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Behavior of Calendar Anomalies, Market Conditions and Adaptive Market Hypothesis: Evidence from Pakistan Stock Exchange

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Abstract

The current study investigates Adaptive Market Hypothesis (AMH) via five different calendar effects in Pakistan stock market. For the purpose we examine daily returns of KSE-100 index. The sample comprises 24 years over the period from January 1992 to December 2015. We use sub-sample analysis by utilizing eight different subsamples. Each subsample comprises of equal length of observations (three years each). We further examine subsamples to determine which market condition proves more conduce to the performance of these anomalies. Through the study we enhance the existing literature on AMH as the study first time links both Gregorian and Islamic calendar anomalies with Adaptive Market Hypothesis that permits the performance of well-known calendar effects to fluctuate through time. Furthermore, the study first time links the varying behavior of calendar effects with different conditions prevail in the market to determine what market conditions prove to be most favorable for the performance of these anomalies. We find that behavior of all five calendar anomalies evolve over time as their performance vary from time to time and support the AMH. Furthermore, we also find the presence of the five calendar anomalies under study in different proposed market conditions which indicate varying degree of behavior of calendar anomalies in various market conditions. Overall findings of the current study propose that AMH well clarifies the behavior of calendar effects than traditional Efficient Market Hypothesis (EMH).

Key words: adaptive market hypothesis; calendar effects; efficient market hypothesis.

1. Introduction

This paper attempts to add to the literature on 'Adaptive Market Hypothesis' (AMH) of Lo (2004) through examination of varying behavior of well-known anomalies prevail in Gregorian and Islamic calendar. Furthermore, it aims to examine what market conditions are more favorable to calendar anomalies in Pakistan by exploring their performance in certain different market conditions. The market conditions impact participant's psychology in the market and the way the investors incorporate new-fangled information into the prices of equity which in turn may change the behavior of calendar anomalies over time. Calendar effects means "Financial Assets" across the calendar tend to display systematic patterns and average return is high or low on any specific day of the month, or at weekend, on any specific month, around turn of the month (TOM), or on any other

specific events like holiday, weather or temperature effects or in different political regimes. According Floros & Salvador (2014) calendar effects are very important facts in financial markets. These effects are due to behavior of the investors and cause variation in return. Calendar patterns in security price movements have been researched more than 75 years and were first reported by Wachtel (1942). These seasonal effects are not only a subject of study for researchers but also important for agents of financial markets. So, the researchers in the study intend to evaluate the behavior of calendar anomalies in the context of AMH (Adaptive Market Hypothesis).

To understand the working of stock exchange in the current investigation, the efficiency of the market has vital importance. Sunil (1996) states that "The efficiency of the emerging markets assumes 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". According to the notion of EMH, if a market exhibits weak form efficieny then stock returns are not preditable as well as must be independent of each other (Fama, 1970). On the other hand, if stock prices are predictable and not independent investors can use the information to earn abnormal profits. There exists a conflict between recent literature and EMH because studies find that market anomalies do exist as stock returns have dependent nature see for example (Halari, 2013; Hashmi, 2014; Shahid & Mehmood, 2015). These studies show that there are some profitable investment opportunities in the stock exchanges. A theoretical viewpoint, supports this conflict as Grossman & Stiglitz (1980) argue that it is impossible for a capital market to be absolutely perfect efficient since investors would have no benefit to "acquire costly information if markets were not inefficient and profit-making opportunities are available". In the view of impossibility of perfectly efficient market, Campbell et al. (1997) propose the idea of relative efficiency rather perfect efficiency, which leads a swing from testing efficiency of market from an "all-or nothing condition" to measure it over the period of time. Lo (2004) offers a new model Adaptive Market Hypothesis (AMH) that enables market anomalies to co-exist with efficiency and allows efficiency of the market to evolve with the passage of time. The basic assertion of this model implies that market efficiency is an ever-changing phenomenon which is dependent on the market participants and environmental conditions of market. Furthermore, it asserts that opportunities to earn profit arise from time to time as efficiency of market is not a guaranteed outcome. Urquhart (2013) argues that previous studies provide evidence of market efficiency and inefficiency over a predetermined period of time while market conditions may change over time and create changes in market efficiency from time to time which is consistent with Adaptive market Hypothesis. In recent literature the AMH receives some attention so, the current study investigates whether Adaptive Market Hypothesis is more suitable to better elucidate the behavior of calendar effects than traditional EMH in Pakistan. The results of the study may be useful for security organizations for better understanding of markets and for investors to forecast more accurately.

We select KSE-100 index from January, 1992 to December, 2015 using subsamples of three years of fixed length to inspect the behavior of Monday effect, January effect, TOM effect, holiday effect and month of Ramadan effect. Analysis of each subsample facilitates an investigation of the behavior of all five anomalous effects under study over the time period. However, Urquhart & Hudson (2013) argue that the choice, selection or range of the size of subsamples are of subjective nature. In order to understand how

calendar effects behave over the time we split our data into eight equal length subsamples of 3 years. Each subsample consists of enough observations to generate reliable results to facilitate a comprehensive investigation of behavior of each calendar anomaly over time. Through the study we enhance the existing literature on AMH in several different ways. First of all, the study first time links both Gregorian and Islamic calendar anomalies with Adaptive Market Hypothesis that permits the performance of well-known calendar anomalies to fluctuate through time. Secondly, the current study is first which investigate the Gregorian and Islamic calendar effects and their performance under different prevailing market conditions to elucidate which of the conditions prove more conducive to the performance of these anomalies. Finally, the paper examines the behavior of calendar anomalies with the application of a regression model "GARCH (1,1)" which facilitates the time varying nature of volatility in equity return. On the other hand, to facilitate the non-normal nature of stock return data we use "Kruskal-Wallis test statistic".

We organize the rest of the paper as follows. The subsequent section presents the relevant review of anomalies pertaining to existing literature on Gregorian, Islamic calendar and on AMH. Section 3 describes the methodology, Section 4 presents data while empirical results are reported in section 5 and findings and conclusions are presented in section 6.

2. Literature Review

2.1 Monday Effect

Ulussever et al. (2011) describe that Monday effect is most prominent and puzzling anomaly and receives attractive attention from academicians, practitioners and researchers. Berument & Bogan (2011) describe as for as the day of the week effect is concerned it claims that investors behave differently on different days through the week and prices usually depressed on Monday. Kelly (1930), first documents that Monday is worse day in the stock exchange to buy stock, similarly, Cross (1973) investigates S&P 500 index from year 1953 to 1970. He finds 0.12 % mean return on Friday and -0.18 % return on Monday. However, (French, 1980; Gibbson & Hess, 1981; Keim & Stambaugh, 1984; Michael & Starks 1986) document a wide range of evidence of Monday effect and conclusion of these studies suggests evidence of usually lowest and negative returns on Monday while, highest and positive returns on Friday in stock markets of US. (Lakonishok & Smidt 1988; Abraham & Ikenberry, 1994; Wang et al., 1997) provide the similar evidence in US stock markets. Solnik & Bousquet (1990) investigate the Paris Bourse stock market and provide the evidence of positive returns on (Monday, Wednesday, Thursday and Friday) but negative return on (Tuesday). Athanassakos & Robinson (1994) find significant negative Monday and insignificant positive Tuesday return in Toronto stock exchange. Husain (1998) provides the evidence that Pakistan stock exchange (PSX) is efficient market by providing the no sign of Monday effect in KSE-100 index over the period of January 1989 to December 1993. Mustafa & Muhammad (2007) consider the period of 1991-2001 and find no significant Monday effect in KSE 100 Index.

Lian & Chen (2004) investigate the Asian countries (Indonesia, Malaysia, Philippines, Singapore, and Thailand) over the years 1992 to 2002. They report that stock exchanges of Malaysia, Singapore and Thailand show negative return on Monday while positive return on Wednesday and Friday, stock market of Indonesia exhibits positive return on

Friday while in Philippine, stock returns are positive on Wednesday and Thursday. With reference to investments patterns and size of the firm, Brusa et al. (2005) explore the Monday effect over the period from 1962-1988 in S&P 500 index. They find lowest return on Monday. Haroon (2009) rejects the weak form efficiency in Pakistan stock exchange (PSX) by providing the evidence of Monday effect. Cai et al. (2014) report negative Monday effect in china. From developed and major stock markets, Doyle & Chen (2009) report weekday effect by taking 13 closing prices indices. The 13 indices consist of most efficiently running indices CAC-40 (France), DAX-30 (Germany), FTSE-100 (UK), Hang Seng composite (Hong Kong), Amex composite, Nasdaq composite & NYSE composite (USA), Nikkei-225 (Japan) along with three upcoming and important emerging indices as Shanghai A, Shangai B shares (China) and Sensex-30 (India). They report inefficiency of all 13 indices but they find no Monday effect. Thus providing evidence of market inefficiency.

Alrabadi & Al-Qudah (2012) investigate the period of 2002-2011 and find negative Monday effect at ASE (Amman Stock Exchange) while also argue that seasonal patterns change the trend in price movement. From Latin America, Roderiguez (2012) finds lowest expected return on Monday and highest expected positive returns on Friday. Iqbal et al. (2013) investigate Pakistan stock exchange for the period of 20 years (1992-2011). With the application of ordinary least square (OLS) method on daily and weekly returns, they find negative Monday while positive Friday effect at PSX. Shahid & Mehmood (2015) investigate KSE-100 index of Pakistan stock exchange over the period of 2008-2012 and find negative Monday returns and positive returns on Friday. However, a major limitation of the study of Shahid & Mehmood (2015) is the results are drawn only on the basis of descriptive statistics while the sample size is very small (5 years). The current study tries to fulfill this gap by taking long sample size of 24 years and draws results with the application of GARCH (1,1) model and Kruskal-Wallis test.A more recent evidence of day of the week effect is documented by (Jaisinghani, 2016) in 11 stock indices of NSE (National Stock Exchange) of India over the period of 1994-2014. With the application of GARCH-M model he finds a weak evidence of day of the week effect.

2.2 January Effect

Over the last few decades a lot many anomalies in the security market have been documented across the globe. One of the most popular of these anomalies is January effect which means that in the month of January securities provide much higher return than other months of the year. Similarly, various studies have been conducted on year end or January effect or on tax loss selling Hypothesis. The tax loss selling hypothesis states that investors sell their stock in the month of December (which is tax month) to minimize tax. This behavior of the investors to sell their stock causes decrease in the price of shares. As the December ends investors rush to buy shares, so returns are normally high in the month of January. This increase in buying trends is resulted from the fact that most of the firms release important information about their financial performance and position in the month of January so, the prices and returns are higher during this month (Rozeff, 1976) and he first documents the January effect, he studies NYSE over the period of 1904 to 1974 and finds average return 3.48 % in the month of January as compared to the other months of the year which generate average return of 0.42 %. Gultekin & Gultekin (1983) studies January effect in 17 countries, they find significantly high positive return in the month of January as compared to the other months of the year. A similar contribution is reported by Wong & Ho (1986) in stock market of Singapore over the period of 1975 to

1984. Similarly, it is observed that returns in the month of January are highly positive and considerably significant as compared to other months of the year Tinic & West (1984). Ogden (1990) supports the findings of Tinic & West (1984) by arguing that investors more likely tend to make their investment decisions in the month of January so, there is an increase in buying pressure during this month. According to Branch (1977) and Brauer & Chang (1990) tax loss transactions are best and valid elucidation for January effect.

Studies also find evidence against the highest return in the month of January. An evidence of very weak January effect is reported by Tonchev & Kim (2004) in Czech Republic, Slovakia as well as in Slovenia. Giovanis (2009) selects fifty one countries and examines fifty five stock indices from them to check the month of the year effect. By employing asymmetric GARCH model, he finds highest return in December in twenty stock markets, February effect in nine markets, January effect in seven while April effect in six stock markets. He finds highest positive return in the above mentioned months. Chia et al. (2006) find no January effect in the stock portfolio return. Al-Saad & Moosa (2005) apply different time series model on daily returns from Kuwait stock market but do not derive month of January effect or December effect. In fact, they find highest positive return in the month of July. Floros C. (2008) examines Athens stock exchange and rejects January effect by reporting high returns in other months but estimated coefficients were statistically insignificant. Instead of January effect Ariss et al. (2011) report highest positive and significant returns in the month of December from Gulf Cooperation Council indices.

The inherited January effect is studied by Wong et al. (2006) in Singapore stock exchange. They report that January exhibits higher positive and significant returns than the other months of year. Mahmood H. (2007) investigates the monthly share price data of companies listed at Pakistan stock exchange over the period of 1996 to 2006. The one-way ANOVA is employed and author finds no January effect at PSX as all the months of the year are not statistically different from each other. Similarly, according to Ali & Akbar (2009) "Our analysis for the monthly returns for the Pakistan stock exchange shows that no monthly returns are significant at the five percent confidence interval. Therefore, we conclude that there are no monthly calendar anomalies present in the Pakistan stock exchange that investors can exploit to earn abnormal returns". A limitation in the study of Ali & Akbar (2009) is that, they report no month of the year effect in the PSX through regression model over the period from 1991 to 2007. But the descriptive statistics of their data expose that the month of May exhibits the lowest mean average return (-0.0044) as compared to other months of the year. It means that the variation in return over the month is existed in PSX. Iqbal et al. (2013) investigate Pakistan stock exchange and use daily as well as weekly data over the period of 20 years (1992-2011). With the application of ordinary least square (OLS) method they do not find January effect as they find insignificant and negative January returns. However, they find significant and negative return in the month of May at PSX. Hashmi (2014) studies January effect in Pakistan stock Exchange (PSX) over the period of 2004-2009. With the application of GARCH model the study supports January effect in stock market of Pakistan. Shahid & Mehmood (2015) investigate KSE-100 index of Pakistan stock exchange of Pakistan over the period of 2008-2012. They do not find January effect at PSX, however, they find negative returns in the month of May, August and December while highest positive returns in the month of March.

2.3 Holiday Effect

The holiday effect can be defined as the average return is significantly higher on the trading day immediately preceding the holidays. These holidays are apart from Saturday and Sunday, means other public holidays on which the stock exchange is closed. Field (1934) first documents the holiday effect who finds that "stock returns on trading days before religious and secular closed-market holidays are significantly higher than returns on other trading days". Seminal studies of Lakonishok & Smidt (1988) as well as Ariel (1990) report that the returns of pre-holiday period are higher than those of post-holidays period. They find abnormal returns not only at weekend closing but for any gap in trading. Ariel (1990) finds eight times greater return on pre-holiday than post-holiday returns. He further proves that the eight holidays per year account for 38% of the total annual rate of returns. Also Lakonishok & Smidt (1988) report pre-holiday return accounts for some 30 to 50 percent of the total return of the US market before the year 1987. Agrawal & Tandon (1994) find pre-holiday effect in seventeen markets. Similarly, Kim & Park (1994) and Brockman & Michayluk (1998) investigate AMEX and NASDAQ from 1963-1987 and 1987-1993 respectively and find holiday effect in US.

Boyle et al. (2002) analyze New Zealand stock market and select five economically different events which have impact on emotions and moods of investors (as claimed psychological researchers). They find that pre-holiday returns are statistically different from other days (non-event). Chong et al. (2005) observe the pre-holiday effect in markets of UK, US and Hong Kong which are the most important markets of the world and they conclude that the average expected return before specific holidays was significantly greater than the average expected return before other holidays. The same effect of holidays is observed in the Kuwait stock exchange over the period from 1984 to 2000 by Al-Saad & Moosa (2005). Picou (2006) studies the stock return behavior in stock exchanges of six countries including All ordinaries index (Australia), Toronto stock exchange index (Canada), Hang Seng index-HSI (Hong Kong), Nikkei-225 (Japan), financial times stock exchange -FTSE (UK), and S&P-500 (US). By calculating daily return for ten years (1989-1999) he finds ex-post-holiday anomaly in all the exchanges. This is because the investors sell more before the holiday to avoid risk after holiday. Marrett & Worthington (2007) measure the period from 1996 to 2006 to test the holiday effect at market and industry level. They consider queen's birthday, Christmas day, New Year day, and Easter as holiday. By applying regression, the results reveal that holiday effect prevails at market and industry level especially in small capitalization stock. Cao et al. (2009) estimate holiday effect in stock market of New Zealand. To test this anomaly pre- holiday returns are considered with the return on other normal trading days of the year. For this purpose, they took data over the period from 1967 to 2006 from NZSE40 and NZSE50 indices. The results of this study show significant positive returns before holidays in New Zealand. Zafar et al. (2012) study the holiday effect and half month effect at PSX. By using data of KSE 100 index from November, 1991 to December, 2007, they calculate daily logarithmic returns to test calendar effects. They conclude that the Pakistan stock exchange is an inefficient market by exploring that pre-holidays have significant positive return than post –holidays.

2.4 Turn of the Month Effect

As the convention in the previous studies (Lakonishok & Smidt, 1988; Kunkel et al., 2003; McConnell & Xu, 2008) the TOM (turn of the month) is referred to as the period

starts from the last trading day of the current month to the first three trading days of the next month. This effect is referred to as curiously high return at the turn of the month in the stock markets. Camptom et al., (2006) describe that among different types of calendar anomalies turn of the month (TOM) is of great importance which is documented by different researchers in domestic as well as in international stock markets. Ariel (1987) first documents the TOM effect in NYSE who identifies that average return for last and first nine days of the next month are significantly greater than other days of the month over the period of 1963 to 1981. Ariel (1987) finds 0.47% return around the turn of the month (TOM) as compared to 0.061% during any other four-day period. Similarly, Lakonishok & Smidt (1988) select DJIA-index (Dow Jones Industrial Average) over the period from 1897-1986 and observe that the average return on trading days around the TOM is greater about eight times than returns on other trading days of the month. Cadsby & Ratner (1992) extend the analysis of Lakonishok & Smidt (1988) on other countries and find the evidence of TOM effect in Australia, Canada, Germany, Switzerland, as well as in UK and but not in France, Hong Kong, Italy and Japan.

Conners et al. (2002) confirm positive return around the TOM and returns are insignificantly different from zero during rest of the month over the period of 1994-1999 in REIT. Kunkel et al. (2003) investigate the stock markets of 19 countries. By calculating daily stock returns and applying a GLM (general linear model), standard regression model and WSR (Wilcoxon signed rank) a nonparametric test, they observe TOM effect in 16 out of 19 countries. Wong et al. (2006) test TOM effect and find that turn of the month exhibits high positive return as compared to other days of the month. Several tests applied reveal that turn of the month effect exhibited higher returns than other days of the month. Zafar et al. (2012) investigate KSE-100 index of Pakistan stock exchange and study the TOM effect over the period from November, 1991 to December, 2007. They find TOM effect in some particular period 1991, 1993, 2002, 2005 as well as in the whole period of 1991-2007. The varying behavior of TOM effect in sub-periods is against the notion of market efficiency. Silva (2010) examines the calendar anomalies in Portuguese stock market by using daily return for the period from 1989-2008. By applying OLS, Silva (2010) finds significant positive return on last day of the month to the first five days of the following month. Similarly, Chen & Chua (2011) primarily find TOM effect in the exchange traded funds and S&P 500 index. Al-Jafari (2011) investigates 50 international stock indices to examine the TOM effect during the period of 1994-2006. He finds the evidence of TOM effect in all the indices. Sharma & Narayan (2014) investigate 560 listed firms on NYSE and finds that TOM effect varies with the type of firms as it depends on sector and size of each firm which implies that TOM has heterogeneous effect on return and volatility of firms. Ehsan (2012) proves that the stock market of Pakistan is inefficient and calendar anomalies are present in it. She further observes that anomalies depend upon the psychology of investors at PSX. By taking daily return of KSE 100 index, she finds significant positive TOM effect over the period of 2002 and 2003. But the study of Ehsan (2012) is limited to a small sample of daily returns from 2002-2004 which makes a space for current study to capture TOM effect in a relatively long sample size of 24 years. Sanaullah et al. (2012) attempt to find the TOM effect in two different sets of data first; 13 years' sample period from 1998 to 2010, second data set excludes years of market crash (2005 & 2008) and consists of 11 years from the same sample period of 1997-2010. By applying different statistical tools, they

find TOM effect is present in PSX returns in the first data set of 13 years, but they could not find the TOM effect in the second data set of 11 years. Turn of the Month (TOM) effect exists in PSX in first data set whereas the second data set is free from such anomalies. Iqbal et al. (2013) investigate Pakistan stock exchange and use daily as well as weekly data over the period of 1992-2011. With the application of OLS (ordinary least square) method they find significant positive returns around the TOM in PSX.

2.5 Month of Ramadan Effect

It is believed that the month of Ramadan generates some positive moods in Muslim community. People's lives, behavior and decision making process are usually affected by religious faith and worship intensity in the month of Ramadan. The positive mood in turn will cause increase in the investment at stock exchange. All Muslims around the globe follow Hijri calendar (contains 12 month) which is shorter than Gregorian calendar by 11 days. Each month starts by appearance of moon, the month of Ramadan is 9th month in Islamic calendar. During the month of Ramadan the upbeat moods of investors positively affect the value of financial markets in Islamic countries. According to Bialkowski et al. (2012) the most celebrated religious tradition in the world is Ramadan festival. Good moods in the month of Ramadan may influence the investment decision of investors in Islamic financial markets. According to Turner (1974), the month of Ramadan provides a good sense of social identity and an increased satisfaction with life of individuals in Muslims, which in turns leads investors to accept risk in investments.

The field of Islamic investment and finance is at growing stage around the globe. So, existing literature on this emerging area is limited. Seyyed et al. (2005) examine the Ramadan effect at Saudi stock exchange and find lower volatility in trading volume, but could not find the effect of month of Ramadan in the mean average return. Al-Ississ (2010) suggests that no doubt religion plays a very important role in the lives of people, it also plays an important role on financial markets. He investigates the impact of religious experiences during holy days of Ashoura and Ramadan in seventeen Muslim financial markets over the period of 1988 to 2008. He finds significant changes in trading volumes on religious days as Ramadan yields positive while Ashoura yeilds negative returns. Mustafa (2011) examines PSX and investigates the Islamic calendar effects on daily return. By applying 5 different models he identifies that Ramadan effect is common in all models and argues that PSX is very risky market during month of Ramadan. Even in India, Dharani & Natarajan (2011) confirm the prevalence of Ramadan effect in Indian stock markets during the period of 2007-2010. Ehsan (2012) proves that the stock market of Pakistan is inefficient and calendar anomalies are present in it. She further observes that anomalies depend upon the psychology of investors at PSX. Bialkowski et al. (2012) examine the religious practices and influence of these practices on the investor's psychology and stock market behavior. They find that upbeat feelings in the month of Ramadan may cause investors to be overconfident, more willingly accept the high risks and they find significant positive and less volatile returns during the holy month of Ramadan.

Al-Hajieh et al. (2011) examine the Islamic Middle Eastern financial markets from 1992 to 2007 and find significance positive impact of month of Ramadan on stock exchange in most of Middle East countries. They also find significance variation in stock return in first few days of Ramadan. This is due to the positive moods of investors in the month of Ramadan, which create an investment environment in this holy month in Muslim

countries. Iqbal et al. (2013) examine the Hijri and Gregorian calendars to investigate KSE 100 index over the period of 1992- 2011. They find significant reduction in volatility of return in Ramadan at PSX. And they further conclude that this reduction in return is because of reduced volume of trading or may because of changed behavior of investor in the month of Ramadan. Halari (2013), acknowledges that the social as well as religious norms can change the investment decisions. He describes that the Islamic calendar may be explained by sentiments of investors because months of Islamic calendar differ in emotions from each other which affects the behavior, feeling and emotions of individuals. The change in individual sentiment may cause change in investment decisions. Khan et al. (2017) argue that month of Ramadan is different in religious rituals as compared to the other months of the Islamic year and it slows down the economic activities in the country. By taking daily returns from KSE-100 index over the period of January 2001 to December 2010, they employ OLS and GARCH models and find minor positive impact of month of Ramadan on stock returns and they further argue that returns in the holy month of Ramadan remain less volatile during the period of their study.

2.6 Adaptive Market Hypothesis (AMH) and Evolving Behavior of Stock Returns and Calendar Effects

In the previous studies, researchers focused on detecting the efficiency of market through traditional, absolute or static EMH. Recently, the focus of many researchers is shifted from testing efficiency of market in all or none form to trace the fluctuating degree of market efficiency which provides way to the idea of AMH. Ito & Sugiyama (2009) and Kim et al. (2011) explore the time varying nature of stock markets of United states. In Asian markets, Lim et al. (2008) and from Japan Noda (2012) provides the evidence of AMH and Urquhart & Hudson (2013) contribute same findings in the stock markets of US and UK. While Indian Stock market is studied by Hiremath & Kumari (2014) and their findings are consistent with AMH. Similarly evidence of AMH in the foreign exchange market is given by (Neely et al. (2009) and Charles et al. (2012). As for as Commodity markets are concerned, international coffee markets is explored by Ramirez et al. (2015) under the notion of AMH. With the application of statistical Non-linear tests they find periods of inefficiency for the case of Colombian Arabica beans.

Lim, et al. (2008) select developed and developing markets to examine the evolving degree of market efficiency. With the application of test statistic of portmanteau bicorrelation test, they observe degree of efficiency of market evolve over time in cyclic fashions. Todea et al. (2009) investigate profitability of the moving average rule strategy in six Asian equity markets over the period from 1997 to 2008. They observe that profitability of moving average rule strategies is not consistent in time which means that it is of episodic nature in the sub periods through the linear and nonlinear correlation. They further observe the cyclic fashion in degree of market efficiency over time. Their data set comprises of daily closing prices of stock indices of Asian pacific countries Hong Kong (Hang-Seng Index), Australia (All Ordinaries Index), India (BSE national Index), Singapore (Strait Times Index), Japan (Nikkei 225 Index) and Malaysia (Kuala Lumpur Composite Index). But Todea et al. (2009) ignore stock exchanges from other Asian countries like Pakistan and china which may provide different results. So the current study specially focuses on Pakistani stock market which is highly volatile market. By employing autocorrelation (time varying) on monthly returns, Ito & Sugiyama (2009)

observe fluctuations in the degree of market efficiency in S&P 500. Kim et al. (2011) take DJIA (Dow Jones Industrial Average) index over the period of 1900 to 2009 and provide the evidence of time varying return predictability in US capital markets. Their findings are consistent and supporting the implications of AMH that predictability of returns is determined by varying market conditions. They find insignificant predictability in returns throughout market crashes while they argue that degree of uncertainty directs predictability of return. Throughout the era of economic and political crunches, stock returns are highly predictable with uncertainty. Finally, they observe US markets are more efficient after year 1980. Smith (2012) examines eighteen European stock markets and explores the adaptive nature of these markets, his findings are consistent and supporting the notion of AMH as each market from European countries is evident of time-varying behavior of predictability of returns.

Lim et al. (2013) employ WBAVR test and rolling window AR test in US Indices, they find US markets have time varying properties and suffer from efficient and inefficient periods. Zhou & Lee, (2013) find a time varying and declining trends in predictability of returns of REIT which is influenced by market conditions. Urquhart & Hudson (2013) use very long period data and divided the data into subsamples of equal length (5-years each) and empirically examine the AMH in Japan, UK and US stock markets which are the three most developed and established stock markets around the globe. By employing linear and nonlinear tests they find that linear autocorrelation test, runs test and variance ratio test show that all three markets exhibit an adaptive nature of markets. While results of nonlinear tests reveal a very strong dependence in each and every subsample under study in all markets, but the magnitude of dependence is varying depending upon each market. They further observe very strong nonlinear dependence throughout, while linear dependence varies from time to time. The overall results of their study provide the evidence that AMH is a better depiction of the behavior of stock market returns than EMH (Efficient Market Hypothesis). But their study is only confined to indices DJIA from US, FT 30 from UK and TOPIX from japan which are the developed markets while in the current study we select index from developing country like Pakistan which may provide different results. Hull & McGroarty (2014) employ Hurst–Mandelbrot–Wallis rescaled range test on equity returns of twenty two emerging markets. By using the sample size of 16 years returns, their findings are consistent with AMH as they find a very aggressive evidence of evolving volatility over time. Over the sample period of 1991 to 2013, Hiremath & Kumari (2014) use linear and nonlinear tests to assess whether AMH delivers the superior depiction of behavior of stock markets of India. They find that linear dependence in stock markets of India fluctuates in cyclic patterns and switches between periods of inefficiency and efficiency. On the other hand nonlinear models expose nonlinear dependence and market inefficiency in the recent period. The studies of (Kim et al. 2011; Smith, 2012; Lim et al., 2013; Urquhart, 2013; Hiremath & Kumari, 2014) are confined to market efficiency and ignore calendar and other anomalous effects which we incorporate in the current study. Urquhart (2013) examines calendar effects in Dow Jones Industrial Average (DJIA) through a sample period comprising years (1900 to 2013). He uses rolling window analysis, subsamples analysis and also creates implied investment strategies which are based on each of four calendar anomalies selected in the study (Halloween Effect, January effect, Monday effect & TOM). He finds that all calendar anomalies taken into account for study support AMH (Adaptive market hypothesis), the performance of these anomalies varies over time and present during

certain market conditions. He further explains that AMH suggests more fruitful explanation of behavior of these anomalies than EMH. But the study is limited to indices of developed countries where markets well perform, confined to few popular calendar effects and doesn't consider stock return of individual company. The present study aims to consider variety of calendar effects (including Islamic Months) in developing country like Pakistan which can provide different results. It is clear from above studies that degree of predictability of return and market efficiency swing in cyclic fashion which do exist from time to time and are consistent with AMH (Adaptive Markets Hypothesis) of Lo (2004), which states that profit opportunities do arises from time to time.

Table 1: Descriptive Statistics

Variable	Observations	Mean	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Price Index	5907	3.6818	0.4960	0.17	1.595	514.131***
Return	5907	0.0522	1.4871	-0.32	9.069	9164.3***

During Full-sample (1992-2015) of the daily prices and return of KSE-100 index while *, **, *** show significance-level at 10%, 5% and 1% level respectively.

3. Methodology

To observe the presence of calendar anomalies and the way the five well-known calendar effects have performed through time, we investigate daily-returns of KSE 100 index over the period comprising 24 years (from 1st January 1992 to 31st December 2015). The following regression equation is estimated:

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

Where R_t represents the stock index return, D_t represents indicator of respective calendar effects and market conditions as adapted by (Urquhart & McGroarty, 2014) while ε_t is the error term. Instead of using OLS regression, we use GARCH (p, q) model to investigate the existence of different calendar effects 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 and applicable in the literature (Engle, 2001). GARCH (1, 1) model "allow researchers to model variance as conditional on the past variance and error, rather than fixed through the series (Urquhart & McGroarty, 2014)". Therefore, to capture the time varying behavior of return of KSE-100 index, we run the following GARCH (1, 1) regression;

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

Where, for equity returns at time t, h_t is the conditional variance, h_{t-1} represents conditional variance of equity returns at time $t-1$ while α_0, α_1 & θ are the coefficients of GARCH model. The GARCH model is 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 test) to examine predominant sensitivity of population to

difference in mean and whether the population has identical distributions from which the samples are drawn. Thus, we investigate the mean differences in the index returns across different calendar anomalous effect days and non-calendar anomalous effect days so that;

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

Where N represents total number of observation, k denotes number of groups, n_j and R_j^2 indicate total number of observation and average rank of observations in the jth group respectively. Therefore, to investigate how exactly calendar effects have 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 3 years thus, generate 8 subsamples of identical lengths. A sub-sample of 3-years contains sufficient set of observations to offer reliable and ample results to investigate the behavior of calendar effects that how the anomalous effects have behaved/performed through time.

4. Data

We select KSE-100 index of Pakistan Stock Exchange (PSX) and calculate daily returns for 24 years (from January, 1992 to December, 2015) to employ the empirical tests discussed in the methodology. The returns are calculated with the following formula;

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

Where at time t, the natural logarithm of price of index is represented by $ln(P_t)$, while at time $t-1$ natural logarithm of index price is represented by $ln(P_{t-1})$. Descriptive statistics for full-sample of KSE-100 price index and log of index returns are presented in Table 1. The log of KSE-100 price index provides evidence of positive skewness while it fails to show evidence of excess kurtosis. When log of index return and its first difference is taken the data is found to be skewed to the left and is evident of a leptokurtic series of 5907 observations which is an indication of excess kurtosis. Both the log of the price and return of index are found to be non-normal as the Jarque-Bera statistics is statistically significant at 1% level.

5. Empirical Results

The segment presents the discussion on results of empirical tests GARCH (1,1) and Kruskal-Wallis test described in the previous section.

5.1 Descriptive Statistics (Calendar Anomalies) Over Full-Sample Period.

Table 2 presents the results of five different calendar anomalies under study over the full-sample period from 1992 to 2015. Kruskal-Wallis statistic (a non-parametric test) as well as differences in mean are studied through standard t-statistic. We observe that Mondays produce negative average return while non-Mondays produce positive return which is an indication of a strong Monday effect. Similarly, returns on Mondays have higher standard deviation than non- Mondays, while both the Kruskal-Wallis statistics and standard t-statistics support a significant difference between returns on Monday and returns on non-Mondays throughout the full sample period. We find higher mean return in January than mean return in non-January supporting the evidence of January effect. However, either the Kruskal-Wallis test or t-statistics do not support the evidence of significant difference between returns of January and non-January. Mean average returns on pre-Holidays are greater than mean returns on non-Holidays. Further, both test statistics supports strong

evidence of Holiday effect by indicating significant mean differences between holiday and non-holidays returns. The mean return on TOM days are higher than non-TOM days and both test statistics support evidence of TOM effect by indicating significant difference between mean return of TOM days and non-TOM days. Similarly, month of Ramadan provides higher mean return than other months of Islamic calendar in Pakistan. Both test statistics supporting evidence of month of Ramadan effect by indicating significant difference between mean returns of Ramadan and non-Ramadan. Therefore we find all five calendar anomalies over the period of 1992-2015 (full sample) with statistically significant Monday, Holiday, TOM and Ramadan effect, while returns in the month of January are higher as compared to the returns during the other months of the year but return in January are not statistically higher.

Table 2: Descriptive Statistics (Calendar Anomalies)

	Mean	**Standard Deviation**	**No. of Days**	**t-Statistics**	**w-Statistics**
Monday	-0.078248	1.728854	1199	-3.4***	36.75729***
Non-Monday	0.085425	1.417146	4708		
January	0.124828	1.555011	501	1.14	2.370185
Non-January	0.045472	1.480525	5406		
Holiday	0.325672	1.444954	280	3.16***	15.57548***
Non-Holiday	0.038595	1.487889	5627		
TOM	0.189188	1.532449	1172	3.53***	33.27797***
Non-TOM	0.018296	1.473754	4735		
Ramadan	0.250995	1.310427	465	3.01***	3.731222*
Non-Ramadan	0.035217	1.500027	5442		

During full sample period while *, **, *** show significance level at 10%, 5% and 1% level respectively.

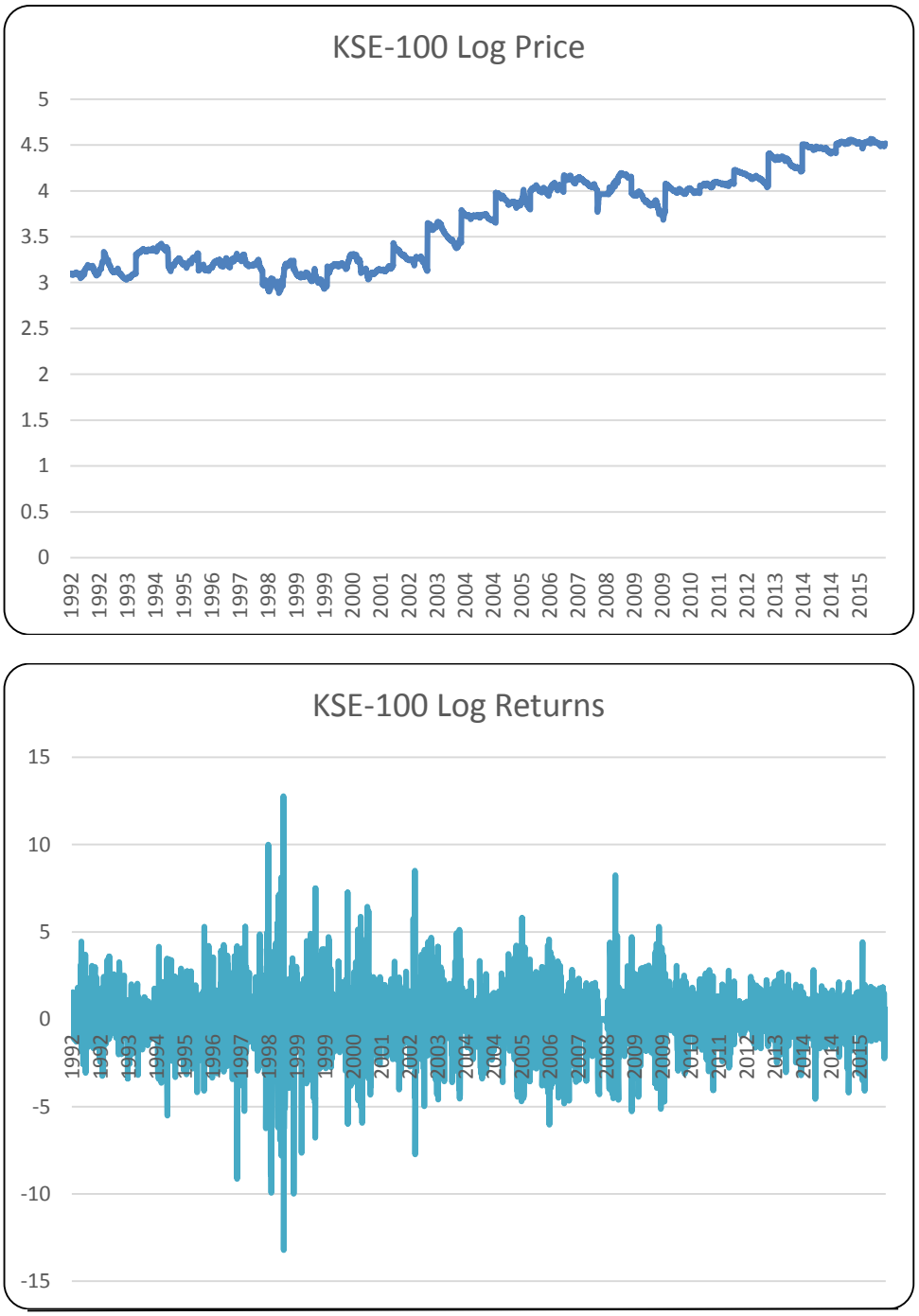

Figure 1: Log Price and Log Returns over the Period of Full-Sample (1992-2015) For KSE-100 Index

Table 3: Results of the Calendar Anomalies (Monday and January Effects)

	Conditional Mean		**Conditional Variance**			**K.W**
	c	β	α_1	α_2	θ	
Panel 1: Monday Effect						
1992-2015	0.1324***	-0.1215***	0.0704***	0.2012***	0.7801***	36.7***
	(9.35)	(-3.85)	(13.95)	(20.55)	(89.35)	
1992-1994	0.0490	-0.1965***	0.1136***	0.21147***	0.7115***	17.88
	(1.40)	(-2.11)	(3.90)	(5.69)	(16.56)	
1995-1997	0.0206	-0.4239***	0.4572***	0.2627***	0.5432***	26.096
	(0.38)	(-3.18)	(3.83)	(6.09)	(7.54)	
1998-2000	-0.0680	0.6472***	0.2570***	0.2497***	0.732980	8.00***
	(-0.97)	(4.75)	(4.59)	(6.94)	(23.24)	
2001-2003	0.1335**	0.2031*	0.2245***	0.208565***	6.7077***	0.0905
	(2.54)	(1.83)	(5.08)	(6.29)	(17.89)	
2004-2006	0.2464***	-0.1549*	0.1167	0.2458***	6.7077***	1.728
	(5.44)	(-1.8)	(4.88)	(5.18)	(17.89)	
2007-2009	0.0019	0.0054	0.0002	0.7238***	0.7506***	6.00***
	(0.36)	(0.77)	(0.72)	(16.78)	(55.94.60)	
2010-2012	0.1650***	-0.1663***	0.0224***	0.08853***	0.881***	4.857**
	(5.02)	(-2.38)	(3.29)	(5.45)	(44.8)	
2013-2015	0.1510***	-0.2239***	0.0733	0.160867	0.7661***	3.7330*
	(4.35)	(-3.22)	(4.65)	(5.566)	(27.04)	
Panel 2: January Effect						
1992-2015	0.1026***	0.6835*	0.0722***	0.2041***	0.7773***	2.3701
	(8.26)	(1.55)	(13.82)	(20.77)	(87.77)	
1992-1994	1.0158	-0.0164	0.1369***	0.21518***	0.6881***	2.637
	(0.47)	(-0.14)	(4.08)	(5.58)	(14.51)	
1995-1997	-0.0766	0.1445	0.4994***	0.24720***	0.5381***	9.99***
	(-1.49)	(0.72)	(3.74)	(5.94)	(7.00)	
1998-2000	0.0675	-0.305***	0.2332***	0.20460***	0.7712***	0.6355
	(0.97)	(-2.08)	(4.52)	(6.66)	(27.37)	
2001-2003	0.1647***	0.2160	0.2504***	0.21204***	0.6925***	6.99***
	(3.7)	(1.09)	(5.37)	(6.25)	(6.45)	
2004-2006	0.1931***	0.1914	0.1163***	0.248728	0.7913***	17.8***
	(5.03)	(0.52)	(4.92)	(5.25)	(16.52)	

2007-2009	0.0026	0.3781***	0.0015	0.80284***	0.57878	0.0019
	(0.96)	(3.55)	(0.86)	(17.1)	(53.5)	
2010-2012	0.1272***	0.0598	0.0192***	0.08366***	0.8964***	1.5555
	(4.07)	(0.69)	(3.17)	(5.37)	(47.8)	
2013-2015	0.0897***	0.1582**	0.0723	0.182789	0.752988	2.05
	(2.86)	(2.16)	(4.71)	(6.11)	(27.84)	

With the application GARCH (1,1) regression model and Kruskal-Wallis test in full-sample as well as in subsamples period data of KSE-100 index. *,** and*** represent significance at levels of 10%, 5% and 1%.

Table 4: Results of the Calendar Anomalies (TOM & Holiday)

	Conditional Mean		**Conditional Variance**			**K.W**
Panel 3: TOM Effect	c	β	α_1	α_2	θ	
1992-2015	0.0773*** (5.91)	0.1614*** (5.54)	0.069*** (13.79)	0.2010*** (20.72)	0.7811*** (89.18)	33.2***
1992-1994	0.0288 (0.78)	-0.0786 (1.05)	0.134*** (4.03)	0.2121*** (5.61)	0.6925*** (14.8)	17.6***
1995-1997	-0.0893 (-1.59)	0.1097 (0.96)	0.508*** (3.73)	0.2511*** (5.94)	0.5306*** (6.78)	27.7***
1998-2000	0.0368 (0.56)	0.0555 (0.39)	0.226*** (4.41)	0.2035*** (6.75)	0.7745*** (27.9)	7.89***
2001-2003	0.1715*** (3.39)	0.0307 (0.28)	0.231*** (5.18)	0.2005*** (6.17)	0.7109*** (17.59)	0.0619
2004-2006	0.1859*** (4.64)	0.1521* (1.84)	0.121*** (5.05)	0.2510*** (5.14)	0.7039*** (15.98)	2.1738
2007-2009	0.0051** (1.97)	-0.0045 (-0.422)	0.0075 (0.33)	0.7638*** (17.1)	0.5951*** (55.6)	5.598**
2010-2012	0.0984*** (2.99)	0.1982*** (3.16)	0.024*** (3.12)	0.0984*** (5.69)	0.8760*** (41.1)	3.722**
2013-2015	0.0381 (1.19)	0.4087*** (5.79)	0.060*** (4.32)	0.1579*** (5.82)	0.7849*** (27.77)	2.2992
Panel 4: Holiday Effect						
1992-2015	0.0987*** (8.13)	0.2124*** (3.36)	0.072*** (14.00)	0.2030*** (20.77)	0.7774*** (87.95)	15.5***
1992-1994	-0.00168 (-0.04)	0.3142* (1.95)	0.158*** (2.88)	0.2557*** (3.98)	0.6426*** (8.83)	0.555
1995-1997	-0.0747 (-1.49)	0.2516 (1.13)	0.5208*** (3.71)	0.2502*** (5.91)	0.5252*** (6.54)	5.55***
1998-2000	0.0105 (0.159)	0.4409* (1.81)	0.2201*** (4.28)	0.2024*** (6.84)	0.7767*** (28.5)	0.402

2001-2003	0.1706*** (3.74)	0.1836 (0.80)	0.2302*** (5.16)	0.2008*** (6.04)	0.7111*** (17.39)	13.4***
2004-2006	0.2081*** (5.59)	0.2697 (1.29)	0.1190*** (5.01)	0.2516*** (5.23)	0.7048*** (16.28)	24.9***
2007-2009	0.0030 (0.89)	-0.0143 (-0.10)	0.0019 (0.76)	0.7514*** (16.9)	0.5985*** (55.67)	0.405
2010-2012	0.1282*** (4.15)	0.0777 (0.48)	0.0221*** (3.22)	0.0878*** (5.40)	0.8891*** (44.4)	5.87***
2013-2015	0.0981*** (3.2)	0.1669 (1.21)	0.0753*** (4.58)	0.1783*** (6.04)	0.7519*** (27.39)	0.21***

With the application GARCH (1,1) regression model and Kruskal-Wallis test in full-sample as well as in subsamples period data of KSE-100 index. *,** and*** represent significance at levels of 10%, 5% and 1%.

Table 5: Results of the Calendar Anomalies (Ramadan Effects)

Panel 5: Ramadan Effect	**Conditional Mean**		**Conditional Variance**			**K.W**
	c	β	α_1	α_2	θ	
1992-2015	0.1019*** (6.81)	0.0792* (6.44)	0.072*** (14.49)	0.2038*** (21.71)	0.777*** (81.18)	3.73
1992-1994	0.0095 (0.29)	0.0923 (0.73)	0.141*** (4.09)	0.221*** (5.57)	0.678*** (14.00)	1.79
1995-1997	-0.1188*** (-2.7)	0.8289*** (3.67)	0.503*** (3.79)	0.237*** (5.93)	0.538*** (6.93)	8.57***
1998-2000	0.0519 (0.74)	-0.03898 (-0.27)	0.230*** (4.47)	0.2041*** (6.59)	0.772*** (27.55)	1.305
2001-2003	0.1838*** (4.00)	-0.0793 (-0.42)	0.231*** (5.20)	0.2027*** (6.15)	0.709*** (17.47)	8.539***
2004-2006	0.2072*** (5.48)	0.1198 (0.82)	0.117*** (4.98)	0.2532*** (5.19)	0.704*** (16.1)	18.35***
2007-2009	0.0151 (0.22)	-0.0422*** (-5.93)	0.000042 (0.82)	0.17411*** (2.94)	0.470*** (21.25)	0.0191
2010-2012	0.1356*** (4.29)	-0.0654 (-0.68)	0.027*** (3.16)	0.0847*** (5.32)	0.893*** (45.71)	1.863037
2013-2015	0.0976*** (3.17)	0.0791 (0.64)	0.075*** (4.68)	0.1828*** (6.09)	0.748*** (26.97)	2.16028

With the application GARCH (1,1) regression model and Kruskal-Wallis test in full-sample as well as in subsamples period data of KSE-100 index. *,** and*** represent significance at levels of 10%, 5% and 1%.

5.2 Subsamples Calendar Anomalies Analysis

Table 3 reports the results of GARCH (1,1) regression model and kruskal-Wallis test for the calendar effects (Monday and January effects) during sub-sample periods. Panel 1: shows that five out of eight subsamples studied generate a negative coefficient for Monday effect. Subsamples (1992-1994 & 1995-1997) generate negative and significant coefficients while subsample (1998-2000) generates positive and significant coefficients and indicate a complete reversal in behavior of Monday-effect in Pakistan stock exchange, thus supporting AMH. Subsample (2004-2006) generates negative but insignificant coefficients. Subsamples (2001-2003 & 2007-2009) generate positive and insignificant coefficient suggesting a weakening of Monday effect. Subsamples (2010-2012 & 2013-2015) generate negative and significant coefficient which is again reversal in behavior of Monday-effect, thus consistent with AMH. Panel 2: shows that subsample (1992-1994) generates insignificant-negative returns while subsample (1995-1997) generates insignificant-positive returns in the month of January but Kruskal-Wallis statistic provides the evidence of significant difference between returns in the month of January and non-January months during (1995-1997). Period of 1998-2000 undergoes a complete reversal of behavior of January-effect as it generates significant and negative coefficient for January effect. The behavior then turns to positive and insignificant January effect in the next two subsamples comprising period of (2001-2006). However, subsample 2006-2009 generates a positive and significant coefficient for January effect while January effect is weakening in subsample 2010-2012 which is complete reversal of behavior of January effect as it generates insignificant coefficient. Similarly subsample (2013-2015) generates positive and significant coefficients which is again a complete reversal of behavior of January effect, thus supporting AMH. Furthermore, Table 4 reports the results of GARCH (1,1) regression model and kruskal-Wallis test for the calendar effects (TOM and Holiday) during sub-sample periods. Panel 3: reports subsamples analysis of TOM effect and reveals that subsample 1992-1994 generates negative returns around TOM, while during the period of 1995 to 2006 KSE-100 index generates positive but insignificant coefficient around the TOM, which is again negative and insignificant during subsample 2007-2009. However, subsample 2010-2012 & 2013-2015 generate positive and significant coefficient which is again a complete reversal of subsample 2007-2009 thus supporting AMH. Panel 4: presents subsample analysis of holiday effect. The panel reports that all the subsamples generate positive coefficients except subsample 2007-2009 which generate negative coefficient. Similarly, Kruskall-wallis test generates significant difference between holiday returns and non-holiday returns representing the time-varying nature of returns and signifies that holiday effect is prevailing in PSX while the strength of the effect varies as the time passed by, thus supporting AMH. Table 5 (Panel 5) reports subsample analysis of Ramadan effect in PSX.

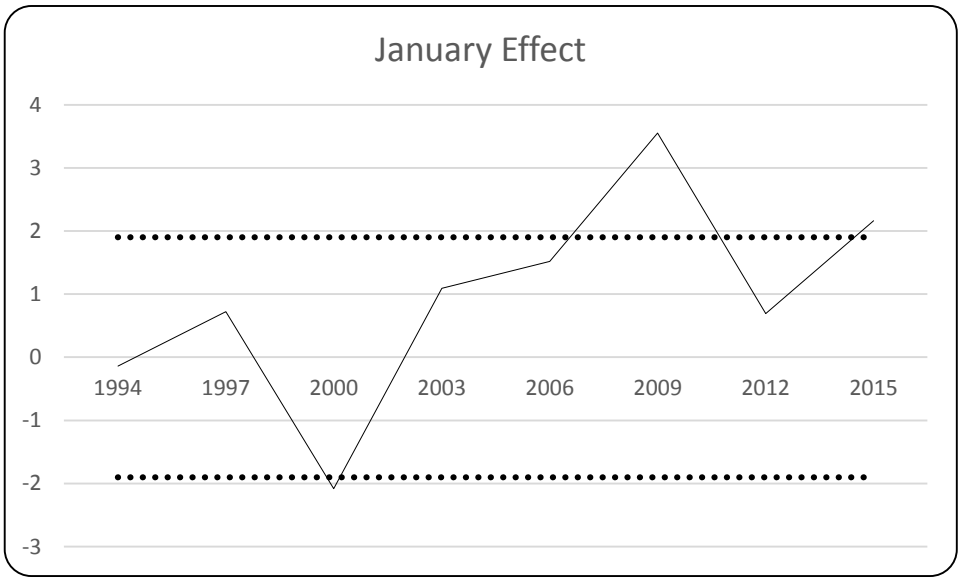

Figure 2: GARCH (1, 1) Regression Returns of Time-Varying Monday Effect

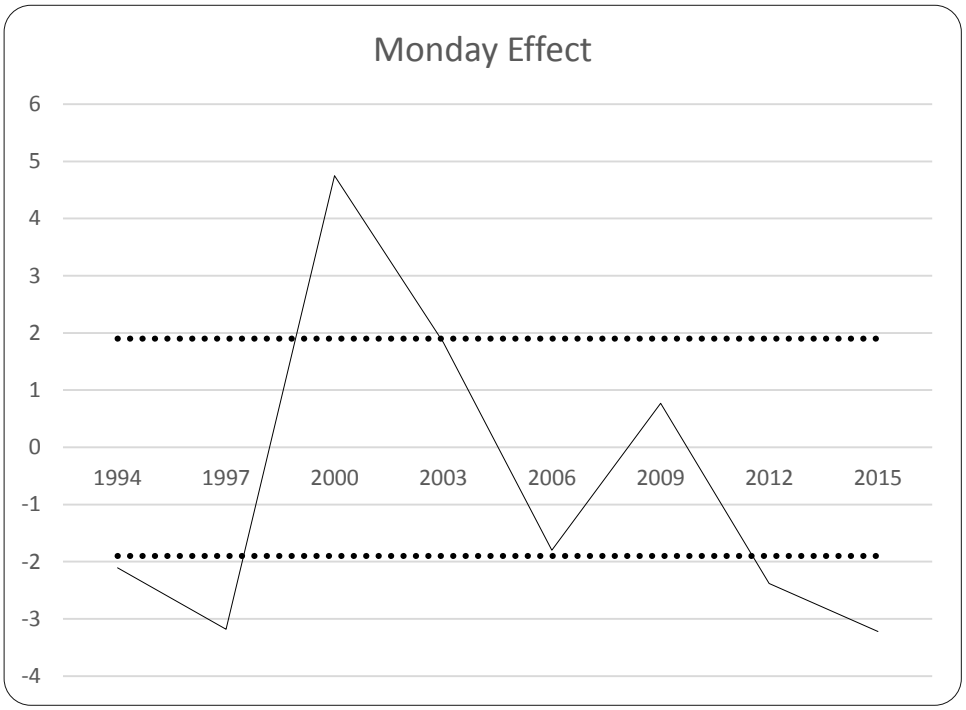

Figure 3: GARCH (1, 1) Regression Returns Of Time-Varying January Effect

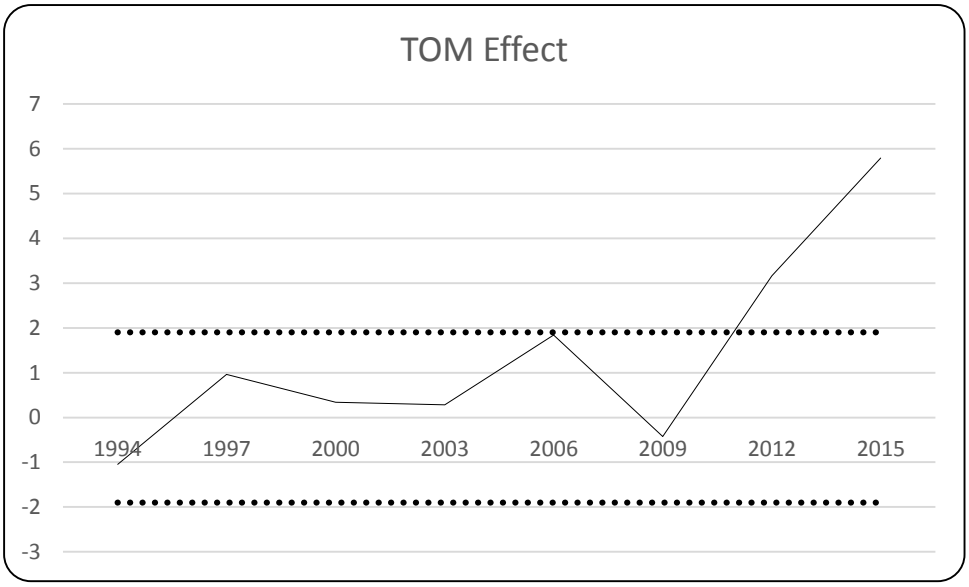

Figure 4: GARCH (1, 1) Regression Returns of Time-Varying TOM Effect

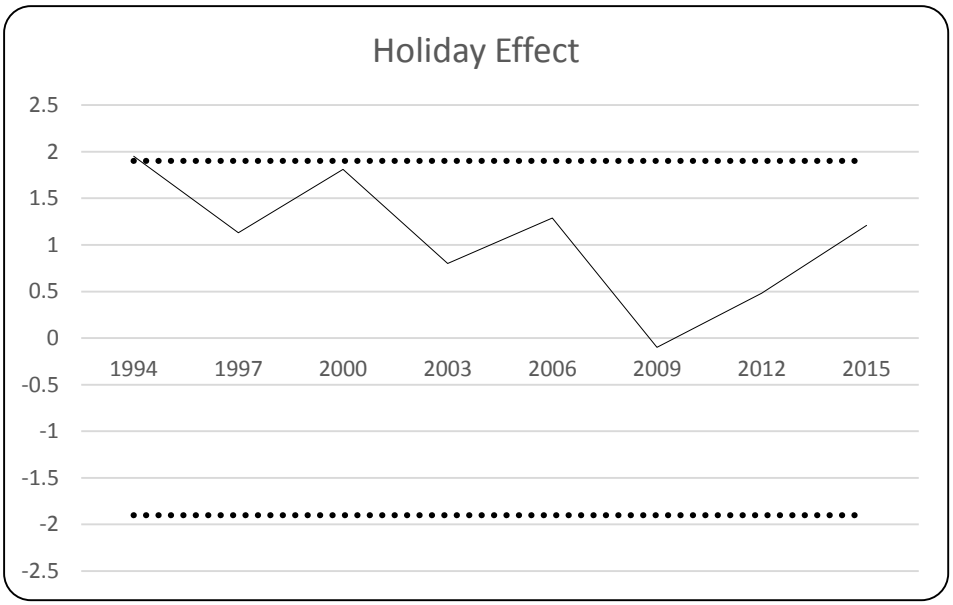

Figure 5: GARCH (1, 1) Regression Returns of Time-Varying Holiday Effect

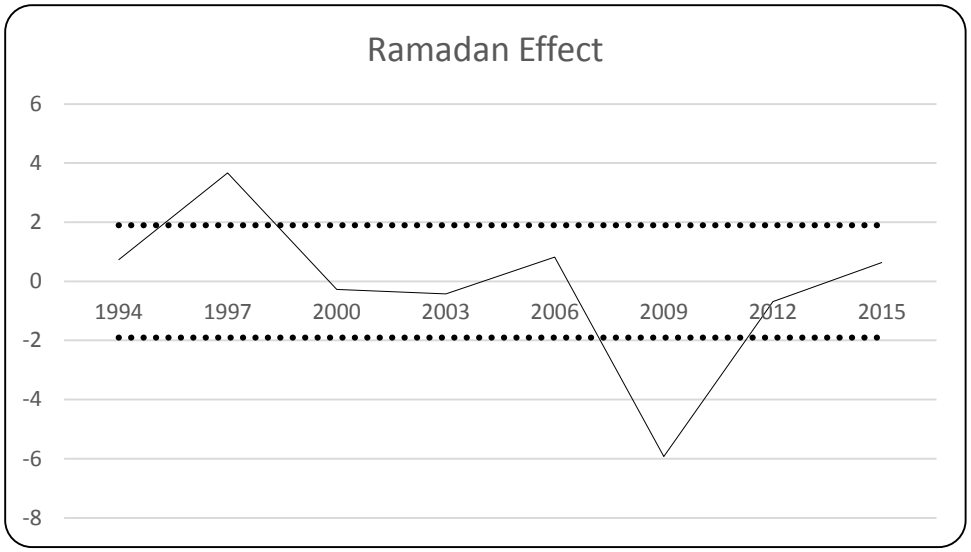

Figure 6: GARCH (1, 1) Regression Returns of Time-Varying Ramadan Effect

We find significant coefficient in only two subsamples 1995-1997 and 2007-2009, while the rest of the subsamples generate insignificant coefficients. However, the signs of the coefficients fluctuate over time as some periods generate negative coefficients and some periods generate positive coefficients. Similarly, Kruskal-Wallis-statistic also generates significant and insignificant coefficients in different periods. However, magnitude of statistic varies over time and supporting AMH. Similarly, Fig. 2,3,4,5 and 6 represent GARCH (1,1) regression returns of time-varying calendar effects using three years' sub-samples. The dense/solid lines represent the t-statistic while the dotted lines indicate the 95% confidence intervals. It is clear from the figures 2,3,4,5,and 6 that all five calendar anomalies under study exhibit bi-directional time varying behavior over the time contrary to EMH while consistent with AMH. Results of our study are similar to the study of (Urquhart & McGroarty, 2014) who employ GARCH (1,1) model and kruskal-Wallis test and find that calendar effects have time varying nature and support AMH. All other studies discussed earlier in literature explore calendar anomalies in the context of EMH while current study is the first one which explore the time varying nature of calendar effects under AMH in both the Gregorian and Islamic calendars.

5.2 Calendar Effects and Market Conditions

Lo (2004) argues that with the passage of time market conditions fluctuate, which cause changes in the levels of predictability and efficiency of any market over time. However, Kim et al. (2011) argues there are no specific recommendations for any particular and proposed indicators of prevailing market conditions. Different prevailing market conditions are taken to investigate under which the well-known calendar effects are most powerful and successful. So, we divide sample size into certain diverse phases of market conditions and employ GARCH (1,1) model (previously described) to investigate the varying degree of the behavior of calendar anomalies. First of all we divide our data into down and up months similar to Fabozzi & Francis (1977). A month is defined and

designated as down month if it generates negative return (average) while month is defined and designated as up month if it generates positive return (average). By doing so we split our data into collectively exhaustive and mutually exclusive division of 115 down and 173 up months. It ignores prevailing trends in the stock market and views each (down/up) month individually and independently. Secondly, on the basis of methodology employed by Fabozzi & Francis (1977) and the methodology employed by Alexander & Stover (1980), Klein & Rosenfeld (1987) provide the definitions of bear and bull markets. "If average monthly return of market is greater than one-half of the standard deviation of monthly market returns, the month is said to be a substantial market mover". Following the definitions of the Klein & Rosenfeld (1987), our sample is divided into bear month and bull month categories. If a month exhibits considerably higher average returns in a month while the adjacent (surrounding) months exhibit bearish behavior, then the month is said to be bearish. Conversely, a month exhibits low or normal average returns while the adjacent (surrounding) months exhibit bullish behavior, then the month is said to be bullish month. The process generates 172 normal, 62 bull and 54 bear months. Furthermore, Santa Clara & Valkanov (2003) claim as the presidencies change in Pakistan, returns from stock market also fluctuate. However, Nazir et al. (2014) argue during Military presidencies, political situation is more stable in Pakistan than in democratic presidencies. Similarly, Majid Shah & Abdullah (2015) claim that democratic presidencies generate negative day of the week effect in Pakistan as compared to military presidencies. Thus, in order to capture the performance of well-known calendar effects during military and democratic presidencies, our data set provides 98 months of Military and 190 months of Democratic Governments. Finally, on the basis of study of Mahmood & Arby (2012), we split our data set into four distinct phases of business cycle and have 25 months in trough phase, 30 months in recession, 60 months in peak and 172 months in recovery phases. The table 4 reveals that the Monday effect is present only during Civilian Government and it is statistically significant while the behavior reverses and become positive and insignificant in Military Government. The January effect is present and statistically significant only during Military Government. The TOM effect is present in both the governments and more prominent and stronger in Civilian Government. Similarly, Holiday effect is also statistically significant in both the Governments and high positive in Military Government. Ramadan effect is insignificant during both Governments with high positive during military Governments. The table 4 also shows that the well-known Monday effect prevails and more pronounces in down months as compared to up months where it is insignificant. January effect is less positive in down months however, insignificant in both up and down months. TOM effect does not depend upon the performance of the market as it is statistically significant in both the up as well as in the down months. The similar behavior is exhibited by holiday effect in both the up and down months but it is high positive in down months. Ramadan effect is insignificant in both the up and down months with high positive in down months. According to definitions of bear and bull markets of Klein & Rosenfeld (1987) the Monday effect is statistically significant in both bull and bear market conditions and stronger in bull. The January effect is positive in both the market condition but statistically insignificant in both conditions of bull and bear markets. The TOM effect is significant and stronger in Bull market form, while insignificant in Bear, however, the month of Ramadan effect is insignificant in both the bear and bull market conditions. Table 4 also depicts that Monday effect is negative and highly significant in peak, recession and trough periods while insignificant in recovery session. We find positive January effect in peak, recovery

and trough but negative in recession while it remains insignificant in all stages of business cycle. TOM effect is significant and positive in peak and recovery while recession and trough produce negative and insignificant TOM effect in Pakistan stock market. Holiday effect is positive-insignificant in both peak and trough, negative-insignificant in recession while produce significant and positive returns in recovery phase. Month of Ramadan effect is positive and significant in both peak and trough, while insignificant in both recession and recovery. The results of our study are consistent with the studies of (Urquhart & McGroarty, 2014; Urquhart & McGroarty, 2016) who contribute the varying degree of calendar anomalies by finding eras of predictability (statistically significant dependence) along with eras of no predictability (no statistically significant dependence) in stock returns under certain market conditions thus supporting evidence of AMH.

Table 4: Calendar Effects Dummy Variables and Market Conditions

	Monday	January	TOM	Holiday	Ramadan
Full Sample	-0.12156*** (-3.85)	0.68351* (1.66)	0.1614*** (5.54)	0.21246*** (3.36)	0.0791* (1.75)
Presidencies					
Democratic/ Civilian	-0.18673*** (-4.886)	0.025121 (0.5587)	0.1590*** (4.5142)	0.15836** (2.1257)	0.0526 (1.0271)
Military	0.040753 (0.700)	0.2814*** (2.874)	0.11673* (2.00)	0.326171*** (2.775)	0.1705 (1.581)
(Fabozzi & Francis, 1977)					
UP	-0.055 (-1.45)	0.074434 (1.54)	0.1978*** (5.80)	0.197636*** (2.617)	0.0556 (0.885)
Down	-0.2728*** (-4.6019)	0.07398 (1.0706)	0.1282** (2.2213)	0.36072** (2.9863)	0.10248 (1.4180)
(Klein & Rosenfeld, 1987)					
Bull	-0.3372*** (-4.939)	0.123086 (1.0371)	0.2364*** (3.555)	0.091306 (0.5242)	0.228641* (1.8862)
Bear	-0.1589** (-2.169)	0.00381 (0.040)	0.0719 (0.922)	0.48196*** (3.689859)	0.16428* (1.674)
(Mahmood & Arby, 2012)					
Peak	-0.20243*** (-2.890)	0.21308 (1.778)	0.3539*** (5.698)	0.25855 (1.7467)	0.27631** (2.2870)
Recession	-0.23931*** (-2.458)	-0.013338 (-0.0428)	-0.163576 (-1.7168)	-0.14725 (-0.8366)	0.28436 (1.5208)
Trough	-0.421307*** (-3.753)	0.00622 (0.0461)	-0.03886 (-0.3746)	0.293468 (1.3685)	0.38827*** (2.4531)
Recovery	-0.023238 (-0.5451)	0.041614 (0.8367)	0.1389*** (3.6075)	0.239383*** (2.836)	-0.048388 (-0.8580)

Through GARCH (1, 1) regression model, *, **, *** indicates significance at 10%, 5% and 1% levels respectively.

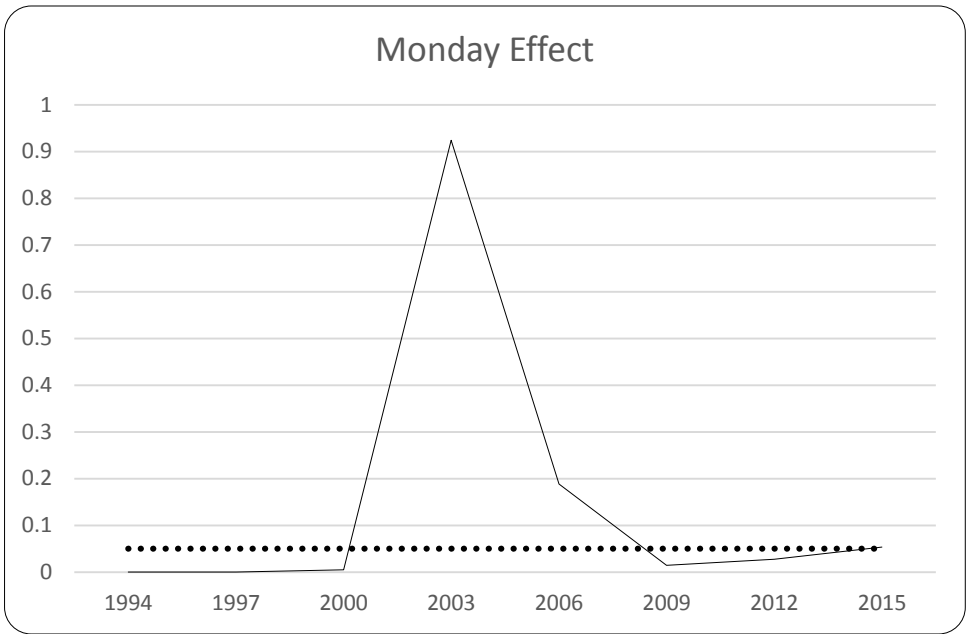

Figure 7: P-Values of the Time-Varying Kruskal–Wallis (Monday Effect)

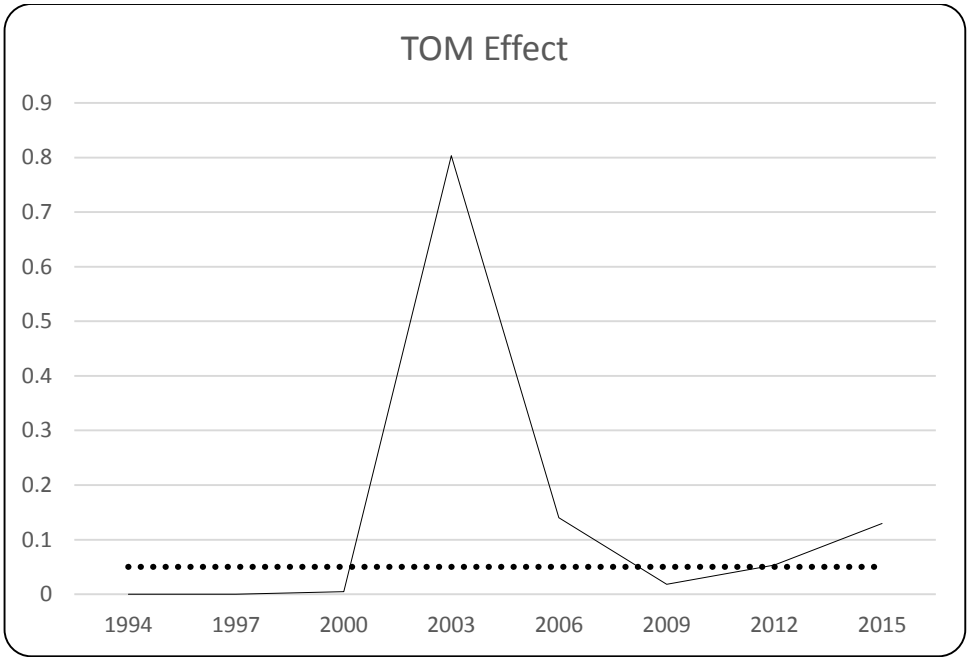

Figure 8: P-Values of the Time-Varying Kruskal–Wallis (TOM Effect)

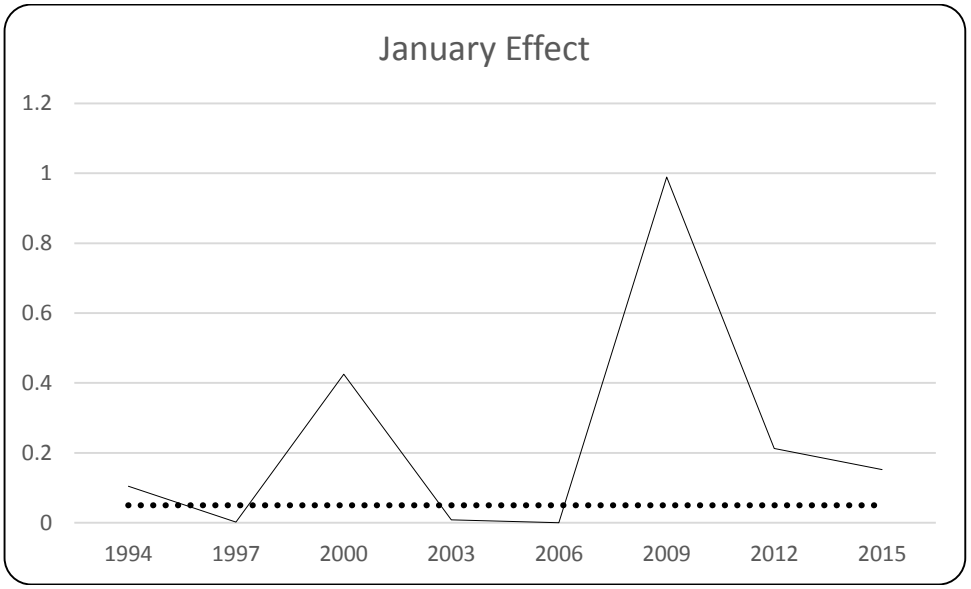

Figure 9: P-Values of the Time-Varying Kruskal–Wallis (January Effect)

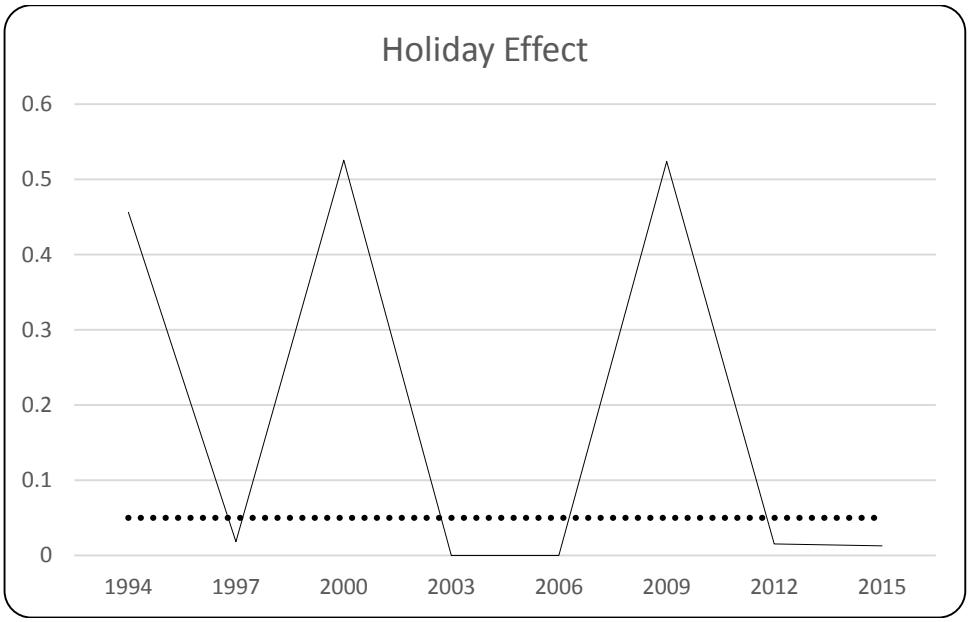

Figure 10: P-Values of the Time-Varying Kruskal–Wallis (Holiday Effect)

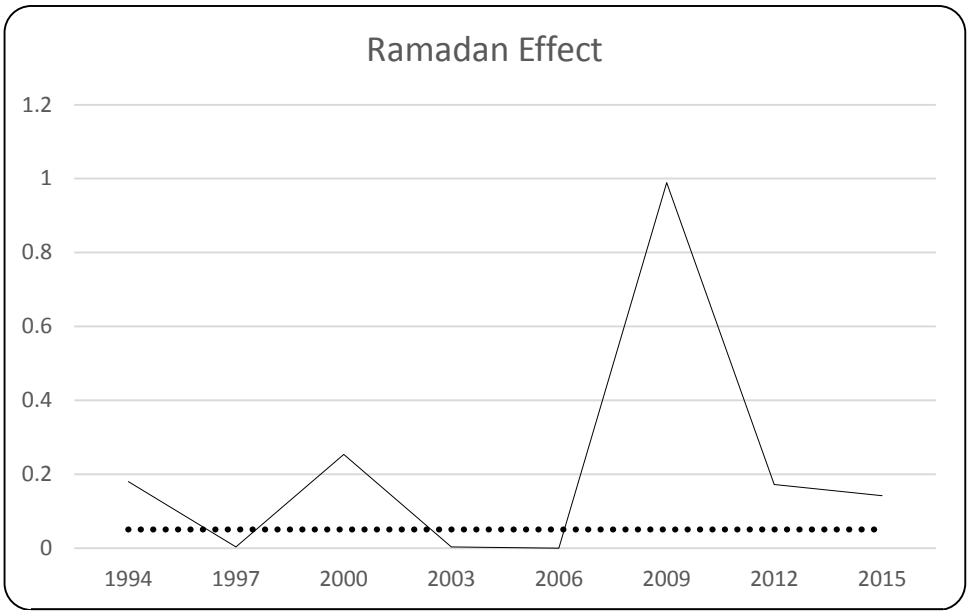

Figure 11: P-Values of the Time-Varying Kruskal–Wallis (Ramadan Effect)

6. Conclusion

The study investigates the fluctuating nature of behavior of well-known calendar effects through time and in which market condition these anomalies perform well. We provide evidence supporting AMH theory as the behavior of all five calendar effects vary over time and their performance is conducive in certain market conditions. We find a strong evidence (significant at 1%) of Monday effect, TOM effect and Holiday effect during full sample period, while January and Ramadan effects are also there in Pakistan stock market over the full sample period but it is significant at 10% level. Furthermore, to inspect whether Gregorian and Islamic calendar effect perform in adaptive style and are consistent with adaptive market hypothesis, we examine the eight subsamples of equal length of three years each with the application of Kruskal-Wallis statistics and GARCH (1, 1). The results of sub-sample reveal the Monday, Holiday, January, Ramadan and TOM effects swing with the passage time as some sub-sample periods generate negative while others positive coefficients. This behavior suggests that calendar effects are not constant in sub-samples and vary over time through full sample, therefore supporting and consistent with AMH and contrary to EMH which leads us to expect a steady erosion over time. On the other hand, in order to determine which market condition is conducive to the performance of calendar effects, we divide our data into different periods based on various market conditions. We examine each calendar effect with GARCH (1, 1) model under various market conditions. We find that Monday effect is more prominent in democratic presidency, bull months, down months and in trough period. Though the returns in January are positive in majority of market conditions but it is significant and more pronounced in military presidency only. Similarly, we find that TOM effect is also present in majority of market conditions, but is more fruitful and effective during

democracy, up months, bull market conditions and peak phase. Holiday anomaly is significant and more pronounced during democracy, military, down and up months but it is more conducive in Military Governments and down months. Meanwhile bear market and recovery phase are more favorable to the performance of holiday effect in Pakistan. Finally, we find positive Ramadan effect in all market conditions except recovery while Ramadan effect is more pronounced in bull months and trough phase. We contribute to the existing knowledge by first time linking Adaptive Market Hypothesis with Gregorian and Islamic calendar anomalies and with different conditions prevail in the market to explore the time varying nature of returns in Pakistan.

In summary, we conclude that KSE-100 index returns reveal that all five calendar anomalies exhibit time varying behavior over time through sub-samples and we find that performance of these anomalies is not constant and depends on certain market conditions. The sign of varying behavior of calendar anomalies is consistent and supporting AMH while opposing to 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) and suggest the current method could be adapted and helpful to examine other calendar and market anomalies in different equity markets in the world and we rest it for upcoming research.

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