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Calendar anomalies in Pakistan stock market

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Anomalies are those irregularities that cannot be defined by the standard finance theories. In this paper, we examined the existence of an intra-month effect and weekend effect in stock returns of Pakistan stock exchange. Data has been gathered from KSE-100 index which is largest and most liquid stock market in Pakistan. Daily stock index data has been gathered from November 2, 1991, through December 31, 2014, which approximates to about 23 years data. Returns on this data were calculated and calendar anomalies were examined. Our results show that there exists an intra-month effect. Similarly, the existence of the weekend effect in the stock market is also observed. Hence, Karachi stock market shows anomalous behavior in the returns.

Keywords: Calendar effects, day of the week effect, seasonality, anomalies.

1 Introduction

The anomaly is an irregularity which can be due to deviation from the common course or rule. In stock markets, the deviation of the group of stocks from the efficient market hypothesis (EMH) is known as an anomaly. By using different anomalous situations, an investor can earn an abnormal returns which are in contradictory to the assumptions of EMH. Anomalies in the stock markets cannot be ignored because of their huge impact on different stock markets all over the world. Anomalies can be of three types:

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calendar, technical and fundamental. The anomalies of stock markets returns which are influenced by the seasonal effects of the calendar year are labeled as calendar anomalies. Different types of calendar anomalies have been discovered: intra-day, weekend effect or Monday effect, January effect, intra-month effect, quarterly, Halloween and daylight savings effect. Weekend effect anomaly shows higher returns on Friday and lower returns on Monday. Returns are positive for first half of the calendar month compared to the second half. The appearance of such anomalies violates the efficient market hypothesis because these are predictable on some calendar effects. Hence, allowing the investors to develop trading strategies to earn an abnormal profit.

The efficient market hypothesis (EMH) states three types of market efficiency which are weak, semi-strong and strong. In weak form, past market information is accumulated in the price of security. In semi-strong form, public information is also taken into account in addition to past information. While in the strong form of the efficient market, past, public information along with hidden (private) information is also reflected in prices of the securities. Anomalies show deviation from the efficient market hypothesis and irrational behavior of the investors. This can be observed in the past data and can be easily exploited.

We focus on two types of calendar anomalies in this paper; weekend effect and intra-month effect. High returns are exhibited on Friday (last trading day of the week) compared to Monday (first trading day of the week) due to the differences in trading patterns of individual investors on these days. This phenomenon is termed as weekend effect or Monday effect. Intra-month effect illustrates the high return in the first half of the month (FH) as compared to the second half (SH). This is attributable to the high cash flow in the first half of the month.

The main purpose of this paper is to analyze the calendar anomalies and assess the impact of time on the prevalence of these anomalies in Pakistan stock market. Haugen and Jorion (1996) suggested that the effect of calendar anomalies should be short term. Therefore, 24 years data is analyzed to get a fair picture of the recent scenario. Calendar anomalies have been documented in an extensive literature; however, most of the former studies are concentrated on U.S and other developed markets. The emerging markets have remained out of focus. Findings of those studies cannot be applied to Pakistan's stock market due to differences in preferences of investors. To the best of our knowledge, very little studies have been published on calendar effects in Pakistan stock market. This study will take recent data to find out these anomalies and to check whether these anomalies prevail in the democratic regime of Pakistan.

The rest of paper is organized as follows: Section 2 includes detailed review of the most recent and relevant literature present on the topic; Section 3 presents econometric methodology to test day of the week effect and an intra-month effect in Pakistan Stock market; Section 4 encompasses the empirical analysis, key findings of the research and investigation conducted including informed results of the overall effort; while Section 5 concludes the paper.

2 Literature Review

The efficient-market hypothesis (EMH) developed by Malkiel and Fama (1970) focuses on rational expectations of the investors and highlights that whenever new information emerges, the expectations of investors will be influenced. Some investors overreact while others under react by following a normal distribution pattern. Basing on this information, market will move toward efficiency. This hypothesis was widely accepted. De Bondt and Thaler (1994) concluded that a person exhibits a rational behavior basing on rational expectations. Moreover, there are some underlying assumptions regarding behavior of a person and his investments. However, the proposed theories don't describe the behavior aspects of an investor. Problem found with the EMH is that there is no reflection of new information in the prices of securities. However, a specific pattern is followed by the person, which gives them the opportunity to make an abnormal profits leading to inefficiency of the market. Behavioral economists explain that imperfection in the market is because of these patterns. These errors are predictable and they influence the reasoning and information processing. These are called anomalies and are very dangerous element for the equity market, as owing to the predictability of the trends. Therefore, abnormal profits can be earned.

Many researchers have documented different anomalies that clearly show deviation from efficient market hypothesis (EMH). Ariel (1987) found the existence of anomaly at the start and end of the month in U.S stocks. Jacobs and Levy (1988) also documented that anomalies occur generally at specific point of time like turn of the year, the month and they contain a significant economic impact. Barone (1990) also conducted a study in Italian stock market and confirmed the existence of anomalous changes in line with those found in U.S markets. Hussain et al. (2011) conducted a study on Karachi stock exchange (KSE) and concluded that the market is inefficient and is showing anomalous behavior towards returns. Chan et al. (1996) analyzed the seasonality in the four Asian stock markets. They confirmed the existence of day-of-the-week effect in all four markets i.e. Kuala Lumpur (KLSE), Bombay (SEB), Singapore (SES) and Thailand (SET) while SES and KLSE also reflects the existence of month of the year effect.

2.1 Day of the Week Effect

Cross (1973) examined the weekend effect by investigating New York Exchange using sample size of 884 sets. Hamid et al. (2010) argued that trading volume of stock market in days before the holidays is large as compare to days after the holidays. French (1980) argued that average returns on Monday were negative and returns were positive for other days. Similarly, Harris (1986) examined the existence of weekly effect and concluded that returns of larger firms are higher on Monday and Friday as compared to small firms (only Monday returns are higher). Furthermore, he reported that most notable change in the prices is observed on the last day of trade. Lakonishok and Smidt (1988) analyzed the persistence of seasonal patterns and concluded that returns are persistent around the turns of week, year, month and holidays. Gibbons and Hess (1981) examined market efficiency and revealed that common stocks are not constant across the week similarly

returns on treasury bills are also not constant. They found significant negative returns on Monday. Keim and Stambaugh (1984) used a longer time period and additional stocks to investigate weekend effect and found consistently negative returns on Monday. Therefore, it is not difficult to find whether market is anomalous or not but actual problem lies in capturing the behavior of the investors toward different anomalies.

Abraham and Ikenberry (1994) investigated the cause of anomalous situations and concluded that trading behavior of individual investors appears to be at least one factor contributing to this pattern. Individual investors are more active sellers of stock on Mondays, particularly following bad news in the market. Wang et al. (1997) showed that Monday effect occurs during last two weeks of the month. They found that Monday effect during the first three week is not significantly different from zero. Lakonishok and Maberly (1990) examined the investor's reactions towards anomalies and concluded that regularities exist in trading patterns of institutions and individuals on day of the week. An increase in trading activity by the individuals is observed on Monday. Individuals indulge themselves more in selling transactions relative to buying.

Jaffe and Westerfield (1985) studied the weekend effect by using daily stock returns of four stock markets. They concluded that Japanese and Australian stock markets show lowest mean returns on Tuesday. Kamara (1997) examined the day of the weekend effect for Standard & Poor 500 and small-cap returns from 1962, through 1993, and concluded that when trading costs decline and ratio of institutional to individual trading increases, it causes decline in returns. In contrast, the seasonal for small-cap stocks does not decline over time and is unaffected by institutional versus individual trading. Informed traders use the (futures) market with the lower transaction costs to exploit the seasonal. Owing to higher transaction costs, some insignificant seasonal remains in spot returns. The results suggested that the institutionalization of equity markets and the trading of stock index futures contracts accelerate the correction of short-term anomalies in the underlying stocks. Chen and Singal (2003) examined the contribution of short sales to weekend effect. Due to inability to trade on weekend short seller close their position on Friday and reestablish new short positions on Monday, which causes stock prices to fall on Monday and rise on Friday. Chan et al. (2004) contributed that this Monday effect is low in stock with low institutional holdings but in high institutional holdings this effect is not significantly different from other days. Rogalski (1984) stated that for all trading days of the week average returns (open to close) are identical whereas day of the week returns are interrelated with firm size, the January effect or turn of the year anomalies.

Aggarwal and Rivoli (1989) argued that the "January effect" and the "weekend effect" have proven to be persistent anomalies in U.S. equity markets. They found that all the markets, except The Philippines, showed higher returns in January compared to any other month of the year. In addition to Monday effect, these markets also showed Tuesday effect. Tuesday effect can be due to the time difference between these countries. Chen et al. (2001) argued that estimation method and sample period can cause day of the week irregularity in China. When transaction cost is taken into consideration, the probabilities of an arbitrage profits availability in this anomaly are very small. Damodaran (1989) concluded that due to declines in dividend reports on Friday, negative returns can be earned. Miller et al. (2003) stated that both Treynor and Sharpe measures can be

improved by daily dynamic trading strategies, which also increases returns by reducing risk.

Ali and Akbar (2009) explained that there is no weekend effect in the stock market of Pakistan. They found that market is inefficient in short run only. Steeley (2001) argued that in 1990s weekend effect in UK stock market have disappeared. Ausloos et al. (2016) examined behavioral preferences of authors who have submitted their paper to a scientific journal. They examined the sample of about 600 papers and found that the behavior of scientific agents in such a process is dependent on the day-of-the-week.

H₁: There exists weekend effect in Karachi stock market of Pakistan (KSE-100 index).

2.2 Intra-month Effect

Cadsby and Ratner (1992) were of the view that turn of month and pre-holiday effects are significant in two groups of countries. First group included West Germany, Canada, Australia, UK and Switzerland, demonstrated turn of the month anomaly. The second group which demonstrated pre-holiday anomaly consisted of Hong Kong, Japan along with Canada and Australia. The Country specific institutional practices can cause absence of these anomalies in some markets. Ariel (1987) stated that the stock returns are positive only in the 1st half of the month and on the days just before it. But in the last half of the month returns are nearly equal to zero. This effect is not dependent upon other anomalies like January effect as documented by others. Penman (1987) argued that stock markets returns on average were higher in the first half of the month as compared to other times. News on corporate earnings were good during this time period but after this period, news were mostly bad. Jaffe and Westerfield (1989) found the last day of the month's evidence. Redman et al. (1997) worked on real estate investment trust (REITs) and found that day of the week effect, turn of the month anomaly; pre-holiday anomaly and January effect exist in REITs. They further reported that REIT tends to show higher returns in the month of January along with Friday, on pre-holiday trading and in turn of the month. Liano and Lindley (1995) argued that Friday's returns are significantly greater than Monday's returns. However, the spread between Monday's and Friday's returns shifts between the first half and the second half of the month. Rosenberg (2004) argued that there exists link between economic business cycle and end of the month effect. This link is explained by evidence, as business go toward expansion anomaly appears and during contraction this disappears. Balaban et al. (1996) stated that empirical results do not verify the semi-monthly effect during 1988, to 1995. But Istanbul Securities Exchange Composite Index showed semi-monthly effect in 1994 when years were investigate separately. Booth et al. (2001) argued that increased returns during the rest of the month are associated with increased liquidity, as measured by different measures of trading activity. Raj and Kumari (2006) concluded that intra-month effects for Standard & Poor 500 futures disappear after 1990, and this result carries over to the Standard & Poor 500 spot market. They explained that a change in the preference of individual investors over time from direct to indirect stock purchases through mutual funds is related to the disappearance of the intra-month effect. Brooks and Persaud

(2001) examined daily seasonal in different countries and found weekend-effect in only nine countries.

H_2 : *There is no equality in mean returns for first half of month (FH) and second half of month (SH).*

3 Data and Methodology

The data has been obtained from Karachi stock exchange (KSE-100 index) of Pakistan. Daily stock index data has been gathered from November 2, 1991, through December 31, 2014, which approximates to about 23 years data. The stock market of a country is representative of all market therefore; it is easy and more accurate to find out the effect of different changes rather than analyzing individual stocks.

The data for weekend effect is divided into three groups; First group corresponds to the time when Thursday and Friday were weekend days ranges from November 2, 1991, through February 27, 1997. The second group is the time when Friday and Saturday were weekend days ranges from March 1, 1997, through December 31, 2007. The third group from January 1, 2008, through December 31, 2014, is the time when Saturday and Sunday were weekend days. These three periods are termed as period I, II and III respectively. The dataset for period I contains 1235 cases; 2654 cases for period II and 1850 cases for period III.

Following equation is used to calculate daily and monthly returns:

$$R_t = 100 * \ln I(t) / I(t-1)$$

Where R_t denotes daily return, \ln is natural log, $I(t)$ is KSE-100 index at time t and $I(t-1)$ is KSE-100 index at time $t-1$. Returns are calculated at the end of week and at the start of week in order to measure the weekend effect.

3.1 Day of the Week Effect

To test the day of week effect, regression equation with dummies is as follows:

$$R_t = \beta_0 + \beta_1 d_1 + \beta_2 d_2 + \epsilon_t$$

Where R_t is return of the stock index. β_1 and β_2 are coefficients of mean returns for days. d_1 and d_2 are dummy variables for days.

$$H_0 : \beta_1 \neq \beta_2$$

If this hypothesis is rejected then it means that the returns on Friday is equal to means return on Monday.

3.2 Intra-month Effect

To test the intra-month effect, we followed Lakonishok and Smidt (1988) pattern. Monthly data is divided into two parts. First half of the month is from 1st day of the month to 15th calendar day of month and second half of month included remaining days of month. The regression equation is as follows:

$$R_t = \beta_0 + \beta_1 d_{2t} + \epsilon_t$$

Where R_t is daily return of the stock index. β_1 is coefficients of mean returns for second half of month. d_{2t} is dummy variable for second half of month.

For intra-month effect, null hypothesis states that the returns in two halves of the month are equal to each other. If this hypothesis is rejected then alternative hypothesis is that there is no equality in mean returns for first and second half of month. To confirm the half month effect, significant negative β_1 coefficient is required.

4 Results and Discussion

4.1 Weekend Effect

Period I

For the Period *I* (public holidays: Thursday and Friday) regression analysis is given below. Day of the Week effect has been analyzed in the following table.

Table 1: Tells about the Day of the Week Effect in period I

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SAT	-0.029929	0.302848	-0.098826	0.9214
SUN	0.037294	0.308208	0.121001	0.9039
MON	1.089122	0.302848	3.596268	0.0004
TUE	0.269200	0.302848	0.888896	0.3756
WED	-0.066850	0.308208	-0.216899	0.8286

Results show that mean returns on Monday are significantly different than all other days' return. Cross (1973), French (1980), Gibbons and Hess (1981), Keim and Stambaugh (1984) all reported weekend effect. French (1980) suggested that the possible explanation of the weekday effect may be tendency for firms to delay the announcement of bad news until the weekend to avoid market disruption.

With reference to other days of the week returns on Monday was observed by regression analysis in the given table.

Table 2: Tells about the stock returns on Monday in period I.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.053608	0.151516	0.353808	0.7240
MON	1.035514	0.336456	3.077707	0.0025

Results show that significant positive mean returns on Monday as compared to other days. Monday returns are influenced by returns on the preceding trading days Cross (1973).

By taking Monday as reference returns on other days of the week were observed in the given table by doing regression analysis.

Table 3: Tells about the stock returns on week days with reference to Monday in period I.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.089122	0.302848	3.596268	0.0004
SAT	-1.119051	0.428291	-2.612826	0.0100
SUN	-1.051828	0.432098	-2.434232	0.0162
TUE	-0.819922	0.428291	-1.914402	0.0576
WED	-1.155972	0.432098	-2.675251	0.0084

Results show that mean returns of other week days are significantly negative when Monday is taken as reference point.

Period II

Regression analysis tables for the Period *II* (public holidays: Friday and Saturday) are given below. Day of the week effect has been analyzed in the following table.

Table 4: Tells about the Day of the Week Effect in period II

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SUN	-0.225078	0.086298	-2.608159	0.0092
MON	-0.224021	0.083331	-2.688323	0.0073
TUE	0.137552	0.083520	1.646949	0.0999
WED	0.179343	0.083144	2.157008	0.0312
THU	0.192763	0.084677	2.276450	0.0230

Results shows that mean returns on Monday and Sunday are significantly negative. The mean returns on Tuesday, Wednesday and Thursday are significantly positive. Gibbons and Hess (1981), and Keim and Stambaugh (1984) also reports significantly negative average returns on the stock markets on Mondays.

In the following tables, returns on Sunday and Monday were observed respectively by taking other days as reference point.

Table 5: Tells about the stock returns on Sunday in period II.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.069340	0.042076	1.647977	0.0996
SUN	-0.294418	0.09650	8 -3.050720	0.0023

Table 6: Tells about the stock returns on Monday in period II.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.074163	0.042424	1.748163	0.0807
MON	-0.298184	0.09396	0 -3.173516	0.0015

Results show significant negative mean return on Sunday and Monday. Returns on Wednesday and Thursday were observed by taking other days of the week as reference. Regression analysis results are given below for Wednesday and Thursday respectively.

Table 7: Tells about the stock returns on Wednesday in period II.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.029361	0.04254	8 -0.690068	0.4903
WED	0.208704	0.094024	2.219679	0.0266

Table 8: Tells about the stock returns on Thursday in period II.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.030752	0.042342	-0.726282	0.4678
THU	0.223515	0.095293	2.345548	0.0192

Results show that mean return on Wednesday and Thursday are significant positive while controlling other days as reference point.

Period III

Regression analysis tables for the Period III (public holidays: Saturday and Sunday) are given below. Day of the Week has been analyzed in the following table.

Table 9: Tells about the Day of the Week Effect in period III

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MON	-0.056864	0.053310	-1.066671	0.2862
TUE	0.072221	0.053645	1.346285	0.1783
WED	0.159698	0.053220	3.000737	0.0027
THU	0.058357	0.053645	1.087851	0.2767
FRI	0.089641	0.054366	1.648856	0.0992

Results show that mean return on Wednesday are significant positive and controlling other days as reference point.

By taking different days of the week as reference returns were observed. Here in the following tables returns on Monday and Wednesday were observed respectively by taking other days as reference point.

Table 10: Tells about the stock returns on Monday in period III.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.098842	0.026778	3.691140	0.0002
MON	-0.155706	0.059647	-2.610455	0.0091

Table 11: Tells about the stock returns on Wednesday in period III.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.044077	0.026799	1.644722	0.1001
WED	0.115621	0.059592	1.940201	0.0524

Results show that significant negative mean return for Monday and significant positive for Wednesday. Following table provides us the summary of mean returns of all days for the sample data.

Table 12: Tells about the mean returns of all periods

Time Period	Days	Mean	Median	Std.Dev
Period I	Saturday	-0.031	-0.00435	1.262361
	Sunday	0.038675	0.315159	1.532348
	Monday	1.128019	1.036228	2.026519
	Tuesday	0.259843	-0.10997	1.658909
	Wednesday	-0.06685	-0.23206	1.683092
Period II	Sunday	-0.230649	-0.233453	1.351919
	Monday	-0.22918	-0.2291	1.144577
	Tuesday	0.138809	0.169348	1.250035
	Wednesday	0.180966	0.16129	1.283077
	Thursday	0.197352	0.141672	1.230034
Period III	Monday	-0.05732	0.0422	1.86386
	Tuesday	0.072721	0.092983	1.546445
	Wednesday	0.160969	0.220706	1.580932
	Thursday	0.058761	0.07585	1.405676
	Friday	0.090708	0.141235	1.503245

Mean returns in the first period are not predictable but in the second and third period mean returns are positive on pre-weekend days and negative on post-weekend days.

4.2 Intra-Month Effect

Regression analysis for the first half of the month is given below.

Table 13: Tells about the stock returns of first half of the month.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002645	0.028443	0.092991	0.9259
FH	0.121087	0.040740	2.972162	0.0030

Where as FH stands for first half of month

Significant positive effect was observed in the above table. Returns are positive in the

first half of the month. Regression analysis for the second half of the month is given in the following table.

Table 14: Tells about the stock returns of first half of the month.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.122737	0.029153	4.210071	0.0000
SH	-0.119271	0.040740	-2.927591	0.0034

Where as SH stands for second half of month.

Results show that significant negative return for second half of the month. Following table provides us the summary mean returns of first and second half of the month.

Table 15: Tells about the mean returns of First and Second half of month

Time Period	Mean	Median	Std.Dev
First Half of Month	0.125201	0.154059	1.500954
Second Half of Month	0.003503	0.064164	1.591123

Mean returns in the first half of the month are considerable higher than the second half of the month. Our results confirmed that there is no equality in mean returns for first half of month (FH) and second half of month (SH). Therefore, our second hypothesis H_2 is accepted. Mean returns for the first half of the month have positive returns while second half has lower returns than first half. Our results are in line with the previous studies as Hamid et al. (2010) observed for the same market. Boudreaux (1995) also report existence of month effect. In the first period when public holidays were on Thursday and Friday, returns on Monday were positive. Results of Period *I* and Period *II* confirmed the presence of weekend effect in the stock market of Pakistan as returns on the day before the weekend were positive while returns on post-weekend day were negative. Therefore, first hypothesis H_1 is accepted; i.e. day of the week exists in the Karachi stock market of Pakistan. These results are in line with the findings of Jaffe and Westerfield (1985). Chan et al. (1996) also confirmed day of the week effect in Kuala Lumpur (KLSE), Bombay (SEB), Singapore (SES) and Thailand (SET) markets. Aggarwal and Rivoli (1989) also reported weekend effect in U.S equity market.

5 Conclusions

Results show that there exists day of the week and month effect in Pakistan stock market (PSX). There exist different types of calendar anomalies. Behavioral finance explained this phenomenon. Results also confirmed inefficiency of Pakistan stock market. In an anomalous situation market, returns are easily predictable. Hence, investor can outperform the market. The anomalies studied in this article are intra-month and weekend effect. In first half of month returns are higher compared to second half. In case of weekend effect pre-holiday show higher returns and post-holiday shows lower returns. Due to time constraint, this study is conducted for the overall period of twenty three years combined. Returns for every year should be calculated in order to find out whether these calendar anomalies as reported by the data, exist at a regular interval or these anomalies disappear at some point. Further studies should be conducted for anomalies like January effect, and holiday effect.

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