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Investigating Calendar Influence in the Karachi Stock Exchange

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Abstract

This paper examines the influence of the Gregorian and the Islamic calendar in explaining any variance in the share returns of the Karachi Stock Exchange (KSE). In addition to the calendar influence, this study sought to uncover whether any variation in share returns earned by the equities from the KSE were related to the size of the firms, the sector in which the firm was located or a particular year from the sample period. This paper reports the results of quantitative analysis based on the daily share price data for 106 companies listed on the KSE over the 17-year period from 1995 to 2011. The results indicate that investing on a sectorial or size basis is less effective than allocating the funds to firms in different months of calendar. More specifically, the analysis revealed that investors may benefit more from aligning their portfolios according to the Gregorian calendar months, and the patterns attached to it rather than the Islamic calendar months since the latter is less influential in explaining the returns of the KSE. Furthermore, the study highlighted that returns earned by equities in the KSE vary significantly from year-to-year; indicating the volatile nature of the KSE market.

Keywords: Calendar anomalies; efficient market; Karachi Stock Exchange (KSE); seasonality; stock returns.
JEL Classification Codes: C12; G10; G11; G14

1. Introduction

For over a few decades, the Efficient Market Hypothesis (EMH) theory has remained an area of great interest within the finance community. The term 'efficient market' was first introduced into the economics literature by Eugene Fama at the University of Chicago as an academic concept in the early 1960s. Fama (1970) defined an efficient market as one in which security prices always fully reflect the available information. In other words, an average investor cannot beat the market consistently as share prices fully reflect all the available information. This concept became widely accepted in the academic literature up until the 1980s when researchers began to document inconsistencies or anomalies which called the theory into question.

According to Fama (1970), no investor has the opportunity to outperform the market consistently on the basis of information available. A large number of empirical studies have been undertaken to test this hypothesis in various international stock market settings (Brock et al., 1992; Fifield et al., 2005, 2008; Hamid et al., 2010). Other research findings which have cast doubt on the validity of the EMH include monthly calendar anomalies; these suggest that share price changes may be predicted for certain months of the year (Rozeff and Kinney, 1976; Gultekin and Gultekin, 1983; Keong et al., 2010). Until recently, a relatively small number of investigations have begun to study the

existence of monthly calendar anomalies in the Pakistani stock market. These studies have attempted to predict monthly calendar anomalies using both the Gregorian and the Islamic calendars[1].

Pakistan, a country with over a 97 percent Muslim population uses the Islamic calendar concurrently with the Gregorian calendar. Although Pakistan's financial markets use the Gregorian calendar for business and government in order to coordinate business dealings with the rest of the world, the Islamic calendar is used to date events in the country and mark annual Islamic holidays, such as Eid. All the financial markets in the country are closed during Muslim festivities and holy days based on the Islamic calendar. For example, the stock markets are closed 9 days (on average) every year to celebrate Islamic holidays and festivals. The Islamic calendar, unlike its Gregorian counterpart, is based on the lunar months; therefore, the Islamic year is about 11 days shorter than the Gregorian year. This implies that while Islamic months fall on the same date in the Islamic calendar, they actually vary each year by about a week and a half according to the Gregorian calendar. The 12 Islamic months are: Muharram, Safar, Rabiul Awwal, Rabiul Thani, Jamatul Awwan, Jamatul Thani, Rajab, Shaban, Ramadan, Shawwal, Zil Qa'ad and Zil Hajj. Thus, an analysis of calendar influence on stock returns for a country such as Pakistan may offer interesting insights. The findings may provide useful information as to how investors can structure investments to maximise their returns, and which calendar they should focus if they were to look for monthly anomalies in the market. For this reason, it is thought that this comprehensive study will make an important contribution to our existing knowledge.

Previous studies investigating Pakistani market indicated that May might have lower returns than other months for Gregorian calendar (Zafar et al., 2010; Rafique and Shah, 2012) whereas the returns for the months of Shawwal and Zil Qa'ad might be different from those in other months of the Islamic year (Mustafa, 2008). However, to date, no academic study has attempted to investigate which calendar has a greater influence on the returns of the Karachi Stock Exchange (KSE) equities in Pakistan. This study attempts to fill this gap in the literature. In order to determine which calendar has a greater influence on the share returns, a General Linear Model (GLM) was fitted to the data. In addition to the calendar effects, this study sought to uncover whether any variation in share returns earned by the equities from the KSE were related to the size of the firms, the sector in which the firm was located or a particular year from the sample period. For this reason, SIZE, SECTOR and YEAR (time) factors were also employed in the model to examine whether they were influential with regards to the returns of KSE shares. Thus, the GLM model was selected to test for the sources of variations in the returns of KSE equities to determine whether: (i) the Gregorian calendar; (ii) the Islamic calendar; (iii) the size of the firm; (iv) the sector; and (v) the year of the sample period influenced any price changes which occurred. In doing so, the model also investigated the interactions between factors.

The remainder of the paper is organized as follows. The review of the relevant literature is discussed in Section 2 while Section 3 describes the data selected for this study. The methodology is outlined in Section 4 while Section 5 discusses the results. The final section, Section 6, provides a concluding summary of the findings.

2. Review of the Literature

In recent years, an increasing amount of research has focussed on investigating monthly calendar anomalies in the KSE. Various empirical studies of the Pakistani stock market have examined monthly calendar anomalies using not just the Gregorian calendar but also its Islamic counterpart. The empirical analysis presented in prior research suggested that returns in certain months of the year were significantly different from returns in other months of the year for both the Gregorian and Islamic calendars. This is a clear contradiction of the EMH theory by Fama (1970) which suggest that share

[1] Calendar anomalies cast doubt on the EMH since the investor knows when a specific month is due and may therefore be able to predict the share price change which will occur.

price changes may not be predicted based on past information on a persistent basis. Indeed, any persistence over time of a monthly anomaly can help investor to predict when share price changes will occur.

A relatively small number of research papers have focussed on investigating calendar anomalies in the Islamic calendar for the Pakistani equities in contrast to a relatively greater number of studies which have examined security returns for the presence of recurring patterns according to the Gregorian calendar (Halari et al., 2013). Husain (1998) was one of the earliest studies to investigate monthly calendar anomaly in the Pakistani equities using an Islamic calendar. He conducted an analysis of daily stock prices and daily index values selected from the KSE covering a period from 1989 to 1993. The study found that share returns declined in the month of Ramadan, but this reduction, in general, was not significant. Hence, the author concluded that the month of Ramadan did not affect the average return achieved by equities in Pakistan. A more recent study to address this issue using an Islamic calendar was conducted by Mustafa (2008). The author analysed daily share price data for the KSE-100 index over the period 1998 to 2004. The results suggested that there was no Ramadan effect in the Karachi stock market, but significantly positive average returns were found in the months of Shawwal and Zil Qa'ad. Hence, suggesting that monthly anomalies existed in the market which may be exploited by the investors.

Unlike Mustafa's (2008) findings, Hussain (1998) concluded that there were no patterns in the returns of the Pakistani equities based on the Islamic calendar. Similar observations were highlighted in the studies of the Pakistani stock market that investigated monthly calendar anomalies based on the Gregorian calendar. Mahmood (2007) was one of the earliest studies to investigate monthly seasonality in the KSE market. He analysed monthly share price data from 1996 to 2006 to test for seasonality in the returns of Pakistani equities using the Gregorian calendar. The results indicated that that the mean returns in all the months were not significantly different from each other for all the eight companies; hence, the author concluded that no monthly seasonal effect was present in the KSE market. More recently, a study by Ali and Akbar (2009) observed a monthly calendar effect in the returns for the KSE 100 index over the period 1991 to 2006 using the Gregorian calendar. Their results confirmed the findings of Mahmood (2007) as their results suggested that no monthly anomalies were present in the KSE index[2].

In contrast to the earlier studies, Zafar et al. (2010) found a monthly calendar anomaly in the KSE using regression analysis based on daily share price data of the KSE-100 index for the period 1991 to 2007. The results from their regression analysis revealed that the coefficient for May was negative and significant; suggesting that the May effect was present in the market. Therefore, the authors concluded that monthly anomalies exited in the KSE market within the Gregorian calendar. More recently, Rafique and Shah (2012) also investigated KSE data for the existence of a calendar anomaly using daily share price data of the KSE-100 index. Initial descriptive statistics revealed that May, June and August were the months in which mean returns were negative. This finding is consistent with the results of the study by Zafar et al. (2010) where a negative mean return for May was reported. Rafique and Shah's analysis also revealed that highest average mean return for all the months occurred in January whereas the lowest average was recorded in May. The results of their study reinforce the finding of Zafar et al. (2010) that monthly anomalies existed in the KSE market.

Therefore, evidence from Pakistan reveals conflicting results with various authors reaching different conclusions about the presence of a monthly anomaly in Pakistani equity returns using both Gregorian and Islamic calendars. Possible reasons for these apparently contradicting findings might be the different time periods analysed and the various models used to examine patterns in returns. Nonetheless, there appears to be evidence of monthly calendar anomalies in both Gregorian calendar and its Islamic counterpart (Mustafa, 2008; Zafar et al., 2010; Rafique and Shah, 2012). The aim of the current study is to investigate which calendar has a greater influence on the returns of the KSE equities. Therefore, if there are calendar anomalies to be exploited, investors should focus on the calendar which

[2] However, the authors only investigated monthly data for a 15 year period which meant they only had 15 values for each month's returns; thus, the power of any statistical tests was relatively weak.

is most influential in explaining the variance of the equity returns of the KSE. To date, no academic study has attempted to investigate this issue; this study provides such a work and arrives at a firm conclusion about the importance of these two calendars in influencing the returns of the KSE equities.

The next section attempts to explore the impact of both of these calendars (as well as other factors) on the returns of the Pakistani equity market. Specifically, the next section explores whether company size, sector or year (time) also have a role to play in influencing the returns available on the Pakistani equity market.

3. Data and Sample Description

The share price information used in this study is taken from Datastream. Specifically, daily share price data were downloaded for 106 companies listed on the KSE over the 17 year period from January 1, 1995 to December 31, 2011. The start date was chosen in order to maximise the number of companies included in the data set whilst having a long enough time frame to investigate the topic in question. This sample of companies covers a broad spectrum of the KSE market and ensures that the results are not specific to a particular sector or size of company. The criteria applied for share selection process were as follows: 1) each share must have traded for the entire sample period; 2) the share price data must have been available on Datastream; 3) share price must have been adjusted for stock dividends, stock splits or share issues[3]; and 4) shares must have been actively traded on the KSE over the period under investigation[4].

After applying these criteria, the final sample of 106 companies emerged. Table 1 reports information about the final sample that was used for this study. A visual inspection of the table reveals that the sample was drawn from various different industries; sample firms have been grouped together into seven different sectors; Automobiles (Sector 1), Financial (Sector 2), Food (Sector 3), Industries (Sector 4), Utilities (Sector 5), Personal Goods (Sector 6) and Chemical sectors (Sector 7). These companies varied in size from a high of Rs. 163,127.40m (NPK) to a low of Rs. 4.09m (UMC); the largest firm (NPK) operated in the Food Industry whilst the smallest size firm (UMC) was drawn from the Financial Services sector. The total volume of shares traded for the sample companies varied between 826,903,200 (DEG) to 12,800 (WYP). Thus, a good mix of firms was present for the analysis although a majority were located in the Industries sector; only six companies were included from the Automobiles sector in the final sample. An analysis of the last two columns of Table 1 indicates that most of the firms were profitable in 2011 since 70 companies paid dividends and 78 companies had a positive P/E ratio[5]. In addition, it is apparent from Table 1 that no strong relationship exists between firm size and the dividend yield or the P/E ratio. For instance, a small firm such as Saif Textile Mills with a market capitalization of only Rs. 131.80m had the highest dividend yield ratio relative to any other company in the sample.

Returns were computed as the first differences of the natural logarithm of prices[6]:

$$R_{it} = Ln(P_{it})-Ln(P_{it-1}) \quad (1)$$

Where Ln is the natural logarithm; R_{it} is the return on share i for day t; P_{it} and P_{it-1} are the prices of firm i for day t and t-1, respectively.

One of the key challenges when undertaking this study was to convert the Gregorian dates into their Islamic equivalents[7]. A total of 4435 Gregorian calendar dates for the 17 year period from 1995 to

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[3] An 'adjusted price' is the price of a company's share after taking into account any stock dividends, stock splits or share issues. It was decided to use adjusted prices since stock dividends, stock splits and share issues were relatively common for the KSE equities over the 17-year period of this research.

[4] All shares that exhibited thin trading were discarded.

[5] According to Section 249 of the Ordinance of the SECP, "No dividend shall be paid by a company other than out of the profits of the company" (The Securities and Exchange Ordinance, 1969). Thus, a dividend payment is an indication of profitability (Khan, 2011).

[6] The natural log of the share returns was calculated to reduce any problems with non-normality in the data (Brooks, 2008; Strong, 1992)

2011 had to be converted to Islamic dates in order to conduct this investigation[8]. A Gregorian-Islamic date convertor was used when undertaking this task. Furthermore, the archives of two newspapers were also searched to mitigate against any errors which might be present and to cross check the results of one publication with another[9]. The data in this study corresponds to the Islamic calendar period ranging from the years 1415 to 1433[10].

4. Methodology

This study attempts to investigate whether any particular calendar had a greater influence on the share returns of the KSE. In doing so, a GLM was fitted to the data. In addition, the GLM sought to investigate whether the size of the firms, the sector in which the firm is located or a particular year for the sample period had any influence on the share returns of the KSE. In doing so, the GLM also investigated the interactions between these factors. For this purpose, the following equation was estimated which investigated the returns of the KSE equities as a function of the Gregorian calendar, the Islamic calendar, firm size, company sector and year:

$$Rj(g,i,s,t,y) = f(\text{Gregorian Calendar}_g, \text{Islamic Calendar}_i, \text{Size}_s, \text{Sector}_t, \text{Year}_y) \quad (2)$$

Where $R_{j(g,i,s,t,y)}$ is the return of company j in Gregorian month g, Islamic month i, of size s, and sector t for the year y.

The model in equation (2) has the benefit of allowing the main factors to be determined; further, it permits interactions between these factors to be taken into account. In order to perform such an analysis, dummy variables were constructed for each of the explanatory factors. For example, the Gregorian and Islamic months were each assigned a value between 1 and 12, representing the 12 months for each calendar; a value of between 1 and 7 was assigned to distinguish between different sectors[11]; a value of between 1 and 3 was given to identify the size of the firms[12]; and a value between 1 and 17 was used to represent the 17 years in the sample period. The findings from this GLM, therefore, should provide insights into how investors can structure investments in order to maximise their returns.

Table 1: Information about the Sample Companies

Sec	Company names	Code	Mkt Cap	VO	DY	P/E
1	AGRIAUTO INDUSTRIES	AGR	1656.00	2604.10	8.70	3.80
	SERVICE INDUSTRIES	SER	2345.49	2628.00	3.21	7.10
	ATLAS HONDA	ATH	8789.02	947.00	4.63	12.30
	GENERAL TYRE & RUBBER	GTR	1249.82	6342.60	11.96	4.80
	INDUS MOTOR COMPANY	IMO	16115.37	9499.90	7.32	5.90
	PAK SUZUKI MOTOR	PSM	4858.15	10966.70	0.85	23.00

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7 Islamic calendars issued in Pakistan could not be used as these calendars are estimated for the coming years; they are forward looking when issued and may turn out to be incorrect based on the lunar cycle. The actual dates may have been different from these predictions based on actual sightings of the moon.

8 After excluding the non-trading days, the total number of observations was reduced to 4067.

9 The Gregorian-Islamic date convertor used was from the website called Islamic Finder (http://www.islamicfinder.org/dateConversion.php). These results were matched with the results of newspaper archives and any discrepancies investigated until a full Islamic calendar was determined. The two newspapers used were Dawn and the Daily Express (http://www.dawn.com/archive, http://express.com.pk/epaper/).

10 The sample period covers 204 Gregorian calendar months and 210 Islamic calendar months from 1st January 1995 to 31st December 2011.

11 The sample firms are categorised into 7 different sectors (see Table 1).

12 The average market capitalisation of the firms was calculated using the mean of the annual values for the seventeen years from 1995 to 2011. These firms were then categorised into small, medium and large; those with an average market capitalisation of not more than Rs. 500m were classed as small, while firms with an average market capitalisation of between Rs. 500m – Rs. 1500m were categorised as medium, and firms with an average market capitalisation of over Rs. 1500m were deemed as large. This classification is consistent with the groupings used in other studies of Pakistan (Qureshi and Iqbal, 2003).

Table 1: Information about the Sample Companies - continued

2	ASKARI BANK	ACB	7091.39	158595.00	6.71	6.80
	BANK OF PUNJAB	BKP	2860.79	506684.10	0.00	N/A
	HABIB METROPOLITAN BANK	MET	17697.87	20278.40	0.00	5.20
	MCB BANK	MBK	112557.40	260888.10	8.71	6.70
	NIB BANK	NAT	17823.92	460454.20	0.00	5.50
	SAMBA BANK	CCB	2078.54	37897.80	0.00	7.30
	SONERI BANK	SON	3521.38	35754.10	30.90	22.10
	AL-NOOR MODARBA MAN	ALN	88.20	798.60	19.05	8.00
	FIRST TRISTAR MOD	ART	23.28	445.70	0.00	2.90
	PICIC GROWTH FUND	ICP	3532.41	60751.40	30.50	6.40
	MODARBA AL-MAL	MAL	14.37	1397.10	0.00	N/A
	STANDARD CHT.MODARABA	GOP	469.72	2663.90	16.67	5.90
	TRUST MODARABA	TMS	58.11	733.20	12.82	2.50
	UNICAP MODARBA LTD	UMC	4.09	118.50	0.00	N/A
	ENGLISH LEASING	ENL	5.20	158.80	0.00	N/A
	INVEST CAPITAL INV.BANK	ASB	56.97	12796.00	0.00	0.10
	ORIX LEASING PAK.	ORI	521.04	5744.80	15.75	3.60
	SECURITY INVESTMENT BANK	SEC	64.29	1636.30	0.00	6.60
	TRUST INVESTMENT BANK	TRU	40.99	1601.10	0.00	N/A
	ADAMJEE INSURANCE	ADI	5753.50	149533.40	5.38	11.10
	CENTRAL INSURANCE	CEI	1955.03	799.30	3.43	2.80
	EFU GENERAL INSURANCE	ETU	4768.75	9469.90	3.28	N/A
	JUBILLE INSURANCE	JIN	5270.87	725.00	3.00	9.40
3	MURREE BREWERY COMPANY	MRB	1210.19	2467.50	7.16	3.80
	DEWAN SUGAR	DSM	73.02	8401.00	0.00	N/A
	HABIB ADM LIMITED	HAB	547.20	1461.90	14.62	4.70
	HABIB SUGAR	HSM	3286.50	12387.60	11.41	6.10
	MIRPURKHAS SUGAR	MIR	342.64	180.50	2.46	4.10
	NESTLE PAKISTAN	NPK	163127.40	318.60	1.53	39.70
	NOON SUGAR MILLS	NON	220.18	1265.50	0.00	N/A
	SHAKARGANJ MILLS	SHK	335.10	2968.90	20.75	N/A
	UNILEVER PAKISTAN	ULV	73990.94	120.20	4.71	22.60
	PAKISTAN TOBACCO	PTC	14179.90	4945.00	15.77	15.30
	PHILIP MORRIS PAKISTAN	LAK	8559.66	333.90	1.80	14.90
4	AL-ABBAS CEMENT	AAC	914.22	13474.40	0.00	N/A
	CHEARAT CEMENT COMPANY	CTC	689.13	5705.80	0.00	N/A
	DADABHOY CEMENT	DAD	138.51	4978.30	0.00	20.10
	DANDOT CEMENT	DAN	110.01	1029.80	0.00	N/A
	DEWAN CEMENT	PLC	486.39	79764.90	0.00	N/A
	DG KHAN CEMENT COMPANY	DEG	8337.40	826903.20	0.00	35.80
	FECTO CEMENT	FEC	195.62	1400.40	0.00	N/A
	GHARIBWAL CEMENT	GWC	2233.53	3287.10	0.00	N/A
	MAPLE LEAF CMT.FACTORY	MLC	974.42	58326.00	0.00	N/A
	PIONEER CEMENT	PCT	749.59	28659.00	0.00	N/A
	SHABIR TILES	SHA	1161.26	516.40	0.00	N/A
	PACKAGES	PAC	6979.88	16996.90	3.93	N/A
	SIEMENS ENGINEERING	SME	8715.05	222.60	8.52	8.70
	PAK ELEKTRON	PET	425.32	54255.10	0.00	2.90
	AL-GHAZI TRACTORS	AGT	8279.86	1675.50	11.67	4.30
	BOLAN CASTINGS	BOC	297.24	686.20	5.26	3.60
	DEWAN AUTV.ENGR.	ALT	16.05	7632.70	0.00	N/A
	HINOPAK MOTORS	HPM	868.66	152.30	0.00	N/A
	MILLAT TRACTORS	MTT	13368.65	18104.90	13.01	5.90
	PAKISTAN ENGINEERING	PEN	204.79	73.20	13.89	1.70
	CRESCENT STEEL	CSA	1024.75	12020.60	19.28	2.50
	HUFFAZ SEAMLESS PIPE	HUF	448.87	3465.10	18.54	3.50
	INTERNATIONAL INDS.	INI	4557.11	18755.70	13.15	16.20
	PAKISTAN NAT.SHIP.	PNS	1678.53	2765.30	7.87	2.40

Table 1: Information about the Sample Companies - continued

5	HUB POWER COMPANY	HUB	39574.69	407066.00	16.08	7.10
	KARACHI ELECTRIC SUPPLY	KIE	36619.39	247777.80	0.00	N/A
	PAKISTAN CABLES	PNC	910.80	1078.70	6.25	20.00
	PAKISTAN TELECM.	TLM	39211.84	510110.60	16.84	5.70
	SUI NORTHERN GAS	SNG	9057.76	95455.80	6.06	3.50
	SUI SOUTHERN GAS	SUI	16992.87	148805.60	12.34	3.60
	ATTOCK REFINERY	ATR	9181.79	329743.70	1.86	72.60
	NATIONAL REFINERY	NAR	19407.08	41126.70	10.30	5.90
	PAKISTAN OILFIELDS	POF	81951.25	397542.40	10.10	11.00
	PAKISTAN REFINERY	PRE	947.94	16113.50	2.22	N/A
	PAKISTAN STATE OIL	PSO	38970.80	195845.90	4.40	4.30
	SHELL PAKISTAN	PBS	13031.88	8727.50	6.31	8.10
6	SECURITY PAPER	SEP	1456.71	2100.40	14.12	4.60
	CENTURY PAPER	CPB	918.88	22576.30	0.00	21.70
	PAKISTAN INTL.AIRLINES	PAL	5076.18	63468.90	0.00	N/A
	BATA PAKISTAN	BAP	6187.10	368.40	1.47	7.10
	CRESCENT TEXTILE MILLS	CTX	405.00	530.50	0.00	1.20
	FAZAL TEXTILE MILLS	FZM	1525.84	470.00	2.43	4.30
	GADOON TEXTILE	GAT	960.94	2503.70	24.39	1.20
	GULISTAN SPNG.MILLS	GSM	60.03	1446.10	24.39	0.90
	KOHINOOR MILLS	KWG	81.97	457.70	0.00	N/A
	KOHINOOR TEX.MILLS	KNR	829.88	12324.70	0.00	3.00
	NISHAT (CHUNIAN)	NHT	2894.93	499244.70	11.20	3.10
	NISHAT MILLS	NMI	14222.20	751626.60	8.16	4.90
	PAKISTAN SYNTHETICS	PSC	1007.04	17509.40	11.13	19.40
	SAIF TEXTILE MILLS	STM	131.80	3282.50	40.08	1.70
	SAPPHIRE FIBRES	SPP	2008.32	40.70	4.90	2.80
	TAJ TEXTILE MILLS	TAJ	8.36	356.00	0.00	N/A
	TRI-STAR POLYESTER	TRP	32.49	387.10	0.00	N/A
7	LINDE PAKISTAN	LDP	2528.91	1905.90	6.44	10.40
	DAWOOD HRC.CHEMS.CORP	DDH	20401.75	25709.50	1.77	1.60
	DEWAN SALMAN FIBRE	DES	443.25	359031.10	0.00	N/A
	ENGRO	ERO	36457.44	566819.90	6.11	21.80
	FAUJI FERTILIZER	FAU	126833.60	487808.30	11.74	11.50
	GATRON INDUSTRIES	GAI	2650.60	80.10	7.24	6.40
	ICI PAKISTAN	ICI	16693.75	93353.10	12.89	6.90
	SITARA CHEMICAL	SIT	1547.20	1136.50	8.66	3.30
	ABBOTT LABS.(PAK.)	ABB	9769.47	1770.40	4.58	9.00
	GLAXOSMITHKLINE PAK.	GLT	16050.17	6680.50	5.19	13.20
	SANOFI AVENTIS PAKISTAN	HPN	1396.66	313.70	6.91	6.20
	WYETH PAKISTAN	WYP	1165.65	12.80	1.22	44.10
	SEARLE PAKISTAN	SEA	1518.05	11773.30	3.03	4.10

Note: This table provides details about sample companies; in particular, this table shows the Sector (Sec), Code, Market Capitalisation in Rs. Million (Mkt Cap), Volume Traded expressed in Rs. thousands (VO), Dividend Yield (DY) and the Price-Earnings ratio (P/E) for all the 106 sample companies at the end of December 2011. Where the P/E ratio was negative, it was replaced by 'N/A' as negative P/E ratio is not relevant for this study. The data has been extracted from Datastream and cross-checked from the official website of the KSE.

The GLM model was selected for the investigation as the procedure generates data relating to the importance of the main factors in explaining the variance of share returns as well as the importance of interactions between factors. Initially, a full factorial model that contains all the 5 main effects and all factor-by-factor interactions was considered. Due to the sheer volume of data and the computing time as well as the computational power needed, the factors had to be reduced to four when performing such an analysis. Therefore, the final decision to employ four factors was a function of the constraints on the statistical software used and the computational power of the computers available. To determine which factor had the least influence in the returns of the KSE market so that it could be discounted

from the model, an all factorial model was employed that tested only the main factor effects and not the interactions between them. For this purpose, the following model was employed:

$$R_{j(g,i,s,t,y)} = \mu + \alpha_g + \beta_i + \gamma_s + \lambda_t + \delta_y + \varepsilon_{j(g,i,s,t,y)} \quad (3)$$

Where $R_{j(g,i,s,t,y)}$ is the return of company j in Gregorian month g, Islamic month i of size s, and sector t of the year y; μ is the overall mean return of company j for all the companies for the whole time period. α_g is the main effect for Gregorian calendar g, where g = 1, 2...12 for 12 Gregorian months. This term isolates the share returns for Gregorian months. β_i is the main effect for Islamic calendar i, where i varies from 1, 2...12 for 12 Islamic months. γ_s is the main effect for size s, where s varies from 1 to 3. λ_t is the main effect for sector t, where t = 1,2...7; ; while δ_y is the main effect for year y, where y = 1,2...17 for the 17 years studied for this investigation[13].

Table 2 presents the results from estimating equation (3). From the analysis of Table 2, the sector factor was deemed to be insignificant and the least influential in explaining the variation in KSE share returns; hence, the sector factor was discounted from the model given in equation (3). The results of Table 1 are explained in detail in the next section. After eliminating the sector factor from the analysis, the final model took the form:

$$\begin{aligned} R_{j(g,i,s,y)} = {} & \mu + \alpha_g + \beta_i + \gamma_s + \delta_y + (\alpha\beta)_{gi} + (\alpha\gamma)_{gs} + (\alpha\delta)_{gy} + (\beta\gamma)_{is} + (\beta\delta)_{iy} \\ & + (\gamma\delta)_{sy} + (\alpha\beta\gamma)_{gis} + (\alpha\beta\delta)_{giy} + (\alpha\gamma\delta)_{gsy} + (\beta\gamma\delta)_{isy} + (\alpha\beta\gamma\delta)_{gisy} \\ & + \varepsilon_{j(g,i,s,y)} \end{aligned} \quad (4)$$

Where $R_{j(g,i,s,y)}$ is the return of company j in Gregorian month g, Islamic month i of size s, for the year y; $\mu$is the overall mean return of company j for all the companies for the whole time period. α_g is the main effect for Gregorian calendar g, where g = 1, 2...12 for 12 Gregorian months. This term isolates the share returns for Gregorian months. β_i is the main effect for Islamic calendar i, where i varies from 1, 2...12 for 12 Islamic months. γ_s is the main effect for size s, where s varies from 1,2 and 3; while δ_y is the main effect for year y, where y = 1,2...17 for the 17 years studied for this investigation. These two factors indentify the size and year component of the share return variance. $(\alpha\beta)_{gi}$ is the interaction between the Gregorian calendar in month g and the Islamic calendar in month i; $(\alpha\gamma)_{gs}$ denotes the interaction between Gregorian calendar in month g and company size s; $(\alpha\delta)_{gy}$ is the interaction between Gregorian calendar in month g and year y; $(\beta\gamma)_{is}$ is the interaction between Islamic month i and company size s; $(\beta\delta)_{iy}$ is the interaction between Islamic month i and year y; $(\gamma\delta)_{sy}$ is the interaction between company size s and year y. $(\alpha\beta\gamma)_{gis}$ is the interaction effect between Gregorian calendar g, Islamic calendar i and company size s; $(\alpha\beta\delta)_{giy}$ is the interaction effect between Gregorian calendar g, Islamic calendar i and year y; $(\alpha\gamma\delta)_{gsy}$ is the interaction effect between Gregorian calendar g, company size s and year y; $(\beta\gamma\delta)_{isy}$ is the interaction effect between Islamic calendar i, company size s and year y. $(\alpha\beta\gamma\delta)_{gisy}$ is the interaction between Gregorian calendar g, Islamic calendar i, company size s and year y; while $\varepsilon_{j(g,i,s,y)}$ is the random error term for company j which is assumed to be an independent identically distributed random variable for the estimation period. An F-ratio was employed to examine the null hypothesis that returns achieved by sample companies are independent of the level of the particular factors, or combination of factors being investigated. In calculating the F-ratio, the following equation was estimated:

$$F - ratio = \frac{Effect\ Mean\ Square\ Error}{\text{Re}sidual\ Mean\ Square\ Error} \quad (5)$$

The null hypothesis is rejected if the test statistic records values greater than the critical values of the F-distribution with appropriate degrees of freedom.

[13] For equation (3), the null hypothesis was the returns achieved by sample companies are independent of the level of the particular factors being investigated and not the combination of factors since it did not take the interaction between factors into account.

5. Results and Discussion

The purpose of this study is to investigate the impact of two calendars (as well as other factors) on the returns of the Pakistani equities. In particular, this paper examines the role of the Gregorian calendar, the Islamic calendar, size, sector and year (time) effects in driving the returns earned by investors in the KSE. These findings can therefore provide insights into how investors can structure investments to maximise their returns.

Table 2 presents the results from estimating equation (3). The sum of squares and the degrees of freedom are reported for each major factor being investigated. The table also highlights the F-ratio which tests the null hypothesis that the factor effect has the same mean response for each level. A large F-ratio indicates that the null hypothesis should be rejected. According to the F-ratios in Table 3, it is clear which factors are significant. The results of the analysis indicate that SECTOR is insignificant in explaining the variations in returns (F-ratio 1.064, p-value 0.381). Thus, returns do not vary between different SECTOR of the market. Apart from SECTOR, all the other main factors included in the investigation proved to be extremely significant since the F-ratios were large and the p-values were all significantly less than 0.05. Therefore, from the analysis of Table 3, the SECTOR factor was deemed to be insignificant and the least influential in explaining any variation in KSE share returns; hence, the SECTOR factor was excluded from the final model[14] (4).

Table 2: Analysis of the General Linear Model: Factor Effects

Variables	Degree of freedom	Sum of squares	Mean square	F-ratio	Sig of F-ratio
Gregorian calendar	11	0.291	0.026	13.743	0.000
Islamic calendar	11	0.144	0.013	6.828	0.000
Sector	6	0.012	0.002	1.064	0.381
Size	2	0.017	0.009	4.497	0.011
Year	16	1.030	0.064	33.504	0.000
Error	431002	828.435	0.002		
Total	**431049**	**830.020**			
Corrected Total	**431048**	**830.013**			

Notes: The table details the analysis of variance of the daily returns for the sample shares over the 17-year period from 1995 – 2011. Sig of F-ration denotes significance of the F-ratio. Table tests whether any of the factors listed are significant.

Table 3 presents the results from estimating equation (4). Table 3 is organised into different sections showing the results of each major factor and the interaction between factor groups. Specifically, the degrees of freedom, the sum of squares, mean squares, the F-ratios and their level of significance are reported for each factor or interaction between groups of factors being investigated. The F-ratio is used to test the null hypothesis that the factor or interaction effect has the same mean response for each level. A large F-ratio indicates that the null hypothesis should be rejected.

A number of interesting points emerge from an analysis of the table[15]. Firstly, the year factor seems to be the most significant of the main effects; it was closely followed by the Gregorian calendar and the Islamic calendar main effects. These results suggest that share returns of KSE firms vary

[14] To check whether the decision to exclude the sector factor from the final model was correct, a further investigation was conducted. Since the sheer volume of data and computational constraints implied that only four factors could be tested at a time, the sector factor was included in the analysis and the size factor was removed (since Table 2 revealed size was relatively the least influential in explaining the return variation of the KSE market after sector; p-value 0.011 vs. 0.381, respectively). The results from this analysis revealed that sector was insignificant as a factor as well as when interacting with any other factor in the model for all the cases. Thus, the decision to exclude the sector from the final equation was deemed to be correct and its omission should not affect the overall results. The results of this analysis are available upon request.

[15] It is worth mentioning that the R^2 for the model is only 1.40 percent. This suggests that the model fails to explain most of the total variation in the share returns of the KSE market. However, the purpose of this investigation is not to explain the variation in share returns but to figure out which factor, factors or the interaction between groups of factors influences the variation in the KSE share returns.

significantly both from year-to-year and with both the Islamic and Gregorian calendar months. These findings are consistent with the results of Fifield et al. (1999) and Middleton et al. (2007); both studies documented that time was an important factor in explaining variations in emerging stock markets returns. For example, Middleton et al. (2007) documented that "the year factor is the most significant of the main effects ... implying that the share returns of emerging European markets vary significantly from year-to-year", (pp. 89-90). However, the current findings go beyond Fifield et al.'s and Middleton et al.'s results since they suggest that both the Gregorian calendar months and the Islamic calendar months are influential in driving returns. This finding, however, suggests that the Gregorian calendar months was more influential than its Islamic counterparts since the F-ratio for this factor at 9.585 was larger than the F-ratio of the Islamic calendar effect (F-ratio = 6.110) – although both were significant at the 5 percent level. Secondly, size is the least significant of the main factors investigated. Instead, the results indicate that the other factors in the model (year, the Gregorian calendar and the Islamic calendar) are more influential in driving KSE share returns than company size.

Table 3: Analysis of the General Linear Model: Factor and Interaction Effects

Variables	Degree of freedom	Sum of squares	Mean square	F-ratio	Sig of F-ratio
Gregorian	11	0.201	0.018	9.585	0.000
Islamic	11	0.128	0.012	6.110	0.000
Size	2	0.014	0.007	3.638	0.026
Year	16	0.485	0.030	15.925	0.000
Gregorian * Islamic	12	0.111	0.009	4.880	0.000
Gregorian * Size	22	0.067	0.003	1.592	0.039
Gregorian * Year	110	2.077	0.019	9.922	0.000
Islamic * Size	22	0.079	0.004	1.896	0.007
Islamic * Year	110	1.347	0.012	6.433	0.000
Size * Year	32	0.124	0.004	2.032	0.000
Gregorian * Islamic * Size	24	0.103	0.004	2.251	0.000
Gregorian * Islamic * Year	3	0.038	0.013	6.679	0.000
Gregorian * Size * Year	220	0.605	0.003	1.446	0.000
Islamic * Size * Year	220	0.668	0.003	1.597	0.000
Gregorian * Islamic * Size * Year	6	0.017	0.003	1.469	0.184
Error	429873	818.006	0.002		
Total	**431049**	**830.020**			
Corrected Total	**431048**	**830.013**			

Notes: The table details the analysis of variance of the daily returns for the sample shares over the 17-year period from 1995 – 2011. Sig of F-ration denotes significance of the F-ratio. Table tests whether any of the factors and interactions listed above are significant.

Thirdly, all the two-way interactions are significant; the F-ratio varied from a low of 1.592 (Gregorian calendar and Size) to a high of 9.992 (Gregorian calendar and Year). The most significant influences were the interactions between Gregorian calendar months with year and Islamic calendar months with year while the least significant were all the interactions involving size (although, these interactions were significant at 5 percent level). These findings suggest that the returns of the KSE market vary significantly from one month to another within a particular year. However, the most influential was the return variation from one year to the next and on a monthly basis.

Fourthly, all the three-way interactions were significant although the largest F-ratio of 6.679 related to the Gregorian calendar X Islamic calendar X year effect. Table 3 suggests that the returns of the KSE market vary significantly between one calendar month to another on size basis; between one calendar to another on yearly basis; between one size to another on Gregorian calendar basis from one year to the next; and between one size group to another on an Islamic calendar basis from one year to the next. Finally, the four-way interaction of the Gregorian calendar with the Islamic calendar with firm size and year was insignificant. The F-ratio was only 1.469 while the p-value was 0.184.

Interaction plots of the factors being investigated facilitates an easily visualisation of some of the relationships uncovered in this analysis. Figure 1 shows the interaction plot for mean returns across both the years and Gregorian months. From a visual inspection of this figure, the variation between years and Gregorian calendar months becomes apparent. Perhaps unsurprisingly due to the global crisis in 2008, the returns in this year exhibited the most dramatic variation between months. Specifically, between 2008 and 2009 the mean returns for August increased from approximately -0.03 percent to approximately 0.01 percent. Moreover, it is apparent from the graph that for all time periods examined, there were wide variations in the mean returns from month-to-month and year-to-year. Certain months appeared to perform better than others; the month of January recorded positive mean values for a majority of the years while the months of May and August recorded the most negative average returns; this is consistent with the results from previous studies investigating monthly calendar anomalies in the KSE (Rafique and Shah (2012). Interestingly, the best performance was recorded in the month of January 1997, while the worst performance was recorded for the month of December in 2008, possibly due to the global crisis (Mahmud and Mirza, 2011)[16].

Figure 2 shows a graphical representation of the interaction plot for mean returns across years and Islamic months. The graph shows a wide variation in the performances of share returns across different months and across different years. Again, as mentioned earlier, due to the global crisis in 2008, the returns in this year exhibited the most dramatic variation between months. Specifically, for the month of Rajab the mean returns increased from -0.01 percent to 0.01 percent. Moreover, it is apparent from the graph that for all the time periods examined, there were wide variations in the mean returns from month-to-month and year-to-year. Certain months appeared to perform better than others. For example, the month of Ramadan recorded positive average returns for a majority of years; this finding is consistent with the results of studies from other international markets that reported a positive Ramadan effect (Al-Hajieh et al., 2011; Bialkowski et al., 2012). Interestingly, the best performance was recorded in the month of Ramadan in 1997, while the worst performance was recorded for the month of Rajab in 2008.

Figures 3, 4 and 5 presents the interaction plots for mean returns across the Gregorian calendar and size, the Islamic calendar and size, and year and size, respectively. From these three figures, it is apparent that regardless of the size category that the company was in, returns all moved in a fairly similar fashion. It is also clear from Figures 3 and 4 that January was the best performing month for all the three size categories while May was the worst performing month. For the Islamic calendar, similar findings to those of the previous section emerged; Ramadan was the best performing month for all size categories. A graphical analysis of Figure 5 reveals that the best performing years were between 2002 and 2004 for all the size categories while 2008 was the worst performing year for the 17–year period investigated. Thus, it is clear that average company returns tended to move in a synchronized manner from month-to-month for both calendars and from year-to-year regardless of the size category to which a company belonged – with only a few exceptions; for example, a visual inspection of Figure 5 reveals that companies from different size groupings behaved differently between the years 2001 – 2004.

In summary the results from this analysis highlight the importance of year effects in explaining the returns of shares from the KSE market. In addition, the results indicate strong evidence for the importance of the Gregorian and Islamic calendars in explaining the variance of the share returns in the KSE market. The findings of this analysis suggest that Pakistani investors should invest to the "right" months of the calendar rather than investing in any particular sector or size of company[17].

[16] The variation of months might not seem as high as it is in reality by looking at the graph because the scale used in x-axis is higher than other figures used in this section.

[17] Transaction costs have been overlooked in this analysis. Of course, any excess returns earned by investing in certain months as suggested by the GLM might be eliminated by the transaction costs and other trading expenses which would be incurred when attempting to exploit any predictability which the results highlight.

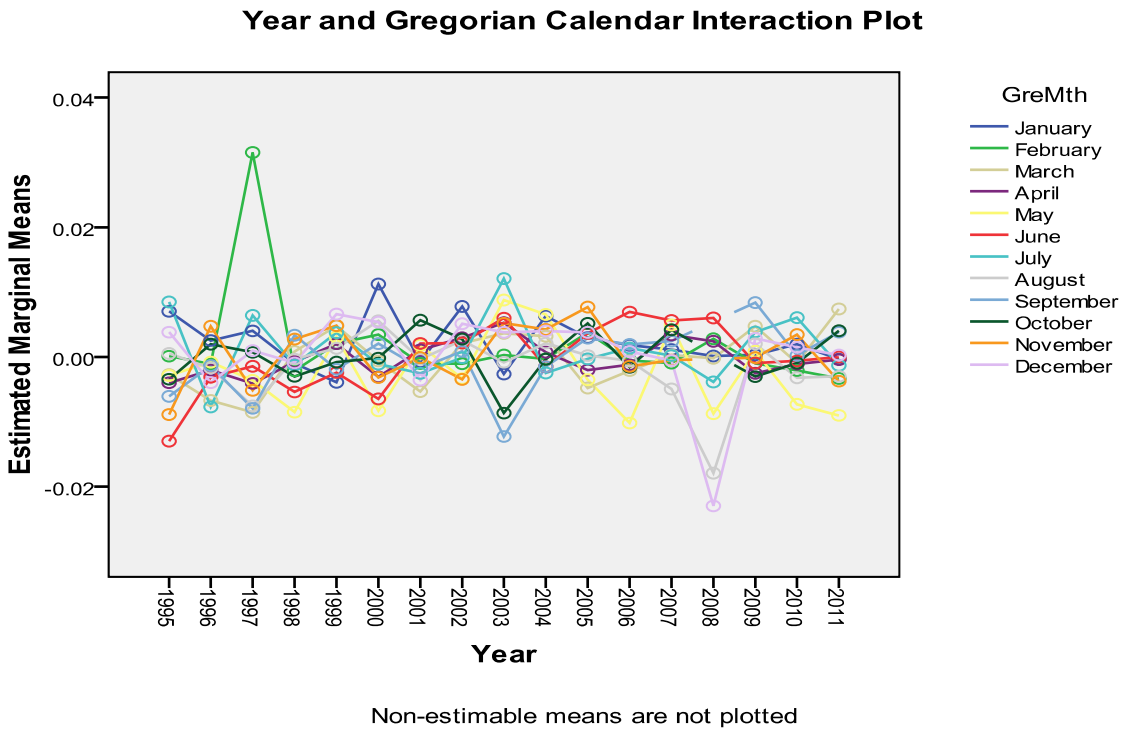
6. Conclusion

To date, no academic study has investigated the nature of influence of the Gregorian and Islamic calendars on the KSE share returns. This study makes an attempt to fill this gap. In particular, this paper investigated different factors which might explain variations in the returns of the KSE market by using a GLM model. Specifically, this study has investigated the sources of variation in the KSE share returns by examining the relative importance of Gregorian calendar, Islamic calendar, company size, sector and the year factors. The study employed daily share returns for 106 companies listed on the KSE over the period 1995 – 2011.

A few important points emerged from this analysis. Firstly, sector was deemed to be not influential in driving share returns and size factor was relatively less significant as compared to Gregorian calendar, Islamic calendar and year (time) factors. This indicates that investing on a sectorial or size basis is less effective than allocating the funds to firms in different months of the calendar. Secondly, the findings suggest that investors may benefit more from aligning their portfolios according to the Gregorian calendar months, and the patterns attached to it rather than the Islamic calendar months since the latter is less influential in explaining the returns of the KSE; although there is strong evidence for the importance of both calendars in explaining the variance of the share returns in the KSE market. Third, the analysis highlighted the significance of a strong year (time) effect, implying that the returns of the KSE market vary significantly from year-to-year; this indicates the volatile situation of the country as highlighted by previous studies investigating the KSE (Kanasro et al., 2009).

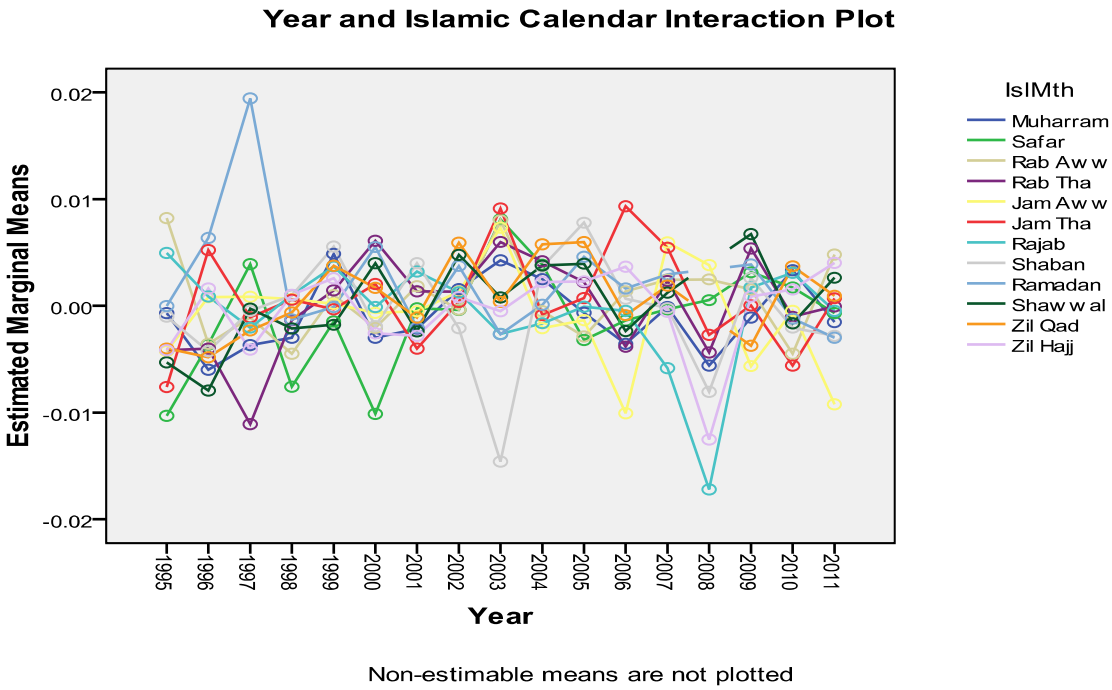
These results offer some insights for investors seeking to invest in the KSE. In particular, the findings suggest that Pakistani investors should invest in the "right" months of the calendar rather than allocating funds in any particular sector or size of company. Moreover, the results suggest that investors should be aware of the likelihood of changes in the pattern of returns over time and the volatility nature of the KSE equities.

Figure 1: Year and Gregorian Calendar Interaction Plot



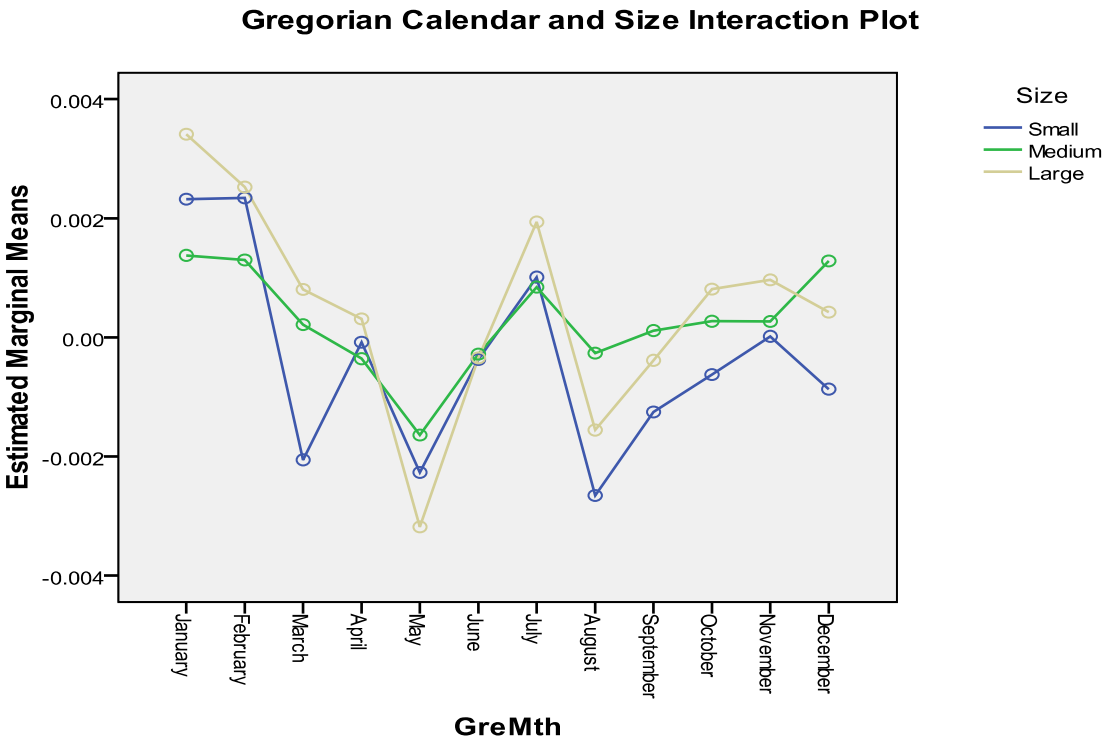
Note: Figure shows the year and Gregorian calendar month interaction for daily returns of the KSE market. The horizontal axis relates to the 17-year period from 1995 – 2011 while the vertical axis relates to the mean returns. GreMth donates to the Gregorian calendar months.

Figure 2: Year and Islamic Calendar Interaction Plot



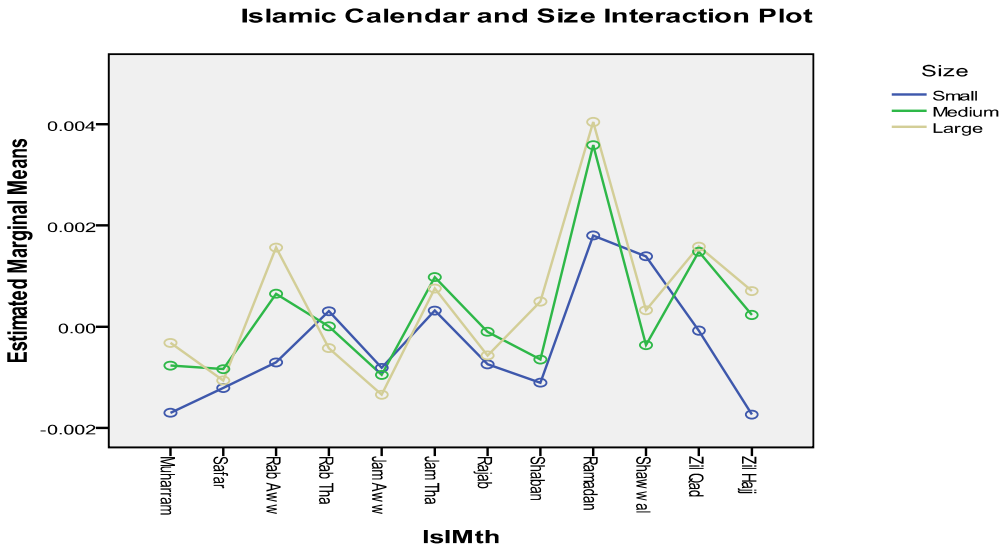
Note: Figure shows the year and Islamic calendar month interaction for daily returns of the KSE market. The horizontal axis relates to the 17-year period from 1995 – 2011 while the vertical axis relates to the mean returns. IslMth donates to the Islamic calendar months.

Figure 3: Gregorian Calendar and Size Interaction Plot



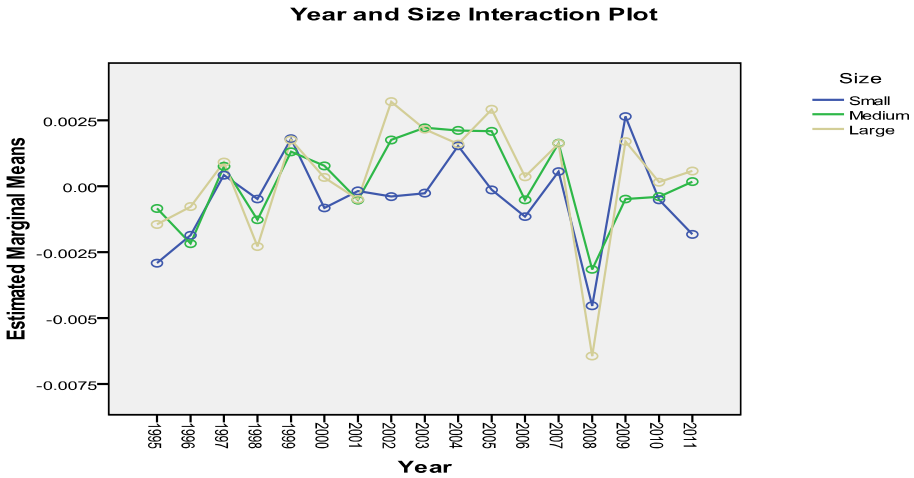
Note: Figure shows the months of the Gregorian calendar and size interaction (small, medium and large) for daily returns of the KSE market from 1995 – 2011. The horizontal axis relates to the Gregorian calendar months while the vertical axis relates to the mean returns.

Figure 4: Islamic Calendar and Size Interaction Plot



Note: Figure shows the months of the Islamic calendar and size interaction (small, medium and large) for daily returns of the KSE market from 1995 – 2011. The horizontal axis relates to the Islamic calendar months while the vertical axis relates to the mean returns.

Figure 5: Year and Size Interaction Plot



Note: Figure shows the year and size interaction (small, medium and large) for daily returns of the KSE market from 1995 – 2011. The horizontal axis relates to the 17-year period while the vertical axis relates to the mean returns.

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