Are Seasonal Anomalies Real or Illusion? Evidence from 10 Countries in Asian-Pacific Stock Markets

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Abstract

This research paper focuses on verification of seasonal anomalies in 10 countries from Asian-Pacific stock markets. Monthly and Daily returns data from 1994 to 2017 from 10 countries in Asia-Pacific area will be examined in this paper. The central questions of this paper is 1) Are seasonal anomalies observed in Asian-Pacific markets, 2) If so, are they diminishing over time and 3) If they are, is this phenomenon more apparent in developed markets than under-developed markets. The tested seasonal anomalies in this paper are as follows: January Effect, End-of-December Effect, Turn-of-the-month Effect, Weekend Effect and Post-School Holiday Effect. Empirical evidence shows most seasonal anomalies except January effect are still found in Asian-Pacific stock markets, but only two of them, Turn-of-the-month and Post-school holiday effect, present decreasing patterns. Finally, developed markets do not seem to have an explanatory power over the returns difference among countries.

1. Introduction

Stock pricing anomalies are deviations from normal returns during particular time periods that cannot be explained by standard asset pricing models. Since Sharpe (1964) firstly brought this issue to the academic field in his paper, lots of literatures have put their focus on discovering seasonal patterns of abnormal returns during 1970s and 1980s (Cross 1973; Ariel 1987; Lakonishok & Smidt 1988). Later, other researchers figured out the seasonal anomalies are not limited only in US stock market, but worldwide phenomenon (Agrawal & Tandon 1994; Cadsby & Ratner 1992). In 2000s, main focus of studying anomalies moved from finding and confirming anomalies in various stock markets in various time periods to finding out whether they persist over time after revelation. The results show a clear decrease of seasonal anomalies after being published as implied by Efficient Market Hypothesis (Kohers et al 2004; Nisser & Valla 2006).

Although seasonal anomalies have been an interesting issue which drag attention of investors seeking arbitrage chances, studies about seasonality are mostly limited to the western markets. Asian-Pacific countries have many of the world's largest stock markets and have relatively low correlation and little cultural similarity with US compared to other western countries. Moreover, unlike western markets where the level of economy in most countries is far above the average of the rest of the world, Asian-Pacific markets include both highly developed markets and under-developed markets. These unique characteristics of Asian-pacific markets allow researchers free from data snooping problem and to compare cross-sectional difference between developed and under-developed countries when studying the existence and cause of seasonal anomalies. Despite above advantages of studying Asian-Pacific markets, little focus has been put on them.

Thus, referring the mentioned literatures, this paper will shed light on Asian-Pacific markets. Especially, this paper assumes seasonal anomalies exist and fade away over time in Asia-Pacific markets and the decrease in seasonal anomalies is because of improved efficiency from developed markets. Therefore, the research questions will be as follows:

1) *Are seasonal anomalies observed in Asian-Pacific stock markets?*
2) *If they are, are they decreasing over time?*
3) *If they disappeared, is this phenomenon more apparent in developed markets compared to less developed market?*

The anomalies studied in this paper are respectively the Weekend effect, the January effect, the End-of-December effect, the Turn-of-the-Month effect and the Post-School Holiday effect. The main findings of this paper are that all the seasonal anomalies except for January effect exist and persist over time in Asian-Pacific market, and they do not show a diminishing pattern. Moreover, there is no significant difference between abnormal returns in developed and under-developed markets, which means developed market dummy cannot explain the seasonal anomalies.

In the following part in this paper, theoretical framework will be discussed first. Then, this paper explains the choice of data and methodology. Thirdly, the results with the possible explanations will be presented. Finally, it will provide a summary of the main findings and interpretations to give an answer to the research questions. Additionally, limitation and recommendations for further research will be given in the last part.

2. Theoretical Framework

In 70s and 80s, tens of papers verified various kinds of seasonal anomalies. One of the first detected anomalies is the weekend effect, where returns on Monday are abnormally negative relative to the rest of trading days (Cross 1973). There had been several attempts to give some fundamental explanation for these abnormal returns, but most of them failed to confirm their hypothesis (Agrawal 1994). Instead, behavioral explanations suggested by Sia and Stark (1995) and Foster and Viswanathan (1990) are accepted to be the most plausible reasons for weekend effect. Foster and Viswanathan found that investors get more informed, especially to unfavorable news, through their own research during the weekend and engage in selling-initiated transactions on Monday based on their private information about bad stocks. In addition, Sia and Stark figured out that institutional investors who take biggest role in the stock market barely trade on Monday, so that substantially decrease buy-side demand. Thus, combined behavioral effect of informed investors' selling initiated trading and less demand by institutional investors results in significantly low Monday returns.

Another well know seasonality is January effect researched by Rozeff and Kinney, which is significantly positive January returns compared to the other months (1976). This was later confirmed by Blume and Stambaugh (1983), Thaler (1985) and Lakonishok & Smidt (1988). Again, researchers focused on individual and institutional behaviors to explain this anomaly. The main explanations are tax-loss selling due to lack of liquidity at the end of the

year and parking the proceed in the following year, and window dressing by large firms (Jones et al 1987; Chen & Singal 2004; D'Mello et al 2003). Moreover, Haugen & Jorion (1996) demonstrated investor expectations have an influence on the January effect and this might be the cause of its persistence over time.

The End-of-December effect describes positive abnormal returns during the second half of December, especially from the last trading day before Christmas to New Year's Day. Lakonishok and Smidt first noticed that returns in the second half of December are significantly higher than the other months (1988). They mentioned that it might be a result of pre-holiday effect since there are two major holidays at the end of December yielding second half returns higher than normal returns. Another study suggests that January effect is shifting forward in time and moves into December effect (Antonides & Van der Sar 2003).

Ariel (1987) first mentioned about monthly regularities that positive rate of returns occurs in the stock market only during the first half of the month. Lakonishok and Smidt (1988) later reported that monthly regularities is actually the turn of the month effect where the higher returns are observed only for the days around the turn of the month, especially from the last trading day of the previous month and the first 3 days. Ogden (1990) showed that concentration of various kinds of payment at the end of the month increases investors' liquidity and trading, leading to higher stock market returns.

The most recently discovered anomaly is Post-School Holiday effect by Fang, Lin and Shao (2018). They found that the returns in month after major school holiday are significantly lower than the other months. This partially contributes to, but not limited to nor just a consequence of, September effect. They found the reason for this effect in institutional investors' inattention to the market during the school holiday. According to their explanation, institutional investors are less attentive to the market during the holiday. Since negative news require higher cost to get than positive news, incorporation of negative news is thus delayed to the end of school holiday, resulting in significantly negative returns in the month after major school holiday.

These anomalies are not limited to certain countries and time periods. Agrawal and Tandon (1994) found evidence for five seasonal patterns in stock markets of eighteen countries: the weekend, turn-of-the-month, end-of-December, monthly and Friday-the-thirteenth effects. Aggarwal and Rivoli (1989) confirmed strong January effect and weekend effect in four

emerging Asian markets: Hong Kong, Singapore, Malaysia and Philippines. Cadsby and Ratner (1992) examined turn-of-the-month and pre-holiday effect on international markets, and concluded the seasonal anomalies are not generated solely by US stock markets. All these results indicate seasonal patterns are prevalent worldwide during 1980s.

However, more recent papers report diminishing seasonal anomalies. The results by Kohers and V. Pandey (2004) show that anomalies were evident during the 1980s in vast majority of the developed countries but have faded away in 1990s. They conclude the long run improvement in market efficiency may have diminished seasonal effects in recent years. Supporting this view, Nisser and Valla (2006) observed most of anomalies are decreasing in time after the academic papers about them are published. They reckon this is because arbitrage seeking investors take advantage from the anomalies after being noticed of them as Efficient Market Hypothesis assumes. Moreover, Mehdian and Perry (2003) found a reversal in Monday effect for large=caps and persistence for small-caps. They explain institutional investors who have great impact on large-caps returns and superiority in the trading cost took advantage of seasonal arbitrage, and that is why Monday effect is faded only for large-caps.

In short, seasonal anomalies are worldwide phenomenon and they are mostly caused by investors' behaviors rather than fundamental factors. Empirical results show that seasonality have faded away by arbitrage-seeking traders since they are revealed, which support Efficient Market Hypothesis. Thus, in the same line with the mentioned literatures, this paper expects 1) significant seasonal anomalies will be found also in Asian-Pacific markets, 2) there has been a significant decrease in seasonality, and 3) this tendency is stronger in countries where well-organized financial market is established and developed enough to be aware of and arbitrage away these anomalies.

3. Data & Methodology

Total 2820 monthly and 57748 daily equity market returns at the country level from 10 Asia-Pacific countries are used in this paper, which are retrieved from Wharton Research Data Services (WRDS). The 10 countries are Australia, China, Hong Kong, Indonesia, India, Japan, Malaysia, Singapore, South Korea and Taiwan. The sample period is from July 1994 to December 2017. This is the maximum length of the sample period, since many emerging markets are incorporated in the world markets by 1994 so that data is limited for some countries in prior years.

5 out of 10 countries are classified as developed markets and the other 5 as emerging markets based on the classification made by FTSE, MSCI and S&P in 2017 (FTSE Russell, 2017; MSCI, 2017; S&P, 2017)[1]. Australia, Hong Kong, Japan, Singapore and South Korea are the developed markets and China, Indonesia, India, Malaysia and Taiwan are the emerging markets. In addition, sample period is divided into 3 sub-periods, which are from July 1994 to December 2000, from January 2001 to December 2010 and from January 2011 to December 2017. The three sub-periods are selected to capture the long run price effects for each decade.

This paper expects the above sorting would show the cross-sectional and time series difference in anomaly. Developed markets and emerging markets will catch the difference of financial environment such as efficiency of market institutions, ease of capital movement and openness to foreign capital, and how anomaly reacts to such differences. Likewise, dividing sample period into three sub-periods will represent how anomaly varies across each period along with technological development such as change in transaction method and following trading costs. For further cross-sectional and time-series analysis, therefore, it is necessary to see if there is any severe outlier or violation of assumptions.

[Table 1] Summary Statistics

	Obs	Mean	Std.Dev	Min	Max
Total	2,820	0.007978	0.0730694	-0.3224507	1.332574
Developed	1,410	0.0066158	0.0611701	-0.2937745	0.4911452
Emerging	1,410	0.0093402	0.083286	-0.3224507	1.332574

[Table 1] is summary statistics of the sample data. There seems no severe outlier. Both average and standard deviation of returns are higher in emerging markets than developed markets, which seems to be the result of higher risk of emerging markets reflected in the stock returns. It is also notable that the maximum return in emerging markets is much higher than developed markets while the difference between minimum values is relatively small.

The following linear regression model with dummy variables is used to find the

[1] "FTSE Russell announces results of FTSE annual country classification review". *FTSE Russell*. 2017-09-29. Retrieved 2017-10-18 *MSCI Global investable Market Indexes Methodology - October 2017*, p. 74 footnote #40 S&P Global Equity Indices Monthly Update, Oct. 31 2017, p 2.

seasonal anomalies. The dummy variable D_{Season} tests if there is any abnormal return in period around the selected seasons at 5% significance level and the interaction term $D_{Season} \times Developed$ captures the difference between developed and emerging markets. Panel regression controlling for Country and Year fixed effects are also examined for robustness test.

$$R_t = \alpha + \beta D_{Season} + \gamma D_{Season} \times Developed + \delta Developed$$

Where,

R_t = Monthly average returns at time t

D_{Season} = Dummy with value one for seasonality and zero otherwise (i.e. January, second half of December, Monday etc.)

$Developed$ = Dummy with value on for developed countries and zero for emerging countries

4. Results

4.1. Monthly Regularity

Before starting the analysis of monthly regularities, briefly looking at the monthly average returns and the returns difference among month will help to get an idea about seasonality. Monthly average returns of each country are given in [Table 2] below. The results show that only four out of 10 countries present positive January returns and the rest 6 countries show negative returns which is inconsistent with January effect. September returns are also assumed to be anomaly by some researches because of its abnormally lower returns compared to the other months, but here, we can observe that only five out of ten countries have negative September returns. It is also noticeable that August returns seem to be more unfavorable than September, which might be related to the end of major school holiday. As expected by December effect, there seems positive and relatively higher December returns in every country except for China. Although monthly average returns help to get an insight of seasonal pattern, it does not actually give valuable information about how each month's returns are different from the others. Thus, it is wise to see the returns difference across month as well.

[Table 2] Monthly average returns (in %)

Panel A. Developed Markets					
	Australia	**Hong Kong**	**Japan**	**Singapore**	**South Korea**
Jan	-0.37039	-1.76888	-0.64283	-0.00788	2.34713
Feb	1.16411	2.57153	0.29972	1.00168	-0.67542
Mar	1.39064	-0.8199	2.17179	-0.08824	2.08448
Apr	2.23565	2.85654	1.84915	2.35314	2.54782
May	-0.65868	0.66361	-0.74444	-0.28362	-1.00457
Jun	-0.00609	1.02455	1.0327	0.87655	0.14229
Jul	1.36689	2.1029	-0.45462	1.64929	1.39209
Aug	0.65839	-1.03259	-1.48174	-2.36574	-1.15363
Sep	0.2615	0.73827	-0.06772	-0.51566	-0.38437
Oct	1.19612	1.33742	-0.68883	0.85638	-0.40473
Nov	0.4522	1.47662	1.74282	1.1581	1.7779
Dec	2.0357	1.10445	1.38777	1.83684	2.24148
Panel B. Under-Developed Markets					
	China	**India**	**Indonesia**	**Malaysia**	**Taiwan**
Jan	-0.40936	-0.77215	2.63972	1.31167	01.03697
Feb	2.20921	1.63363	0.66557	2.80038	1.4225
Mar	2.96859	0.23191	1.79773	-0.08641	1.91756
Apr	4.06747	1.93693	3.04267	1.15935	0.34299
May	2.05686	1.4927	2.16813	0.13812	-0.30669
Jun	0.0185	0.83865	2.78793	-0.14469	0.40017
Jul	-0.63643	1.78582	1.43903	1.02492	0.89554
Aug	3.38747	1.53848	-4.76223	-2.21853	-0.58247
Sep	-0.06353	0.7048	0.06228	-0.2455	-1.95342
Oct	0.33985	-0.99998	0.03771	1.30093	-0.94374
Nov	1.13852	0.89408	0.9685	-0.07471	0.36722
Dec	-0.1569	4.19625	4.04827	2.26339	3.39166

[Table 3] examined how each month's returns deviate from the other months' average returns, and the results are not much different from the monthly average returns. Similar to earlier description, six out of ten countries exhibit lower returns in January relative to the other months, but they are mostly insignificant. Likewise, December has significantly higher returns than the other months in most of countries. The interest thing is that August presents significantly and abnormally negative returns compared to the other months, while September returns' difference is insignificant. As mentioned earlier, this might be because, unlike most countries in western world, major school holiday ends in early August rather than September in some of Asian-Pacific countries studied here.

[Table 3] Returns Difference across month

Panel A. Developed Markets					
	Australia	**Hong Kong**	**Japan**	**Singapore**	**South Korea**
Jan	-1.29004	-2.85871*	-1.09267	-0.59332	1.7509
	(-1.48)	(-1.73)	(-1.03)	(-0.42)	(0.69)
Feb	0.38073	1.86715	-0.06642	0.50589	-1.54007
	(0.60)	(1.29)	(-0.07)	(0.55)	(-1.23)
Mar	0.62738	-1.82546	1.9719*	-0.68082	1.46491
	(0.93)	(-1.51)	(1.79)	(-0.64)	(0.95)
Apr	1.54742**	2.17746	1.6206	1.97737	1.96941
	(2.33)	(1.31)	(1.63)	()1.31	(1.08)
May	-1.60393**	-0.21021	-1.2033	-0.89335	-1.89845
	(-2.12)	(-0.13)	(-1.11)	(-0.55)	(-1.29)
Jun	-0.89339	0.18279	0.73165	0.36964	-0.64974
	(-1.22)	(0.15)	(0.70)	(0.33)	(-0.42)
Jul	0.60385	1.36216	-0.89115	1.21571	0.7138
	(0.76)	(1.22)	(-0.89)	(1.22)	(0.49)
Aug	-0.17055	-2.06501*	-2.01386**	-3.17282***	-2.06874**
	(-0.24)	(-1.65)	(-1.99)	(-2.68)	(-1.96)
Sep	-0.60436	-0.12941	-0.4683	-1.15064	-1.22791
	(-0.65)	(-0.07)	(-0.41)	(-0.83)	(-0.79)

Oct	0.4172	0.52547	-1.14719	0.34903	-1.25016
	(0.41)	(0.24)	(-0.98)	(0.20)	(-0.57)
Nov	-0.39593	0.67762	1.51066	0.67882	1.13549
	(-0.53)	(0.48)	(1.53)	(0.64)	(0.66)
Dec	1.33488***	0.27083	1.12258	1.4207*	1.6422
	(2.88)	(0.27)	(1.12)	(1.69)	(1.00)

Panel B. Under-Developed Markets					
	China	**India**	**Indonesia**	**Malaysia**	**Taiwan**
Jan	-1.78616	-2.06924	1.54446	0.77828	0.59274
	(-0.87)	(-1.28)	(0.81)	(0.71)	(0.33)
Feb	1.06495	0.55019	-0.605	2.39919	01.10251
	(0.98)	(0.38)	(-0.61)	(1.50)	(0.83)
Mar	1.89177	-0.97601	0.6277	-0.74395	1.55153*
	(0.90)	(-0.55)	(0.44)	(-0.74)	(1.65)
Apr	3.08824	0.88042	1.98319	0.62144	-0.16286
	(1.35)	(0.54)	(0.94)	(0.32)	(-0.09)
May	0.89908	0.39675	1.031	-0.49948	-0.87023
	(0.49)	(0.17)	(0.59)	(-0.42)	(-0.74)
Jun	-1.3203	-0.31539	1.70584	-0.80741	-0.10061
	(-0.53)	(-0.19)	(1.48)	(-0.69)	(-0.07)
Jul	-2.04127	0.71867	0.23807	0.46787	0.44045
	(-0.93)	(0.59)	(0.17)	(0.46)	(0.28)
Aug	2.35694	0.44832	-6.54006***	-3.07729*	-1.17505
	(0.41)	(0.33)	(-3.39)	(1.89)	(-0.98)
Sep	-1.41508	-0.46292	-1.26675	-0.92072	-2.67353
	(-1.03)	(-0.30)	(-0.66)	(-0.62)	(-1.57)
Oct	-0.97418	-2.32627	-1.29361	0.76956	-1.56993
	(-0.47)	(-1.16)	(-0.71)	(0.57)	(-1.08)
Nov	-0.1012	-0.25602	-0.27624	-0.73405	-0.13701
	(-0.07)	(-0.17)	(-0.16)	(-0.46)	(-0.11)
Dec	-1.51714	3.35332***	3.09002***	1.82155**	3.16877**

	(-0.82)	(2.65)	(3.10)	(2.04)	(2.16)

4.2.January Effect

[Table 4] describes the results of regression model with January dummy. The first row represents coefficients of January in each time periods, and the second and the third row are coefficients of January after controlling for country and year fixed effect, respectively. The coefficients of January are negative in all time periods, but they are all insignificant. There seems no decreasing trend. The results do not change after controlling for country and year fixed effect. [Table 5] shows January effect after controlling for developed country effect. The variable Dev_January is an interaction effect of developed country and January, which captures returns difference between developed and under-developed countries. The results are same with the previous one. Coefficients of January are negative and insignificant, and interaction term of January and developed country does not show an explanatory power.

It can be concluded that there is no January effect found in this sample data. January returns are not significantly different from zero and more likely to be negative rather than excessively positive. This might indicate either there is no January effect in Asian-Pacific markets at the first place or the effect shifted forward to December as Antonides and Van der Sar insist in their paper.

[Table 4] January effect across country (in %)

	Full Sample	**[1994,2000]**	**[2001,2010]**	**[2011,2017]**
January	-0.50238	-0.15548	-0.90163	-0.26156
	(-0.94)	(-0.11)	(-1.19)	(-0.40)
Country Fixed	-0.50238	-0.15548	-0.90163	-0.26156
Yes	(-0.94)	(-0.11)	(-1.19)	(-0.40)
Year Fixed	-0.48833	-0.06723	-0.90163	-0.26156
Yes	(-0.94)	(-0.05)	(-1.27)	(-0.40)

[Table 5] January effect after controlling developed countries (in %)

	Full Sample	**[1994,2000]**	**[2001,2010]**	**[2011,2017]**
January	-0.18798	0.53963	-0.28628	-0.71682
	(-0.26)	(0.28)	(-0.28)	(-0.99)

Dev_January	-0.62879	-1.39023	-1.2307	0.91052
	(-0.63)	(-0.51)	(-0.86)	(0.89)
Developed	-0.22115	0.12242	-0.50275	-0.14013
	(-0.77)	(0.16)	(-1.22)	(-0.47)
Constant	0.94935	0.36429	0.14588	0.76864
	(4.67)	(0.68)	(5.02)	(3.66)

4.3.End-of-December Effect

The results of examining end-of-December effect is presented below in [Table 6]. Except for the time period [1994,2000], all of the coefficients have significantly positive abnormal returns even after controlling for country and year fixed effect. There found no decreasing trend in abnormal returns along with the time period change. [Table 7] shows the end-of-December effect and the variable Dev_December represent an interaction term of developed country and December effect. The results indicate controlling for developed country effect do not make any difference from the first one estimating the similar coefficients. Again, developed country effect cannot capture the cross-sectional returns difference at 5% significance level though its coefficients are in opposite direction with the anomaly.

The results show the evidence of End-of-December effect, however they are not consistent with the other hypothesis. The December effect is actually strengthened in recent years rather than decrease over time. Moreover, the coefficient of the interaction term in [Table 7] is zero in full period and nearly zero in the other periods. These results conflict with Efficient Market Hypothesis, which expects abnormal returns will fade away after being revealed in developed markets.

[Table 6] End-of-December effect across country (in %)

	Full Sample	**[1994,2000]**	**[2001,2010]**	**[2011,2017]**
December	0.13073***	0.1044	0.11783***	0.17365***
	(5.17)	(1.61)	(3.31)	(5.45)
Country Fixed	0.13101***	0.10285	0.03557***	0.1738***
Yes	(5.18)	(1.53)	(3.34)	(5.45)

Year Fixed	0.13002***	0.09848	0.11952***	0.17449***
Yes	(5.15)	(1.89)	(3.37)	(5.48)

[Table 7] End-of-December effect after controlling for developed countries (in %)

	Full Sample	**[1994,2000]**	**[2001,2010]**	**[2011,2017]**
December	0.1307***	0.08333	0.12979**	0.17477***
	(3.55)	(0.89)	(2.47)	(3.79)
Dev_December	0.00000	0.1295	-0.02515	-0.00243
	(-0.01)	(0.33)	(-0.35)	(-0.04)
Developed	-0.00935	0.03043	-0.02466	-0.0018
	(-0.74)	(0.20)	(-1.29)	(-0.12)
constant	0.03666***	0.0238	0.06168***	0.02761**
	(3.87)	(0.32)	(4.39)	(2.50)

4.4.Turn-of-the-month Effect

Results of regression on turn-of-the-month dummy are given in [Table 8]. Variables -1, 1, 2 and 3 refer to, respectively, the last, first, second and third days around the turn of the month. The results confirm that there are clear positive abnormal returns on the days around the turn of the month even after controlling for country and year fixed effect. It also finds out the coefficients get smaller or insignificant over time as Kohers and Nisser and Valla insist. [Table 9] is the result for the same regression after controlling for developed country effect, and Dev_Day -1, 1, 2 and 3 are interaction terms of developed country and days around the turn of the month. In this regression, abnormal returns are observed only on the last, first and second day in time period [2000,2010] and [2011,2017]. There seems no decreasing tendency in anomalies, and five out of sixteen coefficients of interaction terms have significantly negative value.

The results confirm the turn-of-the-month effect and show diminishing trend as well. However, only half of the coefficients of the interaction terms in [Table 9] have opposite sign to the turn-of-the-month effect, and many of them are insignificant. The other half are positive, in the same direction with the anomaly, and two of them are significant, which implies rejection to the initial hypothesis that anomalies fade away in develop markets.

[Table 8] Turn-of-the-month effect across country (in %)

		Full Sample	[1994,2000]	[2001,2010]	[2011,2017]
Day	**-1**	0.20115***	0.19015***	0.22057***	0.14963***
		(3.38)	(3.20)	(5.47)	(4.66)
	1	0.26083***	0.24982**	0.22632***	0.11643***
		(2.66)	(2.55)	(4.88)	(3.03)
	2	0.09051	0.07951	0.24525***	-0.03168
		(1.45)	(1.28)	(6.04)	(-0.90)
	3	0.25835***	0.24735***	0.01146	-0.07218**
		(3.59)	(3.45)	(0.26)	(-2.10)
Country Fixed Yes	**-1**	0.20135***	0.19034***	0.2205***	0.14965***
		(3.38)	(3.21)	(5.48)	(4.66)
	1	0.26103***	0.25002**	0.22625***	0.11645***
		(2.66)	(2.55)	(4.88)	(3.03)
	2	0.09071	0.0797	0.24518***	-0.03165
		(1.45)	(1.28)	(6.05)	(-0.90)
	3	0.25855***	0.24754***	0.01139	-0.07215**
		(3.60)	(2.45)	(0.26)	(-2.10)
Year Fixed Yes	**-1**	0.19982***	0.1888***	0.22068***	0.14952***
		(3.35)	(3.18)	(5.47)	(4.66)
	1	0.26122***	0.25019**	0.2453***	0.11617***
		(2.66)	(2.55)	(6.09)	(3.02)
	2	0.0909	0.07987	0.2453***	-0.03194
		(1.46)	(1.28)	(6.09)	(-0.91)
	3	0.25874***	0.24771***	0.01151	-0.07244**
		(3.60)	(3.45)	(0.27)	(-2.11)

[Table 9] Turn-of-the-month effect after controlling for developed countries (in %)

		Full Sample	[1994,2000]	[2001,2010]	[2011,2017]
Day	**-1**	0.05016	0.03593	0.23535***	0.25854***
		(0.58)	(0.42)	(3.86)	(5.56)
	1	0.17904	0.1648	0.19821***	0.17466***

		(1.11)	(1.02)	(2.78)	(3.20)
	2	0.06032	0.04609	0.28288***	0.06575
		(0.61)	(0.47)	(4.83)	(1.33)
	3	0.42871***	0.41448***	0.02636	0.0399
		(3.56)	(3.45)	(0.41)	(0.84)
Dev_Day	**-1**	0.30202**	0.30843**	-0.02968	-0.21745***
		(2.55)	(2.61)	(-0.37)	(-3.40)
	1	0.16362	0.17003	0.05607	-0.11641
		(0.83)	(0.87)	(0.60)	(-1.52)
	2	0.06041	0.06683	-0.07551	-0.1949***
		(0.48)	(0.54)	(-0.93)	(-2.79)
	3	-0.34069**	-0.33428**	-0.03001	-0.22425***
		(-2.38)	(-2.34)	(-0.35)	(-3.27)
Developed		0.00451	-0.0019	-0.02163	0.03432**
		(0.14)	(-0.06)	(-1.05)	(2.06)
Constant		-0.03531	-0.02108	0.03076**	0.00857
		(-1.38)	(-0.85)	(2.03)	(0.71)

4.5.Weekend Effect

[Table 10] and [Table 11] are about weekend effect across country and weekend effect controlling for developed country effect, respectively. Again, Dev_Monday is an interaction effect of developed country and Monday. The results show strong and significant negative abnormal returns even after controlling for country and year fixed effect in full sample and [2011,2017]. The other time periods present negative coefficients, but they are not significant. The decreasing trend are not observed in this result, rather the abnormal returns are strongest in most recent years. Effect of interaction term is insignificant also in Monday effect as well as other seasonal anomalies verified above, and again, coefficients are still mostly in opposite direction with the Weekend effect.

The results provide empirical evidence for weekend effect, however cannot support other hypothesis in this paper. Although the opposite sign of interaction terms' coefficients to the weekend effect may indicate some influence of developed markets, they are still insignificant. In addition, strongest effect in recent years seems a puzzle

in terms of Efficient Market Hypothesis.

[Table 10] Weekend effect across country (in %)

	Full Sample	[1994,2000]	[2001,2010]	[2011,2017]
Monday	-0.0599***	-0.05713	-0.02939	-0.1065***
	(-3.47)	(-1.35)	(-1.13)	(-5.21)
Country Fixed	-0.06005***	-0.05684	-0.02995	-0.10643***
Yes	(-3.48)	(-1.34)	(-1.15)	(-5.21)
Year Fixed	-0.06004***	-0.05731	-0.02972	-0.10646***
Yes	(-3.49)	(-1.35)	(-1.15)	(-5.22)

[Table 11] Weekend effect after controlling for developed countries (in %)

	Full Sample	[1994,2000]	[2001,2010]	[2011,2017]
Monday	-0.06746***	-0.06743	-0.05012	-0.0925***
	(-2.60)	(-1.04)	(=1.29)	(=3.07)
Dev_Mon	0.01504	0.02057	0.04118	-0.02821
	(0.44)	(0.24)	(0.79)	(-0.69)
Developed	-0.01286	0.00359	-0.03412*	0.00246
	(-0.99)	(0.11)	(-1.72)	(0.15)
Constant	0.05545***	0.02447	0.07702***	0.05317***
	(5.65)	(0.99)	(5.32)	(4.62)

4.6.Post-School Holiday Effect

The results of testing post-school holiday effect controlling for country and year fixed effect and developed country effect are described below in [Table 12] and [Table 13]. These are the most consistent results with the hypothesis in this paper. Significantly negative returns are observed in Full sample and [1994,2000] even after controlling for country and year fixed effect. To show that this is not just caused by pronounced September effect, this paper examined the effect again excluding September. The results are still robust. Moreover, the abnormal returns are clearly diminishing and become insignificant over time. However, the results do not support the efficient market view, since interaction term of developed market and post-school holiday does not have single significant coefficient. There might be small impact of developed markets on

abnormal returns, though, because the coefficients are positive, opposite to the effect.

[Table 12] School holiday effect across country (in %)

	Full Sample	(1994,2000)	(2001,2010)	(2011,2017)
School Holiday	-0.71239**	-1.93522***	-0.47178	0.08424
	(-2.35)	(-2.67)	(-1.05)	(0.22)
Country Fixed	-0.68821**	-2.04264***	-0.32455	0.06057
Yes	(-2.27)	(-2.84)	(-0.72)	(0.16)
Year Fixed	-0.71311**	-1.93955***	-0.47178	0.08424
Yes	(-2.44)	(-2.70)	(-0.12)	(0.22)
Excluding	-0.64266**	-2.21795***	-0.24819	0.23574
September	(-2.04)	(-2.81)	(-0.56)	(0.58)

[Table 13] School Holiday effect controlling for developed countries (in %)

	Full Sample	(1994,2000)	(2001,2010)	(2011,2017)
School Holiday	-1.07221**	-1.18938**	-0.25552	-0.23024
	(-2.04)	(-2.36)	(-0.35)	(-0.41)
Dev_Holiday	0.65809	2.08584	-0.22456	0.54609
	(1.03)	(1.34)	(-0.24)	(0.72)
Developed	-0.32658	-0.18026	-0.53536	-0.16339
Countries	(-1.05)	(-0.22)	(-1.21)	(-0.53)
Constant value	1.07774***	0.83923	1.46901	0.7396
	(4.39)	(1.25)	(4.26)	(3.17)

5. Conclusion

In conclusion, this paper found no empirical evidence for January effect and of course no decreasing trend in seasonality and developed market effect in Asian-Pacific markets. For End-of-December effect, it proves there are significantly positive abnormal returns on the second half of December. However, the effects get strengthened along with time inconsistent to Kohers, Nisser and Valla's argument and efficient market hypothesis. Moreover, significantly positive

abnormal returns are detected on the days around the turn of the month in this paper. As I expected at the first stage, the effect diminished and becomes insignificant in time. Weekend effect is another obvious seasonal anomaly observed in this paper. However, it is only found in Full sample period and [2011,2017], and there is no diminishing pattern over time. Like End-of-December effect, it is rather strengthened in recent years. Finally, this paper gives evidence for post-school holiday effect, where the returns on the month after major school holiday are significantly lower than the other months. It also verified that the anomaly decreases and get insignificant over time. In none of seasonal anomalies, developed market effect is found. There is no significant difference in abnormal returns between developed and under-developed markets. Still, there are some coefficients of interaction terms that are in the opposite direction to the seasonal anomalies, which might indicate seasonal anomalies are weakened in small degree in developed markets.

The strength of this paper is that it focuses on Asian-Pacific stock markets which have little attention by researchers and investors relative to their importance. The biggest advantage of studying seasonality in Asian-Pacific market is that it is free from data snooping problem which resulted in severe bias in US stock market studies. This paper also verified seasonal anomalies in Asian-Pacific market except for January effect, and capture diminishing pattern in some of the anomalies, Turn-of-the-month and Post-school holiday effect.

However, there are some limitations as well. First, it fails to verify January effect which is found in many other researches. It should be studied if the results imply January effect does not exist in Asian-Pacific markets or the effect shifted forward, so that is absorbed to, December effect or there are some other reasons for this result. Second, unlike the initial expectation, little evidence is found for diminishing patterns of anomalies. Moreover, December effect and Weekend effect are strongest in the most recent years. Third, there seems no statistically significant difference between returns in developed and under-developed markets. The second and third limitations are puzzles in respect of Efficient Market Hypothesis, and this paper cannot provide any explanation. Thus, further study should focus on why the deviation from market efficiency keeps observed even after being revealed and if we can say efficient market theory is valid despite of existence of persisting anomalies

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