1.96	
Result	Do not reject null hypothesis	

*First half means calendar days 30, 31 of previous month and days 1 to 14 of current month
^Second half means calendar days 15 to 29 of current month

Source: own.

Having stated the above, still the aspect needs to be considered that the relative difference between the mean returns in percentage between the first half and second half is as high as 136%. Also the mean returns during the second half are negative in contrast to the the positive mean returns during the first half. This warrants the need for further investigation by testing the hypothesis at a significance level of 10%. The results shown in the Table 5 also confirms the previous finding that no significant difference exists between the mean daily returns of the first half and second half in the calendar month.

Table 5. T-test results at 10% significance level in calendar day approach

t-statistic	0.95
t-critical at 10% significance level	1.65
Result	Do not reject null hypothesis

4.1.2. Trading day approach

The monthly effect is also analysed for the same period using the trading day approach. The null hypothesis is

H_0: Mean daily return for the first half of the trading month is equal to the mean daily return for the second half of the trading month

H_a: Mean daily return for the first half of the trading month is not equal to the mean daily return for the second half of the trading month

The result obtained on testing the hypothesis using t-test is given in Table6. The null hypothesis is not rejected at 5% level of significance. It means that there is no significant difference between the mean returns of first half and second half of each month. It echoes the findings made in the calendar day approach.

Table 6. T-statistics at 5% significance level and related descriptive statistics for trading days

Parameter	Average return across first half*	Average return across second half^
Mean	0.003	-0.04
Std.deviation	1.34	1.18
No: of observations	2379	1903
t-statistic	1.02	
t-critical at 5% significance level	1.96	
Result	Do not reject null hypothesis	

*First half means last trading day of previous month and days 1 to 9 of current month
^Second half means calendar days -9 to -2 trading days of current month

Source: own.

The absolute percentage relative difference between the mean returns during the first half and second half is high at 89.7%. But the returns are negative during both first half and second half. Even a t-test at 10% significance level, the results of which are shown in Table 7, supports the previous finding of no significant difference between the mean returns during both the halves.

Table 7. T-test results at 10% significance level in trading day approach

t-statistic	1.02
t-critical at 10% significance level	1.65
Result	Do not reject null hypothesis

Source: own.

Both the trading day approach and calendar day approach prove that there is no semi-monthly effect in the Singapore market during the 20 year period 1995 to 2015.

4.2. Test of Turn of the month effect

As mentioned in the introduction, various researches in different countries over the past have demonstrated the turn of the month effect. Added to this, a cursory glance at the tables 1 and 2 along with the respective histograms generates an insight that the mean returns during the start of the months along with the end of the previous months are considerably different from the mean return on the other days of the month. The returns on calendar days 30, 31 and 1 are the least. Based on the above observations, the possibility for turn of the month effect will be looked for, initially adopting the calendar day approach. In the calendar day approach, 30th and 31st days of the previous month and 1st and 2nd days of the current month collectively constitute the turn of the month whereas the days from 3 to 29 comprise the rest of the month.

4.2.1. Calendar Day approach

The null hypothesis will be
H_0: Mean daily return during the turn of the calendar month is equal to the mean daily return during the rest of the calendar month
H_a: Mean daily return during the turn of the calendar month is not equal to the mean daily return during the rest of the calendar month

The hypothesis is tested using the t-test. The results of the t-test along with the mean, standard deviation and no: of observations is detailed in the table 8. The mean return during the turn of the month is 107% relatively lower than the average return over the remaining days. The t-test also confirms this considerable difference in returns. The null hypothesis cannot be accepted, as per the result of the t-test. It substantiates that there exists a significant difference between the mean daily return during the turn of the month and the mean daily return during the rest of the month.

Table 8. T statistics and related descriptive statistics for calendar day approach (TOM)

Parameter	Average return on turn of the month*	Average return over remaining days^
Mean	-0.16	0.01
Std.deviation	1.23	1.29
No: of observations	552	4490
t-statistic	-3.06	
t-critical at 5% significance level	1.96	
Result	t stat<-tcritical;Do not accept null hypothesis	

Source: own.

4.2.2. Trading day approach

In accordance with the approach followed by Ariel(1987), the trading days from -1 to 4 build up the turn of the month and the days from -9 to -2 of the previous month added to the trading days 5 to 9 of the current month collectively build up the rest of the month. Similar to the histogram in the calendar day approach, the trading day bar chart in Figure 2 depicting the mean returns provide an insight that the returns during the turn of the month in the trading day approach are considerably lower than the returns for the rest of the month. So the data is analysed for turn of the month effect, for which, the null hypothesis is
H_0: Mean daily return during the turn of the trading month is equal to the mean daily return during the rest of the trading month
H_a: Mean daily return during the turn of the trading month is not equal to the mean daily return during the rest of the trading month

The findings using t-test are given in Table 9. Since t stat is less than t critical, the null hypothesis cannot be accepted. Thus the trading day approach also confirms the finding of the calendar day approach that there is significant difference between the mean daily returns during turn of the month in comparison to the mean daily returns for the rest of the month.

Table 9. T statistics and related descriptive statistics for trading day approach (TOM)

Parameter	Average return on turn of the month*	Average return over remaining days^
Mean	-0.09	0.002
Std.deviation	1.32	1.26
No: of observations	1189	3093
t-statistic	-1.97	
t-critical at 5% significance level	1.96	
Result	t stat<-t critical, Do not accept null hypothesis	

* Turn of the month means trading days -1 to 4
^ Remaining days means trading days 5 to 9 and -2 to -9 of current month

Source: own.

Both the approaches reinstate the presence of turn of the month effect in the Singapore stock market during the period 1995 to 2015. This turn of the month effect is unique to the extent that it can be termed 'reverse turn of the month effect' due to the inverse nature of returns demonstrated during the turn of the month, the returns during the turn of the month being lower than the rest of the month. Studies depicting reversal of return during the turn of the month is scarce, due to which supporting literature is not found.

5. Possible trading strategies

The purpose of the study was to determine the presence of semi-monthly effect or turn of the month effect in the Singapore market during the period 1995 to 2015. In order to confirm the findings made, the study was done using both calendar day and trading day approaches.

No significant difference was found between the mean daily returns in the first half and second half of the months. But turn of the month effect, even to the extent to be termed 'reverse', was very evident as proven by the hypothesis tests using both trading day and calendar day approaches.

In the calendar day approach, the mean return during the rest of the month is approximately 107% higher than the mean return during the turn of the month. The sole strategy which can be suggested would be to purchase the portfolio of stocks, representative of the index, during the turn of the month and sell it during the rest of the month. The profit generated can be further increased if the stock are sold during the first half of the month, considering the fact that the mean returns during the first half are higher by about 106% with respect to the second half. Even after taking into account the transaction costs in the Singapore market, this presents an opportunity to reap good returns in the short term. Another suggestion would be to avoid selling any shares during the turn of the month, to avoid any possible loss due to low share prices during the turn of the month. The absence of any monthly anomalies in the market limits the strategies to be pursued.

The relative difference in percentage for the mean returns between the rest of the month and the turn of the month is 102.5%, in the trading month approach. This fact also points to a similar strategy as in the calendar day approach where in, a portfolio of shares as in the FTSE Strait Times Index can be purchased at a low price during the trading days -1 to 4 and can be sold during the first half of the month (apart from the days comprising the turn of the month) to generate a profit, even after incurring the transaction costs. Similarly selling during turn of the month can be avoided to inhibit a loss.

The above strategies will be particularly suited for short term players, who can increment their current returns, by simply altering the timing of trade. Following

a strategy of limiting their purchase of stocks only to the turn of the month, be it calendar days or trading days, and selling it during the rest of the month will positively impact their portfolio returns. Stating this, it should also be noted that over an year the returns will be affected by myriad factors like economic fundamentals, political climate, natural calamities, economic shocks, to name a few. In the long term, the counterbalancing arbirtrage will eventually result in the disappearance of the anomaly and may lead to a more efficient market.

Conclusion

This study was aimed at detecting the existence of semi-monthly effect or turn of the month effect based on recent data regarding the Singapore market. To ascertain the results further and to avoid any scope for possible conflicts regarding the methodology used, the analysis was done using both calendar day approach and trading day approach. To avoid any short term influences on the data, Strait times Index data over a period of 20 years from 1995 to 2015 was used.

The tests produced some astonishing results. In contrast to the turn of the month effect which has been reported from many markets around the world (Giovanis, 2014; Yakob, Beal & Delpachitra, 2005), Singapore market produced a 'reverse' turn of the month effect. The mean returns during the turn of the month were highly negative and significantly different from the rest of the month. The resulting trading strategy suggested, purchasing a portfolio of shares representing the index during the turn of the month and selling it during the rest of the month painted a reverse picture to the strategies adopted in other markets. On the other hand, no semi-monthly anomaly was detected in the Singapore market during the period. In other words, the mean daily returns during the first half of the months are not significantly different from the mean daily returns in the second half of the months. Having said this, the absolute percentage relative difference between the mean returns during the first half and second half is around 136% in the calendar month approach and approximately 90% in the trading month approach. The returns in the first half being so higher than the returns in the second half opens wide the possibility for increasing the returns for a short term investor, adopting the strategy of purchasing the stocks during the turn of the month and selling it during the rest of the month, by limiting the sales of stocks only to the first half of the month, during which the index will be generally higher than the second half.

This study shows that anomalies do exist currently in the stock markets indicating that the markets are still far from efficient. This study, even though being current, but being limited only to the semi-monthly anomaly and turn of the month effect in the Singapore market alone, puts wide open the possibility for further studies, regarding these and other anomalies, in other markets worldwide.

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