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Recent Developing Trends in Calendar Anomaly Literature

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Abstract

The purpose of this brief review is to track the contemporary developments in the calendar anomaly literature. Some of the recently published empirical works are synthesized and presented, where these studies are organized and summarized by a few identified developing trends. The main strand of literature is based on the extensive evidence of calendar anomaly discoveries. Next, past research has raised the concern regarding the persistence of calendar anomalies as the existence of calendar anomalies may be attributed to data mining. Other strand of literature reflects that calendar effects are weakening and even disappearing from certain stock markets. There is also evidence showing that calendar effects may evolve but will eventually disappear in the long-run. Further, calendar anomalies may exhibit changing behaviour subject to various market conditions. By reviewing the current researches, it is found that majority of the stock markets are yet to be fully informational efficient. Hence, fund managers and investors can still benefiting from the observed calendar-based regularities.

Keywords: *calendar anomalies, efficient market hypothesis, data mining, anomaly persistence, adaptive market hypothesis*

1 Introduction

Whilst there are a number of studies indicating the existence of calendar anomalies in different stock markets, the economic significance of calendar effects is still debated. The calendar effects may only be a 'chimera' delivered by intensive data mining as they are country-specific results and may not stable over time (Borges, 2009). By definition, anomalies refer to the empirical results that seem to be inconsistent with the maintained theories of asset-pricing behaviour, showing either market inefficiency as there exists profit opportunity, or simply the shortcomings in the underlying asset-pricing model. However, anomalies contradict with the efficient market hypothesis (EMH) because the tests of efficiency jointly test a maintained hypothesis of equilibrium expected asset returns, and thus the discovery of anomaly would dispute both the hypotheses (Schwert, 2003). The calendar-based regularity is a common type of market anomaly. Specifically, calendar anomalies are abnormal returns at calendar turning points (Jacobs and Levy, 1988) such as, the day-of-the-week effect, month-of-the-year effect, January effect, twist-of-the-Monday effect, turn-of-the-month (TOTM) effect, holiday effect, and Halloween effect. Since this seasonality is characterized by country-

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specific phenomenon, it is not surprising if the existence of calendar anomalies is not uniform across different countries. A particular type of calendar effect may be more pronounced in some countries but its effect may be weaker in other countries. Fund managers and investors have always had a great interest to recognize the existence of these exploitable profit opportunities in various stock markets.

This is a survey of literature aiming to capture the insight on the recent developing trends in the anomaly literature. Understanding to what extent this subject has been explored presently is pivotal for giving a clear direction on future research. The remainder of this paper is organized as follows: Section 2 presents extensive evidence of calendar anomaly discoveries; Section 3 sheds light on data mining and calendar anomaly persistence; Section 4 concentrates on the evidence of the weakening and disappearing calendar effects; Section 5 focuses on the findings with respect to the evolution and long-run disappearance of calendar effects; Section 6 is specific on market conditions and the changing behaviour of calendar anomalies. The last section is summary and conclusion.

2 Extensive Evidence of Calendar Anomaly Discoveries

Strong evidence of seasonality in stock returns is contributed by a number of current studies. Gao and Kling (2005) estimate the data of stock index returns of Shanghai and Shenzhen Stock Exchanges for the period of 1990 – 2002 using the OLS regression. The study finds that the year-end effect has shifted to February. March and April have higher returns than other months in a year. Mondays have lower returns and Fridays are associated with positive excess returns.

Marrett and Worthington (2007) employ the regression-based approach to examine the holiday effect in the stock market of Australia over the period 9 September 1996 – 10 November 2006. Eight national holidays considered in the study are the New Year Day, Australia Day, the Easter Friday and Monday, ANZAC Day, Queen's Birthday, Christmas Day, and Boxing Day. The holiday effect is estimated on the logarithm of daily returns of the All Ordinaries index, Small Ordinaries index, and ten ASX/S&P industry indices (banking, diversified financials, energy, healthcare, insurance, materials, media, retailing, telecommunications, and transportation). Two dummy variables are used to represent the last trading day before a holiday and the first trading day after a holiday, respectively. The All ordinaries index, Small Ordinaries index, and retail industry index are found to be associated with a positive pre-holiday return but not a negative post-holiday return. A strong seasonality is found in the retail industry index series where the pre-holiday return is on average sevenfold as compared to all other days. This is possibly due to the higher expected

sales turnover during a holiday such as the Christmas Day. The strong seasonality of the retail industry index could have contributed to the observed seasonality in both the market indices' returns.

Lim and Chia (2010) examine the day-of-the-week effect and twist-of-the-Monday effect (the influence of positive or negative previous week return to the subsequent Monday return) in the ASEAN-five stock markets (Indonesia, Malaysia, Philippines, Singapore and Thailand). The authors employ the data of the stock index daily returns over the period 10 June 2002 – 21 August 2009. As indicated by descriptive statistics, almost all markets are associated with negative mean returns on Monday except for Singapore, whereas the returns on Fridays are unusually high. The results based on the Kruskal-Wallis statistic test show the existence of the day-of-the-week effect in the markets of Malaysia and Thailand. The results of the Wilcoxon Rank Sum Test indicate that Mondays have relatively lower returns than Thursday and Friday in the case of Malaysia. For Thailand, Fridays have the highest returns among all other weekdays. The Monday returns are affected by the returns of the previous weeks in the stock markets of Indonesia, Malaysia, and Philippines.

For the post-financial crisis period spanning 1 July 1998 – 30 June 2008, Ng et al. (2011) found strong evidence of the day-of-the-week and month-of-the-year effects in the daily percentage returns of seven Malaysian sectoral indices, including construction, consumer products, finance, industrial products, plantation, property and trading/services sectors. This suggests that the stock market in Malaysia is not fully efficient and thus fund managers and investors can still benefit from these anomalies. The analysis based on the OLS and GARCH (1,1) regressions indicates that most of the sectors are displaying positive January, July, October, and November effects, and positive Friday effect. Specifically, the authors have identified the top three best-return sectors based on the observed means of daily index returns, namely, the Plantation, Consumer, and Industrial products sectors.

Since the Chinese stock market is closed for a week during Chinese Lunar New Year (CLNY) or the Spring Festival, it is impossible to directly test the holiday effect with respect to this festival using domestic Chinese stock prices. Hence, Wu (2013) employs the unique dataset of Chinese stocks listed on NYSE and NASDAQ. The dataset comprises the log daily returns of 118 Chinese firms over the period of 1993 – 2011. To analysis the CLNY effect, the author computes the average daily return for each individual stock in four event windows, where the first three windows represent the five-day period before, during, and after the festival, and the last window represents the whole year excluding the festival period. In every window, an equally weighted portfolio is formed in order to obtain the average daily return. In a comparison, the period before and during the festival have significant higher positive mean daily returns

than the whole year excluding the period of festival. A relatively lower mean daily return is found in the post-festival period. After the ADR return is adjusted with the U.S. market return, the effect of the festival period becomes insignificant. Further, by using the OLS regression, the results indicate that the January effect is absent but there are significant higher returns in April and July, and lower returns in June, August, September and November. According to the author, a positive holiday sentiment may be the reason of the uncovered CLNY effect.

Yuan and Gupta (2014) adduce strong evidence that the major Asian stock markets are affected by the Spring Festival. The authors examine the CLNY holiday effect by analyzing the data of daily stock index returns for Shanghai Composite Index (China), Hang Seng Index (Hong Kong), NIKKEI 225 (Japan), Straits Times Index (Singapore), KOSPI Composite Index (South Korea), FTSE Bursa Malaysia KLCI (Malaysia), and TSEC Weighted Index (Taiwan). The period of study spans from 1 September 1999 to 28 March 2012. The study uses dummy variables to represent the pre-holiday period (the three trading days prior to holiday) and the post-holiday period (the three trading days after holiday). The estimation using an ARMA (1,1)-GARCH (1,1) model produces the results showing a positive pre-CLNY holiday effect for all cases with the most profound effect found in South Korea. The only case with a post-CLNY holiday effect is in Malaysia, where the effect is positive and greater than the pre-CLNY effect. The findings suggest that investors in these Asian countries may be able to earn excess profits by active trade based on the CLNY effect.

3 Data Mining and Calendar Anomaly Persistence

However, past research also reports that calendar effects are not persistent and may be attributed to data mining. Borges (2009) examines the day-of-the-week and month-of-the-year effects for a group of 17 Western and Central European stock market indices including Austria (ATX), Denmark (OMXC20), Finland (OMXHPI), France (CAC40), Germany (DAX), Greece (ASE), Hungary (BUX), Iceland (OMXIPI), Ireland (ISEQ), Italy (MIBTEL), Netherlands (AEX), Norway (OSEAX), Poland (WIG), Portugal (PSI20), Spain (IBEX), Switzerland (SMI), and United Kingdom (FTSE). The data used are the daily returns of the indices in logarithm. Unlike most studies that test the mean daily return of a specific weekday separately against each of the other weekdays, the author estimates the mean daily return of a particular weekday against the mean daily return of the pool of all other weekdays. The author replicates the test for estimating five equations to locate the day-of-the-week effect with respect to each weekday. In order to detect the month-of-the-year effect, 12 equations are estimated. These models are estimated based on the GARCH (1,1) approach. In the findings, a strong day-of-the-week effect is detected in Iceland (negative Monday and positive

Friday effects) and Greece (negative Monday and Tuesday effects; positive Friday effect). The month-of-the-year effect is found in Iceland (excess return is positive in August and negative in October), Austria (excess return is positive in February and negative in September), Portugal (excess return is positive in January and negative in May), and Greece has negative excess return in June. However, the results of the rolling windows regression reveal the highly instability of the calendar effects which casts doubts on their economic significance.

4 Evidence of Weakening and Disappearing Calendar Effect

Nevertheless, literature has documented the evidence that certain calendar effects are weakening and diminishing over time. Tan and Tat (1998) found evidence of the January effect, the day-of-the-week effect, the turn-of-the-month effect, and the holiday effect in the returns of SES All-Singapore Index over the full period of January 1975 – December 1994 and the two ten-year sub-periods. Further, the findings show the evidence of diminishing calendar anomalies. Across the two sub-periods, there is an increase in the *PP*-value of the *FF*-statistic employed for testing the January effect and the day-of-the-week effect (the mean daily returns on Mondays and Tuesdays are relatively higher than those on other trading days in a week), indicating the calendar effects have become weaker. The test results interestingly show that the mean daily return on January in the second sub-period has reduced by about 65 per cent. By using the one-tailed *tt*-tests for locating the turn-of-the-month effect and the holiday effect, it can be seen that these seasonals are reducing as the values of the *tt*-statistics exhibit a decline from the first sub-period to the second sub-period.

By applying more recent data spanning January 1993 – December 2005, Wong et al. (2006) examine the January effect, the day-of-the-week effect, the turn-of-the-month effect, and the holiday effect in the log daily returns of Straits Times Index. The estimation using a GARCH (1,1) model indicates that a positive mean daily return on January only in the pre-crisis period (1 January 1993 – 31 December 1997) while the day-of-the-week effect is insignificant. The results of the one-tailed *tt*-tests support the presence of the turn-of-the-month and holiday effects in the full period, the pre-crisis period, and the post-crisis period (1 January 1998 – 31 December 2005) but the two calendar effects are weakening across the sub-periods.

Inconsistent with Yuan and Gupta (2014) who found evidence of the pre- and post-CLNY holiday effects in the market index returns of Malaysia, the findings of Abdul Karim et al. (2012) refute the presence of holiday effect in the Malaysian stock market. The latter study employs the data of KLCI's daily closing prices over the period 2 January 2001 – 31 December 2009 and estimates the data using the OLS regression.

Three sub-sample periods are used, 2 January 2001 – 31 December 2003, 2 January 2004 – 29 December 2006, and 3 January 2007 – 31 December 2009, respectively. The results show that the pre-holiday mean return is higher than the mean return on other trading days but all coefficients are statistically insignificant. It is suspected that by lumping together insignificant holidays may reduce possible impact of the important holidays. For verifying the test results, the authors further test the CLNY effect. The post-CLNY return is found to be higher than the pre-CLNY return but the coefficients are insignificant. The overall findings of Karim et al. (2012) suggest that there is no holiday effect in the stock market of Malaysia.

Chia (2014) reveals the diminishing day-of-the-week effect from the Australia and New Zealand markets over the period June 2002 – May 2014. The study estimates the daily prices of Australia Morgan Stanley Capital International (MSCI) Index and New Zealand MSCI Index by using the OLS models. There is no evidence of any daily anomalous patterns found in the markets. Accordingly, the author infers that the two markets are suitable for those investors who are more passive in the sense that, they are willing to trade by simply buy-and-hold.

5 Evolution and Long-run Disappearance of Calendar Effects

More recently, Olson et al. (2015) find that calendar anomalies may resurface after their initial disappearance but will eventually diminish in the long-run. This type of evidence may be either a disappearing or a wandering calendar effect. The disappearing calendar effect is predicted by the EMH in which it is showing an anomaly that disappears soon after its discovery. The alternative is a calendar effect that continues to wander but eventually disappears in the long-run. The unit root test has important implication for inference, where a rejection of the unit root hypothesis of nonstationarity suggests long-run reversion toward a zero mean return differential between Monday and the other days of the week, consistent with a disappearing calendar effect. The authors utilize an array of unit root tests including the ADF (1981) tests for a unit root and KPSS (1992) tests for stationarity to estimate the daily compounded percentage returns of Dow-Jones 30 Industrials Index (DOW), Standard and Poor's 500 Index (SP500), Standard and Poor's MidCap 400 Index (SPmid), Standard and Poor's SmallCap 600 Index (SPsmall), NASDAQ 100 Index, and American Stock exchange Composite (AMEX). The data obtained are mostly spanning 1973 – 2013 except for SPmid and SPsmall. The overall findings provide strong evidence for a disappearing weekend effect in the U.S. stock market and are consistent with the efficiency hypothesis.

6 Market Conditions and the Changing Behaviour of Calendar Anomalies

Another developing trend as addressed by Urquhart and McGroarty (2014) is the changing behaviour of calendar anomalies in reaction to different market conditions (i.e. bull and bear markets, and market crashes). Such evidence would be more consistent with the adaptive market hypothesis (AMH) rather than the EMH. The AMH implies that the convergence to efficiency is neither guaranteed nor likely to occur due to the continuous creation of new profit making opportunities. By estimating the daily returns of Dow Jones Industrial Average (DJIA) from 1 January 1900 – 31 December 2013 using the GARCH (1,1) regression and Kruskal-Wallis test, the Monday effect, TOTM effect, and Halloween effect (sell in May and buy back on St Leger Day) are found to be statistically significant. In order to examine whether these anomalies behave in an adaptive manner over time, the two tests are replicated on six subsamples each representing a 19-year period, and the rolling window analysis is employed by taking a five-year window. The subsamples analysis shows that the Monday, January and Halloween effects are fluctuating over time based on the observed inconsistency in the positive and negative coefficients. In addition, the level of significance of the TOTM effect varies through the subsamples. The rolling window analysis consistently finds that for each of the four calendar effects, some windows are generating positive *t*-statistics and some display with negative *tt*-statistics. Thus, these findings are in favour of the AMH.

Urquhart and McGroarty (2014) found the Monday effect is more successful during down months, bear markets and market crashes. While the TOTM effect is significant over different sub-periods, this effect is more pronounced during up months, bear markets, expansions, market crashes, and democrat presidencies. The January effect is only significant during contractions, and the Halloween effect is insignificant during normal periods but is significant when there is a bullish or bearish trend.

7 Summary and Conclusion

The contribution of this literature survey is in identifying the recent trends in the anomaly literature which will be useful to provide the direction for future research. The recent empirical works of calendar anomalies can be summarized as follows: First, calendar anomaly discoveries are supported by extensive evidence, such as Gao and Kling (2005), Marrett and Worthington (2007), Lim and Chia (2010), Ng et al. (2011), Wu (2013), and Yuan and Gupta (2014). In particular, literature has documented strong evidence of the holiday effect during CLNY (i.e. Wu, 2013; Yuan and Gupta, 2014). Second, calendar effects are not persistent and may be the results of data mining (see Borges, 2009). Third, some calendar effects have become weaker and even disappearing

from certain stock markets (see Tan and Tat, 1998; Wong et al., 2006; Abdul Karim et al., 2012; Chia, 2014). Fourth, calendar effects may resurface after their initial disappearance but will eventually disappear in the long-run. Specifically, if a calendar effect declines and initially disappears soon after it is uncovered, then the evidence is more consistent with the EMH. Another possibility is that, a calendar effect may continue to wander and ultimately diminish in the long-run, implying that a market is less efficient (see Olson et al., 2015). Fifth, as postulated by Urquhart and McGroarty (2014), the changing behaviour of calendar anomalies is inconsistent with the EMH but it is well-predicted by the AMH. Market conditions are found to be significantly affecting the profit opportunities provided by the calendar-based regularities.

A plenty of past findings that support the existence of calendar anomalies in different stock markets suggest that these stock markets are yet to be full informational efficient. Investors and fund managers may still benefit from the uncovered calendar anomalies. It can be done by using an investment strategy based on proper timing around a specific calendar effect while taking into account the transaction costs. However, once a calendar anomaly is displaying changing behaviour or behave in an adaptive manner, timing difficulties may arise.

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