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BEHAVIOR OF ISLAMIC AND CONVENTIONAL HOLIDAY-EFFECT AND ADAPTIVE MARKET HYPOTHESIS: A FIRM LEVEL EVIDENCE FROM EMERGING MARKET OF ASIA

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ABSTRACT

This study enhances the existing literature on the Adaptive Market Hypothesis (AMH) and calendar anomalies. The study is a first attempt to link the Islamic and conventional Holidays' effect with the Adaptive Market Hypothesis that allows the performance of well-known Holiday Effect to fluctuate over time. To fulfil the purpose of the study, the daily returns of 107 individual firms listed in Pakistan Stock Exchange over the period of 20 years (from January 1996 to December 2015) are observed. To explore the varying degree of return predictability of Holiday Effect, the research utilizes four different subsamples comprising an equal length of observations of five years each. It is found that the behavior of the Holiday Effect evolves over time as the performance of this effect varies occasionally and is consistent with AMH. Finally, the paper proposes that the Adaptive Market Hypothesis is a well elucidation of the behavior of the Holiday Effect than traditional Efficient Market Hypothesis (EMH).

Keywords: *Adaptive Market Hypothesis; Efficient Market Hypothesis; Holiday Effect; Islamic Holiday Effect; Pakistan Stock Exchange.*

INTRODUCTION

Through investigating the varying degree of well-known holiday effect, the study attempts to add literature on Adaptive Market Hypothesis (AMH) proposed by Lo (2004). Market conditions and the way the market participants incorporate novel information into the prices of equity impact investors' psychology in the market which in turn may change the behavior of holiday effect over time. Thus, the study is intended to investigate the time-varying behavior of holiday effect in the context of Adaptive Market Hypothesis (AMH). The holiday effect can be defined as the effect due to which the average returns become higher and statistically significant on the

trading day immediately prior to the off-trading-days (holidays). These holidays are apart from Saturday and Sunday, means other public holidays on which the stock exchanges remain closed. Thus, the study considers the holidays in the Islamic years which predominantly include : 9th & 10th of Muharram (Ashura); 12th Rabi-ul-Awwal (Eid-Milad-un-Nabi), 1st Shawwal and 10th Zilhaj (Eid-ul-Fitr and Eid-ul-Adha respectively); while holidays in the Gregorian calendar include 5th of February (Kashmir-day), 23rd March (Pakistan-day), 1st May (Labor-day), 14th August (Independence-day) and 25th December (Quaid-e-Azam-day).

Considering the importance of market efficiency is imperative to understand the working of the stock market. Poshakwale (1996), asserted that the efficiency of the emerging markets assume greater importance as the trend of investments is accelerating in these markets, as a result of regulatory reforms and removal of other barriers for the international equity investments. The notion of EMH explores that if the market is weak in efficiency then stock prices must be independent of each other and returns will be unpredictable (Fama, 1970). Additionally, Fama (1970), also classified the market efficiency into three different categories, each category is characterized in terms of different forms of information as; (i) weak form efficiency, which defines that equity prices fully reflect all available information about the historical trading; (ii) semi-strong form efficiency, which delineates that the publicly available information is fully reflected by the equity prices; and (iii) the strong form efficiency which proclaims that the equity prices fully reflect possible relevant information along with inside information of the company. Accordingly, all these three types portray that all possible available information is reflected by the equity prices, thus, any forecasting about future price changes is not possible. Therefore, both the fundamental analysis[1] (predicting equity/security prices on the basis of economic variables), and the technical analysis[2] (predicting equity/security prices on the basis of historical trading and performance of equity/securities) are useless and would not be beneficial for the market participants to gain abnormal returns[3]. In the literature, all three sorts of the efficient market hypothesis (EMH) have captured great attention but the weak form of EMH is widely studied and also is the primary focus of this study.

[1]Fundamental analysis involves analyzing all publicly available information (e.g. financial statements) about a certain stock to infer significant insights that can be used to make a profit in the stock market in future (Kothari, 2001).

[2]Technical analysis involves investigation of time series of past prices and returns of stock to derive a certain pattern that can be extrapolated in the future in order to make profitable predictions of price movements in future (Brown & Jennings, 1989).

[3]"Abnormal Return" is defined as the difference between expected returns and actual returns.

Against the proposition of EMH, if the prices of stocks are predictable and not independent, the investors can gain abnormal returns by using the historical information of the past trading trend. Recent literature contradicts EMH preposition, as many studies (Shahid & Mehmood, 2015; Hashmi, 2014; Halari, 2013), expound the stock returns to have a dependent nature and substantiate that there exist some profitable investment opportunities in the markets, thus, market anomalies do exist in Pakistan. Grossman and Stiglitz (1980), expressed that it is impossible for a capital market to be perfectly efficient as investors otherwise would have no benefit to acquire costly information if the markets were not inefficient and the profit-making opportunities were available. Keeping in view the argument of Grossman and Stiglitz (1980), of "impossibility of perfectly efficient market", Campbell, Lo, and MacKinlay(1997), offered the notion of "relative efficiency" rather than the "perfect efficiency" which leads a swing from measuring efficiency of market from an all-or-nothing condition to test it over the period of time (Shahid & Sattar, 2017). Recent studies (Rehman & Rizwan, 2014; Haque, Liu, & Nisa, 2011), provide the evidence that the stock markets in Pakistan are inefficient while some studies show that Pakistani equity markets are effectual as well. Nisar and Hanif (2012), found that the monthly return data identifies PSX as weak form efficient, similarly, Rabbani, Kamal, and Salim (2013), suggest that PSX was weak form efficient in sub-period 1999-2001 and 2005-2007, while Riaz, Hassan, and Nadim (2012), identified that the efficiency of market changes with the application of different tests which means that market efficiency may change from time to time. Thus, a contradiction exists about efficiency and inefficiency of the markets. Therefore, it is essential to explore the stock market efficiency through AMH (Adaptive Market Hypothesis) which states that efficiency (return predictability) changes over time. To incorporate the varying degree of return predictability, Lo (2004), proposed a new model "Adaptive Market Hypothesis (AMH)" that facilitates market anomalies to co-exist with market efficiency and enables market efficiency to evolve over time.

Moreover, the AMH proclaims that the market efficiency is not a guaranteed outcome as to gain abnormal profit, the arbitraging opportunities also arise from time to time. Hence, Lo (2004), characterized the six attributes of AMH as; i) investors perform in favor of their self-benefits to protect their own self-interest; ii) investors make wrong judgments and

make mistakes; iii) investors pick up learning from their mistakes and adapt them to their behavior which is not explored by EMH; iv) rivalry energizes adaptation as well as innovation; v) market ecology is shaped by natural selection; vi) evolution determine the dynamics of the market.

Susequently, Shahid and Sattar (2017); and Urquhart (2013), argue that the earlier studies apparently clarify the efficiency and inefficiency of the market over a pre-determined time, while market conditions may change from time to time causing changes in efficiency, which is consistent with AMH. Currently, AMH is receiving great attention, thus, this study aims to explore if AMH is the better elucidation of behavior of holiday effect than traditional EMH at firm level in Pakistan. The findings of this study will be useful for individual investors and security organizations for accurate forecasting and a better understanding of the market.

To conduct the study, individual firms listed in Pakistan Stock Exchange have been selected which were list during the time period of January 1996 to December 2015, using subsamples of five years of fixed length, to inspect the behavior of the holiday effect. Investigation of the varying behavior of holiday effect is conceded by sub-sample analysis across the time period of the study. However, the choice/selection of sub-samples as well as the range of their size is of subjective nature (Shahid & Sattar, 2017; Urquhart & Hudson, 2013). Thus, the data set is split into four sub-samples of 5-years, of equal length to investigate how the holiday effect has behaved over time. Sub-samples consist of enough observations to produce reliable results which enable comprehensive analysis of the varying degree of the holiday effect.

Along these lines, an attempt to enhance the literature on AMH is undertaken by fulfilling the missing link of varying degrees of holiday effect through AMH in multifarious ways. Firstly, this study is the first attempt to investigate the Islamic and conventional holidays' effect anomaly with AMH, which alters the behavior of returns during the holidays, over time. Secondly, this is the first study which investigates the performance of holiday effect at the firm level under the umbrella of AMH. Finally, the paper examines the behavior of the holiday effect with the application of a GARCH (1,1) regression model which facilitates the time-varying nature of volatility in equity returns. On the other hand, to handle the non-normal nature of stock returns data, the Kruskal-Wallis test statistic is used. The rest of the paper is organized as follows; the subsequent segments offer the relevant review of holiday effect literature; the data & methodology used to conduct the study; empirical results and summaries; findings and conclusions respectively.

LITERATURE REVIEW

The Holiday effect anomaly have been rigorously tested in previous studies. Fields (1934)[4] first documented the holiday effect and found that "the stock returns on trading days before the religious and secular closed-market holidays, are significantly higher than returns on other trading days". Seminal studies of Lakonishok and Smidt (1988); and Ariel (1990), report significantly higher returns on pre-holidays as compared to post-holiday returns. Furthermore, they found abnormal returns not only on weekend closing but for other gaps in trading. Ariel (1990), found an eight-time greater return on pre-holidays than post-holiday returns. He further proved that the eight holidays per year account for 38% of the total annual rate of returns. Also, Lakonishok and Smidt (1988) reported that the pre-holiday returns occupied 30 % to 50% of the total return of US equity markets before the year 1987. Agrawal and Tandon (1994), found the pre-holiday effect in seventeen markets. Similarly, Kim and Park (1994); Brockman and Michayluk (1998), investigated AMEX and NASDAQ over the period of 1963-1987 and 1987-1993 respectively and found holiday effect's impact on the market.

Boyle et al. (2002), analyzed the New Zealand stock market. They selected five economically different events which had an impact on the emotions and moods of the investors (as claimed by psychology researchers). They found that pre-holiday returns are statistically different from other days (i.e. non-events). Similarly, Chong et al. (2005), noticed the pre-holiday effect in the UK, US and Hong Kong markets which are considered as the most important markets of the world. They construed that the average expected returns before specific holidays were significantly greater than the average expected returns before other holidays. The same effect of holidays was discovered in the Kuwait Stock Exchange from the period of 1984 to 2000 (Al-Loughani, Al-Saad, & Ali, 2005). Picou (2006), studied the stock return behavior in stock exchanges of six countries including the All Ordinaries Index from Australia, Index of TSE from Canada, HIS-Hang Seng Index from Hong Kong, Nikkei-225 from Japan, Financial Times Stock Exchange -FTSE from the UK, and S&P-500 from the US. By calculating the daily return for ten years (1989-1999), he found ex-post-holiday anomaly in all the exchanges, this was because the investors sell more before the holiday to avoid the risk after

[4] For detail see the studies of (Borowski, 2015; Abidin et al., 2012; Abdul Karim et al., 2012; Marrett & Worthington, 2007; Lucey, 2005).

the holiday. Wong, Agarwal, and Wong (2006), examined the Singapore Stock Exchange to investigate the holiday effect. They divided the sample into two periods; pre-crisis period and post-crisis period and found that the preholiday return was higher than the other trading days in the pre-crisis period, but the trend was inverse in post-crisis periods. Marrett and Worthington (2007), examined the holiday effect in Australian Stock Exchange for the period of 1996 to 2006. They selected eight annual holidays that were ANZAC day, Australia day, Boxing day, Easter Friday & Monday, new-year days, Queen's birthday, and Christmas day, and confirmed the pre-holiday effect. Cao et al. (2009), estimated the holiday effect in the stock market of New Zealand. To test the variance, pre-holiday returns were considered along with the non-preholiday returns. For the purpose, they took data for the period of 1967 to 2006 of NZSE40 and NZSE50 indices. The results of this study illustrated significant positive returns before holidays in New Zealand.

Zafar et al. (2012), examined the half-month effect as well as holiday-effect at Pakistan Stock Exchange (PSX) over the period of 1991-2007. They calculated the daily logarithmic returns from the KSE-100 index to test these calendar effects. They concluded the Pakistan Stock Exchange as an inefficient market by elaborating that the pre-holiday has significant positive returns than post-holidays. They further argued that the investors in the market react very certainly and take more part in trading activities before holidays, thus gains in the time prior to holidays is significantly greater than gains after holidays. By using ARMA (1,1) model as well as GARCH (1,1) model over the period of 1999-2012 Yuan and Gupta (2014), presented a robust evidence of positive CLNY-pre-holiday effect in almost all major indices of Asia[5] except for Malaysia, where the post-CLNY effect was greater, significant, and positive than the pre-CLNY[6] effect. Huang (2017), investigated the Chinese stock market to examine the holiday effect returns over the period of 2006 to 2017. With the application of GARCH (1,1) and GARCH (1,1)-M models, the study found evidence of holiday effect in Chinese stock market. Moreover, Shahid and Sattar (2017), investigated the Pakistan Stock Exchange over the period of 1992 to 2015 and found that the holiday effect fluctuates over time and is consistent with AMH. Hassan and Sarker (2018), investigated the Dhaka

[5] Indices from China (Shanghai Composite-Index), from Hong Kong (Hang Seng-Index), from Japan (NIKKEI-225-Index), from Malaysia (FTSE Bursa Malaysia KLCI), from Singapore (Straits Times-Index), from South Korea (KOSPI Composite-Index) and from Taiwan (TSEC Weighted Index).
[6] Chinese Lunar New Year (McGuinness & Harris, 2011).

Stock Exchange to examine pre-and post-holiday returns over the period of 2013 to 2017. With the application of Wilcoxon-signed rank test, they found significantly higher returns in pre-holidays than post-holidays. The literature suggests the prevalence of holiday effect in different stock markets, but a limited number of studies have investigated the varying degree of holiday effect through AMH. Thus, adding more literature on the subject will help to have a comprehensive view of the behavior of the holiday effect in different markets.

DATA COLLECTION AND RESEARCH METHODOLOGY

To observe the presence of holiday effect and how this effect has influenced over time, we investigated the daily-returns of companies listed in the Pakistan Stock Exchange. There were 560 companies listed on PSX in December 2015. Out of the 560 companies only 540 had data available on the data stream database. Thus, the daily share price data was downloaded for all 540 firms. In order to explain the adaptive nature of the behavior of the holiday effect, a large substantial time frame is required for the study to investigate the individual companies. Thus, a sample of 20 years' data from January 1996 to December 2015 was selected. Furthermore, a sample of 107 companies[7] was selected out of 540 companies which had the data available from January 1996 to December 2015. To investigate the varying degree of the behavior of the holiday effect, data of individual firms are more appropriate than using national indices. Thus, the analysis provides a more accurate sign of whether equity returns are foreseeable for investors on holidays and whether this effect has cyclic nature of efficiency. The following regression equation was estimated:

$$R_t = c + \beta D_t + \varepsilon_t, \qquad t = 1,\ldots,T$$

Where R_t represents the stock index return, D_t represents an indicator of holiday effect as adopted by (Urquhart & McGroarty, 2014; Shahid & Sattar, 2017), while ε_t is the error term. Instead of using OLS regression, we use GARCH (p, q) model proposed by , to investigate the existence of the holiday effect in Pakistan stock exchange. Across our analysis, we employ GARCH (1, 1) regression model because GARCH (1, 1) model is the most robust and simplest model of the family of volatility models as well as it is most widely used in the literature . Whereas the GARCH (1, 1) model allow researchers to model variance as conditional on the

[7] The study utilizes a sample of 107 firms from various sectors (seven different sectors, see Appendix 1).

past variance and error, rather than fixed through the series (Urquhart & McGroarty, 2014). Therefore, to capture the time-varying behavior of return of individual firms, we run the following GARCH (1, 1) regression:

$$h_t = \alpha_0 + \alpha_1 \varepsilon^2_{t-1} + \theta h_{t-1}$$

Where, for equity returns at time *t*, h_t is the conditional variance, h_{t-1} represents the conditional variance of equity returns at time *t-1* while α_0, α_1 & θ are the coefficients of the GARCH model. The GARCH model is an appropriate model and possesses the potential ability to capture the desirable features of equity market returns but it is not appropriate to use to capture the non-normality feature of returns series. Therefore, we also employ a non-parametric Kruskal-Wallis (K.W) test to examine predominant sensitivity of the population to the difference in mean and whether the population has identical distributions from which the samples are drawn. Thus, we investigate the mean differences in the stock returns on holidays and non- holidays:

$$H = \left(\frac{12}{N(N+1)} \sum_{j=1}^{k} \frac{R_j^2}{n_j}\right) - 3(N+1)$$

Where represents the total number of observations, denotes the number of groups, and indicate the total number of observations and the average rank of observations in the group respectively. Therefore, to investigate how exactly holiday effect has behaved/performed through time we employ the Kruskal-Wallis test and GARCH regression model to the full-sample as well as to subsamples of fixed length. We split our data into sub-samples of 5 years, thus generate 4 subsamples of identical lengths. A sub-sample of 5-years holds a sufficient set of observations to offer reliable and sufficient results for investigating the behavior of holiday effect and observe how this anomalous effect has behaved/ performed through time.

We employ the empirical tests discussed above on the returns of 107 companies listed at Pakistan Stock Exchange (PSX). We calculate daily returns for 20 years (from January 1996 to December 2015) using the following formula;

$$r_t = [ln(P_t) - ln(P_{t-1})] \times 100$$

Where at time *t*, the natural logarithm of the price of individual

companies is represented by $ln(P_t)$, while at time $t-1$ natural logarithm of price is represented by $ln(P_{t-1})$, series of returns for each of 107 companies comprising 5219 observations.

Kurtosis, skewness and Jarque–Bera-statistics are used to detect the normality of data which show that 107 companies deviate from the normal distribution which indicates that the distributions of companies' return series are not normal (A normal distribution should have a zero-skewness statistic and a kurtosis statistic of three). In order to investigate the series further, three most common types of unit root tests are also conducted (ADF, PP and KPSS) for all 107 companies. Both the ADF test (Augmented Dickey-Fuller) and the PP test (Phillips Perron) have non-stationarity as their null hypothesis while the alternative hypothesis is being stationarity. KPSS test (Kwiatkowski-Phillips-Schmidt-Shin) is also conducted in order to avoid the over the rejection of the null hypothesis. KPSS has stationarity as the null hypothesis while the alternative hypothesis is being non-stationarity. ADF test and PP-test reveal that price level for around 83% firms is non-stationary, as the first difference is taken (returns), the series of return of all the companies become stationary at 1% significance in each case of Pure Random-Walk, Random-Walk with drift and Random-Walk with drift & deterministic trends. The results of KPSS test reveal that price levels of all 107 firms reject the null hypothesis of stationarity at 1 % significance in full-sample; indicating price levels are nonstationary with both Random-walk with drift and Random-walk with drift and deterministic trends. Similarly, the results reveal that when the first difference (return) of the series is taken 99% firms accept the null hypothesis of stationarity at 1 % significance in full-sample indicating return series are stationary with Pure Random-Walk, Random-Walk with drift and Random-Walk with. The results of Kurtosis, skewness, Jarque–Bera-statistics and unit root tests are calculated for full and all sub-samples and are kept with the author may be provided on demand.

Table 1. Descriptive Statistics of Holiday effect in all firms during full sample period while *** shows the significance level at 1%.

	Mean	**Std. Deviation**	**t-statistic**	**W-statistic**
Holiday	0.1681	0.3008	4.884***	36.655***
Non-Holiday	0.0249	0.0385		

Table 2. Mean Returns on Holidays and non-Holidays of individual firms over the period 1996-2015.

Holiday Effect	Firms	Mean	Firms	Mean	Firms	Mean	Firms	Mean
Holiday	PK:ABB	0.037	PK:DEG	0.246	PK:JIN	0.262	PK:TLM	0.071
Non-Holiday		0.052		0.031		0.06		-0.016
Holiday	PK:ADI	0.086	PK:ETU	0.319	PK:KIE	0.63	PK:PTC	0.103
Non-Holiday		0.044		0.055		-0.053		0.063
Holiday	PK:AGR	0.509	PK:ERO	0.135	PK:KRM	-0.075	PK:PSM	0.207
Non-Holiday		0.051		0.045		0.01		-0.022
Holiday	PK:AGT	0.13	PK:FSM	-0.196	PK:KWG	0.489	PK:LAK	0.108
Non-Holiday		0.065		0.055		0.012		0.101
Holiday	PK:ACB	0.196	PK:FAU	0.252	PK:KNR	0.317	PK:PCT	0.391
Non-Holiday		0.031		0.037		0.026		0.029
Holiday	PK:ATH	0.095	PK:FZM	1.296	PK:LDP	0.042	PK:POC	0.271
Non-Holiday		0.101		-0.031		-0.003		-0.013
Holiday	PK:ATR	0.142	PK:FEC	0.086	PK:MLC	0.639	PK:RMP	0.252
Non-Holiday		0.044		0.02		0.001		0.07
Holiday	PK:BKP	0.306	PK:NAK	-0.103	PK:MBK	0.135	PK:RUP	-0.057
Non-Holiday		0.015		0.026		0.067		-0.023
Holiday	PK:BAP	0.124	PK:GAI	-0.157	PK:MIR	-0.127	PK:STM	0.134
Non-Holiday		0.088		0.038		0.041		-0.009
Holiday	PK:BHA	0.091	PK:GTR	0.401	PK:MRB	0.047	PK:CCB	0.548
Non-Holiday		0.036		0.045		0.091		-0.066
Holiday	PK:BOC	0.029	PK:GWC	0.131	PK:NAR	0.055	PK:SAN	0.098
Non-Holiday		0.05		-0.004		0.034		0.008
Holiday	PK:CAL	0.326	PK:GLT	-0.214	PK:NPK	0.265	PK:HPN	0.08
Non-Holiday		-0.003		0.051		0.084		0.032
Holiday	PK:CPB	0.055	PK:GRY	0.388	PK:NAT	0.464	PK:SPP	0.103
Non-Holiday		0.025		0.009		-0.04		0.065
Holiday	PK:CTC	0.33	PK:GUL	-0.005	PK:NHT	0.25	PK:SAP	0.178
Non-Holiday		0.019		0.042		0.05		0.041
Holiday	PK:CSA	-0.016	PK:GSM	-0.07	PK:NON	-0.247	PK:SEA	0.067
Non-Holiday		0.044		-0.019		0.048		0.087
Holiday	PK:CTX	-0.23	PK:HAB	0.12	PK:ORI	-0.047	PK:SER	0.184
Non-Holiday		0.018		0.036		0.021		0.045
Holiday	PK:CYA	0.13	PK:MET	0.188	PK:PAC	0.073	PK:SHA	0.197
Non-Holiday		0.058		0.055		0.043		0.023
Holiday	PK:DAC	0.02	PK:HSM	0.151	PK:PET	0.205	PK:SCM	-0.252
Non-Holiday		-0.028		0.041		0.045		0.017
Holiday	PK:DAE	0.106	PK:HAE	0.189	PK:PSM	-0.031	PK:SHJ	-0.022
Non-Holiday		-0.012		0.008		0.073		0.025
Holiday	PK:DAN	0.365	PK:HPM	0.067	PK:PNC	-0.212	PK:SHK	0.361
Non-Holiday		-0.024		0.062		0.072		-0.002
Holiday	PK:DDH	0.206	PK:HUB	0.03	PK:PEN	2.164	PK:PBS	-0.002
Non-Holiday		0.058		0.029		-0.032		0.033
Holiday	PK:DAW	0.31	PK:HUF	-0.222	PK:PAL	0.437	PK:SIT	-0.097
Non-Holiday		0.056		0.066		-0.021		0.046
Holiday	PK:DKT	0.397	PK:ICI	0.016	PK:PNS	0.291	PK:SON	0.384
Non-Holiday		-0.059		0.021		0.047		0.025
Holiday	PK:DMT	-0.041	PK:IMO	0.293	PK:POF	0.035	PK:SNG	0.285
Non-Holiday		-0.034		0.069		0.064		-0.001

Holiday	PK:DES	0.326	PK:INI	-0.068	PK:PRE	0.119	PK:SUI	0.167
Non-Holiday		-0.07		0.059		0.023		0.019
Holiday	PK:DSM	0.521	PK:ASB	0.173	PK:PSO	0.146	PK:TRP	-0.39
Non-Holiday		-0.062		-0.039		0.027		-0.006
Holiday	PK:DEW	-0.165	PK:JAV	0.082	PK:PSC	0.376		
Non-Holiday		-0.06		0.018		-0.025		

EMPIRICAL RESULTS

Table 1 presents the analysis of Holiday effect covering the whole sample period from 1996 to 2015 on all 107 companies. A non-parametric test Kruskal-Wallis statistic along with a standard t-statistic for differences in mean are calculated. Pre-holidays mean returns are higher than mean returns on non-holidays. Further, both test statistics support robust evidence of holiday effect by indicating significant mean differences between holiday and non-holidays returns. Therefore, we find holiday effect over the full sample period which is statistically significant. Table 2 shows the mean return of holidays and non-holidays for individual companies over the period of full-sample. Holidays mean returns are higher than mean returns on non-holidays in 71.1% firms. Therefore, in the majority of the firms we find holiday effect in the whole sample period on the basis of mean returns. Tables 3, 4, 5 & 6 presents the behavior of holiday effect in full-sample as well as in sub-samples through GARCH (1,1) model and KW test. The results of full-sample reveal that holiday effect is significantly positive in 12 firms[8] over the period of 20 years, comprising 1996 to 2015. This behavior shows that the returns of these firms are significantly higher and positive prior to the holidays time. Similarly, 66 firms[9] show that the pre-holiday return is positive but insignificant over the full sample. However, 78 (12+66) firms show that the returns are positive before the holiday in the full sample period. On the other hand, firms like PK:DAW, PK:GAI, PK:GLT and PK:INI generate significant but negative coefficient prior to holidays, while 25 firms[10] reflect insignificant and negative returns before the holidays.

[8] PK:AGR, PK:CTC, PK:ETU, PK:IMO, PK:JIN, PK:KIE, PK:MLC, PK:PEN, PK:POF, PK:PSC, PK:PCT and PK:SON.

[9] PK:ABB, PK:ADI, PK:AGT, PK:ACB, PK:ATH, PK:ATR, PK:BKP, PK:BHA, PK:CAL, PK:CPB, PK:CSA, PK:CYA, PK:DAC, PK:DAE, PK:DAN, PK:DDH, PK:DKT, PK:DMT, PK:DES, PK:DSM, PK:DEG, PK:ERO, PK:FAU, PK:FEC, PK:GTR, PK:GWC, PK:GUL, PK:GSM, PK:HAB, PK:MET, PK:HSM, PK:HAE, PK:HPM, PK:HUB, PK:HUF, PK:ICI, PK:ASB, PK:JAV, PK:KRM, PK:KNR, PK:LDP, PK:MBK, PK:NPK, PK:NAT, PK:NHT, PK:ORI, PK:PAC, PK:PET, PK:PAL, PK:PRE, PK:PSO, PK:TLM, PK:PSM, PK:LAK, PK:POC, PK:RMP, PK:RUP, PK:STM, PK:CCB and PK:SAN.

[10] PK:BAP, PK:BOC, PK:CTX, PK:DEW, PK:FSM, PK:FZM, PK:NAK, PK:GRY, PK:KWG, PK:MIR, PK:MRB, PK:NAR, PK:NON, PK:PSM, PK:PNC, PK:PNS, PK:PTC, PK:SPP, PK:SEA, PK:SER, PK:SCM, PK:SHJ, PK:PBS, PK:SIT and PK:TRP.

As far as the sub-sample analysis are concerned, Table 3 reveals that the coefficients of the holiday effect are insignificant (independent) in first sub-sample (1996-2000) for the companies PK:BOC, PK:FSM, PK:FZM, PK:MIR, PK:NPK, PK:PAL, PK:PNS PK:PRE, PK:PCT, PK:SPP, PK:SER and PK:SNG. The behavior of the holiday effect then turns to dependency (inefficiency) during the period of 2001-2005 for these companies as the coefficients are significant. While the effect then reverses and turns to independence and market becomes efficient for the companies in next two sub-samples (from 2006-2010 to 2011-2015), thus supporting AMH which states that market efficiency varies over the time and encounters the periods of efficiency and inefficiency. Table 4 reveals that firms PK:CTX, PK:DAN, PK:DDH, PK:HSM, PK:INI, PK:KIE, PK:NAR, PK:PNC, PK:LAK, PK:SEA and PK:SHJ show independence of holiday effect in first two sub-samples (1996-2000 and 2001-2005). The behavior of holiday effect reverses in third sub-sample (2006-2010) and becomes dependent which completely reverses and show independent behavior in the last sub-sample, consistent with AMH. Holiday effect remains insignificant (independent) in first three subsamples (from years 1996-2010) for the firms PK:ADI, PK:AGT, PK:BAP, PK:DAE, PK:DSM, PK:ETU, PK:ERO, PK:GAI, PK:POF, PK:RMP and PK:SHK and then reverts, predictable and moving towards dependency (market inefficiency) in last sub-sample (2011-2015) thus supporting AMH (Table 5). Similarly, Holiday effect for PK:GTR, PK:IMO, PK:JIN, PK:NON, PK:PEN, and PK:PSC (Table 6) also illustrates the behavior consistent with AMH. Therefore, 40 firms show the behavior of holiday effect consistent to AMH, means holiday effect fluctuates over time. While the holiday effect in 67 firms[11] remains independent and does not evolve over time as all the sub-samples produce insignificant coefficient (the results of firms generating insignificant holiday effect are not reported in the study but may be provided on demand).

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[11] PK:ABB, PK:AGR, PK:ACB, PK:ATH, PK:ATR, PK:BKP, PK:BHA, PK:CAL, PK:CPB, PK:CTC, PK:CSA, PK:CYA, PK:DAE, PK:DAW, PK:DKT, PK:DMT, PK:DES, PK:DEW, PK:DEG, PK:FAU, PK:FEC, PK:NAK, PK:GWC, PK:GLT, PK:GRY, PK:GUL, PK:GSM, PK:HAB, PK:MET, PK:HAE, PK:HPM, PK:HUB, PK:HUF, PK:ICI, PK:ASB, PK:JAV, PK:KRM, PK:KWG, PK:KNR, PK:LDP, PK:MLC, PK:MBK, PK:MRB, PK:NAT, PK:NHT, PK:ORI, PK:PAC, PK:PET, PK:PSM, PK:PSO, PK:TLM, PK:PTC, PK:PSM, PK:POC, PK:RUP, PK:STM, PK:CCB, PK:SAN, PK:HPN, PK:SAP, PK:SHA, PK:SCM, PK:PBS, PK:SIT, PK:SON, PK:SUI and PK:TRP.

Table 3. Results of the Holiday-Effect with the application GARCH (1,1) regression model and Kruskal-Wallis (K.W) test in full-sample as well as in subsample periods for companies listed at PSX (PK:BOC, PK:FSM, PK:FZM, PK:MIR, PK:NPK, PK:PAL, PK:PNS PK:PRE, PK:PCT, PK:SPP, PK:SER and PK:SNG). Where ***, ** and * represent significance at levels of 1%, 5% and 10%, while "ß" represents Holiday effect and "c" represents returns in non-holiday and number of observations are represented by "N".

N	Firms	Period	c	ß	α_1	α_2	θ	K.w
5219	PK:BOC	Full-Sample	0.0235	-0.0656	4.028***	0.09***	0.435***	0.0169
1305		1996-2000	-0.0201	0.4228	9.65***	0.075***	0.4169***	1.9203
1305		2001-2005	0.015	0.5901**	0.1982***	0.0639***	0.9056***	0.1428
1304		2006-2010	-0.060***	-0.2262	-0.0128***	-0.0038***	1.0082***	0.272
1305		2011-2015	-0.0006	0.0368	0.4595***	0.167***	0.7403***	0.0703
5219	PK:FSM	Full-Sample	0.0183	-0.2883	2.6657***	0.0586***	0.7165***	0.0001
1305		1996-2000	-0.0911	-0.4604	26.2518***	0.0923***	-0.1092***	0.2456
1305		2001-2005	0.1396*	-1.075***	0.0372***	0.0296***	0.9702***	1.1267
1304		2006-2010	-0.0567***	-0.1378	0.0067***	-0.0071***	1.0052***	1.016
1305		2011-2015	0.0394	0.1587	0.6515***	0.0992***	0.7891***	0.9165
5219	PK:FZM	Full-Sample	0.3666***	-0.4074	9.2275***	2.7492***	0.014***	0.0822
1305		1996-2000	1.121***	0.6892	98.1191***	3.2804***	-0.0003	0.2567
1305		2001-2005	-0.0031	-0.6561**	0.0227***	0.0158***	0.9815***	0.6669
1304		2006-2010	0.0926*	-0.3383*	0.0211***	-0.0079***	1.0068***	0.369
1305		2011-2015	-0.0142	-0.0516	0.0544***	0.0507***	0.945***	0.2276
5219	PK:MIR	Full-Sample	-0.0223	-0.1915	1.7477***	0.0839***	0.7242***	1.415
1305		1996-2000	-0.0701	-0.2557	10.9595***	0.0395***	-0.1844***	0.1657
1305		2001-2005	-0.045	-1.334***	2.4695***	0.1126***	0.7467***	1.9986
1304		2006-2010	0.0481	0.2968	4.7766	-0.0106***	0.5641*	0.106
1305		2011-2015	0.0107	-0.4618*	0.9088***	0.1579***	0.6889***	1.5395
5219	PK:NPK	Full-Sample	0.0498**	0.0751	0.0482***	0.0433***	0.9508***	0.2868
1305		1996-2000	0.0336	0.0517	0.0747***	0.0755***	0.9214***	0.3217
1305		2001-2005	0.0729	0.6624**	4.212***	0.1413***	0.306***	0.7665
1304		2006-2010	-0.0275	0.2621	0.1699***	0.0926***	0.8691***	0.143
1305		2011-2015	0.0156	0.2151	0.5153***	0.1562***	0.72***	0.5815

5219	PK:PAL	Full-Sample	-0.0439	0.3319	0.8653***	0.0959***	0.8444***	4.2956**
1305		1996-2000	-0.0487	-0.3454	1.1573***	0.1039***	0.8374***	0.0828
1305		2001-2005	-0.0321	0.9311***	0.6235***	0.0824***	0.8703***	2.8266*
1304		2006-2010	-0.1608*	0.1593	1.8078***	0.17***	0.6736***	0.205
1305		2011-2015	0.0406	0.4519	0.6967***	0.0868***	0.8729***	2.5274
5219	PK:PNS	Full-Sample	0.0269	-0.1374	0.0134***	0.0228***	0.9775***	0.1973
1305		1996-2000	-0.1423	-0.2746	1.5114***	0.0604***	0.8904***	0.0268
1305		2001-2005	0.2211**	1.0824**	1.1035***	0.1049***	0.8616***	3.0079*
1304		2006-2010	-0.0623	-0.4079	0.5801***	0.198***	0.728***	2.202
1305		2011-2015	-0.0439	-0.0933	1.499***	0.1992***	0.5602***	0.0011
5219	PK:PRE	Full-Sample	-0.0331	0.1881	0.2109***	0.0486***	0.9261***	1.7336
1305		1996-2000	-0.2121**	-0.0332	0.3252***	0.0333***	0.9369***	0.0011
1305		2001-2005	0.0684	0.5228**	0.0947***	0.0499***	0.9407***	0.291
1304		2006-2010	-0.0013	0.0638	0.2874***	0.1901***	0.7737***	0.508
1305		2011-2015	-0.056	0.3093	0.5432***	0.1925***	0.7038***	1.7496
5219	PK:PCT	Full-Sample	0.0586	0.4193**	0.0472***	0.049***	0.9512***	2.7984*
1305		1996-2000	-0.298**	0.4972	1.3841***	0.0583***	0.8932***	1.7603
1305		2001-2005	0.1056	1.2545***	0.695***	0.0701***	0.8973***	0.9387
1304		2006-2010	-0.0187	0.428	0.273***	0.1802***	0.8009***	0.588
1305		2011-2015	0.1347**	0.1702	0.0912***	0.0631***	0.9277***	0.8858
5219	PK:SPP	Full-Sample	-0.0058	-0.128	0.1066***	0.0769***	0.9426***	0.0069
1305		1996-2000	-0.029	0.4543	7.3799***	0.1016***	0.1734***	0.4377
1305		2001-2005	-0.1052	2.2698***	0.114***	0.3702***	0.8783***	0.0795
1304		2006-2010	-0.0342	-0.3984	1.0722***	0.1266***	0.7033***	1.143
1305		2011-2015	0.0381	-0.0142	0.0338***	0.0581***	0.9387***	0.4796
5219	PK:SER	Full-Sample	-0.043	-0.1122	0.0725***	0.0506***	0.9656***	0.8704
1305		1996-2000	-0.0542	0.0769	0.2632***	0.0209***	0.8707***	0.4521
1305		2001-2005	-0.3517***	-1.490***	0.0771	0.9287***	0.8797***	0.1427
1304		2006-2010	0.0406	-0.1832	1.599***	0.0811***	0.7614***	0.833
1305		2011-2015	-0.0144	0.2199	0.5919***	0.221***	0.6672***	4.0494**
5219	PK:SNG	Full-Sample	-0.0026	0.2151	0.5385***	0.1333***	0.788***	2.7583*
1305		1996-2000	-0.0261	-0.0463	0.5194***	0.1519***	0.8096***	0.6661
1305		2001-2005	0.0385	0.6616**	0.4442***	0.0684***	0.8687***	1.114
1304		2006-2010	-0.0279	0.1355	0.7991***	0.2071***	0.6545***	0.247
1305		2011-2015	-0.0039	0.138	0.6567***	0.1252***	0.7221***	0.8842

Table 4. Results of the Holiday-Effect with the application GARCH (1,1) regression model and Kruskal-Wallis (K.W) test in full-sample as well as in subsample periods for companies listed at PSX (PK:CTX, PK:DAN, PK:DDH, PK:HSM, PK:INI, PK:KIE, PK:NAR, PK:PNC, PK:LAK, PK:SEA and PK:SHJ). Where ***, ** and * represent significance at levels of 1%, 5% and 10%, while "ß" represents Holiday effect and "c" represents returns in non-holiday and number of observations are represented by "N".

N	Firms	Period	c	ß	α_1	α_2	θ	K.w
5219	PK:CTX	Full-Sample	0.0053	-0.2381	0.066***	0.0296***	0.966***	0.1938
1305		1996-2000	0.1144	-0.3979	26.1685***	0.1369***	-0.1747***	0.0983
1305		2001-2005	0.0342	0.3194	7.8322***	0.1101***	0.1144	1.3419
1304		2006-2010	-0.0611	-0.8696***	0.0143***	0.1245***	0.8883***	0.436
1305		2011-2015	-0.0082	-0.2484	0.03*	0.0209***	0.9755***	0.5267
5219	PK:DAN	Full-Sample	-0.0419	0.0437	0.0527***	0.015***	0.9843***	1.0317
1305		1996-2000	-0.246	0.3194	-0.2184***	-0.0018***	1.0083***	1.1596
1305		2001-2005	-0.0928	0.2646	9.2593***	0.1784***	0.552***	0.2024
1304		2006-2010	-0.0283	0.9146***	0.0115***	0.1372***	0.8868***	0.022
1305		2011-2015	0.0544	0.4571	0.0103	0.0144***	0.9846***	0.6778
5219	PK:DDH	Full-Sample	0.0711**	0.0719	1.5143***	0.2109***	0.5708***	1.1575
1305		1996-2000	0.1276*	-0.1988	2.4057***	0.2901***	0.5138***	0.2299
1305		2001-2005	0.075	0.302	1.794***	0.2803***	0.4656***	1.4557
1304		2006-2010	0.0239	-0.472**	0.1313***	0.153***	0.8344***	0.497
1305		2011-2015	0.0073	0.2613	0.8094***	0.167***	0.6762***	2.9479*
5219	PK:HSM	Full-Sample	0.0232	0.0696	1.251***	0.0765***	0.7135***	2.2075
1305		1996-2000	-0.0111	-0.1711	3.8677***	-0.0078***	0.4479**	0.2124
1305		2001-2005	-0.0092	0.7972	15.5545***	0.0248***	-0.2737***	2.1292
1304		2006-2010	0.0731	-0.4887**	0.0808***	0.1153***	0.8771***	1.08
1305		2011-2015	0.0917**	0.2564	0.6699***	0.3134***	0.5648***	3.1251*
5219	PK:INI	Full-Sample	-0.0076	-0.1953*	0.7622***	0.2313***	0.639***	0.0246
1305		1996-2000	-0.0591	-0.1545	0.6214***	0.1946***	0.6941***	0.48
1305		2001-2005	0.0645	-0.2594	1.028***	0.3343***	0.6157***	0.0247
1304		2006-2010	0.0671	-0.42*	0.4495***	0.296***	0.6361***	2.372
1305		2011-2015	-0.0445	0.1634	0.7156***	0.1318***	0.677***	4.1979**
5219	PK:KIE	Full-Sample	-0.0571	0.5072**	1.0302***	0.1335***	0.8018***	5.7382**
1305		1996-2000	-0.1388	-0.0317	0.8913***	0.1539***	0.8059***	1.0869
1305		2001-2005	-0.0311	0.3437	0.7067***	0.1365***	0.8203***	0.1372

1304		2006-2010	-0.1748*	0.6773*	2.0821***	0.1692***	0.704***	2.641*
1305		2011-2015	0.0164	0.699*	0.5783***	0.1166***	0.8456***	2.3849
5219	PK:NAR	Full-Sample	0.0107	-0.0151	1.5882***	0.1474***	0.6213***	2.4781
1305		1996-2000	-0.16**	0.2904	0.3414***	0.0952***	0.8768***	0.0026
1305		2001-2005	0.1326*	0.6146*	0.5532***	0.123***	0.8031***	1.3714
1304		2006-2010	-0.0636	-3.2254***	2.1235***	0.7291***	0.2533***	0.092
1305		2011-2015	0.0081	0.2742	0.9319***	0.1417***	0.5525***	4.0226**
5219	PK:PNC	Full-Sample	0.0603	-0.2674	4.1068	-0.0024***	0.5931*	4.2185**
1305		1996-2000	-0.124	0.1029	4.6679	-0.0017***	0.396	0.3722
1305		2001-2005	0.2242*	-0.5656	0.8702***	-0.0045***	0.9229***	2.4281
1304		2006-2010	0.0509	-0.4765***	0.4199***	0.2344***	0.6842***	5.113**
1305		2011-2015	0.0059	-0.1111	0.8553***	0.1492***	0.6936***	0.7227
5219	PK:LAK	Full-Sample	0.0569**	0.14	0.1614***	0.0672***	0.9132***	0.543
1305		1996-2000	0.0731	-0.0427	2.8121***	0.1059***	0.5747***	0.0336
1305		2001-2005	0.1241*	-0.1907	0.1102***	0.0224***	0.9616***	0.0662
1304		2006-2010	0.0627	0.5436**	0.0516***	0.1097***	0.9204***	0.148
1305		2011-2015	0.0117	0.0961	0.0562***	0.0859***	0.9044***	2.0765
5219	PK:SEA	Full-Sample	0.0495*	-0.1622	0.1742***	0.111***	0.867***	0.061
1305		1996-2000	-0.1382*	-0.0612	2.0167***	0.2245***	0.5225***	0.0056
1305		2001-2005	0.1356**	0.0008	0.4736***	0.1433***	0.8008***	0.4626
1304		2006-2010	-0.0358	-0.4854***	0.0951***	0.1217***	0.8702***	0.658
1305		2011-2015	0.1075**	0.0506	0.0648***	0.079***	0.9069***	0.2499
5219	PK:SHJ	Full-Sample	-0.026	-0.0196	1.3599***	0.2328***	0.4937***	0.1822
1305		1996-2000	-0.0029	-0.023	2.0408***	0.1341*	0.4828***	0.0027
1305		2001-2005	0.0489	0.0566	0.8301***	0.2099***	0.5719***	0.4724
1304		2006-2010	-0.0208	-0.4873*	2.0948***	0.1289***	0.4853***	2.406
1305		2011-2015	-0.0711	0.2031	1.7514***	0.2779***	0.465***	0.0742

Table 5. Results of the Holiday-Effect with the application GARCH (1,1) regression model and Kruskal-Wallis (K.W) test in full-sample as well as in subsample periods for companies listed at PSX (PK:ADI, PK:AGT, PK:BAP, PK:DAE, PK:DSM, PK:ETU, PK:ERO, PK:GAI, PK:POF, PK:RMP and PK:SHK). Where ***, ** and * represent significance at levels of 1%, 5% and 10%, while "ß" represents Holiday effect and "c" represents returns in non-holiday and number of observations are represented by "N".

N	Firms	Period	c	ß	α_1	α_2	θ	K.w
5219	PK:ADI	Full-Sample	0.0708**	0.1547	0.5557***	0.1526***	0.7872***	0.9545
1305		1996-2000	-0.0288	-0.1163	0.7853***	0.1299***	0.8026***	0.0373
1305		2001-2005	0.1435*	0.0541	1.3866***	0.2477***	0.6549***	0.7828

1304		2006-2010	0.1798**	0.045	1.1105***	0.1891***	0.6877***	0.334
1305		2011-2015	0.0126	0.4502**	0.2525***	0.1051***	0.8309***	1.5345
5219	PK:AGT	Full-Sample	0.0027	0.1699	0.9197***	0.1373***	0.6897***	0.6773
1305		1996-2000	-0.0775	0.0815	2.1518***	0.1571***	0.5849***	0.4967
1305		2001-2005	0.0606	0.0614	0.4091***	0.1169***	0.8294***	0.0252
1304		2006-2010	0.0222	0.1705	0.2264***	0.2277***	0.7343***	0.004
1305		2011-2015	-0.0171	0.4851**	0.3944***	0.1291***	0.7632***	1.1823
5219	PK:BAP	Full-Sample	0.0076	-0.0468	0.1336***	0.0568***	0.921***	0.326
1305		1996-2000	-0.0588	-0.1249	0.183***	0.0585***	0.8997***	0.0374
1305		2001-2005	0.0394	0.0195	1.3721***	0.0725***	0.686***	0.8996
1304		2006-2010	0.0659	-0.0822	1.9666***	0.1699***	0.5041***	0.208
1305		2011-2015	0	-0.0001**	0	0.114***	0.8971***	0.0992
5219	PK:DAE	Full-Sample	-0.0598*	0.1028	1.236***	0.0995***	0.7204***	0.4999
1305		1996-2000	-0.1148	0.042	5.1726***	0.0841***	0.5094***	2.5337
1305		2001-2005	0.0273	-0.1488	2.8268***	0.0769***	0.2938***	0.6936
1304		2006-2010	-0.0467	0.1519	3.789	-0.0049***	0.3647	0.162
1305		2011-2015	-0.105	0.3514	1.1167***	0.1306***	0.7586***	1.5924
5219	PK:DSM	Full-Sample	-0.0749	0.3726	0.0869***	0.0222***	0.9729***	6.0797**
1305		1996-2000	-0.1237	0.2842	2.1638***	-0.0046	0.5947***	1.9813
1305		2001-2005	0.0057	0.78	5.0981***	-0.0135***	0.5156***	1.4337
1304		2006-2010	-0.1494	-0.438	0.7913***	0.0993***	0.8672***	0.118
1305		2011-2015	-0.063	1.6184***	1.4046***	0.0774***	0.8903***	7.002***
5219	PK:ETU	Full-Sample	0.0242	0.473***	0.9696***	0.1259***	0.7068***	3.3177*
1305		1996-2000	-0.1055*	0.2301	3.8088***	0.028**	0.2346	0.5755
1305		2001-2005	0.1276*	0.2244	1.0173***	0.0514***	0.7923***	0.0241
1304		2006-2010	0.0988*	0.1845	0.5947***	0.2461***	0.6777***	0.115
1305		2011-2015	-0.0428	0.6624***	0.8996***	0.2036***	0.5922***	12.7528***
5219	PK:ERO	Full-Sample	0.0716***	0.1099	0.4451***	0.174***	0.7508***	1.7814
1305		1996-2000	0.0251	0.1871	0.3706***	0.1582***	0.8053***	2.1831
1305		2001-2005	0.0626	-0.2158	0.6358***	0.3281***	0.6053***	1.118
1304		2006-2010	0.1256**	-0.1481	0.7251***	0.2418***	0.6309***	2.321
1305		2011-2015	0.0344	0.5921**	0.1998***	0.0865***	0.8668***	4.5855**
5219	PK:GAI	Full-Sample	-0.0375	-0.7034***	0.0822***	0.0635***	0.9543***	0.0301
1305		1996-2000	-0.1551	-0.6366	11.2847***	0.0938***	0.6127***	0.2085
1305		2001-2005	0.0733	0.3412	0.9577***	0.1091***	0.8043***	0.0276
1304		2006-2010	-0.2319***	0.0298	0.33***	0.0599***	0.893***	0.121
1305		2011-2015	0.0231	-0.2561**	0.0356***	0.0285***	0.954***	0.459
5219	PK:POF	Full-Sample	0.0539**	0.2573*	0.0991***	0.0691***	0.9155***	2.077
1305		1996-2000	-0.0507	0.1047	0.0208***	0.0609***	0.9523***	0.129
1305		2001-2005	0.0795	0.1346	0.5209***	0.2147***	0.7643***	0.5436
1304		2006-2010	0.1258**	0.0285	0.6328***	0.1786***	0.7085***	0.559
1305		2011-2015	0.0101	0.3565**	0.0876***	0.0585***	0.8959***	8.7933***
5219	PK:RMP	Full-Sample	0.0289	0.0164	0.0451***	0.0334***	0.9542***	2.9248*
1305		1996-2000	-0.1241***	0.1129	0.0011***	-0.005***	1.008***	0.0676

1305		2001-2005	0.1054**	-0.1104	0.058***	0.0282***	0.9414***	0.7962
1304		2006-2010	0.0464	0.2902*	0.0854***	0.0538***	0.918***	0.024
1305		2011-2015	0.0167	0.6353**	1.7707***	0.2321***	0.425***	2.0456
5219	PK:SHK	Full-Sample	-0.017	0.1243	0.3017***	0.0294***	0.9504***	0.7855
1305		1996-2000	-0.065	0.3257	6.1137***	0.0556***	0.3899***	0.2361
1305		2001-2005	0.105	-0.4875	0.2469***	0.0199***	0.9649***	1.6014
1304		2006-2010	-0.1313	-0.3088	1.4565***	0.161***	0.7187***	0.188
1305		2011-2015	-0.064	0.8206**	0.507***	0.1092***	0.8575***	1.361

Table 6. Results of the Holiday-Effect with the application GARCH (1,1) regression model and Kruskal-Wallis (K.W) test in full-sample as well as in subsample periods for companies listed at PSX (PK:ADI, PK:AGT, PK:BAP, PK:DAE, PK:DSM, PK:ETU, PK:ERO, PK:GAI, PK:POF, PK:RMP and PK:SHK). Where ***, ** and * represent significance at levels of 1%, 5% and 10%, while "ß" represents Holiday effect and "c" represents returns in non-holiday and number of observations are represented by "N".

N	Firms	Period	c	ß	α_1	α_2	θ	K.w
5219	PK:JIN	Full-Sample	-0.1589***	0.3718*	0.3903***	0.142***	0.8646***	3.2195*
1305		1996-2000	-0.018	0.2464	2.4122***	0.108***	0.5969***	0.6566
1305		2001-2005	-0.4433***	-0.4891**	0.0938**	0.3527***	0.8715***	0.0333
1304		2006-2010	-0.0164	0.1921	0.766***	0.2337***	0.5983***	1.129
1305		2011-2015	0.0398	0.369**	0.3468***	0.0956***	0.8131***	0.1432
5219	PK:NON	Full-Sample	-0.0072	-0.1441	0.5886***	0.0822***	0.8587***	0.0023
1305		1996-2000	-0.0002	-0.5603*	0.1087***	0.0207***	0.9619***	1.0223
1305		2001-2005	0.0923	0.107	0.6236***	0.0425***	0.8969***	0.1206
1304		2006-2010	-0.0473	-0.3939*	0.1766***	0.1749***	0.824***	0.662
1305		2011-2015	0.0657	0.2006	6.3678	-0.007***	0.5746	1.0309
5219	PK:PSC	Full-Sample	-0.0325	0.4385**	0.2962***	0.0553***	0.9229***	0.7705
1305		1996-2000	-0.1447	0.2617	0.6447***	0.0591***	0.901***	0.1721
1305		2001-2005	-0.0129	0.7016**	5.0654***	0.1181***	0.3082***	1.8082
1304		2006-2010	-0.2104*	1.0972**	0.735***	0.0684***	0.9007***	0.162
1305		2011-2015	0.0049	-0.2646	0.3661***	0.1675***	0.7935***	0.0208
5219	PK:GTR	Full-Sample	-0.0201	0.1757	0.7986***	0.15***	0.7605***	2.4734
1305		1996-2000	-0.1937***	0.4306	0.9768***	0.1399***	0.8042***	1.7285
1305		2001-2005	0.0199	-0.2455	1.7227***	0.1849***	0.5977***	0.0002
1304		2006-2010	-0.0431	-0.3898**	0.1801***	0.175***	0.8099***	0.133
1305		2011-2015	0.0491	0.721**	1.6121***	0.1776***	0.5503***	6.2667**
5219	PK:IMO	Full-Sample	0.0606**	0.2933**	0.1939***	0.1009***	0.8713***	3.0898*
1305		1996-2000	-0.137	1.0107***	3.1405***	0.1984***	0.5304***	2.5407
1305		2001-2005	0.1467**	-0.2781	0.8212***	0.1225***	0.7474***	0.1483
1304		2006-2010	0.0256	0.3494	0.1991***	0.1303***	0.8385***	0.015
1305		2011-2015	0.0688	0.2908	0.9386***	0.1855***	0.5065***	4.7209**
5219	PK:PEN	Full-Sample	-0.1392	3.6821***	68.2632	-0.0008***	0.5396	1.6291

1305	1996-2000	-0.4707	8.731***	196.3981	-0.0027***	0.5974*	1.8545
1305	2001-2005	-0.0008	0.1188	1.6502***	0.0909***	0.9122***	0.4753
1304	2006-2010	0.0718	-0.514**	0.4029***	0.1612***	0.7913***	0.92
1305	2011-2015	-0.1055**	0.3573	0.7586***	0.1323***	0.6976***	1.9692

CONCLUSION

Although the recent studies support the fact that calendar anomalies have reversed or even diminished over time, the voluminous literature is evident of the fact that calendar anomalies are accepted in almost all equity markets of the world. This paper examined the holiday-effect across time to explore whether this anomaly can be used to exploit the excess returns. The study finds around 72% of firms exhibit positive returns before holidays thus, supporting the presence of the holiday effect through average returns and GARCH (1,1) model in the whole-sample period of 1996-2015. Thus, this anomaly can be used to earn abnormal returns. Finally, it is clear from sub-sample analysis that holiday-effect in 40 firms has shifted from periods of predictability/market inefficiency to the periods of no-predictability/market efficiency or vice versa, while 67 firms exhibit no swing in holiday effect during sub-samples. As the predictability of holiday effect swings under periods of dependency/ inefficiency and independency/efficiency, we conclude that AMH provides a better description of behavior of holiday effect in Pakistan than the classical/traditional EMH.

In summary, we conclude that the holiday effect in firms' exhibits time-varying behavior across time through sub-samples. The sign of varying behavior of holiday effect is consistent and supporting AMH while opposing the traditional EMH. We believe a sub-sample analysis of long time period may be a more appropriate method to elucidate the idea of Adaptive Market Hypothesis (AMH) in future research and suggest the current method could be adapted and would be helpful to examine other calendar and market anomalies in different equity markets in the world.

Appendix. Names of sample companies and their codes

ABBOTT LABS. (PAK.)	PK:ABB	JUBILLE INSURANCE	PK:JIN
ADAMJEE INSURANCE	PK:ADI	KARACHI ELECTRIC SUPP.	PK:KIE
AGRIAUTO INDUSTRIES	PK:AGR	KARAM CERAMICS	PK:KRM
AL-GHAZI TRACTORS	PK:AGT	KOHINOOR MILLS	PK:KWG
ASKARI BANK	PK:ACB	KOHINOOR TEX.MILLS	PK:KNR
ATLAS HONDA	PK:ATH	LINDE PAKISTAN	PK:LDP
ATTOCK REFINERY	PK:ATR	MAPLE LEAF CMT.FACTORY	PK:MLC
BANK OF PUNJAB	PK:BKP	MCB BANK	PK:MBK
BATA PAKISTAN (~PR) (#T)	PK:BAP	MIRPURKHAS SUGAR	PK:MIR
BHANERO TEXTILE MILLS	PK:BHA	MURREE BREWERY COMPANY	PK:MRB
BOLAN CASTINGS	PK:BOC	NATIONAL REFINERY	PK:NAR
CAPITAL ASSETS LSG.	PK:CAL	NESTLE PAKISTAN	PK:NPK
CENTURY PAPER	PK:CPB	NIB BANK	PK:NAT
CHEARAT CEMENT COMPANY	PK:CTC	NISHAT (CHUNIAN)	PK:NHT
CRESCENT STEEL	PK:CSA	NOON SUGAR MILLS	PK:NON
CRESCENT TEXTILE MILLS	PK:CTX	ORIX LEASING PAK.	PK:ORI
CYAN LIMITED	PK:CYA	PACKAGES	PK:PAC
DADABHOY CEMENT	PK:DAC	PAK ELEKTRON	PK:PET
DADEX ETERNIT	PK:DAE	PAK SUZUKI MOTOR	PK:PSM
DANDOT CEMENT	PK:DAN	PAKISTAN CABLES	PK:PNC
DAWOOD HRC.CHEMS.CORP.	PK:DDH	PAKISTAN ENGINEERING	PK:PEN
DAWOOD LAWRENCEPUR	PK:DAW	PAKISTAN INTL.AIRLINES	PK:PAL
DEWAN KHALID TEX.	PK:DKT	PAKISTAN NAT.SHIP.	PK:PNS
DEWAN MUSHTAQ TEX.	PK:DMT	PAKISTAN OILFIELDS	PK:POF
DEWAN SALMAN FIBRE	PK:DES	PAKISTAN REFINERY	PK:PRE
DEWAN SUGAR	PK:DSM	PAKISTAN STATE OIL	PK:PSO
DEWAN TEXTILE MILLS	PK:DEW	PAKISTAN SYNTHETICS	PK:PSC
DG KHAN CEMENT COMPANY	PK:DEG	PAKISTAN TELECM.	PK:TLM
EFU GENERAL INSURANCE	PK:ETU	PAKISTAN TOBACCO	PK:PTC
ENGRO	PK:ERO	PARAMOUNT SPNG.MLS.	PK:PSM
FAISAL SPINNING MILLS	PK:FSM	PHILIP MORRIS PAKISTAN	PK:LAK
FAUJI FERTILIZER	PK:FAU	PIONEER CEMENT	PK:PCT
FAZAL TEXTILE MILLS	PK:FZM	POWER CEMENT	PK:POC
FECTO CEMENT	PK:FEC	RAFHAN MAIZE PRDS.	PK:RMP
FEROZE1888 MILLS	PK:NAK	RUPALI POLYESTER	PK:RUP
GATRON INDUSTRIES	PK:GAI	SAIF TEXTILE MILLS	PK:STM
GENERAL TYRE & RUBBER	PK:GTR	SAMBA BANK	PK:CCB
GHARIBWAL CEMENT	PK:GWC	SANA INDUSTRIES	PK:SAN
GLAXOSMITHKLINE PAK.	PK:GLT	SANOFI AVENTIS PAKISTAN	PK:HPN
GRAYS OF CAMBRIDGE	PK:GRY	SAPPHIRE FIBRES	PK:SPP
GUL AHMED TEXTILE MILLS	PK:GUL	SAPPHIRE TEX.MLS.	PK:SAP
GULISTAN SPNG.MILLS (~PR) (#T)	PK:GSM	SEARLE	PK:SEA
HABIB ADM LIMITED	PK:HAB	SERVICE INDUSTRIES	PK:SER
HABIB METROPOLITAN BANK	PK:MET	SHABIR TILES	PK:SHA
HABIB SUGAR	PK:HSM	SHADMAN COTTON MILLS	PK:SCM
HALA ENTERPRISES	PK:HAE	SHAHTAJ SUGAR MILLS	PK:SHJ
HINOPAK MOTORS	PK:HPM	SHAKARGANJ MILLS	PK:SHK
HUB POWER COMPANY	PK:HUB	SHELL PAKISTAN	PK:PBS
HUFFAZ SEAMLESS PIPE	PK:HUF	SITARA CHEMICAL	PK:SIT
ICI PAKISTAN	PK:ICI	SONERI BANK	PK:SON
INDUS MOTOR COMPANY	PK:IMO	SUI NORTHERN GAS	PK:SNG
INTERNATIONAL INDS.	PK:INI	SUI SOUTHERN GAS	PK:SUI
INVEST CAPITAL INV.BANK	PK:ASB	TRI-STAR POLYESTER	PK:TRP
JAVEDAN	PK:JAV		

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