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An analysis of monthly calendar anomalies in the Pakistani stock market
a study of the Gregorian and Islamic calendars

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An Analysis of Monthly Calendar Anomalies in the Pakistani Stock Market: A study of the Gregorian and Islamic calendars

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A THESIS SUBMITTED TO THE UNIVERSITY OF DUNDEE IN FULFILMENT OF THE REQUIREMENTS OF THE DEGREE OF DOCTOR OF PHILOSOPHY.

Dedication

To my Parents (Ghulam Hussain Halari and Farzana Halari)

And

My brothers (Umair, Sumair and Adeel)

And

My fiancée (Rowann Baker)

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Declaration

I hereby declare that I am the author of this thesis; that the work of which this thesis is a record has been done by myself, and that it has not previously been accepted for a higher degree.

Signed... Date...............................

Anwar Halari

Certificate

We certify that Anwar Halari has worked the equivalent of six semesters on this research, and that the conditions of the relevant ordinance and regulations have been fulfilled.

Signed... Date...............................

Professor David M. Power

Signed... Date...............................

Professor Christine Helliar

Signed... Date...............................

Dr Nongnuch Tantisantiwong

Abstract

Most of the prior research in the area of monthly regularities has been based on the Gregorian calendar; by contrast, little attention has been given to other calendars based on different religions or cultures. This thesis examines monthly calendar anomalies in the Pakistani stock market for both the Gregorian calendar and its Islamic counterpart. This is one of the first studies to investigate both calendars for monthly seasonality in one investigation on the same dataset. Empirical studies of the Pakistani stock market that have examined monthly calendar anomalies are relatively sparse when compared with investigations from other emerging markets throughout the world. Even the findings from the small number of Pakistani investigations that have examined for the presence of monthly calendar anomalies have arrived at different conclusions about the predictability of equity returns at different times within a year. Since the conclusions of these findings have been mixed, the current study undertakes further work on this topic to offer some clarity in this area; this thesis arrives at a firm conclusion about the monthly calendar anomaly.

For the purpose of this thesis, both qualitative and quantitative research methods were employed. Firstly, 19 face-to-face interviews were conducted with brokers, regulators and individual investors to ascertain their views about share price regularities with regards to monthly calendar anomalies and to gain some insights about the role of investor sentiment in the Pakistani stock markets. Secondly, share returns for a sample of 106 companies listed on the KSE over the 17 year period from 1995 to 2011 were analysed to determine whether Pakistani stock markets are weak-form efficient or whether security price changes can be predicted from knowledge of the month when

the return is earned; it also investigates whether there is a change in the risk (volatility) of shares in different months which might explain any pattern in returns. To answer these questions various research methods were employed.

The results of the interviews suggest that most respondents believed that share prices exhibit patterns in certain months of the year. The most common pattern highlighted by the interviewees related to the month of January for the Gregorian calendar and Ramadan for the Islamic calendar. Interviewees also argued that volatility declined during the religious month of Ramadan; they attributed these changes to investor sentiment and religious duties. Overall, the results suggested that monthly calendar anomalies may be present in the market and that these are studied by investors in an attempt to earn profit.

The results from the quantitative analyses supported the findings from the interviews. Initial analyses suggested that returns varied significantly during certain months which indicate that the market might not be efficient. Further, investigations for seasonality in both the mean and volatility of returns offered conflicting evidence; very little statistical evidence of monthly seasonal anomalies was identified in average returns. However, monthly patterns were present in the variance of equity price changes in Pakistan. Overall, the results confirm that whatever monthly seasonality may be present in the equity prices of Pakistani companies, it is more pronounced in the volatility data than in the mean return numbers. These findings may have useful implications for trading strategies and investment decisions; investors may look to gain from managing the risk of their portfolios due to time varying volatility documented in the findings of this thesis. Further, the results of this thesis have interesting implications for our understanding of the dynamics of equity volatility in the Pakistani stock market.

Chapter 1

Introduction

1.1 Introduction

The efficient market hypothesis (EMH) is an important concept within the finance literature and the focus of extensive research over the last five decades[1]. While early findings were supportive of the hypothesis more recent evidence has thrown up several irregularities known as market ‘anomalies’ which casts doubt on the EMH (Jensen, 1978). The focus for the current thesis is on monthly calendar regularities – which appear at different times of the year (Gultekin and Gultekin, 1983). The month of the year effect has been shown to be a persistent anomaly in capital markets throughout the world; researchers have documented that the returns in some months (especially January) are consistently higher than in others. Nonetheless, the international evidence in support of the monthly seasonal effect is mixed; different researchers have obtained different results while studying various time periods and using different models of expected returns. The substantive literature relating to calendar anomalies appears to have initially concentrated on the share returns of developed markets such as the UK and the US. However, a relatively small number of investigations have begun to study the existence of monthly calendar anomalies in emerging stock markets such as that in Pakistan (Ali and Akbar, 2009; Zafar et al., 2010; Rafique and Shah, 2012)[2]. Further, most of the prior research has tested for

[1] Although research output grew dramatically after the development of capital asset pricing model by Sharpe (1964), Lintner (1965) and Mossin (1966) as well as the increasing availability of sizeable dataset, studies about the unpredictability of equity prices date back to Bachelier (1900) and Cowles (1933).

[2] One reason for the interest in emerging markets is that data from these markets have become more readily available while restrictions on investing in such countries have been lifted. Further, the number of researchers from developing countries who are investigating their own nations' data is rising (Almujamed, 2011). Furthermore, governments are interested in ascertaining information about the efficiency of their county's stock market in order to promote equity investment. Thus, this study will add to the literature about an emerging stock market, namely Pakistan. The results about the monthly anomalies of the Pakistani market should be of interest to academics, practitioners and governments who want to understand the efficiency of the market. Further, this investigation offers foreign investors

monthly regularities based on the Gregorian calendar; by contrast, little attention has been given to other calendars based on different religions or cultures.

The current study investigates monthly calendar anomalies in an emerging market (namely Pakistan) not only for the Gregorian calendar but also for its Islamic counterpart. This analysis considers data over a 17-year time period from 1995 – 2011. Exploring the presence of monthly calendar anomalies for the Islamic calendar in a country such as Pakistan where Muslims account for over 97 percent of the population may yield interesting insights whilst providing important implications for our understanding of the dynamics of pricing efficiency in an Islamic country. Further, the question of whether investor sentiment has a role to play in explaining any anomalous monthly behaviour in share prices is also explored. For this reason, it is thought that this comprehensive study will make an important contribution to our existing knowledge.

There were a number of specific reasons for selecting the topic of the current research. Firstly, I decided to concentrate on this area because of a desire to find out more about pricing efficiency in the Pakistani market whilst working on my MSc dissertation about the day-of-the-week effect in the KSE. Secondly, a review of the literature revealed that no previous research in this area had sought the views of the stock market participants when investigating the presence of calendar anomalies in the Pakistani equity markets; therefore, discussions with my brother who works as a 'Business Development Executive' for a brokerage firm in the KSE (AKD Commodities ltd) suggested that the insights of market participants about this topic

the opportunity to consider diversification into Pakistan; the findings may help to raise their investment returns and reduce their risk.

should be canvassed; he also helped me to gain access to KSE staff and arrange interviews with people involved in the running of the market. It was also thought that such interviews would provide some insights into the behaviour of Pakistani investors and supply an in-depth understanding of investor perceptions about share price regularities with regards to monthly calendar anomalies. Third, most of the studies in Pakistan about calendar anomalies have focussed on the day-of-the-week effect (Hussain, 2000; Ali and Mustafa, 2001; Nishat and Mustafa, 2002; Kamal and Nasir, 2005; Shaheen, 2006; Ullah et al., 2010; Hussain et al., 2011) while only a handful of studies have looked at a monthly seasonal effect for the KSE (see Chapter 3). Yet, the transaction costs of attempting to exploit the former are very high – especially in a country where the derivatives market is relatively underdeveloped. Furthermore, authors have reached different conclusions about the presence of a monthly seasonal in Pakistani equity returns; since the findings from a small number of investigations are mixed, further work on this topic is needed. Fourth, none of the prior studies in Pakistan investigated a full Islamic calendar; instead, they concentrated on one specific month (e.g. Ramadan) or just considered a small fraction of a year (e.g. Muharram, Shaban, Ramadan, Shawwal, Zil Qa'ad, and Zil Hajj). I believe that an investigation of the complete Islamic calendar might arrive at more comprehensive findings. Fifth, only a limited number of studies have investigated seasonality in the Pakistani market while allowing risk to vary over time (Husain, 1998 and Mustafa, 2008). Husain's relatively old paper examined only a limited time span, while Mustafa focused on index data and only investigated price information for six of the 12 Islamic months of the year. By examining a longer time period and employing a model that takes account of variations in both risk and return I believe that novel findings may emerge about these issues. Finally, most previous studies have focused on the KSE-100 index (Kamal and Nasir, 2005; Mustafa, 2008; Zafar et al., 2012; Ali and Akbar, 2009; Hussain et al., 2011). Thus, investigating individual companies' data rather than details of the KSE index may provide a more realistic view of whether abnormal returns are available for investors by investing in particular months for individual companies since the ability to trade an index is relatively restricted in Pakistan; the futures market has, until recently, been underdeveloped.

Overall, the current research aims to challenge our current knowledge about calendar anomalies in Pakistan and open up the issue to potentially further analysis. To this end, this thesis examines the presence of monthly calendar anomalies for the share prices of firms listed on the KSE. The results of the current work will facilitate a comparison with the findings of prior studies in this area and add to the literature about the efficiency of the Pakistani equity market. The research in this thesis should also contribute to our knowledge of what practitioners in the KSE think about the efficient of the market.

The remainder of this chapter is organised as follows. Section 1.2 outlines the research objectives and summarises the research approaches employed in the thesis. The structure of the thesis is presented in Section 1.3. Finally, Section 1.4 concludes this chapter.

1.2 Objectives of the Study and Research Approach

The current thesis seeks to investigate monthly calendar anomalies in the Pakistani stock market with regards to both the Gregorian and Islamic calendars; this is one of the first studies to investigate both calendars for monthly seasonality in one investigation on the same dataset. In particular, this thesis attempts to answer the following research questions: (i) are Pakistani stock markets weak-form efficient or can security price changes be predicted from the knowledge of monthly occurrences?; (ii) do practitioners believe that investor sentiment plays a role in explaining any anomalous behaviour in market prices in terms of trading behaviour and attitude to risk during certain months of the year?; (iii) do share prices exhibit particular patterns in different months (both Gregorian and Islamic calendars are investigated) – and, if so, can these patterns be exploited to achieve excess returns?; and (iv) is there a change in the risk (volatility) of shares in different months?

To answer the above research questions both qualitative and quantitative research methods are employed. Thus, a mixed method approach (Bryman, 2007) is employed to address the research questions that form the basis of the current thesis. Such an approach was chosen so that the limitations of any one method would be compensated for by the strengths of other methods used. In addition, it was hoped that the mixed method approach might facilitate a more comprehensive evaluation of the research questions being examined. The thesis initially conducted interviews with investors, brokers and regulators who were involved in security trading in order to gain insights from market participant's perceptions about the efficiency of the KSE and monthly calendar anomalies in Pakistan. Thus, the interviewees are drawn from a mix of backgrounds but are familiar with the main stock market of Pakistan. Furthermore, the interviews sought views about the role of investor sentiment in the Pakistani stock markets. After the interviews were completed, quantitative analyses were conducted to identify whether the KSE was efficient with regards to monthly calendar anomalies.

Various quantitative tests were carried out; the initial analysis only focused on the returns data and assumed that volatility was constant. These tests included: (i) Analysis of Varicance (ANOVA); (ii) Kruskal-Wallis; (iii) a two-sample t-test; and (iv) a General Linear Model. The research then modelled time varying volatility by employing an asymmetric Generalised AutoRegressive Conditional Heteroskedasticity (GARCH) model (developed by Glosten et al., 1993), also known as GJR GARCH model, to investigate the nature of any seasonality in the KSE.

1.3 Thesis Structure

The remainder of the thesis is structured as follows. Chapter 2 highlights background information about Pakistan, its political background and its current economic situation in order to inform the reader about the environment in which Pakistani investors operate. Further, the history and a general overview of the historic development of Pakistan's stock markets are discussed since the country's independence in 1947; together with the regulations and laws that govern the behaviour of the stock exchanges in the country. Since the data used in this thesis has been selected from one of Pakistan's stock exchange – the KSE – a detailed discussion of this exchange, its development, trading procedures and settlement periods are provided in Chapter 2. Such background details are needed to help the reader to understand the findings which are arrived in the later chapters.

Chapter 3 of this thesis supplies a comprehensive review of the literature on monthly calendar regularities; both Gregorian and Islamic calendar anomalies are discussed in detail. Further, this chapter reviews the literature about whether the mood of market participants and investor sentiment has any role to play when investing in shares or explaining any anomalous behaviour in market prices; especially for the Islamic calendar. Initially the chapter outlines the theory underpinning the efficiency of the market and reviews the relevant literature on the weak-form of the EMH. The chapter then moves on to discuss those studies which have investigated monthly calendar anomalies for various stock markets around the world. The chapter then focuses on the prior evidence concerning monthly seasonal anomalies in the Pakistani stock market with regards to both the Gregorian and Islamic calendars. Articles about investor sentiment and its impact on share prices is subsequently reviewed. Overall, the literature provides a detailed background to the issues investigated in the current thesis; this information will allow a comparison between the results of the current investigations and the findings of previous studies.

The methodology and methods underpinning the research in this thesis are discussed in Chapter 4. Specifically, the ideological perspective underpinning the research is discussed in detail. The chapter starts by outlining the four paradigms of social science research identified by Burrell and Morgan (1979). Further, the justification for selecting the functionalist research paradigm is provided in the chapter. In addition, the research methods adopted for this study are outlined; both quantitative as well as qualitative methods are used to address the research questions examined in the current thesis and these are discussed in detail at the end of Chapter 4.

Findings from the interview analysis are reported in Chapter 5. This chapter analyses the views of Pakistani participants in the KSE about share price behaviour around different months of the Gregorian and Islamic calendars. In particular, this chapter reports the views of brokers, regulators and individual investors who are involved in share trading on a daily basis. In addition, the chapter attempts to investigate whether investor sentiment among market participants has a role to play in explaining any anomalous behaviour in market prices with regards to Islamic calendar months. The findings from these interviews should complement the statistical analyses presented in later chapters which study the share price data. Thus, findings from this chapter will be combined with quantitative investigations employed in later chapters to reach an overall conclusion about the research questions being studied.

Chapter 6 presents the first quantitative analysis of the study; it examines whether monthly calendar anomalies are present in the KSE return data. Specifically, the chapter employs daily return data for 106 companies listed on the KSE over the 17-year time period from 1995 to 2011 when investigating whether monthly calendar anomalies are present in the Pakistani stock market. First, the descriptive statistics of the sample are analysed before the results of a number of statistical tests are reported; specifically, ANOVA, Kruskal-Wallis and a two-sample t-test are initially employed. Subsequently, a GLM model is fitted to the data to test for the sources of variation in the returns of KSE equities by examining the importance of the Gregorian calendar, the Islamic calendar, company size, sector and year factors. Specifically, the chapter explores whether the returns of individual KSE equities vary according to: (i) Gregorian months; (ii) Islamic months; (iii) the size of the firm; (iv) the sector; and (v) the year of the sample period. According to the analysis, monthly calendar anomalies are found to be present in the data for both the Gregorian calendar and its Islamic counterpart.

Following the investigation in Chapter 6, which is based on average returns and does not take into account any time-varying volatility, Chapter 7 presents the findings from an analysis of both mean price changes and return volatility for the KSE market. Specifically, a GJR GARCH (1, 1) model is employed to investigate whether monthly seasonality is present when variations in both risk and return are incorporated into the analysis; the same data set was employed in this chapter as that which was used in Chapter 6. The chapter conducts a pilot study on 30 sample firms when selecting an appropriate GARCH model. After indentifying the best GARCH model for the data, the results are examined. These empirical findings about monthly patterns in mean returns and the volatility of returns are then compared with the results of Chapter 6.

Finally, Chapter 8 concludes the thesis. In particular, this chapter summarises the main findings that have emerged from the empirical analysis of the current research and discusses the contributions of the current study. Further, it outlines the limitations of the current study and provides a justification for why these limitations were not addressed in the current thesis. The chapter also offers some signposts for future research into the stock markets of Pakistan.

1.4 Conclusion

The aim of this chapter was to introduce the topic of the research to the reader. It aimed to shed light on the focus of the research; therefore, the research questions and the motivations for undertaking the research were discussed. In addition, the chapter has outlined the structure of the thesis and highlighted the material contained in subsequent chapters.

Chapter 2:

An Overview of Pakistani Equity Markets

2.1 Introduction

This chapter introduces readers to background information about the history and development of Pakistan. It also supplies details about the evolution of Pakistan's equity markets. In particular, it describes how the stock markets in the country emerged since Pakistan's independence in 1947. Such information should provide the reader with the necessary information to understand the discussions in the remainder of the thesis. The content of this chapter should also supply institutional and other insights which may help in understanding the findings which are arrived at in the later chapters.

The remainder of this chapter is organised as follows. Section 2.2 contains a brief introduction to the development of Pakistan; the economic, political and legal changes within the country since its establishment. Section 2.3 provides a general overview of the Pakistani stock markets and discusses the regulations and laws that govern the behaviour of the stock exchanges in the country; specifically, it outlines how these laws and regulations protect the rights of shareholders and encourage share trading in Pakistan. Furthermore, Section 2.3 describes the evolution of the different stock markets in Pakistan and explains the reasons behind their introduction. Since the data used in this research has been selected from the KSE, a detailed discussion of this exchange is also present in Section 2.3. The characteristics and the development of the KSE are discussed in Section 2.4. Section 2.5 highlights the trading procedures and the settlement periods as well as the technological changes which have taken place at the KSE; it also outlines the different computerised systems that have been put in place in order to improve the efficiency and transparency of the markets. Finally, Section 2.6 concludes.

Section 2.2 Background Information about Pakistan

Pakistan came into being as a separate country on 14th August 1947, when it gained independence from British colonial rule of the Indian subcontinent (Gilmartin, 1998). Following a population increase from 34 million in 1951 to over 170 million people in 2011, it is now the sixth most populous country in the world and has the second largest Muslim population after Indonesia[3]. Geographically, it consisted of two parts in 1947; these were separated by Indian territory. They were known as East Pakistan and West Pakistan. The Eastern part of the country later gained independence to form a new country known as Bangladesh after a round of Indo-Pakistani hostilities in 1971 (Sisson and Rose, 1990). Pakistan was carved out of the Indian Subcontinent as a homeland for Muslims. This religious underpinning of the country has remained strong throughout its subsequent existence; the urge to shape Pakistani society in accordance with Shariah laws and rules has persisted since independence[4] (Mahmood, 2003). All successive governments of Pakistan have proclaimed their commitment to enabling the people to live their lives in accordance with the injunctions of the Holy Quran and the Sunna (Akhtar, 1989)[5]. Indeed, the first Prime Minster of the country, Liaqat Ali Khan justified the establishment of Pakistan as follows:

[3] According to the Federal Bureau of Statistics (FBS) of Pakistan at the end of 2011.
[4] Shariah is the sacred law of Islam; the divine revelations of the Quran and the teachings of Prophet Muhammad.
[5] The term sunna refers to the sayings and living habits of Muhammad, the last prophet of Islam.

> "Pakistan was founded because the Muslims of this subcontinent wanted to build up their lives in accordance with the teaching and traditions of Islam, because they wanted to demonstrate to the world that Islam provides a panacea to the many diseases which have crept into the life of humanity today". (Assembly of Pakistan, Debates, 1947, p.3)

The first Constituent Assembly in Pakistan was set up under the Indian Independence Act of 1947 and was charged with the task of framing a constitution and acting as the central legislature of the country during the interim period (Choudhury, 1955). Until the framing of the constitution, Pakistan was to be governed in accordance with the Government of India Act 1935, suitably amended to take account of the withdrawal of British colonial power. One of the difficult tasks faced by the framers of the constitution was to identify the role of Islam in the newly developed State. It was not easy to reach a consensus as to how the new constitution would incorporate Islam within the structure of the State. During the first seven years of Pakistan's existence (1947-1954), political ideology was undergoing a transition. Since Pakistan had no history as a political entity prior to 1947, the country's institutional structures were largely adapted from the British colonial period. Soon after independence, calls for the wholesale replacement of the inherited colonial system were made, though its proponents never managed to gather enough support to carry out this plan[6] (Mahmood, 2003). It took about nine years to frame the first constitution of Pakistan (Mahmood, 2003); the first constitution of Pakistan was adopted in 1956. However, this constitution would remain in force for a period of just over 2 years, as it was abolished in 1958. The second constitution was adopted in 1962, but was abolished in 1969. The third constitution, the present one, was enacted in 1973. In the "preamble"

[6] Also see 'Islamisation of Laws in Pakistan', Lahore 1986, 1989 and 'Islamisation of Laws in Pakistan', Karachi 1986.

to the 1973 constitution, it formally stated that Pakistan was a Muslim country which would operate according to Islamic principles:

> "Wherein the Muslims shall be enabled to order their lives in the individual and collective spheres in accordance with the teachings and requirements of Islam as set out in the Holy Quran and Sunnah [sayings of Prophet Muhammad]" (The Constitution of Pakistan, 1973)

An almost identical commitment to the enforcement of Shariah was written into all of the three Constitutions of Pakistan (1956, 1962 and 1973). However, according to Mehmood (2002), a legal analysis of the relevant provisions of the third constitution shows that there remained some "gap" which needed to be addressed for the proper enforcement of the Islamic provisions. For instance, the provision regarding the elimination of interest (riba) was made part of the Constitution's "Principles of Policy" although it was known that no action or law could be called into question merely on the grounds that it was not in accordance with the Principles of Policy; indeed, no action could be initiated against the State, any organ or authority of the State or any person on that ground. However, the Islamic provisions in the constitution facilitated a process of Islamisation, which altered the political and legal institutions which had been inherited from British Colonial rule[7] (Anderson, 1996).

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, 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

[7] This term Islamisation has traditionally been used to describe the process of a society's conversion to the religion of Islam.

days based on the Islamic calendar. For example, the KSE is closed 9 days (on average) every year to celebrate Islamic holidays and festivals (the KSE official website). Section 2.2.1 explains the Islamic calendar in more detail

Section 2.2.1 Islamic Calendar

The Islamic calendar, unlike its Gregorian counterpart, is based on lunar months[8]. The Islamic calendar year is therefore about 11 days shorter than the Gregorian year[9]. This means that while Muslim holy days fall on the same date in the Islamic calendar, they actually vary by between a few days to a few months each year on the Gregorian calendar. Thus, the Islamic months fall in different seasons over time[10]. Similar to its Gregorian counterpart, the Islamic calendar has 12 months but only a total of either 354 or 355 days in a year[11]. 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.

An Islamic calendar month consists of either 29 or 30 days unlike some of the Gregorian calendar months that go up to 31 days. The beginnings and endings of these months are determined by the sighting of the crescent moon, also known as 'Hilal'[12] in Arabic. After the 29th sunset of the current month, the crescent of the next month is

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[8] Lunar calendars aim to ensure that conjunction, crescent visibility, or full moon determines the start of the month. The Islamic calendar is the only lunar calendar used today (Xin, 2001).

[9] As mention in the Quran "They ask you, (O Muhammad), of new moons. Say: They are fixed seasons for mankind and for the pilgrimage" (2:189).

[10] Muslims consider it a blessing that the Islamic months fall in various seasons of the year. The fasting month of Ramadan, therefore, sometimes falls during long summer days and sometimes during shorter winter days. Since Muslims are located in both the Northern and Southern hemispheres, this ensures that everyone participates evenly in the fast periods throughout their lifetimes.

[11] Allah says in the Quran: "The number of months in the sight of Allah is twelve (in a year) - so ordained by Him the day He created the heavens and the earth...." (9:36).

[12] The word means crescent-moon in Arabic. Muslims look for the 'hilal' when determining the beginning and end of Islamic months.

observed. Since this new moon (crescent) sets a while after the sunset, it requires careful observation. If the sky is somehow blocked by dust, smog or cloud, observation may be hard or even impossible. If the crescent cannot be observed, the current month is counted as 30 days (Bukhari, Sawm, 810-870[13]). In such a situation, there is no need to observe the crescent the next day. The second month would be due that day by sunset since no lunar month lasts longer than 30 days[14]. As stated by Prophet Muhammad:

> "When you see the crescent of the month of Ramadan, start fasting, and when you see the crescent of the month of Shawwal, stop fasting; and if the sky is overcast and you can't see the crescent, then regard the month of Ramadan as of 30 days." (Bukhari, Sawm, 810-870)

For the Islamic calendar, there are 7 days in a week, with each day beginning at sunset. For example, day 1 begins at sunset on Saturday and ends at sunset on Sunday. Determining the first day of every Islamic month is very crucial as it determines when the Muslim festivities will fall on. For instance, Muslims need to know the first day for fasting in the month of Ramadan and when fasting ends in order to determine when the feast day of Eid must be celebrated. Most Muslim countries follow different methods for determining the start of Islamic months. Countries ascertain the beginning of lunar months using a variety of methods that range from eyewitness observations of the new crescent moon to advanced astronomical calculations. Thus,

[13]Sahih Bukari is a book compiled by Imam Bukhari, (196-256AH / 810-870AD). The book provides guidance of Islam such as the method of performing prayers and other actions of worship directly from prophet Muhammad (Ahmed et al, 2005).

[14] Astronomical calculations can help predict when the moon should be visible, but Muslims still tend to follow the traditional method of looking at the sky themselves and physically "sighting" the moon, especially for the month of Ramadan. The exact day of the beginning of Ramadan is not generally known until the night before the fast begins, when the moon is actually sighted and confirmed.

Islamic holy days fall on different days within the same Hijri year across Muslim countries (Al-Ississ, 2010). Pakistan along with Bangladesh, Oman, India and Morocco employ a review panel to sight the new moon. By contrast, Muslims in US and Canada use astronomical calculations. Other countries like Qatar, Kuwait, UAE, Bahrain, Yemen and Turkey follow the decisions taken by Saudi Arabia[15].

Different holy days in different Islamic months vary from each other in terms of the emotions that they evoke in individual religious observers as well as in the Muslim community of the country as a whole. Major historical Islamic events that took place during specific months can explain the emotions of Muslims at various times of the year. For example, the 9th month of the Islamic calendar, the month of Ramadan, is dominated by positive emotions and a joyous mood as Muslims exercise their faith in anticipation of reaping the blessings of the month and the forgiveness of their past sins (Al-Ississ, 2010). This is the month during which the Quran was revealed to the Prophet Muhammad. As the Quran mentions:

> "The month of Ramadan is that in which the Quran was revealed, a guidance to men and clear proofs of the guidance and the distinction; therefore whoever of you is present in the month, he shall fast therein..." The Quran (2:185[16])

It is associated with increased consumer spending, similar to the shopping period during the run-up to Christmas in Western countries. During the entire month of Ramadan, adults fast from dawn to dusk. At the end of the day, a sizeable meal breaks the fast, including special expensive dishes that are not consumed on a daily basis in other months of the year (Abadir and Spierdijk, 2005). Al-Ississ (2010) explores the

[15] http://www.bt.com.bn/art-culture/2010/08/09/sighting-new-ramadhan-moon-brunei

[16] Muslims believe the Quran to be verbally revealed from God to Prophet Muhammad over a period of last 23 years of Prophet Muhammad's life (Al-Laithy, 2002).

effect of Ramadan on the financial markets of 17 Muslim countries, including Pakistan, and finds that religious experience during the month of Ramadan has a statistically significant positive effect on the returns of Muslim financial markets. Furthermore, the author observes that this religious experience also affects the trading volume in the market which drops during the holy days of Ramadan.

During the month of Ramadan the financial markets around the country experience noticeable changes in their trading activities (with reduced working hours). For example, the KSE reduces its working hours by more than an hour during this Islamic month; opening hours of the KSE during Ramadan for the year 2012 were from 9:15am to 2:00pm from Monday to Thursday with a pre-open session from 9:00am. On Friday, the market opened at 09:15am and closed at 12:30pm (KSE website, 2012).

Section 2.2.2 Political and Economic Background

Since gaining independence, Pakistan's political history has been characterised by periods of military rule, political instability and conflicts with neighbouring India[17]. Weak political leadership within the country meant that government became a pawn in the hands of the military (Akhtar, 1989). According to Chandio (2006), since Pakistan’s inception, the country had more periods of martial law than democratically-elected governments. The key feature of these non-elected military governments is the inability of citizens to hold those in charge accountable. This form of government in Pakistan pursued policies that were in the interest of the military as

[17] Warfare between India and Pakistan occurred in 1947, 1965, and 1971; the last conflict led to the independence of Bangladesh (formerly East Pakistan).

resources were allocated more towards defence rather than development. Table 2.1 shows the years of martial law and democratic government in Pakistan. According to this table, Pakistan was under martial law for over 33 years against a short period of 22 years when democratic governments ran the country. Therefore, elected representatives were not involved in the decision-making process for over 33 years. Even when elected representatives were in power, their administrations tended to be short-lived with democratic governments typically lasting an average of only 3.14 years. Despite the changing regimes within the country, commitment to the enforcement of Shariah has always been one of the key objectives of the various leaders. Akbar (1989) has shown that all the major political parties, along with religiously-oriented organisations, have expressed their belief in the importance of Islam within Pakistan.

Table 2.1 Chronology of Various Governments of Pakistan

No.	Government	Forms of Government	Years in Power
1	General Iskander Mirza	Democratic	1956 - 1958
2	General Ayub Khan	Martial Law	1958 - 1969
3	General Yahya Khan	Martial Law	1969 - 1971
4	Zulfikar Ali Bhutto	Democratic	1971 - 1973
5	Fazal Ilahi Chaudhry	Democratic	1973 - 1977
6	General Zia-ul-Haq	Martial Law	1977 - 1988
7	Benazir Bhutto	Democratic	1988 - 1990
8	Nawaz Sharif	Democratic	1991 - 1993
9	Benazir Bhutto	Democratic	1993 - 1996
10	Nawaz Sharif	Democratic	1997 - 1999
11	General Pervez Musharraf	Martial Law	1999 - 2008
12	Asif Ali Zardari	Democratic	2008 - to date

The country’s Islamisation phase gathered pace when General Zia-ul-Haq, the sixth President of Pakistan, came into power. The government began a programme of public commitment to enforce an Islamic legal system (Nizam-e-Mustafa); this was a significant departure from the predominantly Anglo-Saxon law that Pakistan had inherited from the British. One of the first measures adopted by General Zia-ul-Haq was the reconstitution of the Council of Islamic Ideology soon after his seizure of power (Mehmood, 2002). In his very first address on 29 September 1977 at the inaugural meeting of the newly constituted Council, he directed the Council to prepare a report suggesting measures to eliminate interest (riba) from the economy (Mehmood, 2002)[18]. He specially asked the Council to prepare a blueprint for an interest-free economic system; later, on 10 February (12 Rabiul-Awwal) in 1979 he set a time limit of three years for the elimination of interest from the economy[19]. With this change, Pakistan became one of the first countries to embark on a process of fully Islamising its economy (Mehmood, 2002).

The Zia-ul-Haq regime took many executive measures to Islamise the economy. These executive measures were legitimised with reference to the constitutional claim that Pakistan was an Islamic country. Examples of these executive measures included: a report on the elimination of interest from the economy (1980); the introduction of interest-free counters in banks alongside the existing normal interest-bearing counters; the Hudood Ordinance (1979)[20]; the adultery Ordinance (1980); the prohibition Order (1980)[21]. For example, in 1980, a Federal Shariah Court was established by Presidential Order. This Court has the power to examine if any law is repugnant to the

[18] Riba is an Arabic term meaning Interest, which is forbidden in Islam.
[19] Report of the Council of Islamic Ideology on "Elimination of Riba from the Economy and Islamic Modes of Financing", (1991).
[20] The Hudood Law was intended to implement Islamic Shariah law, by enforcing punishments mentioned in the Holy Quran and sayings of Prophet Mohammad for adultery, theft, drinking of alcohol and false accusation of adultery. This law was replaced in 2006 by the Women's Protection Bill.
[21] These laws proved to be controversial both internationally and domestically. They have been questioned by liberals and moderates in Pakistan.

"injunctions of Islam, as laid down in the Holy Quran and the sayings of Prophet Mohammad" (Federal Sharia Court, 2012). If a law is found to be repugnant, the Court must notify the level of government concerned specifying the reasons for its decision. The Court also has jurisdiction to examine the decisions of any criminal court relating to the application of hudood penalties[22]. The Supreme Court also has a Shariah Appellate Bench empowered to review the decisions of the Federal Shariah Court[23].

In what was called the final phase of the Islamisation of the economy by the government of Pakistan, under Zia-ul-Haq's authority, the Finance Minister in his budget speech on 14 June 1984 announced that interest would be completely eliminated from domestic banking operations in the country effective on 1 July 1985 (Iqbal, 1986). However, despite these numerous announcements in public, the government could not bring about any substantial change in actual practice (Mehmood, 2002). It is believed that the authorities took steps to ensure that the new modes of financing did not upset the basic functioning and structure of the banking system. As a result, the exceptions proved more important than the rules themselves and the government was thus caught between two sets of conflicting forces. Since the death of General Zia-ul-Haq in 1988, inconsistency and instability has prevailed in Pakistani laws.

It could therefore be said that Pakistan has made some progress towards the goal of Islamisation. However, there is currently no deadline for the transformation of the existing banking and the financial system into one conforming fully to Shariah

[22] Part of the Hudood Ordinance
[23] Afzal Iqbal,Islamisation of Pakistan, 1981.

principles (Mehmood, 2002). Nonetheless, Islamic events and religious dates always have a significant impact on Pakistan's society, both economically and financially. There is no doubt that Islam has always been an important factor in political decision-making as well as financial activities within Pakistan.

Despite problems of political instability, a rudimentary infrastructure, an almost nonexistent industrial base, and a small entrepreneurial class, Pakistan's economy made steady progress soon after independence largely due to a healthy mix of private and government support (Hussain and Qasim, 1997). Rapid industrialisation was viewed as a basic necessity and as a vehicle for economic growth. For more than two decades, economic expansion was substantial and growth of industrial output striking; indeed, in the first 20 years after independence, Pakistan had the highest growth rate in South Asia (Husain, 2010). With the passage of time, therefore, the structure of the Pakistani economy changed from a mainly agricultural base to a strong service sector focus. Agriculture now only accounts for roughly 20 percent of GDP, while the service sector accounts for 53 percent of national output[24].

In the 1960s, the country was considered a model for other developing countries. In the first half of the decade, the economy underwent remarkable growth, however, a war with India in 1965 and socio-political unrest in the late 1960s affected the economy adversely. The performance of the economy during the 1970s remained dismal for the country due to adverse economic and political conditions. A separatist movement in the Eastern province of Pakistan caused another war with India in 1971 that resulted in the separation of the East of Pakistan to form a new country, namely,

[24] Federal Bureau of Statistics of Pakistan, 2010.

Bangladesh. Subsequently, Zulfiqar Ali Bhutto's government came into power with a socialist manifesto and started nationalising large segments of industry, insurance companies and banks[25]. This nationalisation policy discouraged private business activities and with it economic investment. The imposition of Martial Law in the late 1970s proved disastrous for the economy and paralysed the investment atmosphere in the country (Hussain and Qasim, 1997). During the 1980s, under the reign of Zia-ul-Haq, a policy of greater reliance on private enterprises began. Many of the state-owned industries were privatised; as a result, private sector investment increased from 51 percent in 1983 to 83 percent in 1988 (Rasheed, 2008). These measures improved the investment climate, increased business confidence and had a favourable impact on the economy as well as the stock market[26]. Pakistan was one of the few developing countries that achieved an average growth rate of over 5 percent over a four decade period ending in 1990 (Husain, 2005).

The 1990s started with another privatisation process to liberalise the economy (Hussain and Qasim, 1997). In the beginning of 1991, significant measures were taken such as: the opening of the stock market to international investors; privatisation of public sector industries; deregulation of the economy; and allowing privately owned commercial banks. However, the country did not reap the positive results of this liberalisation process in the years immediately following its introduction. Bekaert and Harvey (2003) documented that in the case of Pakistan, real GDP growth declined and real investment growth became negative after liberalization. Further, in Bekaert and Harvey's (1997) study, Pakistan was the only emerging market for which volatility

[25] By 1974, it was estimated that almost 70 percent of the country's economy was under state control, while the 30 percent private sector was dominated by fully nationalised financial sector (Hussain and Qasim, 1997)

[26] As a result, by 1990, listing at the KSE rose to 487 compared to 314 in 1980s. The annual turnover also rose nearly ten times to 252.9 million shares (Hussain and Qasim, 1997).

after liberalization greatly increased. A similar impact was also reported by Kim and Singal (2000). Thus the impact of liberalization on Pakistan's economy and the market did not appear to be positive at least in the years immediately following the opening up of the economy from State control. According to Iqbal (2012), one interpretation of this outcome is that although the market was liberalized it was not integrated. Another reason for the poor economic performance which they highlighted was that other factors negated the impact of liberalization; for instance, the post liberalization period was characterised by political instability with frequent government changes over short periods of time. Also, this period was characterized by large budget and current account deficits and small foreign exchange reserves. A sequence of currency devaluations between 1995 to 1997 and the negative impact of sanctions on Pakistan's economy after its nuclear tests in 1998 may also have out weighted any positive impacts from liberalization[27]. However, in the late 1990s, the positive results of liberalisation started to arrive as listings at the KSE rose to 781, an increase of more than 60 percent compared to 1990. Furthermore, the market capitalisation of the KSE increased by more than eight times to Rs 465 billion.

The year 2000 started with some evidence of Pakistan's economic recovery. The recovery was the fastest paced in the country over the last two decades. GDP growth started to gather momentum for the country. For example, GDP growth was 3.6 percent (in 2000-2001) and increased to a rate of 5.1 percent in 2002-2003; it rose to 6.4 percent in 2003-2004, and reached a peak of 8.4 percent in 2004-2005. The recovery of the economy was mainly due to an improvement in performance for the manufacturing, agriculture, and the services sector (Chandio, 2006). This recovery

[27] The KSE-100 index and market capitalization in 1998 dropped as a result of sanctions on Pakistan over the issue of nuclear tests. These nuclear tests were conducted on May 1998 in response to similar tests conducted by India (Iqbal, 2012).

was also associated with a large inflow of funds from the US (to help in 'war-on-terror') to the frontline States particularly Pakistan, immediately after the terrorist attacks of 9/11 on the World Trade Centre in the US. For example, Suleman (2012) argued that Pakistan recieved 11,998 million dollars from the US under the Coalition Support Fund during the war-on-terror period. About a quarter of this fund (3,129 million) was for economic development and the rest was for security and defence purposes. Similarly, Ahmed and Farooq (2008) argued that the terrorist attacks of 9/11 resulted in some unexpected benefits for Pakistan (e.g. a surge in remittances, an increase in export quotas for textiles to the EU and the US as well as debt rescheduling). The authors argued that this may have improved firm performances and increased the liquidity of the stock exchange.

GDP, however, declined to 1.6 percent in 2007-2008 due to political and economic instability; the assassination of the ex-Prime Minister Benazir Bhutto in December 2007 and the ongoing military operations in the North-West region of Pakistan against Taliban rebels[28] had a detrimental impact on the GDP growth for this period. A recovery phase started in 2008 when GDP grew to 3.6 in percent 2008-2009 before rising to 4.3 percent in 2009-2010 (Pakistan Economic Survey, 2009). The GDP then declined to 2.4 for the period 2010-2011. In conclusion, it can be noted that Pakistan's economic situation has varied significantly since its inception in 1947.

[28] Taliban is an Islamic fundamentalist militant group that is criticised of its strict interpretation of Sharia law.

2.3 An Overview of Pakistan's Stock Markets

Pakistan's equity markets have had an interesting history. After independence in 1947, Karachi the largest city and chief port of the country attracted immigrants from all over the subcontinent and became the business hub of the nation. With no access to the Bombay Stock Exchange after independence (Mirza 1993), a group of entrepreneurs got together and started trading shares and securities in downtown Karachi. This informal gathering lead to the establishment of the Karach Stock Exchange (KSE) on September 18, 1947. After its foundation, the KSE was converted into a Company Limited by Guarantee on March 10, 1949 (Security and Exchange Commission of Pakistan, 2009). At that time the KSE only had around 90 members and less than 10 of these were active brokers. Also, there were only 13 companies listed with a paid-up capital of US $33.6 million. Today, the KSE is the main stock exchange of Pakistan; it is the largest and oldest stock exchange in the country with over 650 Pakistani as well as overseas listed companies, amounting to 25 percent of the GDP in Pakistan with a market capitalization of US $ 26.48 billion[29]. Therefore, the KSE was chosen as the primary source of data collection for the current research to test for monthly calendar anomalies as this is the most active exchange in Pakistan with over 92 percent of the country's market capitalisation belonging to firms listed in the KSE[30]; therefore, the data for this research was selected from this market. The institutional structure of the KSE currently remains weak (lack of liquidity, small float and considerable price volatility) and future prospects are, to some extent,

[29] This indicates that it is a small market with high turnover which is a common feature in emerging stock markets around the world. The reasons for the shallowness of the market and high levels of turnover in emerging markets are poor information, insider trading, liquidity, and market manipulation. In developed markets, the market capitalization ratio to GDP is large and turnover is small. The Pakistan stock market stands in contrast to developed markets like the US, where the market capitalization to GDP ratio is 92 percent and turnover is 65 percent (Mustafa and Nishat, 2007)

[30] Pakistan Economic Survey, 2011-2012.

overshadowed by the deteriorating law and order situation, rising inflation, an unstable political environment and regulation (Ali and Mustafa, 2001)[31].

The KSE began with a 50 shares index. As the market grew, a more representative index was needed. On November 1, 1991 the KSE-100 was introduced and remains to this date the most widely used measure of the Exchange's activity[32]. The KSE-100 is a diversified index of the 100 largest companies' shares by market capitalisation from all sectors of Pakistan's economy. It includes the largest companies on the basis of their market capitalization and represents over 92 percent of the market capitalization of the exchange. The quarterly performance of the KSE-100 index over an 18 year period from 1st October 1994 to 31st September 2012 is presented in Figure 2.1. A close inspection of this figure reveals that the index started to move upwards from the beginning of 2002, reaching a level 15268.22 points in the first quarter of 2008; this phenomenal growth also attracted foreign investors and portfolio investment increased four-fold (Hasan and Javed, 2009). There was an increase of 7.4 percent in the index during the start of 2008, making KSE-100 the best performing index among major emerging markets indexes (Gulf News, 2008). Different reasons have been put forward to explain this increase, such as acceleration of inflows of foreign assistance to Pakistan that led to the higher growth (Husain, 2009 and 2010). However, soon after reaching its record high, the KSE-100 index witnessed a sharp fall, dropping to only 6037.38 at the the end of 2008. This was due to the military operations against

[31] The unstable political environment and regulation in Pakistan make the country a particularly pertinent research environment for investigating efficiency of the market. The KSE has also been influenced by events such as sanctions on the Pakistani economy after the nuclear tests in May 1998 and 9/11, leading to a change in the price process of the stock market (Mustafa and Nishat, 2007). The results of this study might facilitate the existence of a substantial regulatory framework to protect investors and ensure fair play in the market.

[32] The KSE and the State Bank of Pakistan calculate and publish indices to measure the stock market performance in Pakistan. The KSE-100 is one of these.

the Taliban and the global financial crisis of 2008. Moreover, the KSE remained suspended for the last quarter of 2008 (August 27, 2008 to December 12, 2008) because of the decline in KSE index to very low levels (Awan et al., 2010)[33]. The KSE-100 index started its recovery phase in 2009, reaching 11886.02 by the end of 2010. By the end of the 3rd quarter in 2012, the KSE-100 index reached its highest level of 15444.82 since it was launched in 1991.

Three other indices exist for the KSE; in 1995, an all share index was introduced to provide the basis for index trading in the future; it consists of all companies listed on KSE. The KSE 30, formally launched in September 1, 2006 includes only the top 30 most liquid companies listed on KSE. Finally, in 2008 the KSE introduced the first Islamic Index known as the KMI 30 index in collaboration with the Al-Meezan Group[34]. This index tracks the 30 most liquid shariah-compliant companies[35] listed on the KSE. Companies in this index are first scrutinised for their compliance with certain Islamic principles before they can be included. Furthermore, the market capitalisation for each company is capped at 12% of the total market capitalisation of all KMI-30 companies to ensure that a relatively diversified index exists.

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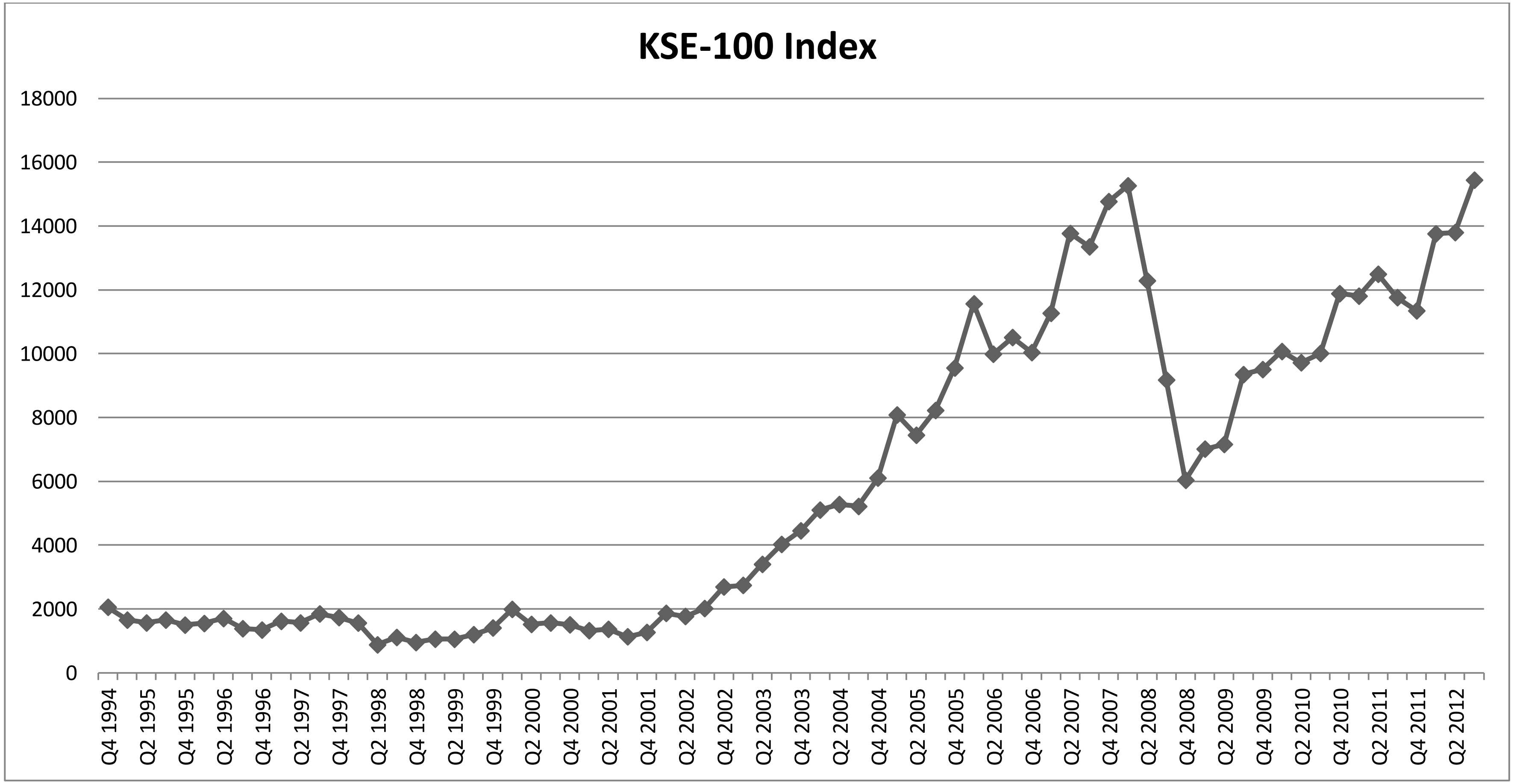
[33] This was due to the implementation of Floor-Price-Level limit on KSE during this time; from August to December 2008, the government imposed a floor on KSE to prevent further declines. This decline in the KSE index was partly due to global financial crisis and partly on account of political unrest.

[34] Al Meezan group is an affiliation of Meezan Bank Limited and Pakistan Kuwait Investment Company Private Limited. Al Meezan Group is the largest Shariah compliant asset management company in Pakistan; incorporated on July 13, 1995 as a public limited company under the Companies Ordinance (1984). The company was listed on the Karachi Stock Exchange on September 16, 1996. Al Meezan bank operates strictly under the principles of Islamic Shariah and is well recognized for its product development and Islamic Banking research and advisory (http://www.almeezangroup.com/).

[35] It only includes companies that comply with the laws of Islam (KSE website).

Figure 2.1: Quarterly KSE-100 Index from October 1994 to September 2012



Note: Data has been taken from Datastream.

Pakistan has two other stock exchanges currently in operation; the Lahore Stock Exchange (LSE) which was set up in 1970, and the Islamabad Stock Exchange (ISE) which only commenced operations in 1992 and is relatively small. Although the Lahore Stock exchange was established in 1970, security trading in the city dates back to the 1930s. Some 13 years before Pakistan's independence, a stock exchange was formed in Lahore during 1934; this exchange later merged with the Punjab Stock Market which had been set up in 1936. Three further stock exchanges were established in the late 1930s to cater for the rich Lahore business community (Mirza, 1993). All these exchanges suffered from illiquidity following World War II and were closed down when partition took place in 1947[36]. After independence and the establishment of the KSE, an attempt was made to revive a stock exchange in Lahore (Mirza, 1993). However, this proposed development made little progress and was soon dropped. In May 1970 another attempt was made to relaunch a stock market in Lahore; the present LSE was formed and began functioning in that year. It currently accounts for between 12 to 16 percent of the daily traded volumes across the whole country (LSE, 2012). The LSE emerged in response to a desire for a stock exchange in the province of Punjab. The LSE is the second largest and was the first automated stock exchange in the country[37]. It initially started with 83 listed companies but this number of quoted firms increased to 159 in 2009, covering 37 sectors of the economy. Soon after its formation, the LSE faced many difficulties due to adverse political and economic developments: namely, the outbreak of hostilities with India and the separation of the country's Eastern Province (Bangladesh). Subsequently, a socialist

[36] Except for one exchange that merged with Dehli Stock Exchange in India.

[37] The LSE and the KSE have successfully launched a Unique Identification Number (UIN) System in order to make security trading more efficient and transparent and to improve the surveillance and monitoring capacity of the exchanges. More recently, the LSE and KSE have joined together to establish a Unified Trading Platform which will help to increase the liquidity of the market, improve the price discovery process, maximize transparency, increase turnover, broaden the investor base, lower risks and provide a cost effective service to the investing public.

government came to power and started nationalising large segments of industry, insurance companies and banks (Hussain and Qasim, 1997). By 1974, it was estimated that almost 70% of the country's economy was under the control of the government, while the remaining private sector was dominated by the fully nationalised banks and insurance companies (Hussain and Qasim, 1997). This nationalisation policy discouraged private business activities and investment in the stock markets. Having survived this difficult period, the LSE grew steadily. Today, the LSE has a total capital of Rs. 555.67 billion and a market capitalization of around Rs. 3.64 trillion (the official website of LSE, 2012). It has 152 members of whom 81 are corporations and 54 are individuals[38]. The only Index for the LSE is the Lahore Stock Exchange Twenty Five Company index: the LSE-25.

The ISE was incorporated as a Company Limited by Guarantee on 25th October, 1989 in the capital city of Islamabad. The ISE is the youngest of the three stock exchanges of Pakistan. It was established to cater for the financial needs of less developed areas of the Northern part of Pakistan. It was argued that a stock exchange in Islamabad would provide a route whereby the small savings of the residents in less developed areas could be channelled to help finance local industries[39]. The ISE offers access to both domestic as well as foreign investors. The exchange has played a pivotal role in the economic growth of the area and thereby contributed to the overall economic prosperity of the country[40]. The ISE used the KSE-100 index for its trades until 1st January 2010 when it introduced its own capital weighted index known as the ISE-10

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[38] The LSE is an active member of the Federation of Euro-Asian Stock Exchanges (FEAS) and the South Asian Federation of Exchanges (SAFE), helping it to expand its presence and profile beyond the boundaries of Pakistan. The LSE has also increased its geographical influence by establishing branches in other cities of the Province. Two such branch offices have become operational in Faisalabad and Sialkot.

[39] Investor education, the ISE official website

[40] Investor education, the ISE official website

with the base date of December 31st, 2002. There are currently 261 companies listed in Islamabad Stock Exchange but the number of listed companies varies from time to time due to delistings, mergers and company defaults.

Prior to 1990, the stock exchanges in Pakistan only permitted individuals or a partnership of close relatives as members. After 1990, corporate membership was introduced into the KSE; the LSE and the ISE soon followed. Memberships of the stock exchanges in Pakistan are fixed; membership of the KSE is limited to 200 "seats" and prospective members have to purchase a seat from an existing member[41]. The price of the membership seat is freely negotiable between the buyers and sellers and varies according to the demand and supply. Since June 1990 when membership was opened to corporate entities, a minimum paid-up capital of Rs 20 million was introduced[42]. Corporate members are also subject to additional criteria fixed by the Board of the KSE. Initially, the KSE had only 2 corporate members – Jahangir Siddiqui & Co. Limited and Khadim Ali Shah Bukhari & Co. Limited; however, this situation has changed in the last two decades. Currently the KSE has 183 corporate members including 13 listed on the KSE. The KSE is mostly dominated by 15 to 25 members (Mirza, 1993). In 2005, foreign corporate entities were also allowed to become members of the KSE on condition that the nominee member of the company is a citizen of Pakistan.

[41] Investor Guide, official KSE website.
[42] Opening up the membership to corporate entities enabled the brokers to reach out to funds of individuals in smaller towns.

The KSE is the only stock market in Pakistan to have the full complement of 200 members as allowed by legislation. The LSE initially had 83 members but the number increased to 152 by 2009; of these 81 are corporate and 54 are individual members. The smallest stock market of Pakistan, the ISE, has 120 members; 94 are corporate members and the remaining 26 are individual members.

All of the three stock markets of Pakistan are regarded as emerging markets (Standard & Poor's Global Stock Market Factbook, 2009). For instance, the International Finance Corporation (IFC) considers all stock markets in developing countries to be "emerging". They suggest that countries are developing if they have a low to middle income per capita. However, definitions about what constitutes an emerging market vary between academics and practitioners (Almujamed, 2011). Practitioners often define emerging markets according to: (i) stock market capitalisation; (ii) the number of listed companies; (iii) the turnover (trading volume); and (iv) the rules and regulations (Mobius, 1994). Academics tend to focus on the IFC definition, together with the availability of data and the ease of access (Fifield et al., 1999 and 2005). Nevertheless, despite these differences, most commentators employ the IFC definition.

Table 2.2 provides detailed information about the performance of all the three equity markets of Pakistan. An analysis of this table reveals that the KSE in the most active exchange since the KSE has the highest number of firms listed and the largest market capitalisation, on average, as compared to the LSE and the ISE. Furthermore, an inspection of Table 2.2 reveals that the KSE-100 index is the largest index of the country when compared to the indices of the other two exchanges. The ISE, by comparison, is quite small; by 2011, only 236 companies were listed with an ISE-10 index of only 2621 points.

Table 2.2: Information about the Stock Exchanges

	2005	2006	2007	2008	2009	2010	2011
Panel A: KSE							
Number of Listed Companies	661	652	654	653	651	644	638
New Companies Listed	15	14	16	7	8	8	1
Listed Capital (Rs. Billion)	439	496	631	706	782	910	944
Market Capitalisation	2746	2801	4019	3777	2143	2732	3347
Turnover (Rs. Billion)	88.30	79.50	54.00	63.30	28.30	43.00	28.00
KSE-100 Index	9557	10040	14077	5865	9386	12022	11348
Panel B: LSE							
Number of Listed Companies	524	518	520	514	511	510	496
New Companies Listed	5	7	10	2	9	25	9
Listed Capital (Rs. Billion)	403	470	595	665	728	843	888
Market Capitalisation	1995	2693	3860	3514	2018	2622	3166
Turnover (Rs. Billion)	42.10	24.50	38.80	29.70	32.80	67.50	18.10
LSE-25 Index	3762	4379	4850	3869	2132	3093	3051
Panel C: ISE							
Number of Listed Companies	232	240	246	248	261	244	236
New Companies Listed	5	6	12	7	15	2	-
Listed Capital (Rs. Billion)	337	374	489	551	609	716	727
Market Capitalisation	1558	2102	3061	2872	1713	2441	2722
Turnover (Rs. Billion)	0.70	0.40	0.20	0.60	0.30	0.20	0.04
ISE-10 Index	1558	2102	3061	2872	1705	2262	2621

Note: The data has been collected from the Economic Surveys produced by Pakistan's Ministry of Finance in 2012. This table shows the number of listed companies, new companies listed, listed capital which is the aggregate total number of shares issued by listed companies, aggregate market capitalisation (Rs. Billion), total turnover of shares and the specific indices of the three stock markets in Pakistan.

All three stock markets of Pakistan are seen as risky (Iqbal, 2012), due to the fact that they operate in a high inflation economy with an unstable political environment[43]. Currently, there is no restriction on foreigners or non-residents purchasing shares of listed companies or subscribing to public offerings of shares in Pakistani firms (see Standard and Poor's Emerging Markets Factbook, 2009). However, approval is needed from the Investment Promotion Bureau (IPB) which is usually given as long as the investment does not relate to an industrial project in one of the restricted industries (arms and ammunition, security printing, currency and mint, high explosives, and radioactive substances) (Mirza, 1993).

All the stock markets in Pakistan are regulated in a similar fashion and employ the same operating procedures. Regulation of the stock market and securities business in Pakistan is principally governed by the Securities and Exchange Ordinance (SEO) 1969. Prior to 1999, the Corporate Law Authority (CLA), an agency constituted under the Companies Ordinance (1984) was responsible for supervising stock exchanges and their members, licensing investment advisors and enforcing legislation pertaining to both companies as well as corporate securities. In addition, the CLA was legally empowered to suspend trading on the stock exchange, override a listed company's board of directors or cancel its registration. The Securities and Exchange Commission of Pakistan (SECP) was created to replace the CLA, as a division of the Ministry of Finance in 1999. The process of restructuring the regulator was initiated in 1997 and a Securities and Exchange Commission of Pakistan Act was passed by the Parliament and promulgated in December 1997. Following the enactment of this legislation, the SECP commenced operations on January 1, 1999 (SECP, 2010). The

[43] It should be noted the biggest and the oldest stock market of Pakistan, the KSE, is in the process of amalgamating with major stock markets as the involvement of the foreign investors and their level of investment increases rapidly.

Act gave the SECP the administrative authority and financial independence to reform Pakistan's capital markets with the assistance of the Asian Development Bank (ADB)[44]. It was initially concerned with the regulation of the corporate sector and the capital market. Over time, its mandate has been expanded to include the supervision and regulation of insurance companies, non-banking finance companies and private pensions. The SECP has also been given the authority to oversee various external service providers to the corporate and financial sectors, including chartered accountants, credit rating agencies, corporate secretaries, brokers and surveyors[45]. The SECP's primary function is to protect investors and regulate the market. The mission statement of the SECP states that the organisation's goal is to promote:

> "The development of modern and efficient corporate sector and capital market, based on sound regulatory principles, which provide impetus for high economic growth and foster social harmony in the Country" (Senate secretariat, Islamabad, 1997)

The Commission is located in the capital city of Islamabad and is organized into five main divisions; the Company Law Division, the Securities' Market Division, the Specialized Companies Division, the Insurance Division and the legal Division. The SECP is a member of the International Organization of Securities Commissions (IOSCO) and is currently on its Emerging Markets Committee (EMC), its Technical Committee and its Standing Committee on financial intermediaries[46].

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[44] The Asian Development Bank is a regional development bank established on 22 August 1966 to facilitate economic development of countries in Asia.

[45] SECP official website.

[46] Interested readers can see Mirza (1993) and Khan (1993) for comprehensive information concerning the evolution, regulations, and operations of the Pakistani equity market, particularly the KSE.

2.4 Characteristics and Development of the KSE

The KSE is the most active exchange in Pakistan with over 92 percent of the country's market capitalisation belonging to firms listed in Karachi. The LSE, by comparison, is relatively small with only around 5 – 9 percent of Pakistan's market capitalisation attributable to firms quoted on this exchange. The ISE only accounts for 1 percent of the market capitalisation of Pakistani companies. The Pakistani stock markets are quite small in terms of their market capitalization since they represent a mere one percent of all emerging stock markets (Standard and Poor's Emerging Markets Factbook, 2009). Many academic writers have tried to explain why this capitalisation ratio is low. For example, Khwaja and Mian (2005) have argued that political factors are a key influence on this ratio; they found that politically-connected firms[47] in Pakistan borrow 45 percent more from banks and have default rates that are 50 percent higher than their non-politically connected counterparts; this preferential treatment occurred exclusively in government banks and meant that such firms did not issue equity. Hamid and Kozhich (2006) highlighted that a majority of listed corporations in Pakistan are family-owned enterprises where control of the businesses is exercised via a pyramid structure with many cross-shareholdings. Other authors, such as Iqbal (2012) believe that the low market capitalisation to GDP ratio in Pakistan is due to a lack of entrepreneurial skill among the managers of family owned firms which operate with high retention levels in order to fund future investment.

[47] Firms whose controlling shareholders and top managers are members of national parliament or government.

Volatility is one of the key characteristics of Pakistan's stock markets, especially the KSE[48]. A number of studies have suggested the KSE is a volatile market. For example, Farid and Ashraf (1995) indicated that the KSE became more volatile over the period 1993 to 1994, as share price movements became extreme. The authors also documented that, during the first half of 1994, the dominant focus among KSE investors was investing for short-term gains. A majority of investors entered the market when it was rising, and abandoned it when it started to fall. In other words, many investors seemed to follow their own portfolio strategies which simply tracked the overall performance of the market. The authors concluded that this trend had contributed to the increase in the volatility of share prices during the period of their study. This impact of "naive" shareholders was probably exacerbated by a dearth of sophisticated investors within the country. No sizeable analyst community exists within Pakistan while large fund managers are not common. Ahmed and Rosser (1995) arrived at a similar conclusion using daily data of the Karachi stock market index from 1987 to 1993; they concluded that the KSE was a volatile market. In general, they suggested that the KSE had exhibited a significant amount of fluctuation since its inception and this variability in prices had grown throughout the 1990s. Further, Kanasro et al. (2009) confirmed the presence of high volatility in the KSE market using a more recent time period from 2003 to 2009 using ARCH and GARCH models. More recently, Iqbal (2012) documented that "Pakistan's stock market operates as a typical emerging market with a high level of returns and volatility..." (p. 88)

[48] Volatility is defined as the variation in share price (either fluctuation upwards or downwards). Increased volatility is perceived as indicating a rise in financial risk which can adversely affect the spread of values for investors' assets and wealth (Hameed and Ashraf, 2006)

Many studies have documented a significant shift in the volatility of share returns in Pakistan after the terrorist attacks of 9/11 on the World Trade Centre in the US (Hameed and Ashraf, 2006; Ahmed and Farooq, 2008; Nguyen and Enomoto, 2009; Suleman, 2012; Khan et al., 2012). For example, Ahmed and Farooq (2008) found that the conditional variance, risk premium and the asymmetric response of the conditional variance to past innovations in KSE returns changed significantly from their pre-9/11 levels during the post- 9/11 period. Hameed and Ashraf argued that due to the surge in capital and higher liquidity in the Pakistani stock markets, the stock exchanges were reformed after 9/11; e.g. the Security and Exchange Commission of Pakistan (SECP) introduced a number of initiatives such as implementation of T+3 settlement procedure, rationalization of risk management measures and imposition of circuit breakers.

The KSE has grown rapidly in the 1990s primarily because barriers to foreign investments have been removed and measures to deregulate the economy have been adopted. A policy of financial liberalization[49] and increased reliance on the private sector also helped the stock markets to advance (Mirza, 1993). According to the International Finance Corporation (1992), the KSE was ranked third according to the percentage increase in the local stock market index in 1991[50]. Moreover, the KSE was declared as the "Best Performing Stock Market of the World" by Business Week in 2002 (Iqbal, 2012)[51]. With respect to the turnover ratio, the market was ranked first

[49] Henry (2000) defines liberalization as a country decision's to allow foreign investment. According to Henry (2000), a stock market liberalisation "is a decision by a country's government to allow foreigners to purchase shares in that country's stock market … stock market liberalization may reduce the liberalising country's cost of equity capital by allowing for risk sharing between domestic and foreign agents" (p. 529).

[50] Since the 1990's, after deregulation and privatization of the economy and other trade liberalization policies, Pakistan's stock markets have progressed significantly.

[51] However, that rating deteriorated in the late 2000s because of the political situation and the "war on terror" against Al-Qaeda.

and third in 2003 and 2006 respectively (Global Stock Markets Factbook, 2004; 2007). Iqbal (2012) suggests that the reason for this high turnover ratio was the growth in GDP, relatively stable political conditions at that time, low interest rates and remittances by overseas nationals. Pakistan's equity markets were also among the top three performers in the MSCI FM index[52] in 2009, gaining 61 percent over the 12 month period. The markets' excellent performance in 2009 continued in 2010 when market capitalisation reached US $30.5 billion[53].

Opening up the country to foreign investment and deregulation of the economy in the early 1990's were key to the development of the KSE. This economic development and financial liberalisation has seen the market's size and depth improve (Hussain and Qasim, 1997). Allowing foreigners to invest in Pakistani equities has also played an important role in improving trade executions, settlement periods and the dissemination of market information to investors[54]. According to Mirza (1993) investment by foreigners in Pakistani shares started in March of 1991, as investors in Hong Kong and Singapore began to purchase equity stakes in local firms; this influx of funds helped the market capitalisation to more than double to US $7.4 billion by 1991 from $2.8 billion in 1990. Since 1991, foreign investors have the same rights and opportunities as local investors when operating in the secondary capital market of the KSE. As a result, the number of listed companies rose from 487 in 1990 to 542 in

[52] This ranking is based on an index created by Morgan Stanley Capital International (MSCI) that is designed to measure equity market performance in global emerging markets.

[53] This could be seen as an improvement considering that 2000 started with the tragic incident of the World Trade Center (WTC), followed by the 2005 Kashmir earthquake claiming more than 75000 lives and the change of government in 2008 after the assassination of ex-Prime Minister Benazir Bhutto in December 2007. In addition, the ongoing military operation in the North-West of Pakistan against the Islamic militants has worsened the deteriorating economic situation in Pakistan (Khan, 2011).

[54] In 2003, future trading in some active stocks also started. The KSE plans to start options in the near future and according to their estimate by 2012, 50 percent of the trading will be in the derivatives (Iqbal, 2012).

1991 as local companies sought to satisfy the appetite of foreign investors for equity stakes.

Table 2.3 presents information about the KSE from 2000 to 2011. The table reveals a significant increase in market capitalisation from Rs. 379 billion in 2000 to Rs. 2954 billion in 2011, despite the fact that the number of listed companies fell from 762 to only 638 over this period, which is a decline of over 19 percent. The highest positive change in the market capitalisation was documented in 2002; market capitalisation increased by 101 percent from Rs. 296 billion in 2001 to Rs. 595 billion in 2002 (the same year the KSE was declared as the "Best Performing Stock Market of the World" by Business Week). In contrast, the largest negative change in the market capitalisation was documented in 2008; market capitalisation declined from a record high of Rs. 4330 billion in 2007 to Rs. 1858 billion in 2008 (a 57.09 percent decline). The KSE started recovering in 2009 and by the end of 2011 the market capitalisation was Rs. 2954 billion; although the the market capitalisation fell by 5.60 percent from 2010. This was due to the introduction of a Capital Gains Tax (CGT) (Khan, 2011). Pakistani securities trading remained exempt from CGT for 36 years till June 30, 2010. The imposition of CGT on securities from July 1, 2010 reduced the average traded value. This was due to the fact that after the imposition of CGT, investors were required to file income tax returns along with declaring evidence of investments. Due to this greater transparency, the investors reduced investments in the stock markets and the average daily turnover fell along with the share prices (Pakistan Economic Survey, 2012).

Other measures confirmed that the performance of the KSE improved over this period. For example, in 2006 the KSE-100 index broke through the 10,000 barrier for the first time in its history. However, this out-performance did not last long as the value of shares traded started declining. In 2008, the KSE-100 index lost more than 58 percent of its value from a peak of 14,077 in 2007. This was due to the fact that the ‘war on terror’ and the 2008 elections (Khan, 2011) coincided with the global financial crisis which wiped out more than half of the market value. This was indeed the worst crisis that ever hit the KSE. However, the KSE started recovering after this poor performance; from 5865 points at the end of 2008 the market rose to 11348 points by the end of 2011.

A visual inspection of Table 2.3 also reveals that the largest negative P/E value was documented in 2000 (-117.4) suggesting that a large number of companies recorded losses in that year. However, the P/E ratio improved after the 2001 period, reaching its highest level of 15.3 in 2007. A visual inspection of the table shows that the dividend yield increased up until 2001 as prices declined; this average ratio then fell until 2005. The highest dividend yield was achieved in 2001 (12.5 percent). However, dividend yields fell sharply over the years reaching its lowest levels of 2.5 percent in 2005 before increasing to 11.8 percent in 2008.

Overall, the analysis of the Table 2.3 shows that the KSE gained momentum in 2001 and made significant progress in terms of the level of the KSE-100 index and market capitalisation. However, the market lost its momentum in 2008 due to the political turmoil and the global financial crisis. Soon, measures were taken to rescue the market which lead the market to grow again and the KSE-100 index reached its peak in 2012 (15812 points). Therefore, in general, the statistics in Table 2.3 indicate that the KSE has been characterised by reasonably high levels of share price volatility and uncertainty over the last decade (Husain, 2008).

2.5 The Trading and Settlement System at the KSE

The trading days in Pakistan have changed twice in the last two decades. Initially, trading days were Saturday to Wednesday which recognised that most Muslims went to the Mosque on a Friday. This trading week changed to Sunday to Thursday in June, 1992 (Ali and Akbar, 2009). Finally, in order to coordinate security dealings with the rest of the world, Pakistan changed its trading days to Monday to Friday in 1997 (Ali and Akbar, 2009).

The official trading hours for the KSE are 9:30 AM – 3:30 PM Monday to Thursday although there is a pre-open session of 15 minutes prior to the start of trading. On Friday, there are two sessions because of the prayers observed by all the Muslims in Pakistan. The first session runs from 9:15 AM – 12:00 PM while the second session operates from 2:30 AM – 4:30 PM. A 15 minute pre-open period exists for both of these sessions prior to the start of trading. The LSE has the same trading times as of the KSE however the hours of business at the ISE are different in two respects. Firstly, there is no 15 minutes pre-open period for the second session on Friday. In addition, trading continues for an additional half hour on Friday mornings which means that dealing does not finish until 12:30 PM.

Table 2.3: Information about the KSE

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Listed Companies	762	747	712	701	661	661	652	654	653	651	644	638
Market Cap (Rs. Billion)	379	296	595	951	1723	2746	2771	4330	1858	2705	3269	2954
Change in Market Cap (%)	4.99	-21.90	101.01	59.83	81.18	59.37	0.91	56.26	-57.09	45.59	20.85	-9.64
Trading Value (Rs. Billion)	1760	765	1543	3846	4314	8396	7617	6103	3529	N/A	N/A	N/A
Change in Trading Value (%)	62.66	-56.53	101.70	149.25	12.17	94.62	-9.28	-19.88	-42.18	N/A	N/A	N/A
KSE-100 Index	1507	1273	2701	4472	6218	9557	10040	14077	5865	9386	12022	11348
Change in Index (%)	7.03	-15.53	112.18	65.57	39.04	53.70	5.05	40.21	-58.34	60.03	28.08	-5.60
P/E ration	-117.4	7.5	10	9.5	9.9	13.1	10.8	15.3	3	N/A	N/A	N/A
P/BV ratio	1.4	0.9	1.9	2.3	2.6	3.5	3.2	4.7	0.8	N/A	N/A	N/A
Dividend Yield (%)	6.2	12.5	9.2	7.5	7	2.5	4	3.3	11.8	N/A	N/A	N/A

Note: This table provides information about the KSE over an 11 year period from 2000 to 2011. This table is based on the data from Standard & Poor's Global Stock Markets Factbook, 2009. The table shows the total number of listed companies, total market capitalisation (Market Cap) of all listed companies, percent change in market capitalisation, trading value, percentage change in trading value, the KSE-100 index, percentage change in the KSE-100 index, Price Earnings (P/E) ratio, Price to Book Value (P/BV) ratio and finally the Dividend yield. N/A denote to data not available.

As the primary stock market of Pakistan, the KSE has always had a five day trading week. Prior to 1992, trading took place from 10:15 a.m. to 2:00 p.m. under an open-outcry system where the members' clerks[55] started the auction by announcing a suggested initial bid and offer for each listed security (Mirza, 1993); transactions occurred when the prices from different clerks were matched. The transactions were noted by a KSE representative, recorded on a board, and also communicated to members via closed circuit monitors. After the bids were matched, settlement of shares took place through a centralized clearing house[56] once a week, generally on a Sunday. Thus, shares traded in any week from Saturday through to Wednesday were settled on the Sunday of the following week. On any clearing day, settlement essentially involved payment by the purchaser of the security before 11:30 a.m. with the share certificates being delivered the same day[57] (Mirza, 1993).

As the market grew and number of trades started to rise, the KSE abolished the open outcry system on May 26, 1998 and introduced a computerized system called the Karachi Automated Trading System (KATS) and the Central Depository System (CDS) to cope with increasing business volumes (Mirza, 1993). This automated trading system made transactions faster and more transparent[58]. The CDC registers

[55] Intermediary functions between the buyers and sellers of a security in the KSE are performed by brokerage firms called members of the stock exchange. Members' assistants and helpers are known as their clerks.

[56] This is a financial institution that provides clearing and settlement services for financial and commodity derivatives and securities transactions.

[57] Forward trading was also permitted on the KSE, but was limited to only five widely-held shares: ICI (Pakistan) Limited, the Pakistan Engineering Corporation, the Ravi Rayon Limited, National Motors Limited, and the Pakistan National Shipping Corporation. Forward trading used to take place on the basis of delivery and settlement at the end of each month. Trading for the new month generally started around the 20th of the previous month (Mirza, 1993).

[58] The LSE was the first exchange in the country to automate trading in 1994. Since that date, the LSE has continued to make large investments in technology in order to keep pace with the globalization of securities trading. For example, it was the first exchange in Pakistan to permit internet-based trading in 2001. This change enabled LSE brokers to reach out to untapped retail markets. Currently, more than 50 percent of the total trading volume at the LSE originates from internet trading terminals. The aim of

and documents the transfer of securities in the form of an electronic book-entry. It transfers the ownership of securities without any physical movement of share certificates. Investors have the option to purchase the share certificate in paper form or as an electronic book-entry. Presently, 97 percent of settlements are routed through the CDC[59]. Regulated trading in the KSE is carried out through the KATS system. Soon after its introduction, the market witnessed a dramatic rise in the turnover ratio; according to World Bank (2000), the turnover ratio of the KSE increased from 8.7 in 1990 to 345.2 in 1999. The new systems not only provided a transparent, efficient and cost effective market for the investors but also brought the KSE into line with other stock exchanges throughout the world in terms of the infrastructure used.

Trading at the KSE can be grouped into five distinct activities each of which has its own clearing and settlement procedures. The most commonly used is the Ready Market (T+2)[60] settlement procedure, in which transactions are settled through the Clearing House which nets out the purchases and sales of the financial obligations of each member and issues instructions on deliveries for the outstanding amounts[61]. In a

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all of these measures is to transform the LSE from a regional to a national exchange and to allow it to compete for business with the KSE (LSE website).

[59] Investor Guide (2008), Security and Exchange Commission of Pakistan.

[60] T+3 settlement procedure has been recently replaced with T+2. This ensures share delivery in two days following the day on which the trade takes place.

[61] The LSE is not very different from the KSE in terms of trading and settlement. The LSE, with a reputation for being a technologically-advanced exchange, also has a computerised trading system to provide a transparent, efficient and cost effective market mechanism to facilitate investors. The trading system of the LSE is comprised of four distinct segments each of which has its own clearing and settlement procedures. The main and most commonly used is the T+3 settlement system (an investor who buys shares through the secondary market becomes the owner after 4 working days), where the purchase and sale of securities is netted and the balance is settled on the third day following the day of the trade. The shares of companies, which have a minimum public offering of Rs.100 million, are traded on the segment known as the Provisionally Listed Counter. In a third segment spot, transactions are dealt with and normally the trade is settled within 24 hours. Finally, there is a segment for future contracts; this segment is known as the Futures contract. The ISE replaced its old open out-cry system with a computerized trading system commonly called ISECTS on August 31, 1997. In 2002, ISECTS joined with the LSE and adopted the ‘Ultra Trade’ trading system, because it had an extended trading capacity and internet trading functionality. When the ISE was established, a T+7 period was used for settlement of shares. In 2001, a T+3 period was introduced. This T+3 settlement period continues to the present.

different segment, trading in provisionally listed companies is carried out for new entrants with a minimum public offering of Rs. 500 million. Futures contracts started in 2003 and the futures market is traded in a different segment; presently, the scrip of 30 well established companies are traded with a fixed contract period of one month. Finally, the last segment deals with debt market securities and was launched on the 2nd of November 2009 under the name Bonds Automated Trading System (BATS); this offers participants a transparent and efficient trading system for the debt market.

2.6 Conclusion

This chapter has provided a brief background to Pakistan's history; the political and economic changes since its emergence as a country. This will supply the backdrop for the empirical work conducted in this thesis. This chapter also provides an overview of Pakistan's stock markets and reviews the main features of the stock markets of Pakistan; a brief description of the different stock market indices is also explained. The KSE is discussed in more detail than its smaller counterparts since the KSE is the main market of the country and the data for this research has been taken from the KSE. The characteristics and the development of the KSE are further discussed in order to help the reader with the rest of the thesis. Recent technological advancements in the stock market are also discussed. In addition, this chapter has also shed light on the trading procedures and settlement system for shares traded on the KSE.

Chapter 3

Literature Review

3.1 Introduction

This chapter discusses the theory underpinning the efficiency of the market and reviews the relevant literature on the weak-form of the EMH. A number of studies have examined whether the weak-form of this hypothesis holds; both statistical and non-statistical tests have been used to investigate whether share price changes are independent; in other words, whether share price changes are unpredictable on the basis of historic information. While early findings were supportive of the hypothesis (Kendall, 1953), more recent evidence has thrown up several irregularities known as market 'anomalies' which cast doubt on efficient markets theory (Jensen, 1978). The most relevant of these anomalies for the current thesis are calendar regularities – sometimes referred to as seasonal patterns – which appear at different times of the day (French, 1980; Harris, 1986), different days of the week (Jaffe and Westerfield, 1985), and different months of the year (Gultekin and Gultekin, 1983). Many academic researchers have focussed on calendar anomalies when investigating the weak-form of the EMH. However, most of these academics have tested for regularities based on the Gregorian calendar; by contrast, little attention has been given to other calendars based on different religions. This chapter will focus on research into anomalies based on the Islamic calendar; special attention will be paid to literature about seasonal effects in returns for different Islamic months.

The substantive literature on the EMH relating to calendar anomalies appears to have investigated the share returns of developed markets such as the UK and the US. Only a relatively small number of investigations have studied the existence of calendar anomalies in the emerging stock markets; hence, little is known about the presence of seasonal patterns in the returns of emerging markets, especially those of Pakistan. Yet, if calendar anomalies are explained by the tax system of a country (Dyl, 1977; Reinganum, 1983), institutional structures within a market (Hepsen, 2012), a trading mechanism which may be in place (Fama and Blume, 1966) or cultural factors (Chan et al., 1996) one would expect differences from one country to another. Thus, an analysis of this topic for a country such as Pakistan may offer interesting insights which may be different from the findings which have been documented for developed nations. Therefore, this review of the literature will include investigations that have examined calendar anomalies in both the developed and the developing countries around the world; however, the review will concentrate on studies about the Pakistani stock market since the findings of these investigations are most relevant for the current thesis.

The remainder of the chapter is organised as follows. Section 3.2 discusses the theory underpinning the EMH and outlines the empirical studies which have investigated various calendar anomalies that have examined this aspect of weak-form efficiency for developed and developing countries. Evidence concerning monthly seasonal anomalies for various stock markets around the world is discussed in Section 3.3. Investigations about Islamic calendar anomalies in Muslim countries are presented in Section 3.4. Section 3.5 focuses on a sub-set of the literature which investigates calendar anomalies in the Pakistani stock market; this should provide a background against which the results of the current thesis can be evaluated. In Section 3.6, investor sentiment and its impact on share price is discussed; this section analyses the arguments from the investor psychology literature in explaining anomalous behaviour (such as calendar anomalies) in security pricing. The final section provides a number of concluding observations.

3.2 The EMH and the Weak-Form Efficiency

For over a century, the pricing of stock market securities has remained an area of great interest within the finance community. This interest is hardly surprising because of the important role which a stock market plays in the development of a country's economy. The main purpose of the stock market is to facilitate the exchange of securities between buyers and sellers (Dalton, 1993). In addition, it allows funds to be raised from savers by companies who want to invest in profitable ventures which aim to achieve a rate of return in excess of the market-determined borrowing rate. Hence, it is argued that the equity market matches the needs of lenders and borrowers and facilitates the development of the economy. According to finance theory, a perfect capital market is one with the following features: there should be many buyers and sellers; all buyers and sellers should be rational expected-utility maximisers; transaction costs and taxes should not exist; information should be freely available and correctly understood; and there should be perfect competition in product and securities markets (Wang, 2002). Of course, such conditions are not realistic and this leads to the idea of an efficient market. According to Copland and Weston (1983), a perfect capital market is different from an efficient market. In an efficient market, the price is an unbiased estimate of the true value of the investment.

The assumption of market efficiency is an important concept in the literature of finance; it is the focus of extensive study and research dating back many decades.

Indeed, the first study on the EMH was conducted in 1900 by Bachelier using French data. He tested whether share price changes were statistically independent and whether patterns were present in equity return data. He arrived at the rather surprising finding that share price changes were no different from a random set of numbers. However, this concept of an efficient market did not develop until the 1960s. 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.

Three types of efficiency have been identified in the academic literature; allocational, operational and pricing efficiency. A stock market is allocationally efficient when funds are directed to the most profitable ventures which firms want to undertake (Arnold, 2005). Samuels et al. (1995) argue that a stock market is operationally efficient when transaction costs for the trading of shares are low due to competition between brokers and market-makers. Finally, pricing efficiency asserts that investors cannot outperform the market on a regular basis by trading on an information set since all the information is already incorporated into share prices. It is this question of pricing efficiency that most researchers have focused on; the current thesis also concentrates on this form of the efficiency. In his paper, Fama (1970) suggested that there were three forms of pricing efficiency in the stock market: weak form efficiency, semi-strong efficiency and strong form efficiency. Under the weak form of the EMH, no investor can earn excess returns on a consistent basis by trading on historical information. In other words, the information in past prices or returns cannot be used to achieve excess returns in the future (Fama, 1970); it is this form of efficiency which is tested in the current thesis. The semi-strong form of the EMH asserts that all publicly available information is fully impounded into equity prices such that no investors can outperform the market by trading on such information. Therefore an investor cannot beat the market by transacting on information which has just been published such as annual reports, dividend announcements, stock splits, rights issue or earnings announcements (Fama, 1970). Finally, the strong form of the EMH asserts that all information is fully reflected in share prices such that no investor can earn excess returns using any information, whether public or private. Thus, details held by corporate insiders like chief executives officers cannot be exploited to gain excess profits in the stock market (Fama, 1970).

According to Fama (1970), these three forms of the EMH imply that the market price should be equal to the "true" value of the share at every point in time such that no investor should consistently outperform the market on a basis of information available (Fama; 1965, 1970). For example, Fama (1970, p.383) stated that:

> "The primary role of the capital market is allocation of ownership of the economy's capital stock. In general terms, the ideal is a market in which prices provide accurate signals for resource allocation: that is, a market in which firms can make production-investment decisions, and investors can choose among the securities that represent ownership of firms' activities under the assumption that security prices at any time 'fully reflect' all available information. A market in which prices always 'fully reflect' available information is called 'efficient'".

According to this definition, 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. A vibrant debate about the EMH has taken place since the 1960s and many studies have attempted to predict share returns using various information sets. If future share returns are predictable and excess returns can be obtained from trading on information, the EMH would be called into question[62].

Most empirical studies of pricing efficiency have focused on the weak-form of the EMH (Kendall, 1953; Fama, 1965). When testing for weak-form efficiency, the question that researchers have focused on is "how well do past returns help in predicting future share price changes?". There is a significant amount of research on this topic for different capital markets around the world. A lot of studies have looked at the weak-form of the EMH for stock exchanges in developed countries (Brock et al., 1992; Fama, 1965, 1970) while a growing number of studies have considered this issue for emerging markets (Fifield et al., 2005, 2008; Tijjani, 2008; Almujamed, 2011). One way of testing the weak-form of the EMH is to determine whether the random walk model characterises share returns; this model suggests that share price movements are random and cannot be forecasted from past return values as suggested by the weak form of the EMH. Bachelier (1900) was the first researcher to highlight the random fluctuation in commodity prices; later studies by Working (1934), Cowles (1933) and Cowles and Jones (1937) concluded that US securities also shared these characteristics. However, these studies did not receive a lot of attention until the late

[62] According to Broke et at. (1992), technical analysts attempt to forecast prices by the study of past prices as they believe that shifts in supply and demand can be detected in charts of market action. However, if the EMH holds for an economy then the need for technical analysts would not be required as the share prices would already have impounded all the past information.

1950s. A sizeable number of investigations in the 1950s and 1960s tended to confirm the initial findings of Working, Cowles and Jones (Kendall, 1953; Roberts, 1959; Alexander, 1961 and 1964; Cootner, 1962; Moore, 1962; Fama, 1965; Fama and Blume, 1966). They supported the random walk theory by highlighting that security price changes were independent of each other and had the same probability distribution (Kendall, 1953). Also, their results supported the random walk model by documenting that the chances of a security price increasing were approximately equal to the probability of it decreasing (Fama, 1970). In addition, share selection techniques involving technical analysis were discovered to be unprofitable (Fama and Blume, 1966); this evidence was used to bolster the random walk model which argued that the past price movements of a share could not be used to predict future returns.

The random walk model and the weak-form of the EMH have received a great deal of attention in the academic literature since the 1950s – especially in developed markets (Kendall, 1953; Roberts, 1959; Osborne, 1959; Cootner, 1962; Fama, 1965). A sizeable number of research papers emerged which investigated the weak form of the EMH as large data sets became publically available. For example, Fama (1965) conducted one of the most comprehensive studies of the weak form of the EMH at that time. He used daily prices for each of the 30 shares included in the Dow Jones Industrial Average Index over the period December 1957 to September 1962. Specifically, he examined serial correlation coefficients and conducted runs tests to determine if past price changes were related to future return values[63]. His results suggested that no statistical dependence existed between share returns and that the difference between the actual and the expected numbers of the runs (or trends) in the

[63] The serial correlation test examines the relationship between price changes in one period and price changes in a previous period. According to the weak-form of the EMH, the correlation between price changes should be zero.

series was small. Kendall (1953) tested for serial dependence in commodity prices. His data comprised of indices for 19 industrial sectors and wheat prices over the period from 1928 to 1938. The results suggested that there was no significant relationship between price changes which lead to the conclusion that historical information was of no use in predicting future prices; therefore, he concluded that prices moved in a random fashion. Thus, the findings of early investigations were supportive of the weak form of the EMH. Later studies by Moore (1962), Cootner (1962), Mandelbrot (1963) and Samuelson (1965) documented similar results and generally supported Kendall's original findings[64].

Other research findings which have cast doubt on the validity of the EMH include a number of stock market 'anomalies'; these suggest that share price changes may be predicted based on the company characteristics, market operations or time periods. The different anomalies uncovered include the small firm effect (Roll, 1981; Dimson and Marsh, 1986; Banz, 1981; Chan, 1988; Arnold, 2005), the price earning effect (Basu, 1977; Goodman and Peavy, 1983; Chan et at., 1991), the momentum effect (Rouwenhorst, 1998), the overreaction effect (DeBondt and Thaler, 1985; Howe, 1986; French and Roll, 1986; Dyl and Maxfield, 1987; West, 1988; Zarowin, 1989; Jegadeesh, 1991; Lehman, 1990; Power et al., 1991; Power and Lonie, 1993; MacDonald and Power, 1993; Mazouz and Li, 2007), the earnings yield effect (Reinganum, 1981) and the holiday effect (Ariel, 1990; Lakonishok and Smidt, 1988).

[64] However, several of the relatively recent studies that have analysed correlation statistics using longer time series and more high frequency data have rejected the weak-form of the EMH; they have questioned the findings of these early investigations of the EMH (Fama and French, 1988 and 1989; Lo and Mackinlay, 1988; Keim and Stambaugh).

However, perhaps one of the best researched anomalies has focused on calendar regularities which suggest that share returns are predictable for certain months (Rozeff and Kinney, 1976), on certain days (Jaffe and Westerfield, 1985) and at specific times (Ariel, 1987). These calendar anomalies cast doubt on the EMH since the investor knows when a specific month, day or time period is due and may therefore be able to predict the share price change which will occur. Calendar anomalies have remained a focus of many academic researchers when investigating the weak-form of the EMH; these researchers have documented that average security returns are statistically significantly different in some calendar periods compared to others[65]. For example, researchers have discovered that share prices exhibit patterns on different days of the week (French, 1980; Gibbons and Hess, 1981; Keim and Stambaugh, 1984; Jaffe and Westerfield, 1985; Board and Sutcliffe, 1988; Lokanishok and Maberly, 1990)[66], on Holidays (Ariel, 1990; Lakonishok and Smidt, 1988), in the month of January (Rozeff and Kinney, 1976; Gultekin and Gultekin, 1983; Thaler, 1987; Haugen and Lakonishok, 1988; Zarowin, 1989) and at the turn-of-the-month (Ariel, 1987; Lakonishok and Smidt, 1988). Indeed, Mills and Coutts (1995) and Chien et al. (2002) have suggested that the existence of calendar anomalies in stock market returns is one of the clearest contradictions of the EMH. Some of these calendar anomalies are more prominent than others and have received a greater amount of attention in the substantive literature – especially the day-of-the-week effect and the January effect. Studies of the day-of-the-week effect, holiday and January effects first began to appear in the 1930s and 1940s (Fields, 1931 and 1934; Wachtel, 1942) however academics did not began to seriously examine these return patterns until after

[65] If share returns follow a random walk then 'on average' there ought to be no difference between returns in different calendar periods.

[66] Some of the recent analyses on the day-of-the-week effect were conducted by Choudhry (2000), Herwartz, (2000), Brusa et at. (2000), Pettengill (2003), Bhattacharya et al., (2003), Kiymaz and Berument (2001 and 2003), Schwert (2002) and Chan et al. (2004).

a special issue of the *Journal of Financial Economics* was devoted to this topic in 1980 (Black et al., 1992). It is the monthly seasonal anomaly that is most relevant for this thesis; therefore, special attention will be paid to the monthly seasonal anomalies in the next section of this literature review; evidence concerning monthly seasonal anomalies for various stock markets will be discussed in the following section of this chapter.

3.3 Monthly Seasonal Anomalies

The month of the year effect has been shown to be a persistent anomaly in both developed and emerging markets capital markets throughout the world. Researchers have documented that the returns in some months are consistently higher than in others. Although there is a great deal of support for an existence of a monthly pattern, the international evidence is mixed about which seasonal effect is present; different researchers have obtained different results while studying various time periods and using different models of expected returns.

The paper by Rozeff and Kinney (1976) was one of the seminal investigations in this area. This study examined the returns earned by NYSE equities from 1904 to 1974 on a month-by-month basis. They discovered that share returns in January were statistically higher than the average returns in the other 11 months of the year for US equities; their results indicated that the average January monthly return was approximately 3.5 percent while the average return over the other months was only

0.5 percent[67]. Rogalski and Tinic (1986) arrived at a similar conclusion from their investigation of an equally-weighted index of NYSE and the American Stock Exchange equities for the period from 1963 to 1982. Many academics have attributed this statistical regularity to the fact that most US firms finalise their tax liability in December and January is the start of a new tax year (Dyl, 1977; Roll, 1983; Givoly and Ovadia, 1983; Jacobs and Levy, 1988). These researchers have posited that investors sells shares in December to minimise their capital gains tax liability and purchase equities again in January; the excess demand for shares in January leads to higher returns. Despite these suggestions of a close relationship between the tax year end and the January seasonality, this link is not well understood[68]. Studies have found evidence for a January effect for countries where a majority of companies have a non-December tax year end. For example, Brown et al. (1983) provide evidence of above-average monthly returns for January in Australia, even though the beginning of the tax-year in this country is July[69].

A monthly seasonality has been documented in many international markets; indeed, an international perspective on month-of-the-year effect was adopted by Gultekin and Gultekin (1983). They found that a monthly seasonal pattern in security returns was not confined to US market; when they examined the value weighed equity indices of 17 countries over the period 1970 to 1979, using both nonparametric and parametric methods, they discovered that a significant monthly pattern and a strong positive

[67] The seasonality was found to exist throughout the test period, with the exception of 1929 to 1940 due to the period of high variability during the Great Depression.
[68] Jones et al. (1991) found that the January effect existed in the USA long before income taxes were introduced.
[69] A more recent Australian study by Marrett and Worthington (2011) which investigated the month-of-the-year-effect in the Australian stock market discovered that equity returns in April, July and December were significantly higher than their counterparts in other months of the year. Berges et al. (1984) found a January effect in the Toronto Stock Exchange prior to 1972 when Canadians paid no taxes on capital gains. A January effect for the Toronto Stock Exchange was also presented in the study of Gultekin and Gultekin (1983).

"January" effect was present in 12 stock markets[70]. This return in January varied from a low of 0.74 percent for Australia to a high of 10.59 percent for Singapore. Boudreaux (1995) arrived at a similar conclusion; he investigated data from 7 (mostly European) countries and found evidence for the January effect; moreover, the outperformance among his sample was not spread evenly throughout January but concentrated at the end of the month in German, Danish and Norwegian stock markets[71]. Agrawal and Tandon (1994) also conducted a multi-country investigation of the month-of-the-year effect over the period 1971 to 1987; the countries examined in their study were drawn from Europe (Belgium, Denmark, France, Germany, Italy, Luxembourg, Netherlands, Sweden, Switzerland and the United Kingdom), Asia/Australia (Australia, Hong Kong, Japan, New Zealand and Singapore), and North as well as South America (Brazil, Canada and Maxico). They found that equity returns were unusually large on the last trading day of a month in nine countries. Furthermore, they documented that returns were larger in January and smaller in December for 14 of the countries studied[72].

A more recent study by Asteriou and Kovetsos (2006) examined eight Central and Eastern European stock markets over the period 1991 to 2003 and uncovered strong statistical evidence for the January effect in Poland, Romania, Hungary and Slovakia[73]. Perhaps one of the most comprehensive recent investigations of this topic to date was conducted by Giovanis (2009). He investigated 55 stock market indices

[70] Counties included: Australia, Belgium, Canada, Denmark, France, Germany, Italy, Japan, The Netherlands, Norway, Singapore, Spain, Sweden, Switzerland, UK and US.
[71] Countries included: Denmark, France, Germany, Norway, Singapore/Malaysia, Spain and Switzerland.
[72] Counties that did not report higher average January returns were Hong Kong, Netherlands, Sweden and Switzerland. Gultekin and Gultekin (1983) reported similar findings for Australia, Canada and Denmark for an earlier time period while Brown et al. (1983) also report similar results in Australia for an earlier time period.
[73] Countries Included: Czech Republic, Hungary, Lithuania, Poland, Romania, Russia, Slovakia, and Slovenia.

from 51 countries using a GARCH methodology to model both the risk and mean return of each equity index[74]. The author discovered a December effect in 19 countries (Austria, Belgium, Brazil, Canada, Denmark, Estonia, Germany, India, Indonesia, Ireland, Luxemburg, Mexico, Netherlands, New Zealand, Philippine, Switzerland, Turkey, UK and finally in Yugoslavia). Furthermore, a January (April) effect was documented in seven (six) stock markets which varied in size from 0.00342 (for Pakistan) to -0.00124 (for Luxemburg). In each instance, the null hypothesis that the average return was equal to zero was rejected at conventional statistical levels.

Only a limited amount of research on this topic has focussed exclusively on emerging stock markets. In an early study in this area, Aggarwal and Rivoli (1989) investigated seasonal patterns in returns for four emerging markets between 1976 and 1988[75]. Their study confirmed that the January effect was not only prevalent in developed markets but also occurred in emerging markets. Based on their study of daily data for the 12-year period from 1976 to 1988, the results supported the existence of a seasonal pattern in the equity markets studied; returns in the month of January were higher than in any other month for all of the markets examined (with the exception of the Philippines). Ho (1990), using daily returns for a similar period (from 1975 to 1987), arrived at a similar conclusion. He found that six out of his eight Asian Pacific emerging stock markets exhibited significantly higher daily returns in January than in other months of the year. These markets included Hong Kong, Korea, Malaysia, Philippines, Singapore and Taiwan. The author also reported evidence of seasonality

[74] Countries included: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Croatia, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hong Kong, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Kuwait, Latvia, Lithuania, Luxemburg, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippine, Portugal, Russia, Singapore, South Korea, Spain, Sri Lanka, Sweden, Swiss, Taiwan, Thailand, Turkey, UK, US, Yugoslavia and Zambia.
[75] The Countries considered included: Hong Kong, Singapore, Philippines and Malaysia.

during the months of April and December which he linked to the tax year ends in those countries.

A relatively recent study by Fountas and Segredakis (2002) tested for seasonal effects in the stock returns of 18 emerging markets for the period 1987-1995[76]. Although evidence in favour of the January effect was relatively sparse, the existence of significant differences in monthly returns in several countries was well documented; the strongest evidence of a significant monthly seasonal pattern was reported for equities in Chile (January, February, June, August and December), Colombia (April, May, June, September and December), India (August), Malaysia (February, April, May, and December), Mexico (March, May and July), Nigeria (all 12 months) and Zimbabwe (April, May, July and August)[77]. These results confirmed the evidence of a monthly seasonal in emerging market security returns for the 18 emerging markets investigated. More recently, Keong et al. (2010) investigated security returns in 11 Asian countries using a GARCH (1, 1) model over a 20-year period from 1990 to 2009[78]. Their results suggested that share prices increased in December for all the countries, with the exception of Hong Kong, Japan, Korea, and China. A positive January effect was documented for five countries (Indonesia, Philippines, Singapore, Taiwan, and Thailand) with open economies and strong trade links with the US. Furthermore, their results documented an April effect for Indonesia, Malaysia, Korea and China while a May effect was reported for Hong Kong, India, Indonesia and

[76] Countries included: Argentina, Chile, Colombia, Greece, India, Jordon, Korea, Malaysia, Mexico, Nigeria, Pakistan, Philippines, Portugal, Taiwan, Thailand, Turkey, Venezuela and Zimbabwe.
[77] The authors observed that share returns for January were significantly higher than the returns for the remaining 11 months only in Chile, Greece, Korea, Taiwan and Turkey.
[78] Countries included: Hong Kong, India, Indonesia, Japan, Malaysia, Korea, Philippines, Singapore, Taiwan, China and Thailand.

Philippines. In addition, their results demonstrated a negative August effect for Indonesia.

Studies investigating single emerging stock markets have arrived at the same results as their multi-country counterparts. For example, a study by Nassir and Mohammad (1987) documented that in Malaysia, average returns were significantly positive and higher for January than in the other months of the year during the period from 1970 to1986. A relatively recent study conducted by Panday (2002) also examined the data from the Kuala Lumpur stock exchange (the EMAS index); his findings suggested that average returns from February and December were significantly different from those of other months of the year. These findings contrasted with the results from an earlier study by Pang (1988) for the Hong Kong stock market which only highlighted existence of a return seasonality during the month of January. Kumari and Mahendra (2006) studied month-of-the-year effect in the Indian Stock Market over a period from 1979 to 1998. They found that the returns in April were significantly higher than (and different from) their counterparts in other months; the average price change of April was higher than that of the next highest month and this difference was significant with a p-value of 5 percent.

A monthly seasonality has also been documented for the returns of shares listed in African countries. For example Alagidede and Panagiotidis (2009) discovered that returns in April (8 percent) were significantly different from those in other months of the year for Ghana. A more recent study was conducted by Agathee (2008) for the Stock Exchange of Mauritius over the period 1989 to 2006. The results indicated that returns on average were lowest in the month of March (March coefficient = -0.000715). However, regression analysis revealed that returns did not vary significantly according to the months of the year, except for January. Wyeme and Olfa (2011) arrived at a different conclusion; they investigated the existence of the monthly seasonality in daily market returns for the Tunis Stock Exchange over the period from 2003 to 2008. The authors could not detect any January effect; instead, they documented an April effect where the mean daily market returns were significantly higher in April (April coefficient = 0.0019203) than the price changes calculated for rest of the year.

This section has highlighted that monthly seasonal anomalies are present in the share returns for different countries throughout the world. There appears to be evidence of a monthly pattern in returns for developed as well as emerging market countries. Since the Gregorian calendar is the internationally accepted civil calendar, the literature examining seasonal patterns in returns for the Islamic calendar is relatively sparse. The next section reviews the small number of studies that have tested whether Islamic calendar anomalies exist.

3.4 Islamic Calendar Anomalies in Muslim Countries

This section of the chapter reviews the literature on Islamic calendar anomalies. A relatively small number of research papers have been published on this topic in contrast to the sizeable number of studies which have examined security returns for the presence of recurring patterns according to the Gregorian calendar. The Islamic calendar, unlike its Gregorian counterpart, is based on the lunar months. As Chapter 2 indicated, the Islamic calendar year is therefore about 11 days shorter than the Gregorian year. This means that while Muslim holy days fall on the same date in the

Islamic calendar, they actually vary each year by about two weeks according to the Gregorian calendar.

One of the Islamic months that has been explored when testing for a seasonal pattern is Ramadan[79]. Generally, in Muslim countries, business activity in the month of Ramadan is different from that in other months. People fast during daylight hours, visit mosques frequently, pray regularly and participate more in social services. Restaurants and shops are closed during the day. Economic activity in all walks of life slows down as people devote more time to the performance of religious rituals. The working hours, including the trading hours at the exchange, are also reduced (Husain, 1998; Bialkowski et al., 2012). Thus, a number of researchers have investigated whether share returns in this month are different from the price changes which arise in other months of the Islamic calendar.

One of the early investigations in this area was undertaken by Oguzsoy and Guven (2004) who examined data for the Istanbul stock market over the period 1988 and 1999 to study the existence of the Ramadan effect. Based on an analysis of data for the Istanbul stock exchange 100 index and the ISE 30 stock index, this study confirmed that a holy day effect did exist; in other words, the Ramadan effect was prevalent in the Istanbul stock exchange as the results showed a significant increase in the average returns during that period. However, the authors also noted that an investment strategy based entirely on the Ramadan effect was not profitable in itself due to the transaction costs and other trading expenses which would be incurred. More recently, Rehomme and Rejeb (2008) arrived at a similar conclusion when they

[79] Ramadan is the ninth month of the Islamic calendar. It is the month of fasting and also known as the holiest month for the Islamic calendar.

examined the impact of religious events on the Tunisian economy using a 12 month analysis of time series data from 1986 to 2006. Their results confirmed that economic activities in Tunisia were affected by the Islamic calendar; such as, money supply and energy production. The authors determined that some Islamic events influenced the economy more than others such as the Ramadan event.

Another study by Abadir and Spierdijk (2005) tested for the Ramadan effect for four Muslim nations in the Middle-East (Egypt, Jordon, Pakistan and Turkey) and two countries with Muslim majorities in the Far-East (Malaysia and Singapore). They examined the impact of the festive month of Ramadan on stock market indices for these countries and found that anomalies existed; share returns generally followed a pattern during this month. According to their results, index returns tended to be negative before festivities, as investors liquidated positions in advance of the holy days. This underperformance was followed by periods of strong positive gains after the festivities were over when re-investment took place. Hence they concluded that Ramadan activities exerted a sizeable impact on equity returns and trading volumes in Muslim countries. Abadir and Spierdijk's findings confirmed the earlier results of Wong et al. (1990). These authors found evidence in support of several seasonalities in the Malaysian stock market. For instance, they found a January effect, a Chinese New Year effect and an Eid-ul-Fitr[80] effect in their analysis; however, the Eid-ul-Fitr effect associated with the Islamic calendar was less pronounced than its Chinese New Year and January effect counterparts.

[80] Eid-ul-Fitr is a religious holiday celebrated by Muslims worldwide that marks the end of Ramadan.

Further evidence about the influence of Islamic calendar effects on stock market returns was presented by Al-Ississ (2010). He examined the impact of religious events on equity prices and trading volumes on the Muslim holy days during Ramadan and Ashoura for 17 financial markets in "Islamic" countries over a 20 year period from 1988 to 2008[81]. His analysis documented that the religious period of Ramadan was associated with statistically significant positive returns in the financial markets of all Muslim countries investigated; the author discovered that daily returns were 0.05 percent higher (significant at the 95 percent confidence level) for this month as compared to all other months of the Islamic calendar across the 17 Muslim countries. By contrast, Al-Ississ's results showed that the markets experienced a drop of 0.26 percent during the holy day of Ashura in the Islamic calendar month of Muharram. Therefore, the author concluded that Ramadan had a positive impact on daily returns while Ashoura was associated with a negative effect. Interestingly, the results from Al Ississ (2010) highlighted that religious events also affected the trading volumes of the financial markets studied; transactions declined in the Islamic month where these two holy days are located; volume declined by approximately -0.52 percent for Ashoura and -0.33 percent for Ramadan, on average. The study also discovered that the drop in trading activity was largest on the holiest of the days in these months reaching over 50 percent of the daily volume of equities typically purchased and sold. The author attempted to explain the results as follows:

> "Aside from a divine intervention, which is clearly well beyond the earthly confines of this paper, two channels can lead to the statistically significant impact of holy days on market returns. The first channel is that holy days alter the composition of stock market participants due to potentially reduced trading activity by religiously observant investors on holy days. The second channel is that the heightened faith experience on holy days

[81] Ashoura is the 10th day of Muharram in the Islamic calendar and marks the climax of the remembrance of the battle of Karbala.

> affects the mood of investors, thus affecting their decision making process and risk assessment. This mood explanation is consistent with a number of studies that have linked mood to changes in stock market returns." (Al-Ississ, 2010, p.18)

More recently, Bley and Saad (2010) analysed daily share return data at both the market index and company level across the Gulf Coorporation Council (GCC) region[82]. They found that the anticipation of Eid Al Fitr, a Muslim holiday that marks the end of Ramadan, generated significant positive returns in all the GCC countries with the exception of the smallest market, Bahrain. However, the authors found no significant return effect at the beginning of Ramadan. They also noted that the Islamic New Year produced a positive effect only in Qatar. They attributed their findings on Bahrain to the presence of foreign investors in that market:

> "The magnitude of the holiday effect depends not only on the cultural/religion setting of a country market but the cultural/religious background of its market participants. If a local market is dominated by foreign investors, their belief system, even if different from the local investors, is reflected in the return behaviour of the local market." (pg. 306)

In the same year, Al-Hajieh et al. (2011) tested for Islamic calendar anomalies in a different mix of Middle Eastern stock markets during the period 1992 to 2007 (Bahrain, Egypt, Jordon, Kuwait, Qatar, Saudi Arabia, Turkey and the UAE). They documented that mean returns during Ramadan were higher than the yearly mean returns (excluding Ramadan) for four out of the six Middle Eastern stock markets that they studied. For example, in Egypt, Jordan, Kuwait and Turkey, the share return difference during Ramadan was 0.0799, 0.0914, 0.1194 and 0.4985 respectively; only

[82] GCC consists of six members as follows; Bahrain, Kuwait, Quatar, Oman, Saudi Arabia, and the United Arab Emirates. It seeks to strengthen corporation in areas such as trade, investment, agriculture and industry.

the markets in Bahrain and Saudi Arabia did not report significantly higher mean returns for Ramadan.

A recent investigation of the impact of the Islamic calendar on the stock markets of other Muslim countries was conducted by Bialkowski et al. (2012). They studied share returns during Ramadan for a broad sample of 129 Ramadan months in 14 predominantly Muslim countries (including Pakistan) over the years 1989 to 2007. The main aim of this paper was to examine whether Ramadan, a month of religious practice, affected the behaviour of stock market prices. Hence, the countries selected in their research were the ones where the majority of the population are adherents to the Islamic faith. Their findings suggested that during the month of Ramadan, the mean annualized return was, on average, almost nine times greater than the mean return over the rest of the Islamic year (38.09 percent vs. 4.32 percent). The authors used 10 different approaches to test their research question and each time re-confirmed the robustness of the anomaly[83]. They also found that there was a significant decrease in the share price volatility during Ramadan for all of the sample countries with the exception for Turkey. Hence, their results were inconsistent with the notion of an efficient market. Therefore, the authors believed that investors could consistently outperform by buying shares in Muslim countries prior to the start of Ramadan and selling them at the end of the holy month. According to the authors, the transaction costs incurred by such a strategy would appear to be small in comparison to the magnitude of the gain which they observed.

[83] The statistical and econometric methods employed in this paper included: a simple test for equality of two mean returns, the parametric t-test and the non-parametric z-test in both a constant-mean-adjusted and a market-model-adjusted event study, portfolio regressions, a portfolio-based event study, pooled OLS regressions, fixed effects panels and SUR models.

Most recently, Almudhaf (2012) studied seasonal anomalies associated with the stock markets of 12 countries where a majority of the population are Muslims: Bahrain, Egypt, Indonesia, Jordan, Kuwait, Malaysia, Morocco, Oman, Pakistan, Saudi Arabia, Turkey and UAE. The authors found evidence of Ramadan seasonality in equity returns for four countries of their sample. The results indicated that a significant Ramadan effect was present (higher returns during Ramadan) in Jordan, Kuwait, Pakistan, and Turkey.

One reason why a seasonal pattern may exist in share returns at different times of the Islamic calendar is that economic activity in Muslim countries fluctuates according to the Islamic month of the year. Researchers have documented that religious beliefs have an impact on the economic activities of a country. For example, as long ago as the 1930s, Weber (1930) argued that religious beliefs and practice had a significant effect on economic development. Several studies have also examined whether or not the Islamic calendar has an impact on the economic activity of Muslim countries. For example, Alper and Aruoba (2004) analysed the effects of seasonal fluctuations of macroeconomic variables in Turkey around the time of religious events which are associated with the Islamic calendar. They examined 23 monthly macroeconomic time series for Turkey and found that of the 23 variables examined, nine contained significant seasonal effects; these nine variables included measures of aggregate economic activity such as industrial and manufacturing production. The results also indicated that the volatility of the stock market decreased during religious festivals. However, the stock indexes that they analysed did not exhibit any significant Ramadan effect for the Istanbul stock exchange.

These Islamic calendar effect findings suggest that there are patterns in the returns for financial markets in counties that follow or use the Islamic calendar; these findings therefore contradict the weak-form of the EMH. Such patterns may be exploited by investors to gain abnormal profits. Of course, any test of the EMH must consider the risk involved when attempting to exploit such patterns. This thesis will test the existence of Islamic calendar effects in the Pakistan stock market to see whether patterns are present in the data once risk is accounted for. The following section highlights the findings of prior researchers that have focussed on calendar anomalies in the Pakistani stock market; the material in this section should form the backdrop against which the results of the current thesis can be evaluated.

3.5 Calendar Anomalies in the Pakistani Stock Markets

The key investigations underpinning the research in the current thesis are those that have studied monthly seasonal anomalies in the Pakistani stock market; this section of the chapter reviews these key empirical investigations. Empirical studies of the Pakistani stock market that have examined calendar anomalies are relatively sparse when compared with investigations from other emerging markets throughout the world[84]. Furthermore, most of the studies in Pakistan about calendar anomalies have focussed on the day-of-the-week effect (Hussain, 2000, Ali and Mustafa, 2001; Nishat and Mustafa, 2002; Kamal and Nasir, 2005; Shaheen, 2006; Ullah et al., 2010; Hussain et al., 2011). Only a handful of studies have looked at a monthly seasonal effect for the KSE.

[84] As Chapter 2 noted there are three stock exchanges in Pakistan but the most commonly used is the KSE. Therefore, unsurprisingly, most of the studies were conducted on the data from the KSE market.

A summary of the results from all of the Pakistani studies is presented in Table 3.1. A visual inspection of this table highlights that various authors have reached different conclusions about the presence of a monthly seasonal in Pakistani equity returns; possible reasons for these apparently contradicting conclusions might be the different time periods analysed and the various models used to examine patterns in returns. In addition different securities (indices v companies) have been examined; Mahmood (2007) is one of the few studies that examined data for individual shares; all of the others have tested returns for stock market indices. However, even the study of Mahmood (2007) is relatively limited as the author only considered 8 companies in his analysis. A detailed inspection of Table 3.1 reveals that all the studies summarised have only conducted statistical tests to investigate whether a monthly seasonality is present in the Pakistani stock market; none have interviewed market participants about the possibility of a calendar pattern in returns. Furthermore, only one of the studies (Husain, 1998) has taken account of volatility in their analysis. However, even this study is relatively limited as Husain (1998) only focussed on the month of Ramadan and a relatively small time period (5 years) was analysed. Thus, prior studies that have focussed on calendar anomalies in the Pakistani stock market have not examined: (i) whether the volatility of returns varies from month to month in Pakistan; and (ii) whether this change in volatility could explain seasonal pattern which may be present in equity price changes.

Table 3.1 Summary of previous studies that investigated the monthly seasonality for the Pakistani stock markets

No.	Authors	Calendar	Time Period	Sample	Method	Findings
1	Husain (1998)	Islamic	1989 - 1993	Daily share prices of 36 individual shares, 8 sector indices, and the general market index	GARCH (p, q)	No Ramadan effect was found. However, the author found a significant decline in stock returns volatility in Ramadan.
2	Mahmood (2007)	Gregorian	1996 - 2006	Daily and monthly share prices of 8 listed companies in the KSE	ANOVA	The authors reported no monthly seasonal effect in the KSE.
3	Mustafa (2008)	Islamic	1998 - 2004	Daily share price of the KSE-100 index	Regression analysis	The author found an "after-Ramadan" effect and reported that the KSE is a relatively low risky market during the month of Ramadan.
4	Ali and Akbar (2009)	Gregorian	1991 - 2006	Monthly data of the KSE-100 index	ANOVA, OLS and serial correlation	Their analyses for the monthly returns documented no monthly seasonality for the KSE.
5	Zafar et al. (2010)	Gregorian	1991 - 2007	Daily share price of the KSE-100 index	Regression analysis	Their results revealed negative returns in month of May as compared to that of January (used as intercept).
6	Rafique and Shah (2012)	Gregorian	1997 - 2011	Daily share price of the KSE-100 index	Regression analysis	The authors documented no January effect in the KSE. However, the authors reported significantly negative May returns for the KSE market.

Note: Table 3.1 presents a brief summary of studies that have examined the monthly seasonality in the Pakistani stock markets. In particular, the table reports, the authors, the time period analysed, the data frequency (sample), the method employed and the findings of the studies. All the above studies were conducted in the KSE.

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 for eight of the KSE-100 index companies[85]. The one-way ANOVA procedure was employed to test for seasonality in the returns of these eight shares. The results indicated that that the mean returns in all the months were not significantly different from each other for all the eight companies studied (the highest F-statistic was 2.061 with a p-value of 0.08 for Indus motors); 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. The authors also employed a one-way ANOVA test; but they also used, OLS and serial correlation tests to investigate monthly seasonality in the KSE. Their results confirmed the findings of Mahmood (2007). Indeed, they suggested no monthly anomalies were present in the KSE; all the coefficients on their monthly dummy variables in the OLS analysis were insignificant. The authors therefore concluded that the KSE was weak form efficient by stating:

> "Our analysis for the monthly returns for the Karachi 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 Karachi stock exchange that investors can exploit to earn abnormal returns". (p.402)

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 analysis may not

[85] Companies included: Engro Chemicals, Fauji Fertilizer, Sui Northern Gas, Sui Southern Gas, Adamjee Insurance, Indus motors, ICI and Pakistan State Oil.

have been comprehensive and the power of any statistical tests weak. Further research was needed in the area based on more observations.

Zafar et al. (2010) attempted to address this limitation in Ali and Akbar's work. They tested for monthly calendar anomalies in the KSE using regression analysis based on daily share price data of the KSE-100 index for the period 1991 to 2007. Initial descriptive statistics revealed that the month of May recorded the lowest mean return in comparison to all the other months in the year (-0.0044). The results from their regression analysis revealed that the coefficient for January was positive, but insignificant (January coefficient = 0.2146, and t-value = 1.4085); suggesting that no January effect was present in the market. Furthermore, the coefficient for May was negative and significant (May coefficient = -0.4131, t-value = -2.3693). Therefore the authors concluded that the KSE market was weak form inefficient.

More recently, Rafique and Shah (2012) investigated KSE data for the existence of any calendar anomaly. They analysed daily share price data of the KSE-100 index to test for any seasonality. Regression analysis was conducted for the entire period with the month of January subsumed in the constant term. 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 also reported. Rafique and Shah's analysis also revealed that highest average mean return for all the months occurred in January (22.860) whereas the lowest average was recorded in May (-36.735). The authors reported that:

> "We have found one significant coefficient (-0.529986) for the dummy variable of MAY (*D5t*) which enables us to believe that mean returns

> of each month are not equal to each other and thus not equal to zero. This provides evidence for the negative anomaly in returns for the month of May (May Effect) instead of a January Effect." p.91

Most studies which investigated calendar anomalies in the Pakistani market have used data for the KSE-100 index and focussed on the Gregorian calendar; an investigation of data for individual companies' shares might offer a clearer understanding into the nature of any seasonality in the Pakistani stock market. Furthermore, these studies fail to take the issues of varying time volatility into account; volatility needs to be modelled in order to provide a clearer picture of whether any monthly seasonal pattern in the Pakistani equity markets is an anomaly or the rational response to shifts in volatility over time. Two exceptions to this generalisation were the studies by Mustafa (2008) and Husain (1998) which examined share price data from the KSE for any anomalous behaviour around Islamic calendar months while modelling volatility in their equations.

Husain (1998) was one of the earliest studies to address this issue. He conducted an analysis of daily stock prices and daily index values selected from the KSE. The data consisted of equity prices for 36 individual shares, 8 sector indices and the general market index; it covered the 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. The largest sectoral decline in mean returns was documented for the Chemical industry at -0.195 percent while the biggest reduction in average returns for individual shares was achieved by Baloch securities at -0.380 percent; however, both reductions were not significantly different from zero at the 1 percent level. Hence, the author concluded that the religious observances associated with Ramadan did not affect the average return achieved by equities in Pakistan. However, Husain did uncover a significant decline in return volatility during the month of Ramadan. The biggest decline in return volatility was for the Chemical sector at -0.141 percent while the greatest drop in return volatility for an individual security related to Grindl at -1.713 percent; both reductions were significant at the 5 percent confidence level. Husain therefore concluded that:

> "The Ramadan does not significantly affect the average return in the market. On the other hand, there is strong evidence of a significant decline in the volatility of stock returns in this month. The decline in volatility may be attributed to the generally slow pace of economic activity, including a reduction in trading hours in Pakistan in the month of Ramadan. On the other hand, many Muslims may refrain from stock market speculation in this month. Hence, whether it is the moral factor or the reduced trading hours that is responsible for the decline in volatility needs further investigation." (p. 79).

Husian (1998) also pointed out that although the average return did not change significantly in Ramadan, as volatility was reduced, an attractive investment opportunity existed for investors[86].

One criticism that can be levelled at Husain (1998) is that he only focussed on the month of Ramadan and analysed data for a relatively small time period (5 years). The paper by Mustafa (2008) attempted to address this issue. Specifically, the study by Mustafa (2008) analysed both conditional and unconditional measures of risk to investigate the impact of Islamic calendar effects using daily share price data for KSE-100 index; he used five regression models to measure equity returns over the period 1998 to 2004: a simple OLS regression model; an OLS model with a constant risk factor; an unconditional risk model; a positive and negative risk factor model; and

[86] A more recent study by Seyyed et al. (2005) found similar results for the Saudi Arabian stock market over the period 1985 to 2000.

a conditional model. The results indicated that the average return in the month of Ramadan was small and insignificant, which suggested that there was no Ramadan effect in the Karachi stock market. However, positive and significant average returns were documented in the month of Shawwal and Zil Qa'ad. Although different models produced different results, the Zil Qa'ad effect was found in all the models whereas the Shawwal effect was found in all except one model. Shawwal is the 10th month in the Islamic calendar whereas Zil Qa'ad is the 11th month in the Islamic calendar. Thus, Mustafa (2008) reached the conclusion that there was a post-Ramadan effect in the Karachi stock market because these two months followed Ramadan. The author argued the following:

> "During this month and for Eid festival the consumption of people increases and they pay less attention towards investment in stock market. After Ramadan and Eid people concentrate to investing in the stock market that is why trading activity increases in the month of Shawwal and Zil Qa'ad in Karachi stock market." p.7

Moreover, the author discovered that investors preferred to invest in the month of Shawwal more than the month of Zil Qa'ad; the author explained that after Eid, people concentrate on investing in the stock market; that is why trading activity increases in the month of Shawwal. His results also indicated that the KSE was a relatively low risk market during the month of Ramadan, which is in line with the findings of earlier studies in this area[87].

[87] Only 6 months of the Islamic calendar were investigated in his analysis; a full Islamic calendar investigation might have reached more comprehensive findings.

3.6 Investor Sentiment and Calendar Anomalies

A separate line of research during the mid-1980s has focused on the psychological aspects of investor decision making and their impact on share prices. This line of research is generally termed behavioural finance and seeks to apply insights from the psychology literature to explain financial behaviour[88]. Although it started in the 1980s with the investigation of stock market overreaction (De Bondt and Thaler; 1985, 1987) it was not until the 1990s that researchers in behavioural finance began to challenge the efficient market hypothesis. Some researchers suggested that the notion of market efficiency may be more complex than originally assumed (De Bondt and Thaler, 1985); they built models which recognised that people might not necessarily act 'rationally' as economists and financial researchers had assumed. From the 1980s, researchers have attempted to explain patterns in the stock markets using behavioural finance theory[89]. Market professionals and researchers began to realise the importance of learning from cognitive psychology about how individuals make judgements; they recognised that humans are prone to biases which can significantly affect their decision making process (Johnson and Tversky, 1983).

It is also believed that any heightened faith-experience on holy days and during religious months affects the mood of investors; it affects their decision making processes and risk assessments which in turn impact on market returns (Al-Ississ,

[88] According to Subrahmanyam (2007), finance education in general can be more useful if it sheds specific light on active investing by addressing aspects such as: (i) what mistakes to avoid while investing; and (ii) what strategies in financial markets are likely to work in terms of earning abnormal returns. These are the main pedagogical goals of behavioural finance, which allows for explanations of financial phenomena based on non-rational behaviour amongst investors.

[89] Some researchers have developed models of behavioural finance (Tversky and Kahneman, 1986). These behavioural models are based on how people actually behave based on extensive experimental evidence, as well as survey and interview findings.

2010). This explanation of investor behaviour is consistent with a number of studies that have linked mood to changes in stock market returns. The important role played by religion has been highlighted in several studies that date back to the 1930s (Weber, 1930). For example, Weber (1930) argued that religious beliefs and practice had a significant effect on economic development. Another study by Stulz and Williamson (2003) documented empirically that religion had the power to explain cross-country variations in creditor rights and the level of enforcement associated with business debts. The current thesis acknowledges that religious and social norms can have some bearing on the investment decision. Given that Islamic calendar months differ from each other in the emotions which they evoke within religious observers, the Islamic calendar anomaly may be explained by investor sentiment. For example, the month of Ramadan is associated with: (i) positive emotions such as purity, peace and happiness from observing the fast; as well as (ii) enhanced worship requirements, especially during its holiest days (Al-Ississ, 2010). Indeed, several verses of the Quran are explicit about the duties of Muslims during Ramadan:

> "O you who believe! Observing As-Saum (the fasting) is prescribed for you as it was prescribed for those before you, that you may become Al-Muttaqun (pious)." (Chapter 2, 183)

In a subsequent verse, the holy book states that:

> "(These days are) the month of Ramadan in which the Quran was revealed to serve as a good direction to men and clear proofs of the right direction and discernment" (Chapter 2, 185)

Ellison et al. (2009) suggested that the impact of religion on security returns was not limited to Muslims. For instance, Ellison et al. (2009) demonstrated that religious beliefs (of all kinds) and high degrees of social integration positively influenced individuals' feeling of tranquillity. It is therefore plausible that as many investors reach a state of inner peace and calmness, the behaviour of share prices change to reflect this specific mood of the stock market participants.

Previous research in this area has documented the influence of emotional states on cognitive[90] processes such as information processing (Tiedens and Linton, 2001; Bagozzi et al., 1999) and risk perceptions (Lerner and Keltner, 2001; Isen et al., 1988; Johnson and Tversky, 1983). Indeed, as far back as 2001, Richard Taffler concluded the following:

> “Psychologists teach us that because of our congnitive limitations all of us, however professionally well qualified or experienced, are prone to a number of key biases in our judgements. We are also frequently forced to resort to the use of heuristics, trial and error, back-of-the-envelope rules of thumb, which we use to simplify our complex judgement or decision tasks. However, such simplification strategies often lead to adverse consequences for the judgements we make” p.21

A number of researchers have sought to explain the anomalous behaviour of stock markets by linking the mood of investors to changes in equity returns. Research in psychology indicates that feelings need not be extremely intense to be potent (Clark and Isen, 1982). In fact, mild, transient, pervasive feelings or "moods" may influence one's ongoing behaviour (Clark and Isen, 1982; Gardner and Vandersteel, 1984). They suggest that moods may play an important role in the decision making processes of an investor. Several researchers have argued that feelings may be a key influence on the information processing activities of investors and aspects of consumer behaviour (Park et al., 2007; Hirschman and Holbrook, 1982).

[90] Cognitive is the psychological term for "the process of thoughts" or information processing view of an individual.

Mood may also play an important role in judgmental and evaluative processes. For example, emotions and moods have been found to effect the decision making of individuals (Bagozzi et al., 1999). Indeed, moods have been shown to influence judgment regarding uncertain future events, with a good mood leading to a more positive evaluation in a number of situations (Wright and Bower, 1992). Positive moods have been found to increase the likelihood of helping people (Isen and Levin 1972), and the probability of leaving a generous tip in a restaurant (Cunningham 1979)[91]. Also, a "happy" person tends to believe that good weather is more likely than bad weather (Bower, 1991; Mayer et al., 1992). According to Wright and Bower (1989), a person in a good mood tends to be rather "optimistic"; they report higher probabilities for positive events and lower probabilities for negative events. Conversely, Wright and Bower (1989) imply that people in a negative mood are "pessimistic", providing lower (higher) probabilities for positive (negative) events. Of special relevance to financial markets is the finding that moods influence peoples' judgment of risk (Johnson and Tversky, 1983)[92]. Johnson and Tversky (1983) discovered that subjects with a positive mind set tended to believe that events with favourable outcomes would occur more frequently, and that events with unfavourable outcomes would occur less frequently than a control group anticipated.

One of the early empirical studies explaining the effect of mood on stock markets was conducted by Saunders (1993). He documented that returns for the NYSE were positive, on average, on sunny days; by contrast, returns were only moderate on days characterised by a lot of cloud. Hirshleifer and Shumway (2003) confirm this finding with evidence from a number of international markets. Their study examined the

[91] For a more comprehensive review of research in this area, see Clark and Isen 1982.
[92] For a review of the impact of mood on decision making see Loewenstein et al. (2001) and Hirshleifer and Shumway (2003).

relationship between the number of hours of morning sunshine in the city of a country's leading stock exchange and the daily returns earned by the market index; they performed their analysis with data for 26 countries from 1982 to 1997. They found that sunshine was strongly associated with share returns. After controlling for the number of hours of sunshine, variables measuring rain and snowfall were found to be unrelated to returns. However, they suggested that the use of weather-based trading strategies was only optimal for an investor with very low transactions costs. Overall, their study indicated that investor mood (which was supposedly negative on cloudy days) affected the stock market.

Cao and Wie (2004) conducted a study on how temperature affects mood and how mood-changes in turn cause variations in equity investment behaviour. They found a negative correlation between temperature and returns across the whole range of temperatures for different stock markets around the world; they confirmed that mood affected the behaviour of investors. These findings built upon earlier research by Kamstra et al. (2000) who documented that returns around the weekend of the switch to standard time from daylight savings time were very negative. They suggested that induced depression from the switch amongst investors along with seasonal affective disorder caused the negative return[93].

Edmans et al. (2007) indicated that the outcomes of sporting events involving the country as a whole impacted on the stock market of the country. Their paper investigated the stock market reaction to sudden changes in investor mood. Motivated by psychological evidence of a strong link between soccer outcomes and mood, the

[93] Daylight saving occurs when clocks are adjusted forward one hour near the start of spring and backwards one hour in autumn to make better use of daylight in evenings.

authors used international soccer results as the primary mood variable. The authors documented a significant market decline after soccer losses. Specifically, the authors found that a loss in the Soccer World Cup elimination stage lead to a next-day abnormal stock return of -0.49 percent. They also documented a negative stock market performance after losses in international cricket, rugby, and basketball matches. The authors argued that it was hard to imagine what else but mood could cause this effect.

Happy subjects are more optimistic in their risk assessment (Lerner and Keltner, 2001), and feel more certain in subsequent situations (Tiedens and Linton, 2001). Also, according to Smith and Ellsworth (1985), happiness is associated with appraisals of elevated certainty and individual control. Conversely, unhappy subjects experience the opposite feelings[94]. It is well established that negative mood adversely distorts people's perceptions and judgments (Carson and Adams, 1980; Cunningham, 1988; Gorn et al., 1993; Johnson and Tversky, 1983; Mayer et al., 1992; Wright and Bower, 1992). For example, Alloy and Ahrens (1987) found that people in a sad mood were less likely to underestimate the probability of negative events, or to overestimate the possibility of positive ones. Also, Tabachnik et al. (1983) argued that people with a negative mind set were less likely to overestimate their own abilities in ambiguous task situations. For example, Frieder and Subrahmanyam (2004) tested the effect of Jewish sentiment on the U.S. equity market by examining return and volume data around major Jewish Holy Days on which the stock market is open. They found that

[94] One application of this behavioural approach in the current study relates to the month of Muharram; this time of the year is dominated by negative emotions such as sadness. The key reason for sadness amongst most Muslims in the month of Muharram is because the day of Ashura falls in this month. The day of Ashura is seen by Muslims as a day of mourning for the martyrdom of Hussain ibn Ali, the grandson of the Islamic Prophet Muhammad, at the Battle of Karbala on 10 Muharram in the year 61 AH (October 2, 680 CE).

share returns were negative after Yom Kippur (which is a relatively solemn occasion), whereas they tended to be positive after Rosh Hashanah (which is more joyful).

Thus, there is an increasing literature linking investor sentiment to changes in share returns; academic writers have argued that investor psychology may explain the anomalous behaviour in the stock markets (this is specially true for Islamic calendar months). Some of the studies discussed in the previous sections have attributed positive Ramadan returns due to positive investor sentiments (Al-Ississ, 2010; Bailkowski et al., 2012) whereas the others have explained the decline in the volatility of share returns in terms of trading activity during this month (Husain, 1998; Seyyed et al., 2005; Mustafa, 2008). The current thesis will built upon the findings by conducting interviews with practitioners (see Chapter 5) to ascertain views about the role of investor sentiment in the Pakistani stock markets and whether returns vary from one Islamic month to another where the different months from the Islamic calendar are associated with various sentiments.

3.7 Conclusion

This chapter has highlighted a number of empirical studies that have examined the weak-form of the EMH in developed and emerging markets using various testing procedures. Specifically, the focus is on calendar anomalies in the developed and emerging markets; special attention is paid to the Pakistani stock markets' however. The main conclusion that emerges from the studies reviewed in this chapter is that a vast majority of studies were conducted in developed markets; the findings from developed stock markets indicated that these markets are more efficient than their emerging counterparts. What also emerges from the analysis of the literature is that an increasing level of attention has been paid to emerging markets over the past two decades. In addition, the literature confirms the existence of differing returns at different calendar months for both the Gregorian and Islamic calendars. The review also indicated that there is an increasing literature linking investor sentiment to changes in share returns; academic writers have argued that investor psychology may explain this anomalous behaviour in the stock markets.

Further, the literature review has shown that little investigation has been performed in the Pakistani stock markets, specially using the Islamic calendar. Table 3.1 presents the findings from all of the studies of the Pakistani stock market to date. Evidence from Pakistan reveals conflicting results with some studies suggesting that no monthly seasonal anomaly is present in the market (Mahmood, 2007; Ali and Akbar, 2009) while others argue that returns in certain months are significantly different from others and suggest that there are patterns in the share prices of the Pakistani equities which may be exploited by trading rules (Mustafa, 2008; Zafar et al., 2010; Rafique and Shah, 2012); this contradicts the weak form of the EMH. Various authors have reached different conclusions. Possible reason for these different conclusions might be the different time periods analysed and the use of various models. Since the findings from this small number of investigations are mixed, perhaps further work on this topic is needed which allows risk to vary over time (Husain, 1998 and Mustafa, 2008). Husain’s relatively old paper examined only a limited time span, while Mustafa focused on index data and only examined six of the Islamic months. The current research resolves the issues highlighted earlier by testing a large number of firms listed on the KSE and examining a longer period of share price data for Gregorian and

Islamic calendars. Furthermore, the literature revealed that prior studies on the Pakistani stock market had only used statistical analyses to ascertain the share price regularities with regards to monthly calendar anomalies. Therefore, interviews along with statistical analysis shall provide a much richer set of findings; the use of this mixed-methods approach should bring robustness to the research findings. Thus, the current thesis extends the existing literature and adds to our knowledge about financial markets.

Chapter 4

Research Methodology and Methods

4.1 Introduction

The main purpose of the current chapter is to outline the methodology and methods used for this research; specifically, a description of methodology is supplied so that the ideological perspective underpinning the research is apparent to the reader. The main purpose behind the description of the method is to answer ‶questions regarding the way in which data will be collected" (Saunder et al., 2009). The research philosophy is based on the researcher's world view; it informs any interpretation of, and decisions about what constitutes, data, facts and knowledge. It is an important component of the research process since it helps to frame the questions addressed as well as to guide the selection of an appropriate research design. This chapter discusses a range of philosophical positions available and justifies the position selected for the current thesis. These philosophical assumptions will shape the empirical work in the subsequent chapters.

The remainder of this chapter is organised as follows. Section 4.2 provides a detailed description of the four paradigms or research categories identified by Burrell and Morgan (1979). This section also sheds light on the philosophical assumptions that underpin this research. Section 4.3 provides a brief critique of the Burrell and Morgan (1979) framework. The research location is discussed in Section 4.4 while Section 4.5 outlines the research methods selected for the study; the section justifies the use of quantitative as well as qualitative methods when addressing the research questions examined in the current thesis. This justification is followed by a brief description of the semi-structured interview method which is used to gather some of the empirical findings for this study. Finally, Section 4.6 concludes the chapter.

4.2 Research Paradigms

Research can be defined in a number of ways, such as the search for knowledge or an investigation to establish facts in order to solve new or existing problems. For example, Hoque (2006) defines research as "...a voyage of discovery, or a choice of theoretical perspective as well as gathering empirics or facts on a problem or a situation" (p. 1). Research involves questions (why, how, what, when or where) or problems to be addressed. Indeed, Creswell (2005) defines research from a functionalist point of view: according to his perspective, "research is a process of steps used to collect and analyze information in order to increase our understanding of a topic or issue" (p. 3). Any investigation concerned with society or human behaviour is referred to as social science research. All social science research has philosophical ideas underpinning the phenomenon being studied. Burrell and Morgan (1979) provide a detailed analysis of the philosophical assumptions underpinning different methods of research in the social sciences.

Burrell and Morgan (1979) indentified two key dimensions of analysis: a dimension involving assumptions about the nature of science and a dimension involving assumptions about the nature of society. According to Burrell and Morgan (1979), assumptions about the nature of science can be thought of in terms of a subjective–objective dimension, while assumptions about the nature of society can be characterised along a regulation–radical change dimension[95]. The authors indicate that all approaches to the investigation of social science are based on the various sets of assumptions that relate to ontology, epistemology and human nature which together

[95] Laughlin (1995) outlined three key dimensions which are different from Burrell and Morgan's (1979). These dimensions were named theory, methodology and change. Laughlin (1995) further mentioned three different positions on each of these dimensions: high, medium and low.

shape the methodology of an investigation. These assumptions about social science research are shown in Figure 4.1.

Figure 4.1 Assumptions in Social Science Research

The Subjective approach to social science				The Objective approach to social science
Nominalism Individual consciousness	←	**Ontology** Is the topic real or socially constructed?	→	**Realism** Concrete structure
Anti-positivist Interpretation	←	**Epistemology** How do we gain knowledge about the topic?	→	**Positivist** Observation
Voluntarism Free will	←	**Human nature** Can we do as we want or are there are rules directing us?	→	**Deterministic** Defined
Ideographic Subjective	←	**Methodology** How are we going to do the research?	→	**Nomothetic** Scientific /objective

Note: Reproduced from Burrell and Morgan, 1979. p.3

Based on these assumptions the researcher will be able to identify whether the research is subjective or objective in nature. According to Burrell and Morgan, objectivism assumes a separation between the subject (r esearcher) and the object (knowledge), a belief in an external world and human behaviour that can be known, described, and predicted; they suggested that in this situation, the research methodology used must maintain this subjective-objective separation (Martin and Nakayama, 1999). Where the researcher is located on this objective-subjective continuum of research depends, according to Burrell and Morgan, on their ontology, epistemology, views on human nature and methodological approach. According to Figure 4.1, the ontology assumption relates to the researcher's view of the world; it ranges along a continuum from nominalism to realism depending on whether the researcher views the world as having a reality which exists independent of individual consciousness or not. Wand and Weber (1993) refer to ontology as "a branch of philosophy concerned with articulating the nature and structure of the world" (p. 220). The realism position refers to something which can be talked about, something which is knowable, objective and real[96]. By contrast, the nominalist position asserts that social phenomenon and their meanings cannot have an existence that is independent of social actors. Therefore, society is socially constructed in the minds of individuals.

In the social sciences, the assumption about epistemology refers to the study of knowledge, knowing and belief. As a result, it relates to the ways in which knowledge can be acquired (Bryman and Bell, 2007). According to Hirschheim et al. (1995) epistemology denotes "the nature of human knowledge and understanding that can possibly be acquired through different types of inquiry and alternative methods of investigation" (p. 20). In other words, it describes how it is possible to know about and study society. It is concerned with the nature, scope and limitations of knowledge. It addresses questions about what knowledge is and how is it acquired, what people know and how they know things[97]. Burrell and Morgan (1979) suggested that epistemological assumptions range along a continuum from positivism to anti-positivism. Positivism suggests that the social world can be analysed in a manner similar to that of the natural sciences. In contrast, the view of anti-positivism relates epistemology to elements such as values, norms and perceptions; it suggests that the subjective position of the researcher and the research community are important for

[96] Morgan and Smircich (1980) noted that "Once one relaxes the ontological assumption that the world is a concrete structure, and admits that human beings, far from merely responding to the social world, may actively contribute to its creation, the dominant methods become increasingly unsatisfactory, and indeed, inappropriate" (p.498).

[97] Together the ontological and epistemological assumptions direct the researcher to investigate various phenomenons (Burrell and Morgan, 1979; Chua 1986; Creswell, 1994).

deciding about what constitutes knowledge (Bryman and Bell, 2007). Thus, the two positions reflect different views of the world and the way in which the research should be conducted.

Assumptions about human nature are also classified along a spectrum by Burrell and Morgan (1979) with two extreme positions discussed: voluntarism and determinism. A researcher's position on this spectrum depends upon their view of whether an individual can do what they want (because they have "free will") or whether there are rules directing people's actions. According to Burrell and Morgan (1979, p.6), a determinist view "regards man and his activities as being completely determined by the situation or environment in which he is located" while a voluntarist view assumes that "man is completely autonomous and free-willed".

Thus, a researcher's ontological, epistemological and human nature assumptions about the social world determine the methodological stance of the research and of the study being undertaken. Burrell and Morgan (1979) argue that methodology can be divided into nomothetic and ideographic approaches. The nomothetic approach is scientific and objective in nature whereas the ideographic stance is more subjective in outlook. Nomothetic methodology focuses on an examination of regularities and relationships based on universal laws, while ideographic approaches centre on reasons why individuals create and interpret their world in a particular way (Putman, 1983).

Burrell and Morgan (1979) also suggested that a researcher's assumptions about the nature of society could split into two extreme positions: the sociology of regulation and the society of radical change. According to Burrell and Morgan, the sociology of regulation refers to “a sociology which is essentially concerned with the need for regulation in human affairs; the basic questions which it asks tend to focus upon the need to understand why society is maintained as an entity” (p. 17). The sociology of regulation, does not seek fundamental changes within the society; instead it focuses on studying the status quo. Conversely, the sociology of radical change, according to Burrell and Morgan (1979) is “concerned with what is possible rather than with what it is; with alternatives rather than acceptance of the ‘status quo’” (p.17). The differences between the two extreme viewpoints of the nature of society are highlighted in Figure 4.2

Figure 4.2 Assumptions about the Nature of Society

The Sociology of REGULATION is concerned with:	The sociology of RADICAL CHANGE is concerned with:
1) The status quo 2) Social order 3) Consensus 4) Social integration and cohesion 5) Solidarity 6) Need satisfaction 7) Actuality	1) Radical change 2) Structural conflict 3) Modes of domination 4) Contradiction 5) Emancipation 6) Deprivation 7) Potentiality

Note: Reproduced from Burrell and Morgan 1979. p.18

Based on their categorisations of assumptions about society as well as approaches to research, Burrell and Morgan (1979) identified the four distinct paradigms in social science research: the functionalist, interpretive, radical humanist and radical structuralist paradigms. The authors combined the subjective – objective dimension about the nature of science with the regulation – radical change dimension about the nature of society when identifying these four paradigms. Paradigms are described as “an approach to knowledge adopting particular theoretical assumptions, goals and methods" (Burrell and Morgan, 1979). A paradigm provides a conceptual framework for understanding the social world. According to Burrell and Morgan (1979), "to be located in a particular paradigm is to view the world in a particular way." Indeed, the term paradigm is equated with the notion of "world view" by Patton (1990). However, it was Kuhn (1970) who introduced the term as "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners"[98]. The significance of paradigms is that they characterise how a researcher observes the world and allows the researcher to reflect on their role in the research process.

The four paradigms, proposed by Burrell and Morgan (1979), are mutually exclusive; thus, Burrell and Morgan suggested that a researcher cannot operate in more than one paradigm at a given point in time as in accepting the assumptions of one paradigm, the assumptions of all others are disregarded[99]. The four paradigms are shown in Figure 4.3:

[98] In the postscript to the second edition of his book, Kuhn (1970, p. 175) provides a useful definition of a paradigm; "it stands for the entire constellation of beliefs, values and techniques, and so on shared by the members of a community."

[99] Building on the work of Burrell and Morgan (1979), Chua (1986) identified three paradigms that where different from those presented by Burrell and Morgan (1979). The paradigms identified by Chua (1986) were the mainstream, interpretive and critical approaches. According to Chua (1986), mainstream accounting assumptions were based on beliefs that there is a world of objective reality that exists independently of human beings and that has a determinant nature or essence that is knowable; interpretive accounting researchers believe that social reality is a consequence of human behaviour; for critical approach, the beliefs are concerning the relationship between theory and practice.

Figure 4.3 Paradigms in Social Science Research

	The Sociology of Radical Change		
Subjective	Radical Humanist	Radical Structuralist	**Objective**
	Interpretive	Functionalist	
	The Sociology of Regulation		

Note: Reproduced from Burrell and Morgan (1979). P.22

Each paradigm has its own set of assumptions, with regard to one's understanding of social science research and the nature of society; each therefore characterises a different approach to research. Burrell and Morgan (1979) suggested that:

> "It will be clear from the diagram that each of the paradigms shares common set of features with its neighbours on the horizontal and vertical axes in terms of one of the two dimensions but its differentiated to the other dimension. For this reason they should be viewed as contiguous but separate – contiguous because of the shared characteristics, but separate because the differentiation is, as we shall demonstrate later, of sufficient importance to warrant treatment of the paradigms as four distinct entities. The four paradigms define fundamentally different perspectives for the analysis of social phenomena. They approach this endeavour from contrasting standpoints and generate quite different concepts and analytical tools." (p.23)

It is vital for the researcher to be aware of the particular paradigm that they are located in since location has implications for the methods which may be appropriate to address the research question being addressed. Although each of the paradigms shares a common set of features with its neighbour on the horizontal and vertical axes, they have quite separate connotations of what constitutes research in the social science area[100].

The functionalist paradigm is based upon a positivist stance. It is the central paradigm which is used to study finance (Burrell and Morgan, 1979). The main assumptions of this paradigm are that human behaviour is rational; as a consequence, logical explanations of all actions and interactions within society can be discussed. It seeks to provide rational explanations of human activities. It adopts a realistic view of the world and is firmly embedded in sociological positivism; the research question under consideration has measurable and observable outcomes. This paradigm assumes that the social world is composed of knowable empirical facts that exist separate from the researcher and reflects on the attempt to apply models and methods from the natural sciences to the study of human behaviour (Burrell and Morgan, 1988; Deetz, 1996; Gudykunst and Nishida, 1989; Mumby, 1997). Burrell and Morgan (1979) state that "the functionalist approach to social science tends to assume that the social world is composed of relatively concrete empirical artefacts and relationships which can be identified, studied and measured through approaches derived from the natural sciences" (p. 26). Relationships and organizational behaviours are concrete and can be identified, studied and measured via hypothesis testing. According to Burrell and Morgan (1970), this paradigm "has provided the dominant framework for the conduct of academic sociology and the study of organisations ... it is characterised by a concern for providing explanations of the status quo, social order, consensus, social integration, solidarity, need satisfaction and actuality. It approaches these general sociological concerns from a standpoint which tends to be realistic, positivist,

[100] Burrell and Morgan (1979) suggested that each paradigm "offer alternative views of social reality, and to understand the nature of all four is to understand four different views of society" (p.25).

determinist and nomothetic" (pp. 25-26). Research in this paradigm is positioned at the sociology of regulation end of the continuum and is objective in nature. Therefore it is located in the bottom right of Burrell and Morgan's (1979) matrix shown in Figure 4.3. Studies based on the functionalist paradigm are often problem-oriented in approach and attempt to provide practical solutions to practical problems.

The interpretive paradigm suggests that research is subjective and located within the boundaries of the sociology of regulation; it does not seek to challenge the status quo. Understanding and knowledge can be gleamed from individuals' perceptions; the researcher can examine an issue by studying individual behaviour and ascertaining individuals' views on a topic. Since reality cannot exist independently of individuals, this paradigm suggests that reality can only be studied by examining individuals' perceptions. It highlights the subjective nature of the world where individuals are interested in understanding the non-physical aspects of their lives. Burrell and Morgan (1979) mentioned that:

> "interpretive sociology is concerned with understanding the essence of the everyday world. In terms of our analytical schema it is underwritten by an involvement with issues relating to the nature of the status quo, social order, consensus, social integration and cohesion, solidarity and actuality ... it challenges the validity of the ontological assumptions which underwrite functionalist approaches to sociology in general and the study of organisations in particular" (pp. 31-32).

The radical humanist paradigm, according to Burrell and Morgan (1979), is "defined by its concern to develop the sociology of radical change from a subjectivist standpoint" (p.32). It is mainly interested in removing the social barriers that limit human potential. Researchers who adopt this paradigm see currently prevailing principles and philosophies as separating people from their "true potential" (Gallhofer and Haslam, 1996). The Radical humanist paradigm shares the interpretive paradigm's subjective approach to social science however it is located towards the sociology of radical change end of the continuum. Hence, according to Burrell and Morgan (1979), researchers within this paradigm place more emphasis on radical change, modes of domination, emancipation, deprivation and potentiality (for example, Chua, 1996; Davis and Sherman, 1996; Gallhofer and Haslam, 1996; Paisey and Paisey, 1996)

The last paradigm in Burrell and Morgan's (1979) matrix is labelled the radical structuralist. Researchers in this paradigm are also concerned with the sociology of radical change while adopting an objective approach to social science research – similar to the functionalist paradigm[101]. Burrell and Morgan (1979) state that:

> "Radical structuralism is committed to radical change, emancipation, and potentiality, in an analysis which emphasises structural conflict, modes of domination, contradiction and deprivation. It approaches these general concerns from a standpoint which tends to be realist, positivist, determinist and nomothetic." (p.34)

This paradigm is based upon an ontology which emphasises the hard and concrete nature of the reality which exists outside of the minds of men. Researchers in this paradigm aim at providing a critique of the status quo; it is a perspective which is concerned not just with understanding the world, but with changing it.

[101] This has been the fundamental paradigm of Marx, Engles, Bukharin, Plekhanov and Lenin (Burrell and Morgan, 1979).

4.3 A Critique of Burrell and Morgan (1979) Framework

As organisational science and research techniques have continued to evolve, the framework presented by Burrell and Morgan (1979) has been subjected to a number of critical commentaries. For example, Chua (1986) argued that:

> "The Burrell and Morgan framework … is not without its problems … these problems stem from: (a) their use of mutually exclusive dichotomies (determinism v. voluntarism); (b) their misreading of Kuhn as advocating irrational paradigm choice; (c) the latent relativism of truth and reason which their framework encourages; and (d) the dubious nature of the differences between the radical structuralist and humanist paradigms" Chua (1986), p. 603

She argues that the four paradigms of Burrell and Morgan do not accommodate certain perspectives on society. According to Chua (1986), Burrell and Morgan's assumption that the four paradigms are separate from each other is not justifiable; therefore, she identified three paradigms within accounting and finance research; the mainstream, the interpretive and the critical research paradigms. Like Hopper and Powell (1985), Chua (1986) merged two of Burrell and Morgans's paradigms (the radical humanist and the radical structuralist) into one, namely, critical research. She also criticised Burrell and Morgan's (1979) work by linking it to the seminal work on the process of theory development by Kuhn (1970), from where Burrell and Morgan's paradigm typology was drawn. Chua (1986) argued that Burrell and Morgan misinterpreted the work of Kuhn; for example, she highlighted that their "interpretation of Kuhn as encouraging irrationalism (there are no good reasons for preferring one theory to another) as the basis for theory choice" was wrong suggesting that this "misreads his rational intent" (Chua, 1986, p. 626). Indeed, Willmott (1993) suggests that "the central arguments of [Burrell and Morgan's] paradigms depart from [Kuhn's] work". Further, Willmott (1993) argues that Burrell and Morgan's paradigms "unnecessarily constrain the process of theory development within the confines of its polarised sets of assumptions about science and society (p. 682)"

Other studies have criticised the subjective – objective dualism concept presented by Burrell and Morgan[102]. For instance, Deetz (1996) argues that "the most problematic legacy of Burrell and Morgan's analysis is the perpetuation of the subjective – objective controversy" (p. 193). Likewise, Willmott (1993) suggested that the "division between 'subjective' and 'objective' approaches to social science is problematical, or anomalous; and is therefore a social construction that can, and should be, addressed and resisted rather than treating it as an immutable metaphysical principle that must simply be accepted and obeyed". Indeed, in an attempt to overcome this problem, Laughlin (1995) presented a three-dimensional framework labelled theory, methodology and change as an alternative to Burrell and Morgan's subjective – objective dimension. Despite the fact that the Burrell and Morgan framework has been questioned and criticised by numerous commentators, the research in this thesis recognises the benefits of Burrell and Morgan's (1979) typology as a device to make explicit philosophical assumptions that underpin the current study; therefore, their framework is adopted for the purpose of this thesis.

[102] Willmott (1993) states: "Burrell and Morgan's polarisation of subjective and objective dimensions of social science transforms a dualistic tendency in organizational analysis into a metaphysical principle" (p. 705).

4.4 Research Location

To be located in a particular paradigm implies that the researcher views the world in a particular way. According to the meta-theoretical assumptions underpinning this thesis a reality exists independent of the researcher. Specifically, share prices are seen as real tangible items of information which convey important details about a company; they have real consequences for decisions both within a company and externally among owner-investors. Further, the main research question motivating this thesis seeks to explain whether patterns may exist in share price changes which can have important consequences for the efficiency of the Pakistani stock market; apart from the fact that such patterns can have real financial consequences in terms of wealth changes for investors who might exploit such anomalous behaviour, the credibility of the KSE itself may be called into question and the willingness of companies to have their shares listed may dissipate.

In addition, the main research question of this thesis does not seek radical change to the status quo. It is not concerned with emancipation of any participants associated with the KSE or any power asymmetries between companies and investors. Rather, it recognises (and accepts) that some stakeholders may know more about companies than others. Therefore this thesis is situated within the functionalist paradigm. Although interviews are employed which might suggest that the research could be viewed as interpretive in nature, the interviews are used to guide the more functionalist (market- based) research which follows.

Identifying a particular paradigm where the research is located will help the researcher by classifying the basic assumptions about this social science investigation that are implied and supplying guidance for the methods which may be appropriate. Such guidance and assumptions about reality underpin the thoughts and actions of the researcher and are selected in order to fit with the world view of this thesis' author. The functionalist paradigm, as explained by Burrell and Morgan, represents a perspective which is located in the sociology of regulation, i.e. there is no intention of changing the status quo, and the subject matter is approached from an objective point of view. The objective approach implies ontological assumptions that involve real, concrete structures. A positivist epistemology is employed since the research deals primarily with observations and quantitative data[103]. The research assumes that humans are deterministic while the methodology is normothetic and scientific. All of these assumptions confirm that the research is functionalist in nature.

This thesis builds on a key area within finance theory – the nature of share price anomalies in emerging markets. The aim of this thesis is to investigate the pricing efficiency of the Pakistani stock markets within an EMH framework. The thesis focuses on the existence of monthly calendar anomalies for Gregorian as well as Islamic calendar; most studies in the extant literature have suggested that patterns based on the Gregorian calendar may be present in equity prices but few have looked at the Islamic calendar. Furthermore, this thesis examines whether investor sentiment could explain any patterns or anomalous behaviour; investor trading activities and attitudes to risk are considered to see if they can explain any patterns detected. Therefore, this thesis can be regarded as positivist in nature as the observations will be

[103] Topics under the functionalist paradigm are observable and measurable

based on share price data that are perceived as real. The share prices are relatively objective pieces of information which can have important consequences in practice; as they can be measured and observed and the findings are assumed to be generalisable provided that an appropriate sampling procedure is employed. Furthermore, stock returns are seen as objective facts that may be classified as normal or abnormal. Since this study has no intentions of questioning the status quo, the research is viewed as objective in nature. The key assumption about reality (i.e. the ontological assumption underlying this study) is that share prices are assumed to fully reflect all historic information so that any investor who attempts to trade on the basis of such historic information will not outperform the market (Fama, 1965); therefore, this study examines what is seen as a concrete reality rather than one which is socially constructed.

For the purposes of this thesis, both qualitative and quantitative methods are employed to address the research objectives outlined in Chapter 1; despite the use of interviews, this investigation adopts a functionalist approach in carrying out the research[104]. The qualitative method used in this thesis is interviews whereas hypothesis testing is conducted for the quantitative analysis of the share price data. This study will adopt a deductive approach as the statistical analysis and hypothesis testing will be based on an existing theory and the results on the EMH. The analysis of interviews and results from the hypothesis testing should aid our understanding of whether the Pakistani stock market is weak-form efficient or whether monthly anomalies are present in the market for both the Gregorian and Islamic calendars that could be exploited by investors to earn excess returns.

[104] Interview questions were designed in a manner to provide element of objectivity in the responses.

4.5 Research Methods

The key objective of the research in the current thesis is to ascertain whether the KSE in Pakistan is weak-form efficient with respect to monthly calendar anomalies for both the Gregorian and Islamic calendars; specifically, it examines whether any anomalies present could be exploited by investors in order to achieve abnormal profits. In addition, this thesis investigates whether the sentiment of market participants when investing in shares has any role to play in explaining any anomalous behaviour in market prices. For the purpose of this thesis both quantitative and qualitative methods are used to address these research objectives[105]. Due to the nature of the research questions being asked and the paradigm adopted, several research methods were available for testing. The research employs the qualitative method first; for the purpose of this thesis, interviews are used. These interviews will ascertain the views of those who are influential within the main stock market of Pakistan. Experienced brokers, regulators and investors were considered as being the most suitable interviewees when seeking views about the efficiency of the KSE. Several quantitative methods were also employed in this study; these are discussed in Section 4.5.2. The data used for the quantitative analysis in this thesis is daily share price of 106 companies listed on the KSE over the 17 year period from January 1st, 1995 to December 31st, 2011.

[105] According to Bryman (2006), the mixture of the qualitative and quantitative methods can be very productive as he mentioned that: "If the two are conducted in tandem, the potential – and perhaps the likelihood – of unanticipated outcomes is multiplied" (p.111). Modell (2010) also supports the idea of mixed research methods. Collis and Hussey (2009) argues the using both qualitative and quantitative methods for collecting and analysing data is possible and advantageous. Denzin (2009) suggests that a mixed method approach can lead to greater validity and reliability than the use of a single method or methods. Other finance studies which have employed a mix of quantitative and qualitative research methods include McCluskey (2005) and Almujamed (2001).

4.5.1 Interviews

The choice of research methodology depends on the nature of the topic being studied (Creswell, 1994). For the topic of the current research, one important qualitative methodological option is the use of interviews[106]. According to Cooper and Schindler (2006), the purpose of using a qualitative research approach is to gather 'data which provide a detailed description of events, situations and interaction between people and things' (p.198).

These interviews should provide detailed insights into the behaviour of Pakistani investors and facilitate some understanding of investor perceptions about the efficiency of the stock markets in Pakistan[107]. The interviews will focus on people who are involved in daily share-trading within the stock market since these should be the most knowledgeable about the research questions being asked. Further, these individuals should be articulate and able to express their views to the researcher when answering questions[108]. Since most of the trading is done in the KSE the interviews will concentrate on ascertaining views of participants for this market[109]. Thus, the strategy of the current thesis is to obtain the views of those who are influential within the main stock market of Pakistan. Experienced brokers, regulators and investors were considered as being the most suitable candidates for interview when investigating the KSE.

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[106] Interviews are generally regarded as a very important tool for the researcher who is attempting to find individuals' perspective on certain issues (Easterby-smith et al., 1991).

[107] Although qualitative research will be primarily used to address the fourth research objective, when answering the first questions about the efficiency of the Pakistan stock markets and the monthly calendar anomalies quantitative methods will be employed.

[108] The interview method will adopt a functionalist approach in the current study since that accords with the aims of the research.

[109] In 2011, over 92 percent of market capitalization was represented by the KSE-100 Index.

An interview is defined as a conversation between an interviewer and a respondent where questions are posed in order to elicit in-depth research information from the interviewee about the phenomenon under investigation (Powney and Watts, 1987). Research interviews help investigators to collect reliable data in a field of study (Saunders et al., 2007). Moreover, May (2001) considers that the interview is one of the most useful methods for gathering information about an issue where relatively little is known. Interviews have become a very popular method of gathering information in social science research. Indeed, Bryman (2001) suggests that interviews are probably the most commonly used method in qualitative research. The structure of interviews can vary in practice. The interviews may be highly formalised and structured, using standardised questions for each research participant. Alternatively, they may be informal and unstructured conversations (Robson, 2002; Saunders et al., 2007). Based on their level of structure and formality, research interviews, are generally classified into three types: structured, semi-structured and unstructured. The first type is typically referred to as 'interviewer-administered questionnaires'. A predetermined and 'standardised' or identical set of questions is typically used for collecting quantifiable data; thus, they are also referred to as 'quantitative research interviews'. By contrast, semi-structured and unstructured in-depth interviews are more flexible; they are often regarded as 'qualitative research interviews' (Saunders et al., 2007; King, 2004).

For the purpose of this thesis, a semi-structured interview approach will be employed to ascertain the viewpoints of influential people in the KSE about the possibility of share price regularities around the Gregorian and Islamic calendars. Semi-structured interviews generally consist of a list of themes and questions to be covered, although their exact format may vary from interview to interview. An interviewee is allowed to talk freely about the research issue being considered, but their comments are directed by the interviewer. Also, the order of the interview questions might vary depending on the direction of the answers supplied; additional questions may also be asked to explore some research issues in further depth. According to Patton (1990), this approach gives the researcher the freedom to modify questions and pursue issues in more detail depending on the interviewee's responses. Patton further argues that the face-to-face format of the semi-structure interview enables any confusion about a respondent's answer to be clarified by follow up questions[110]. Bryman and Bell (2007) suggest that the flexibility and comparability of semi-structured interviews can help the interviewer to concentrate on the main objectives of the interview.

The interview questions in this thesis concentrate on what information sources investors employ when they value equities and whether the Pakistan stock market is weak-form efficient; they ascertain views on whether share prices exhibit any particular patterns in difference Gregorian and Islamic months; they also seek information on whether any patterns detected can be exploited by investors to achieve profits. Finally, views are ascertained on whether investor sentiment can explain any patterns that may be present in the KSE during certain Islamic months.

Prior to the interviews being carried out, a list of questions was constructed from the literature in order to ensure that all interviews covered the same material. A semi-structured interview questionnaire was then developed (see Appendix 5.1). This

[110] Hussey and Hussey 1997, stated that semi-structures interviews perited follow-up questions to be asked and allowed responses to be probed.

questionnaire was split into four sections. The first section consisted of 7 questions which sought to extract basic background information about the interviewees such as age, gender, education and religion. Section B focused on whether the interviewees believed that calendar anomalies are present in Pakistan's stock markets and consisted of 9 questions. Section C involved 7 questions all concentrating on the influence of Islamic thoughts and activities on equity decision making in Pakistan; specifically, views on the presence of Islamic calendar effects were sought. For example, interviewees were asked if their securities' trading varied with the Islamic calendar. If so, what sort of pattern was present and did they factor this predictability into their investment decisions. The last section, Section D, consisted of 7 questions. This section considered the respondents' views about psychological aspects of investment behaviour in Pakistan; questions focused on investor mood and whether it had any role to play in explaining any anomalous behaviour of the stock markets at the time of Islamic holy days. For example, the interviewees were asked about whether emotions and moods had any effect on decision making, risk assessment and equity valuation and whether market prices were influenced by this investor mood. Altogether 30 questions were identified from an analysis of the literature and these were all put to the interviewees.

Each interviewee's consent was obtained for recording of the interview as suggested by Jankowicz (2005) and Erikson and Kovalainen (2008). The semi-structured questionnaire was developed in English and pilot tested on a number of Pakistani research students in the School of Business at the University of Dundee. As a result, a couple of questions were omitted after being identified as repetitive; small modifications were made to some of the questions to enhance understandability and the order of the questions was slightly re-arranged to improve the flow of the interview. The questions were designed to be as clear as possible so that the interviewees would not have any problems in understanding them. Once all of these changes were implemented, the questionnaire was piloted on a number of colleagues[111] to ensure that the quality was appropriate.

4.5.2 Quantitative Methods

The five quantitative methods employed in this investigation of the KSE market are: (i) ANOVA; (ii) Kruskal-Wallis, the non-parametric counterpart of ANOVA; (iii) two-sample t-test; (iv) a General Linear Model (GLM) and (v) a GJR GARCH (1, 1) model. The first three methods are commonly used in the literature when examining monthly calendar anomalies (Gultekin and Gultekin, 1983; Boudreaux, 1995). A GLM method was applied to the data to test for the sources of variation in the returns of the KSE equities. In particular, the GLM was used to examine the role of the Gregorian calendar, the Islamic calendar, firm size, company sector and year effects in driving the returns earned by investors in the KSE; the interactions between these factors were also investigated. Finally, the GJR GARCH model was used to facilitate the testing for monthly calendar anomalies while allowing for time varying return volatility in the KSE market.

All the quantitative methods employed in this research use the same dataset; the share price information used in this thesis is taken from Datastream. Specifically, daily share price data were downloaded for 106 companies listed on the KSE over the 17

[111] These colleagues were fellow Pakistani PhD students in the School of Business at the University of Dundee; specifically, Naimat Khan and Muhammad Khan helped with this process.

year period from December 31, 1994 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 monthly calendar anomalies for the KSE market. An unusual feature of this study is that it employs individual companies' data rather than details of the KSE index. Most previous studies have focused on KSE-100 index (Kamal and Nasir, 2005; Mustafa, 2008; Zafar et al., 2010; Ali and Akbar, 2009; Hussain et al., 2011). Thus, the analysis provides a more realistic view of whether returns are predictable for investors in particular months for individual companies; individual company data is of more importance to investors than the national indices since indices are difficult to invest in or may not be tradable in some cases; and they tend to be dominated by a few large shares[112]. 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. There were a total of 652 companies listed on the KSE at the end of December 2010; out of these, only 578 had data available on the Datastream database. From this sample of 578 firms, only 176 companies had a start date before 31/12/1994. Of those 176 companies, 39 firms did not have adjusted prices[113]; therefore, the sample was reduced to 137 companies with a start date 31/12/1994 and where adjusted prices were available. In addition, 31

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[112] In Pakistan, the Karachi Stock Exchange recently announced the launch of Stock Index Futures Contracts (SIFC) from January 2012 (KSE official website). SIFC is one of the core components of Derivate Instruments available at the KSE where the underlying commodity is a stock index, such as the KSE-100 or KSE-30 Index. Stock indexes cannot be traded directly, so futures based upon stock indices are the primary way of trading at the aggregate level. One of the concerns with using these contracts is the transaction cost involved and the lack of knowledge about their performance. Therefore, traders may not be confident in trading on these contracts; Mohammad Sohail, CEO at brokerage Topline Securities explained why, in an interview to Dawn news: "In order to develop Derivative Market [SIFC], there has to be a Market Maker … the country's stock markets had not so far found any Market Maker in any derivative product". He pointed out that "Futures Contracts" were already in the market, but were unable to catch investor attention. Therefore, focussing on companies instead of the KSE index will allow more meaningful conclusions to be drawn (http://dawn.com/2011/11/17/kse-to-launch-stock-index-future-contracts/).

[113] 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 KSE equities over the 17-year period of this research (Khan, 2011).

companies were eliminated from the investigation as they were found to be inactively traded[114]. Hence, the final sample of 106 companies emerged[115]. This final sample consisted of all the shares that were actively traded on the KSE over the period under investigation; all shares that exhibited thin trading were discarded (see Table 4.1). An analysis of 106 companies should still facilitate an investigation of the performance of most of a market's activity since a common characteristic of emerging markets is that a large proportion of market capitalisation is often concentrated in a relatively small number of liquid equities (Howell, 1994); these are included in the final sample of the current thesis.

Table 4.1 Sample Selection Details

Details	No.
Total listed companies on the KSE on 31/12/2011	652
Less: companies data not available on Datastream	(74)
Total population	578
Less: data without start date 31/12/1994 and unadjusted	(441)
Less: shares thinly traded	(31)
Final Sample	**106**

[114] Inactive shares are shares listed on the stock exchange that are not traded frequently. In the case of some of the shares excluded from the sample, trades were not apparent for periods of over nine months at a time. There is no formal definition which defines what an actively traded share is. Several authors have employed different cut-off points when deciding whether a share is actively traded or thinly traded (Waelkens and Ward, 1997; Al-Abdulqader, 2003; McCluskey, 2005; Tijjani, 2009). For the purpose of this study, a cut-off point of 33 percent was employed which meant that if 33 percent or more of the returns for a share were different from zero the share was included in the sample. This cut-off point is consistent with the figure employed by Al-Abdulqader (2003) and McCluskey (2005) in their studies of other stock markets.

[115] The decision to eliminate thinly traded companies is consistent with the approaches adopted in other studies (Waelkens and Ward, 1997; Al-Abdulqader, 2003; McCluskey, 2005; Tijjani, 2009). Although, unlike these other studies, the main reason for eliminating thinly traded firms' shares from the sample was mainly due to the use of the GARCH model in a later chapter. The model will be used to investigate whether share volatility varies according to the Islamic calendar; hence, if thinly traded firms are included in the sample the results might not be reliable since if a firms' share is thinly traded the volatility would be low regardless of the Islamic month being investigated throughout the calendar year.

Table 4.2 reports information about the final sample that was used for this chapter of the thesis. 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, Financial, Food, Industries, Utilities, Personal Goods and Chemical sectors (see Appendix 4.1). These companies varied in size from a high of Rs. 163,127.40m (PK:NPK) to a low of Rs. 4.09m (PK:UMC); the largest firm (PK:NPK) operated in the Food industry whilst the smallest size firm (PK:UMC) was drawn from the Financial Services sector. The total volume of shares traded for the sample companies varied between 826,903,200 (PK:DEG) to 12,800 (PK: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 4.2 indicates that most of the firms were profitable in 2011 since 70 companies paid dividends and 78 companies had a positive P/E ratio[116]. In addition, it is apparent from Table 4.2 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.

[116] 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).

The returns are computed as the first differences of the natural logarithm for all the sample firm[117]. Returns were calculated from from data as follows:

$$R_{it} = Ln(P_{it}/P_{it-1}) \qquad [4.1]$$

Where	Ln	=	natural logarithm;
	R_{it}	=	return on share i for day t;
	P_{it}	=	price of firm i for day t;
	P_{it-1}	=	price of firm i for day t-1.

The data was divided into sample sets based on the months of the 17-year period under investigation for Gregorian and Islamic calendars. One of the key challenges when undertaking this study was to convert the Gregorian dates into their Islamic equivalents[118]. A total of 4435 Gregorian calendar dates for the 17 year period from 1995 to 2011 had to be converted to Islamic dates in order to conduct this investigation[119].

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

[118] 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 (see Chapter 2 for more details).

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

Table 4.2 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
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
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, 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.

Newspaper archives and a Gregorian-Islamic date convertor were used when undertaking this task[120]. In fact, 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[121]. The data in this Chapter corresponds to the Islamic calendar period ranging from the years 1415 to 1433[122].

Furthermore, the data was "trimmed" in a number of ways to make the results for any testing more reliable and robust. First, all the national holidays were excluded from the total number of observations. All the holidays in the sample were coded as missing values so that any significant effect uncovered in the tests would not be biased by any market closures. In addition, the four-month suspension of the KSE in 2008 was also excluded from the sample[123]. Effectively, all the non-trading days were omitted from the dataset; these were initially recorded as having a return value of zero when equation [4.1] was estimated. Secondly, the data were "trimmed" to remove extreme observations. Specifically, any return with a value greater than 100 percent in absolute terms was excluded from the sample. A total of 52 outlier observations were discovered when the data were searched by the researcher[124].

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[120] 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.

[121] The two newspapers used were Dawn and the Daily Express (http://www.dawn.com/archive, http://express.com.pk/epaper/). Dawn is the oldest and most widely read English newspaper in Pakistan while Daily Express is one of Pakistan's most widely circulated Urdu newspapers.

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

[123] Log returns for when the KSE market was suspended in 2008 were showing to be zero which in fact, is not true since the market was closed rather than the log returns being zero. Hence, it seemed a reasonable proposition that all those values be excluded from the sample and replaced by "*" i.e. missing values. Further details on national holidays and market suspension of 2008 can be found in Chapter 2.

[124] These returns were primarily deleted for the months of Zil Hajj (12), Shawwal (8) and Rajab (6). Prior researchers have attributed such extreme values to (i) stock splits or bonus shares (Wu and Chan, 1997; Malhotra et al., 2007) and (ii) errors in the data (Fama and French, 1998). Other approaches to dealing with such outliers were examined (example, leaving the observations in) but those did not affect the results to any great extent.

These share returns were then employed to test for the monthly calendar anomaly using both the Gregorian and the Islamic calendars. To investigate whether some months are significantly different from others in terms of return performance, a number of tests were employed; specifically, ANOVA, Kruskal-Wallis and two-sample t-tests were performed. The ANOVA (Kruskal-Wallis) test investigates whether the average mean (median) returns are equal across all months for both calendars; following null hypothesis was investigated:

$$H_0 \quad = \quad The\ mean\ (median)\ returns\ are\ equal\ across\ all\ months \qquad [4.2]$$

The reported p-value for the ANOVA (Kruskal-Wallis) will allow for rejection or acceptance of the null hypothesis. If the p-value is greater than 0.05, the null hypothesis cannot be rejected, implying that the weak-form of the EMH holds at a monthly level. However, if the reported p-value is less than 0.05, the null hypothesis can be rejected, implying that the weak-form of the EMH may not hold at monthly level for the Pakistani stock market; it suggests that returns are significantly different across different months of the year[125]. Hence investors may outperform by trading in specific months of the year; the EMH suggests that returns should not vary in a predictable manner across different months of the year.

A two-sample t-test was then employed in order to investigate in a more detailed way whether any significant result in the ANOVA or Kruskal-Wallis test may be due to differences in a small number of months. Therefore, the two-sample t-test should

[125] The null hypothesis investigated using the ANOVA (Kruskal-Wallis) test examines whether the population means (medians) are all equal or not; the test compares all means (medians) simultaneously rather than individually.

highlight whether returns in a specific month are different from returns in another month by examining each pair of months to uncover any significant deviations[126]. The two-sample t-test was used to investigate the hypothesis:

$$H_0 = differences\ between\ each\ pair\ of\ months\ do\ not\ follow\ a\ pattern \quad [4.3]$$

Similar to ANOVA and Kruskal-Wallis, the test statistics produce p-values which are used to decide on whether significant differences were present. Should any specific month exhibit significant deviations, there may be an opportunity for investors to outperform by trading in these months. This would imply that the Pakistani stock market may not be fully efficient; hence not all historical information is absorbed in the pricing of Pakistani equities; thus, violating one of the assumptions of the EMH.

Once these preliminary tests were conducted, the study then investigated whether any particular calendar months 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. Furthermore, 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:

[126] This test compares average returns of each of the two months and determines whether their population means are equal. This was used to compare the population means for each pair of the individual months across all sample periods.

$$R_{j(g,i,s,t,y)} = \mathrm{f}\left(\text{Gregorian Calendar}_{\mathrm{g},}\ \text{Islamic Calendar}_{\mathrm{i},}\ \text{Size}_{\mathrm{s},}\ \text{Sector}_{\mathrm{t},}\ \text{Year}_{\mathrm{y}}\right) \quad [4.2]$$

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 [4.2] has the benefit of allowing the main factors to be determined; further, it permits interactions between these factors to be taken into account (details in Chapter 6). Once again, the same dataset was employed in this investigation as in the previous quantitative analyses; however, to perform this 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[127]; a value of between 1 and 3 was given to identify the size of the firms[128]; 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.

All the above quantitative methods assume that variance is constant; the findings are based on returns and do not take account of any variation in daily volatility in the market returns. The final quantitative method employed in this study overcomes this

[127] The sample firms are categorised into 7 different sectors (see Appendix 4.1).

[128] 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).

problem by modelling the volatility of returns whilst investigating for monthly calendar anomalies in the Pakistani equity market. Further, the model takes account of any leverage effect (Black, 1976) which may be present where the impact of good news on the variance of returns may be different from the effect of bad news[129].

The final quantitative method employed in this study involves the use of a GARCH model to facilitate the testing of monthly calendar anomalies under the assumptions of time varying return volatility among KSE equities. A GARCH model is an extension to the model proposed by Engle (1982) which assumes that returns follow an AutoRegressive Conditional Heteroskedasticity (ARCH) process. Engle (1982) proposed the use of ARCH models in order to model the variability in the variance of the residuals; these models assume that the variance of the residuals is not constant over time and allows the conditional variance to change over time as a function of past errors (Bollerslev, 1986). Bollerslev (1986) extended the ARCH specification by making the conditional variance a function of lagged values of the conditional variance in addition to the lagged values of squared residuals; thereby, permitting a more flexible lag structure. This model is known as the GARCH model, where the variance of the residuals is expressed as the sum of a moving-average process of order q on past residuals (the ARCH term) and an autoregressive process of order p, on past variances (the GARCH term) (Bollerslev, 1986). The simplest form is the GARCH (1, 1) model, which includes only one lag both in the ARCH term (last period's volatility) and in the GARCH term (last period's variance).

[129] A detailed discussion of the leverage effect is presented in Chapter 7.

GARCH models have been widely used in various financial time series analyses since one of the most important features of returns is that their volatility changes over time (Glosten et al., 1993). With the introduction of the leverage term, a GJR GARCH model is obtained; this model was developed by Glosten et al. (1993). For the purpose of this study, a GJR GARCH (1, 1) model is employed; such a model captures any leverage effect which may be present since it recognises that the market may respond differently to good and bad news; in this model, good news and bad news have differential effects on the conditional variance. This type of model was employed based on the results from a pilot study conducted on 30 sample firms; details of which can be found in Chapter 7. A more elaborate description of this model is presented in Chapter 7 of this thesis.

4.6 Conclusion

This chapter has highlighted the paradigm adopted for the current thesis and the research methods employed to investigate share price predictability in the Pakistani stock market. In particular, this chapter has highlighted the social research methodology discussed by Burrell and Morgan (1979); the four paradigms identified by these authors are discussed. In addition, the research methods adopted for this study are noted; both the quantitative and qualitative methods are discussed. Furthermore, this chapter has justified the research methods used and their relevance to this thesis. The results of interview findings are discussed in the next chapter while the quantitative findings are presented in Chapter 6 and Chapter 7 of this thesis.

Chapter 5:

Interview Analysis

5.1 Introduction

This chapter presents the results of interviews with brokers, regulators and individual investors. These interviews sought to complement the statistical analyses presented in the later chapters which tested for calendar anomalies in the share price data. Specifically, this section documents the findings of 19 face-to-face interviews conducted in Pakistan over the period from June to July 2011. Karachi was chosen as the primary location for the interviews because it is the financial capital of Pakistan and the location of the main stock exchange in the country (see details in Chapter 2). To date, very little is known about the monthly calendar anomalies in the Pakistani stock market (see Chapter 3). Further, none of the prior studies in this area has sought the views of Pakistani stock market participants when investigating monthly calendar anomalies; therefore, the current work makes a contribution in an area that has not been previously explored[130]. In particular, it aims: (i) to ascertain the views of Pakistani stock market participants about the weak-form efficiency; (ii) to gain some insights into the behaviour of Pakistani investors and to gain an in-depth understanding of investor perceptions about the share price regularities with regards to monthly calendar anomalies[131]; and (ii) to ascertain views about the role of investor sentiment in the Pakistani stock markets.

[130] It was felt that interviews findings would add to the comprehensiveness of this investigation. The purpose of these interviews is to not only help interpret the results from the statistical analysis but also to document the opinions of participants involved in the running of the market.

[131] During the interviews conducted for this research, both the day-of-the-week and month-of-the-year effects were investigated. However, it was decided to concentrate on the monthly seasonal anomalies due to the time constraints associated with completing a doctoral thesis.

The remainder of this chapter is organised as follows. Section 5.2 outlines the sample details and provides background information about the interviews[132]. Section 5.3 discusses the opinions of the interviewees about the efficiency of the KSE and whether monthly calendar anomalies associated with the Gregorian calendar occur. The existence of Islamic calendar anomalies and their possible influence in Pakistan is discussed in Section 5.4. Section 5.5 provides a detailed discussion of whether the interviewees believed that investor sentiment could explain any patterns or anomalous behaviour present in KSE returns. Finally, Section 5.6 contains some concluding remarks.

5.2 Sample and Background Information

Nineteen interviews were conducted between June and July of 2011 in the city of Karachi[133]. The interview questions involved a mixture of open-ended and close – ended questions in order to gather basic knowledge about practitioners' thoughts on the operations of the KSE as well as to obtain the views of the people involved in the trading of shares on daily basis. Each interview lasted for a minimum of 30 minutes. With the exception of two[134] of the interviews, all discussions were digitally recorded with the consent of the interviewees[135]. These recordings were later analysed to arrive at the results. In addition to the recordings, the researcher took notes during each interview about the main points that the interviewee raised. Following each interview the tape-recording was played and the manuscript notes taken at each meeting were

[132] Details about the interview method is provided in Section 4.5.1 of Chapter 4.
[133] Further details about the research method are provided in Chapter 4.
[134] Interviewee RE1 is a regulator within the KSE and therefore it was not possible for the interview to be recorded.
[135] All interviews were in English and were transcribed word-for-word. However, where interviews contained Urdu, or a mixture of English and Urdu, they were translated and important quotations were noted.

analysed; important points made were then noted. Once all the interviews were complete, an Excel sheet was used to summarise the essential replies identified in each interview in order to highlight core findings. This also facilitated the identification of prominent views as well as patterns in the interview data and assisted the research process by identifying apparent contradictions among the main views expressed. The main observations that emerged form the basis of the findings reported and discussed in the subsequent sections of this chapter.

Each interviewee was assigned a code in order to maintain their anonymity and protect the confidentiality of the respondents. As Table 5.1 indicates, the interviewees included 14 brokers[136], 3 regulators at the KSE, and finally, 2 individual investors – one of these was a large investor with an average monthly investment of 1 billion rupees. Thus, the interviewees had an in-depth knowledge of the topics being discussed, were articulate with their comments and capable of offering insights into the issues covered within the semi-structured interviews. The questions asked in each interview were related to the background of each interviewee; for example, all brokers and regulators were queried on their perceptions about Pakistani investors as a whole, whereas individual investors were asked about their own personal views on their own behaviour[137].

The interview questionnaire was spilt into 4 sections; the first section (Section A) involved background information on the interviewees. Section B focused on the

[136] 2 of these were the CEO's of their brokerage houses, 2 were Chief Executives and 2 were Directors of their brokerage firms. Of the remaining 8 brokers, 3 had the title "Head of Equity Sales", 2 were Vice Presidents of Equity Sales, BR1 was a Senior Manager while BR5 was a KATs Operator and BR8 was an Equity Trader.

[137] Two types of semi-structured questionnaire were used; one questionnaire for brokers and regulators whilst the other was designed for individual investors. Appendix 5.1 and 5.2 provides a copy of the questionnaires used in the interviews.

possible presence of calendar anomalies in the Pakistani stock market and sought details about whether the Pakistani market was weak-form efficient with regards to the Gregorian calendar; specifically, questions in this section concentrated on whether patterns could be identified in returns based on the month of the year in which the price change occurred. Section C sought views on the influence of Islamic factors on the Pakistani market and whether there are any patterns that could be identified in security returns based on Islamic calendar months. To date no study has examined the whole Islamic calendar; previous investigations have focused mainly on the month Ramadan (Hussain, 1998; Al-Hajieh et al, 2011).

The final section, Section D, dealt with respondents' views about psychological aspects of investing in Pakistan. Specifically, it considered whether investor sentiment might explain any anomalous behaviour in the market during different Islamic months. It also ascertained views on whether psychological factors have any effect on investor decision making, trading behaviour and attitudes to risk in the Pakistani market. At the beginning of each of the remaining sections of this chapter the analysis will focus on the responses from brokers and regulators. Subsequent analysis will then concentrate on the two individual investor groupings. It was hoped that the findings arrived at this section would inform the statistical analyses and testing which are conducted in Chapter 6 and Chapter 7.

Table 5.1 Interviewee Summary Details

Code	Location	Age	Job title	Brokerage house/Firm	Experience
BR1	Karachi	31-40	Senior Manager - Equities	Foundation Securities	7
BR2	Karachi	31-40	Head - Equity Sales	Foundation Securities	9
BR3	Karachi	31-40	Chief Operating Officer	Multiline Securities	10
BR4	Karachi	31-40	Chief Operating Officer	FDM Securities	19
BR5	Karachi	21-30	KATs Operator	FDM Securities	5
BR6	Karachi	21-30	Assistant Vice President International Equity Sales	BMA Capital Management	6
BR7	Karachi	21-30	Vice President - Equity Sales	BMA Capital Management	11
BR8	Karachi	31-40	Equity Trader	BMA Capital Management	7
BR9	Karachi	21-30	Head - International Equity Sales	BMA Capital Management	6
BR10	Karachi	31-40	Director	Arif Habib Management Ltd	9
BR11	Karachi	41-50	Chief Executive	Alfalah Securities	19
BR12	Karachi	41-50	Head of Sales	ZHV Securities	8
BR13	Karachi	21-30	Director	ZHV Securities	10
BR14	Karachi	41-50	Chief Executive	Intermarkert Securities	20
RE1	Karachi	41-50	Manager Research	The Karachi Stock Exchange	17
RE2	Karachi	41-50	Director	The Karachi Stock Exchange	25
RE3	Karachi	41-50	Director	The Karachi Stock Exchange	23
IND1	Karachi	41-50	Manager	Al-Munaf Coeporation	18
IND2	Karachi	31-40	Vice President - International Sales	Arif Habib Management Ltd	4

Note: This table presents the summary details of the interviewees. In particular, the table shows the Interviewee name, location, age group, job title, brokerage house/firm and number of years of experience in the market. Each interview was assigned a code. BR refers to Broker, RE refers to Regulator and IND refers to individual investors.

5.3 Monthly Calendar Anomalies

The first question of Section B was used to gauge the average investment size of Pakistani investors. The interviewees' responses were varied and most suggested that "it depended on the economic and political situation in the country". Some of the interviewees were more specific in their answers. For example, interviewee BR1 responded that he dealt "with institutional clients, so [the transaction] size is usually more than one billion". Interviewee RE2 agreed with this view; he stated that "institutions invest in millions and billions". BR9 gave a more comprehensive reply arguing that:

> "There are three categories; the first is institutional, second is high net worth individuals. Investments for other individuals are relatively small. High net worth investors usually start with Rs. 5 million and go up to Rs. 30 million. There is no limit for institutional investors. Their investments are usually very large. Their minimum portfolio investment I would say is close to Rs. 6 billion."

On further questioning, the respondents suggested that most investors tended to focus on a small number of sectors; 88 percent of the interviewees mentioned the Oil and Gas sector and the Fertilizer sector as important industries within Pakistan; for example, interviewee RE1 stated that "Oil and Gas [sector] and Fertilizer [companies] are the most common [investment areas] due to their payout [level] and performance." Interviewee BR13 responded in a similar fashion to RE1. Interviewee BR2[138] concurred with RE1 and BR13 by mentioning that:

[138] Interviewee BR2 was voted as the second best equity sales person by Asia Money Polls for the year 2007 and was awarded the best equity sales person award in 2010 by CFA (Chartered Financial Analyst) association of Pakistan.

> "Usually investors prefer to invest in large-cap sectors... There are three main large-cap sectors in the KSE: the Oil and Gas sector makes up around 40 percent of the index weightage; Banks make up around 22 percent and the Fertiliser sector constitutes around 10 percent of the index weightage. These are the three sectors where you'll see the bulk of the [investing] activities."

Interviewee RE3 suggested that the reason behind this choice was the volatility in the petrochemical sector:

> "Nowadays the sectors which are popular [among] investors are the Oil sector because of the volatility of the oil [price] in international markets and because of the [high level of] profitability; the favourite companies are Pakistan Oil Field, PPl and OGDC. These are the famous companies [which] investors are normally interested in and they have shown tremendous growth in the last 2 years. Like a 300 percent growth in price; 2 – 3 years ago the price was below 100 rupees for Pakistan Oil Field and now it is 380 rupees and besides that they also offered dividends and bonuses [to investors]."

According to this interviewee, if investors based their trading strategies on investing in these sectors, their chances of getting a good return was high on the basis of past experience.

Eight out of 17 interviewees suggested that the LSE and the ISE followed the KSE whilst six interviewees argued that all the three markets moved together. The remainder of the interviewees indicated that "KSE was the benchmark" and that "95 percent of trading [took place] in KSE"; thus, they concentrated on the Karachi stock market since the "KSE was the biggest market". An analysis of the responses suggested that KSE was the main stock market of Pakistan and that the LSE and the ISE just mimicked changes in the KSE index. Hence they argued that by investigating the performance of the KSE market, any findings could be generalised to all the stock markets in Pakistan.

The aim of this section was to investigate whether or not the Pakistani market was influenced by any Gregorian calendar anomalies; whether these could be identified and exploited by investors to earn abnormal returns. Question 12 in this section of the research instrument focused on this issue. Some 79 percent of the interviewees (including the two individual investors) responded ‘Yes’ to a question about whether “share prices exhibit patterns on various months in a year” and if so, what respondents thought these patterns were. Specifically, interviewees’ views were sought on whether anomalies based on Gregorian calendar offered investors’ opportunity to beat the market on the basis of monthly patterns. If they supported this notion of patterns in the returns of Pakistan’s equities, the efficient market hypothesis would be called into question. Interestingly the respondents highlighted that returns varied across months of the year. For example, Interviewee BR1, a senior manager in charge of equity sales at a brokerage house, stated that:

> “Normally before the budget you see that people participate less in the market because of uncertainty [about the contents of] the budget. The main result season is January/February. December’s results are announced in January/ February and July/August is used for those with a June year-end. So in July/August we see good volumes because of the results. January/February volumes are also above average because of the results season. Indeed, before June [in the month of May] there is lack of trading by participants because of uncertainty about the budget. So 2 to 3 periods have huge volumes and a great deal of participation because of these results.”

Other respondents also highlighted month-of-the-year effects. For example Interviewee IND2, an individual investor was typical of these responses when noted that:

> "Obviously there are cyclical dips of supply and demand. For example, in the month of June we get a lot of volume because people try to realign their portfolios according to the year-end valuations so we can see a cyclical pattern particularly in the trading volume[139]."

Interviewee BR2 supported this perspective and mentioned that:

> "Yes, one pattern you can say that the market exhibits is that it usually performs well or volume patterns pick up during the reporting season ... So these stocks trade actively as they approach their respective year end. So the volume picks up during the reporting season and pre-reporting season in anticipation of the results."

BR2 suggested by way of example that the average traded value at the KSE was 100 million dollars for the month of January whereas from April and May it dropped to between 40 to 50 million dollars as investors waited for company results to be announced. Thus, he suggested that the month of the year "had a huge impact" on the market.

BR12 argued that there were patterns linked to companies' interim results; specifically, he noted that "there are patterns especially after the end of each quarter". He suggested that volatility increases and patterns can be identified every three months. The reason for this was that "there is a lot of speculation going on as well just

[139] The Pakistan government's fiscal year starts on July 1 of the calendar year to June 30 of the following year. Private companies are free to observe their own accounting year, which may not be the same as government of Pakistan's fiscal year, Ministry of Finance and Revenue of Pakistan.

before the quarter's end. Eg. March, June, September and December". BR12 argued that "Half yearly and year end months are very volatile times."

The respondents' comments clearly indicated that there were patterns present in the market which could be exploited by investors using appropriate trading strategies. The most common pattern highlighted related to January, May and during the reporting season. Interviewees also suggested that there was heightened volatility and speculation before annual reports were published. The next question asked interviewees whether investors tried to predict these patterns or trade on the basis of these regularities. In addition, respondents' opinions were sought on whether investors looked at the past trends in prices or trading volumes on specific times of the year when deciding about the purchase or sale of an equity investment. These questions were covered in Section B of the semi-structured questionnaire. Surprisingly, all of the interviewees[140] (all 17 of the brokers and regulators) responded positively to these questions. Their responses tend to suggest that patterns were present in the market and that these were being exploited by investors; as such, the responses of the interviewees indicated that past price changes could help predict future returns which contradicted the weak form of the EMH. For example, Interviewee BR2 stated that his brokerage firm had "a technical research team that was specifically looking for these patterns" in order to advise their clients about when to invest. BR11 disagreed slightly with this view. He argued that over the longer term, new information was eventually incorporated into the share prices and that these prices fully reflected all of information contained in past prices, such that investors could not outperform the market. However, BR11 admitted that profits might still be

[140] The other two interviews were individual investors and they were asked "Do 'you' try to predict these patterns or trade on the basis of these regularities?" Investor IND1 replied 'Yes' where as IND2 gave a mixed reply.

made by exploiting patterns in the short term. For example, he noted that "when everybody tries to [exploit a regularity in returns] those patterns fade". However, he suggested that "for certain periods ... following the identification of those patterns, an investor can earn good money." His response indicated that information was not impounded into the share price in a rapid fashion and there were times when investors could beat the market. These findings are consistent with a majority of the studies of the KSE market which document that the KSE is not weak-form efficient (Kamal and Nasir, 2005; Shaheen, 2006 and Ali and Akbar, 2009).

Some of the interviewees also highlighted that investors' interest in past price information kept most of the respondents in their jobs as members of technical teams in brokerage houses that helped with identifying patterns in returns and charging investors a fee for their advice. Interviewee BR9 even said "that's what keeps us employed" when asked about whether investors try to predict patterns in equity returns. The follow-up question in section B of the questionnaire sought views on whether investors examined graphs or charts of past share price movements when deciding to buy or hold securities. Again, 100 percent of the interviewees (including all of the individual investors) replied positively to this question. The most common answer to this question highlighted that the research teams of different brokerage houses (typically the technical analysis team) was responsible for issuing this kind of data to their clients so that they could base their decisions on technical indicators[141]. Some of the interviewees mentioned that Pakistani investors who studied technical charts were usually short-term in orientation and sought to make quick profits. For example, interviewee BR6 highlighted that brokers and investors usually only went

[141] 9 out of the 19 interviewees mentioned that research team of brokerage houses usually issues reports to help the investors with this information.

back less than 2-3 years when analysing a share's past performance; anything before that was deemed irrelevant and did not influence future prices. Interviewee RE2 concurred when he stated that "three years [of historic analysis] is good enough because the market is not that long-term [orientated]". Therefore, he suggested that "three years [of information] about a company can show what's going on." Interview BR14 agreed with this point when he noted that "investors usually believe that the last two years of a company's past data is quite important."

The final question in this Section of the questionnaire ascertained whether any patterns in equity prices or trading volumes varied across the three different stock markets of Pakistan. Some 95 percent of the interviewees (or 18 of the 19 respondents[142]) suggested that there was no difference between the KSE, the LSE and the ISE in terms of predictable share price patterns for specific months of the year. Indeed, the respondents indicated that if there were patterns in one market then similar regularities would be present among the share prices of other Pakistani markets. Interviewee BR6 pointed out that "there cannot be different patterns as if there were, it would create arbitrage opportunities." In addition, most of the interviewees highlighted that the KSE was the main market; the equity prices of shares on the LSE and ISE just followed those of the KSE so that any patterns in the equities traded in Karachi would transfer to the other two exchanges. Interviewee BR12 summed up this point of view by saying:

> "They [the LSE and the ISE] have the same patterns. However since they are small markets there isn't any focus on their patterns. Our clients are never interested in any information on the LSE or the ISE."

[142] Interviewee BR2 was not clear in his reply and his answer is deemed ambiguous.

5.4 Islamic Calendar Anomalies

Section C of the interview questionnaire sought respondents' views on the possible existence of Islamic calendar anomalies; it focused on the influence of Islam on decisions about equity investment and whether the Pakistani capital market behaved differently during various Islamic months and festivals. Interviewees were initially asked whether certain types of investors only invested in sharia-complaint companies. All of the respondents (broker and regulator) answered 'Yes'. However, the two individual investors indicated that they invested in all the companies. For example, IND1 stated that he preferred to invest in sharia-complaint companies but if such companies were not available, he considered non-complaint firms. In response to this question, BR9 argued that his brokerage firm had "individuals who would only invest in shaira-complaint firms"; his firm even had "institutional investors who would only invest in sharia-complaint companies." In this regard, respondent BR6 noted that "the KMI-30 Index deals with Islamic securities and is in fact made by the Islamic bank called Al-Meezan. Every quarter the sharia-complaint companies list keeps changing. This index was actually launched to grab the investors who would not invest in the stock market due to religious reasons." Interviewee BR12 agreed with this view. He argued that some investors would only invest in sharia-complaint shares and that Islamic beliefs were important for them. Respondent BR11 also highlighted that at "a funeral, [he discussed] that some brokerage houses had started a completely Islamic brokerage desk that means they would only deal with Islamic companies."

In answering this question, many respondents asserted that Islamic principles underpinned the security analysis and equity decision making of investors to some extent; they suggested that the emphasis on Islamic principles varied from one individual to another. For example, Interviewee RE1 was typical of these respondents when he stated that “it does [depend upon one’s beliefs] to an extent - especially to the investors who are more religious.” However, Interviewee BR1 cautioned against overstating the importance of Islamic influences on individual investment decision making; he argued that:

> “In terms of importance, not more than 5 percent of the total investment amount is [currently invested in] Islamic based shares; but its awareness is increasing. Earlier, it was 1 percent but now it is 5 percent. I hope we will see more than 15-20 percent within 2-3 years.”

When asked about how Islamic securities were evaluated, a mixture of responses emerged, with most answers being fairly vague. For example, Interview BR3 made the point that the evaluation of Islamic shares was different “as there wasn’t much focus on the technical analysis”. According to this interviewee, Islamic securities were “deemed riskier as they don’t deal with interest.” According to BR3 therefore, the funding sources of firms with Islamic securities might be restricted and growth prospects limited because interest-bearing debt securities were excluded. As interviewee BR10 highlighted, most Islamic securities “under performed” as he suggested that there wasn’t “much profit to be made and isn’t much profit in these companies”. However, he argued that their investment clientele “would still invest in them as it made them feel that they were following a religious path.” However, in contrast to these views, a number of interviewees believe that the evaluation of Islamic securities was no different from their non-Islamic counterparts (BR4, BR5, IND1 and IND2). They suggested that investors in both sets of securities looked for a return on their investment and studied fundamental as well as technical indicators. Some 79 percent of respondents indicated that Islamic teachings had an impact on the stock market of Pakistan. The most comprehensive reply was provided by BR2:

> **“**To an extent, I would say that 10 – 15 percent of institutional investors’ portfolios and 20 percent of individuals’ portfolios [are informed by Islamic teachings]. But the Islamic market is growing rapidly. One area [where this growth is pronounced] is the mutual funds industry which had [sold mostly] conventional products are coming up with more and more of Islamic products. Example, Islamic capital protected funds, equity funds, debt income funds etc [are now available].”

Consistent with this argument, Interviewee IND1 agreed that Islamic teachings affected that market “to an extent”. He also argued that “the influence of Islamic teaching was increasing with the introduction of new Islamic products”. He also suggested that the launch of the KMI index, which only dealt in sharia-complaint companies, was an example of such a growth in influence. He noted that “it was becoming a lot easier to comply with the Islamic teachings and trade in the market”. In fact, he pointed out that “the reason for launching the KMI index was to involve those people in the market who are religious and would only invest in sharia-complaint companies.” BR1 also indicated that the Islamic investor was a potentially important constituent of the Pakistani market:

> “Total deposits in Pakistan are more than Rs.6 trillion. There are Rs.6 trillion deposits and more than 30-40 percent are keeping them in current accounts. Why? Because they believe in Islam. That is why. Tell me a country other than an Islamic country where people keep 40 percent of 6 trillion – that is 2.4trillion rupees in current accounts. They are not getting anything [on these deposits], but banks are making money on it. So why are people keeping it in a current

> account? Because they believe in Islam. They don't take interest."

The next question in this section of the semi-structured questionnaire sought views on whether share prices exhibited any patterns in different Islamic months, and if so, were these predictable; specially, respondents were asked whether these patterns could be exploited to earn abnormal returns. Some 68 percent of the respondents replied positively to this question[143]; 10 of these were brokers, 2 were regulators and one of the investors. Four of the Islamic calendar months were mentioned by the interviewees as periods when patterns were present in security returns (Ramadan, Muharram, Safar and Zil-Hajj). For example, Interviewee BR12 noted that:

> "Trading varies mostly in the month of Ramadan. There has been a trend [in security performance] in this month for the past 5 to 10 years. Since people believe it's a blessed month according to Islamic teachings, there is this hope that the market will show a positive trend and therefore people take additional risk based on that hope. This leads to increased trading volume and therefore trends can be seen [since demand for equities exceeds supply]. It could be that the market goes down one or two days but the overall trend is upwards during Ramadan."

This interviewee also mentioned that patterns were present in other months of the Islamic calendar. For example he argued that:

> "The month of Safar [the second month of the Islamic calendar] also shows trends. It is believed that this is a difficult month as a lot of difficulties came to Muslims in this month at the time of Prophet Muhammad and therefore people stop their investments and avoid investing in this month. If you look at the last 10 year trend for the month of Safar you'll see that either the market is going down or something's wrong with the market; people just generally avoid investing at this time of the year".

[143] Interviewee BR14 never responded to this question.

He also added that “in the month of Muharram, the Shiat community freeze their investments as they are generally busy in mourning the very tragic incident that took place many years ago [i.e. the battle of Karbala] . In Zil-Hajj, the last month of Islamic calendar, it was suggested that the volumes also decline due to the fact that many Muslim investors go to Makkah for the Haj (pilgrimage). So trends and patterns could be found if you take all this into account.”

These views were different from the findings of Mustafa (2008) where he documented no Ramadan effect in Pakistani security returns over the period March 1998 September 2004. They are also inconsistent with the results of Husain (1998) who discovered that there was a significant decline in the volatility of share returns in the month of Ramadan; far from increasing risk as BR12 suggested, in fact risk fell during Ramadan. Interviewee BR1 also highlighted that share returns might be predictable during the months of Ramadan and Safar. He also suggested that “in Ramadan there is normally an upward trend in share prices”. Once he spotted this trend, he then “checked for a reverse pattern in the month of Safar”. He suggested that “in Safar, the market underperformed [on the basis of very little activity]”; he attributed this underperformance in the month of Safar to “a generally negative mood” among the population.

Although some interviewees mentioned that returns in other Islamic months could be predictable, the most common pattern highlighted related to the month of Ramadan. Some 18 of the 19 interviewees mentioned that the period of Ramadan had an effect on the stock market in Pakistan[144]. By contrast, for the next most mentioned month, the month of Muharram, only 6 of the 19 interviewees highlighted that share performances was predictable as well.

In support of Al-Ississ's (2010) findings, most of the interviewees suggested that market returns were positive in the month of Ramadan. For instance, interviewee BR2 mentioned that:

> "Trading volumes and market performance picks up before Ramadan... Some of the investors become more religious and they don't opt for leverage products in the month of Ramadan because it's not allowed in Islam. Volumes are generally low [during the month] as well because the trading hours are shortened in Ramadan[145]. For the past ten years, since I have been in this market, Ramadan coincides with a bullish period in the market. Usually technical analysis shows us that the typical Bull run starts from September/October and lasts until March/April. If you study the calendar for last 10 years, you will see that Ramadan has fallen during August to February."

Interviewee BR2 suggested that the link between Ramadan and a bull market was a mere coincidence. However other respondents associated this effect with the shortening of the trading times and the increased devotion among investors to prayers. For example, interviewee RE3 stated that:

> "During Ramadan we have shorter trading times. Normally the timings are 9:30 – 15:30 but in the month of Ramadan the trading time is 9:00 – 13:00. The volume and average trading per day therefore comes down because of the shortening of the time [for trading]. A lot of investors are not interested in investing during the month of Ramadan because their thoughts are diverted to

[144] Two of the 18 interviewee's mentioned the month of Ramadan but said that there is no longer any Ramadan affect in the market. Whereas one of the individual interviewee, IND2, said that his trading did not vary with the Islamic calendar however the general volumes in Ramadan goes down. Interviewee BR14, did not answer the question.

[145] This was mentioned in the study by Husain, 1998.

> preaching, fasting and 'taraweeh'[146] so they don't work. A lot of people also travel to the Umrah[147] [and so are not around to trade]."

This comment was in line with the findings from Husain (1998) where he discovered that equity price volatility was lower in the month of Ramadan. Six of the respondents claimed that this effect was not present during the whole period of Ramadan but was concentrated in the final weeks of the holy festival; they suggested that volumes were quite thin in the last 10 days of Ramadan[148]. They attributed this thin trading to the fact that a lot of investors are out of the country for religious reasons towards the end of this month. In this context, respondent RE1 mentioned the "attendance at the stock market is low especially in the last 10 days of Ramadan when people go to Saudi Arabia for Umrah and prayers. As a result, he noted that "there were fewer shares changing hands and fewer settlements [in this period]". A couple of interviewees also mentioned the prominence of the "Memon" community in the stock market; they suggested that individuals from this community essentially had an influence on the level of trading around Muslim festivities; this community were religious and concentrated on Islamic practices more in Ramadan rather than their equity investments. For example interviewee BR11 stated that during the "last ten days [of Ramadan], because the brokerage industry is dominated by the business community called Memons, [trading declines] because they focus more on religion and forget about business." Interviewee BR8 concurred with this observation; he commented that "most of the participants in the market belong to a particular community called the Memons and this community, especially in Ramadan, practices Islam very strictly and enthusiastically."

[146] Extra congregational prayers performed by Muslims at night in the month of Ramadan.
[147] Pilgrimage performed in Saudi Arabia.
[148] A study by Al-Assiss (2010) found that the last 10 days of Ramadan have a higher return than the first ten days (0.18 percent vs. 0.07 percent) this was associated by the positive investor mood which will be discussed later in this chapter.

The respondents associated the Muharram effect with the law and order situation in the country and with the mourning observed by the 'Shia' Muslims in this particular month of the Islamic calendar. Sunni Muslims generally mark Muharram to honour the liberation of Moses and the Israelites from the Pharaoh and his army. Sunni Muslims fast on certain days of that month, following the example of the prophet Mohammad[149]. On the other hand, Shia Muslims mourn the martyrdom of Hussein ibn Ali, the grandson of the prophet Mohamad at the Battle of Karbala on Ashura during Muharram (Al-Assis, 2010). In the same context, the response of IND1 was typical when he mentioned that:

> "Muharram is the month when Shia-Muslims are busy mourning for the martyrdom of Imam Hussain and Imam Hassan. Thus, they pay less attention to the market during this period. Also, because the law and order situation is tense in this month because more often than not there is some sort of clash or riot [between Sunni and Shia Muslims who adopt different approaches to this month]. Especially on the 9th and 10th of Muharram."

When asked "why security trading might vary with Islamic religious events" the most common reply was that investors focused more on religion at the time of these events and attendance at the market was down. In addition, the shortening of trading hours during these events further reduced volumes as well as liquidity.

Finally, respondents' views were sought on whether Islamic calendar events were more important to security trading and stock market performance in Pakistan than their

[149] Narrated Aisha: Quraish used to fast on the day of 'Ashura' in the Pre-lslamic period, and Allah's Apostle too, used to fast on that day. When he came to Medina, he fasted on that day and ordered others to fast, too. Later when the fasting of the month of Ramadan was prescribed, he gave up fasting on the day of 'Ashura' and it became optional for one to fast on it or not. (Sahih Bukhari, Book #31, Hadith #220)

Western calendar counterparts. Thirteen out of the 17 respondents (76 percent) who replied to this question said that Islamic calendar events were "more important" than the Western calendar. The most comprehensive reply was supplied by interviewee BR2 when he asserted:

> "Of course, for the market it's a function of local dynamics; [in Pakistan] the bulk of the activity is done by the local investors. 85 percent of the activity according to the trading statistics is done by the local investors so Islamic events have a bearing on the market."

An individual investor, interviewee IND2, was one of the two respondents who suggested that Western events had an impact in the market; he pointed out that the KSE also attracts a growing amount of "foreign investment as well so sometimes if there is Christmas, New Year or a Chinese holiday", there is "a slowdown in the [inflow of] foreign funds and that results in a decline in the overall volume as people tend to follow [the lead of] foreign investors". He stated that "if the activity of foreign investors declines, local investors also stay away from the market."

Again, it is quite clear from the interviewees that the Islamic religion had an influence on security trading and stock market performance in Pakistan. Most interviewees suggested that trading patterns could be identified in different Islamic months which could be predicted and exploited to generate abnormal returns; hence most interviewees rejected the EMH. The next section attempts to explain whether the interviewees believed that investor psychology could also explain any patterns or anomalous behaviour in terms of trading activity and attitudes to risk.

5.5 Psychological Aspects

In the final part of the questionnaire, Section D, the respondents were asked 7 questions. This section sought respondents' opinions on the importance of psychological aspects associated with investment in Pakistan; the questions focused on investor mood and whether it had any role to play in explaining any anomalous behaviour of the stock market. For example, the interviewees were asked about whether "emotions and moods have any effect on decision making, risk assessment and equity valuation". They were also questioned about whether market prices were influenced by investor mood. All 16 of the regulators and brokers who answered this question replied positively. In addition, the two individual investors also agreed that their mood affected their investment decisions, risk assessment and equity valuations. BR2 summed up this perception as follows:

> "Yes definitely, perceptions can change but obviously fundamental techniques won't change but yes, perception and mood governs trading patterns. Every time you have any of these catastrophes or terrorist events, that can change the mood of investors."

The Chief Executive Officer of a brokerage firm, BR11, gave an example of how a cricket match could change the mood of investors and in turn influence the stock market[150]. For instance, he stated that:

[150] A study by Edmans et al. (2007) indicated that the outcomes of sporting events involving the country as a whole impacted on the stock market of the country. Their paper investigated psychological evidence of a strong link between soccer outcomes and investor mood. The authors used international soccer results as the primary mood variable. They documented a significant market decline after soccer losses. Specifically, the authors found that a loss in the Soccer World Cup elimination stage lead to a next-day abnormal stock return of -0.49 percent. They also documented a negative stock market performance after losses in international cricket, rugby, and basketball matches. The authors argued that it was hard to imagine what else but mood could cause this effect.

> "If there is a cricket match [with Pakistan winning] people are happy so they want to buy more shares; they don't want the market to fall. They may be busy watching the cricket but they still don't want the market index to decline".

He suggested that at these times investment was "all about emotions". Interviewee RE3, one of the directors of the KSE, agreed with this point of view when he noted that:

> "When the people are happy they are even interested in buying at higher prices like when there is a big joyous occasion for the nation there is [a wave of] emotional buying as well. For example, when Pakistan won the [cricket] world cup everybody was so happy that the next day the market went up by more than 100 points."

Individual investor, Interviewee IND1, gave a more recent example of the same phenomenon. He noted that if he was "in a positive mood" he might be "willing to take on more risk than he would normally do". He suggested that the same approach "applied for the whole nation as well; for example, if the whole nation is in a positive (negative) mood then market will experience a positive (downward) trend". For instance, he pointed out that when President Benazir Bhutto was assassinated (Kilcullen and Exum, 2009) "the market remained shut for a few days and after it re-opened people were very reluctant to put their money in equities". In fact he suggested that "investors were scared because of the political situation and some pulled their capital out of the market; as a result the Index started decreasing drastically". So he argued that:

> "Emotions and mood have a big impact on the market especially when a majority of the population is going through similar emotions and

> experiences[151]. Ideally this should not be happening as investors don't think rationally but unfortunately it does happen, especially when they are assessing the risk of the securities. Emotions are generally short term and affect shares on an individual basis. However mood is long term and things like the state of the economy and the law and order situation affect mood of more than just individuals."

An operator from the KSE, BR5, also mentioned that the valuations of equities were affected by individual mood. For example, he pointed out that "if there is a bad news event in the country, investors' start selling their shares and this creates panic in the market. People under-value shares and sell them at low prices and end up making a loss just because of the bad news that has been broadcast." Broker BR6 summed up this perspective noting that "Emotion free trading is only possible when you are dealing with High frequency transactions; i.e. when the trading is done by machines and not humans."

There was less disagreement amongst the respondents about whether various religious events affected investor mood differently. Apart from the brokers BR4 and BR14 and investor IND2 all agreed that they did[152]. Broker BR2 was typical in his response when he noted that:

> "Yes, Muharram does have an effect on investor mood. Usually people that belong to the Shia sector don't trade in the month of Muharram and there is a fair share of those people in the market; they postpone their investment in that month. Also in the month of Ramadan, Muslims are fasting, their energy level is low and that affects the mood as well."

Individual investor, IND1, agreed with this general view noting that:

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[151] This point is also mentioned by Al-Hajieh et al., 2011.
[152] 84 percent of the interviewees said 'Yes' to that question.

> "The months of Muharram and Safar generally have a negative impact on my mood because of the events that took place involving Muslims many years ago; it is not just my mood but the mood of the whole country that is affected. However in Ramadan there is a positive feeling of goodwill throughout the nation because people are generally happy; they are out shopping for their families for Eid and socialise more."

Some investors associated mood at the time of religious events with trends in security prices and risk. For example, BR13 mentioned that "in the month of Muharram investor mood is generally very negative. There are a lot of security issues in this month as well and so the market is normally slow in this month. This is especially true on the 9th and the 10th day of Muharram because of the security fears". BR3 noted that "Ramadan had a positive impact on the mood. If you look at the history, the market has always been positive in Ramadan and the public follows these previous trends and a greater amount of speculation occurs."

In a group interview with four brokers (BR6, BR7, BR8 and BR9), broker BR6 implied that the mood was generally positive in the month of Ramadan, consistent with the results from Bialkowski et al. (2012), and that there was a slowdown in the market especially in the last 10 days of Ramadan[153]. Another broker, BR8 argued that:

> "In Ramadan activity is slack for another reason which is extremely logical and simple to understand: namely the trading hours are shorter. So you have less time to think [about equities] and make your investment decisions and this has an effect on the overall performance of market as well."

Broker BR6 disagreed with his view, however, noting that "in the days when the market used to always close at 1:00PM there was no difference in the timings of

[153] Apart from one group interview (BR6, BR7, BR8 and BR9), all other interviews were conducted on an individual basis. BR6, BR7, BR8 and BR9 were interviewed as a group because they all worked for BMA Capital Management and were available at the same time after work.

trading in Ramadan [and non-Ramadan months]; but still the volumes were low in Ramadan."

The interviewees were asked further questions as to whether market prices and trading volumes were influenced by investor mood[154]. Some 17 of the 19 respondents replied 'Yes' implying that market prices were influenced by investor mood. In addition, 18 of the 19 respondents agreed that share trading was also influenced by the general mood within the country. Broker BR4 noted that "if the mood is positive, buying increases and if it is negative there is a lot of selling". This comment was typical of the opinions expressed by the interviewees. For example, BR14 noted that "if investors are pessimistic they will avoid investments and this [reduction in demand] consequently will have an effect on the price". This comment was consistent with the findings of Wright and Bower (1992) who documented that sad people are "pessimistic", providing lower (higher) probabilities for positive (negative) events. Broker BR3, the CEO of a brokerage house, added that:

> "The market is very sentimental and these days the sentiments are quite weak; therefore the market is bearish these days. The reason [for this bearish sentiment is] that the government have just introduced capital gains tax and that has adversely affected investor sentiment and hence the mood of the market[155]".

From these responses it would appear that mood has an impact on the stock market and religious events impact on mood differently; these impacts will be transmitted to the stock market; hence, a number of respondents suggested that investor sentiment

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[154] Here, individual investors, IND1 and IND2 were asked the question directed to them. They were asked whether market prices and share trading influenced by "their mood".

[155] Broker BR4 also mentioned tax when he replied "I believe it does, definitely. For example government just introduced a capital gains tax and this made a negative impact on investor mood and there are no volumes in the market these days. So yes, it does have a big effect on the market".

and mood could explain patterns in terms of trading behaviour for certain months of the Islamic calendar.

The interviewees were then asked what other factors, apart from Islamic events, could affect the mood of investors. Various factors were mentioned by different respondents; these factors included: the state of economy; political factors; economic factors; the law and order situation of the country; the annual budget and announcement seasons[156]; and national sporting success. All these factors seemed to play an important role in affecting investor mood according to the interviewees. Interviewees were also asked about whether the performances of stock markets in Muslim countries such as Pakistan differed from the performances of stock markets in non-Muslim countries. There was a mixture of responses to this question; 7 respondents said 'Yes', 5 respondents said 'No' and 6 respondents gave mixed replies[157]. For instance, respondent RE1 noted "It's really difficult to answer that question as there is no comparison. Some of the non-Muslim markets are well developed and far bigger than most of the Muslim markets so you can't compare them." By contrast, interviewee BR11 responded negatively to this question. He noted:

> "No, ... people say Pakistan is different; I'll tell you nothing is different. All markets are same; even the American market is controlled by some big players. Here you can identify some influencial people but there it's all a big game. All markets are similar".

Broker BR5 agreed with BR11 saying that "if there is an effect in the New York market there will be an effect on the KSE as well. So I don't think there is much

[156] Interviewee RE1 was the only respondent that mentioned this factor.
[157] One of the interviewees, BR14, did not answer the question.

difference in the performance of the two markets." Overall, this question gave rise to a lot of disagreement between the respondents and no definite conclusion emerged.

Finally, the interviewees were asked whether the influence of Islamic events on the Pakistani stock markets had changed over recent years and if so, how. Nine respondents said 'Yes', seven replied 'No' and two interviewees were equivocal in their replies; the remaining interviewee, BR9, did not answer. The respondents who answered 'Yes' to this question were able to explain the reasoning behind their reply whereas the interviewees who replied negatively to this question were unable to indicate why they had arrived at this conclusion; all they said was that the influence had not changed; it was still the same. Investor IND1's response was quite convincing when he explained why the influence had changed over time; specifically, he noted that:

> "Before the KSE used to remain shut for almost all Islamic events but because of the increase in competition [from other exchanges in the region] and international exposure that's not the case anymore. Now it only remains closed for major Islamic holy days. In comparison to before, it has a lot more Islamic products and also a KMI index which only deals with sharia-complaint securities. However, the emotional experience still remains the same for religious months whether it is Ramadan, Muharram or Safar. So I believe that with the introduction of new Islamic products the influence of Islam is increasing."

Broker BR11 added to this statement by highlighting that "before, Shia Muslims did not use to do business in the month of Muharram but some of them now invest because they know they have to live with the market, they can't stay away." Broker BR9 mentioned that "back in the 1970s, 1980s and early 1990s, the market didn't have any foreign investors and so there hardly used to be any work during Ramadan.

There used to be public holidays for every single Islamic event.” Speaking about the holidays, BR14 went on and said “there used to be more holidays before [the influx of foreign investors] in different Islamic event months but now you only get national holidays on important Islamic occasions. For example, just yesterday [a day before he was interviewed] it was *Shab-e-Baraat* and there was no holiday; the stock market used to be closed on this day in previous years”. Again, he suggested that the influence was not as pronounced “now as it was before”. He suggested that this change was to keep up with the other stock markets around the world.

Another interesting point was made by the director of a brokerage house, BR13. He observed that

> “A long time ago the weekend was Thursday and Friday - Friday because of the Muslim Friday prayers. It then changed to Friday and Saturday and eventually to be consistent with the other market; Pakistan changed its working days to Monday to Friday, Saturday and Sunday being the weekend. So this shows that the influence was more pronounced before.”

The point made by IDN1 was supported by other interviewees as well (RE1, RE2 and BR6) stating that the influence of Islam was increasing.

5.6 Conclusion

This chapter reports the findings of the interviews that were conducted with investors, brokers and regulators who were involved in the KSE. It provides detailed evidence about the views of people who are knowledgeable about the KSE regarding any monthly calendar seasonality. A number of findings have emerged from this research work. First, the results as a whole suggest that monthly calendar anomalies are present in the market and these are studied by the investors in an attempt to make profits. Past monthly trends in prices were considered useful by practically all the interviewees and they all believed that past price patterns in certain months could help predict future trends which were present in the price data. This chapter also reported that all of the interviewees (brokers and regulators) believed that investors tried to predict these patterns or traded on that basis which contradicts the EMH theory.

Second, there are investors present in the Pakistani market that would only invest in sharia-complaint companies and, more importantly, the trading of the Pakistani investors, according to the interviewees, varied with the Islamic calendar. Further, interviewees suggested that patterns can be identified in different Islamic months (especially for Ramadan) which could be predictable and exploited to make abnormal returns; hence, they rejected the EMH.

Third, interviewees also suggested that investor mood and sentiment played an important role in affecting the decision making, risk assessments and equity valuations of investors in Pakistan. Hence, the respondents believed that investor sentiment had an influence on stock market prices and the share trading of the investors. Therefore, the findings suggested that investor mood and sentiment might explain any anomalous behaviour in the Pakistani stock markets around different calendar months.

This study provides an important contribution to knowledge by suggesting that the Pakistani markets may not be weak-form efficient with regards to calendar anomalies – according to the views of the respondents consulted. The respondents also believed that Islamic calendar anomalies were present in the market and could be exploited by the right trading strategy. Further, investor sentiment plays a big role in explaining the anomalous behaviour of equities in different months for the Pakistani market; this was particularly true for Ramadan, according to the interviewees, as they suggested that volatility declined in this religious month and attributed these changes to investor sentiment and religious duties. These views will be tested with the quantitative analysis of the share price data in Chapter 6 and Chapter 7 before any firm conclusions are arrived at in Chapter 8.

Chapter 6

Testing for Monthly Calendar Anomalies

6.1 Introduction

The purpose of this chapter is to examine the weak-form efficiency of the KSE; in particular, it investigates whether monthly calendar anomalies are present in the Pakistani stock market with regards to both the Gregorian and Islamic calendars. This chapter 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. Descriptive statistics, ANOVA, Kruskal-Wallis and a two-sample t-test were initially employed. These tests were used to discover whether monthly calendar seasonality was present in the KSE market that could be exploited by investors to gain abnormal profits. A GLM model was then fitted to the data to test for the sources of any variation in the returns for KSE equities by examining the importance of a number of factors such as, the Gregorian calendar, the Islamic calendar, company size, sector and years. The GLM model builds on the findings of interviews conducted in Chapter 5. These interviews indicated that certain sectors may be more profitable in different Gregorian and Islamic months of the year; thus, the GLM model takes that into account while investigating the sources of variation in the returns of the sample shares.

The remainder of this chapter is structured as follows. Section 6.2 reports the descriptive statistics and discusses the preliminary analysis. Details of the findings from the ANOVA and Kruskal-Wallis tests are discussed in Section 6.3 while Section 6.4 documents the results of the two-sample t-test. The empirical findings from the GLM model are highlighted in Section 6.5. Finally, Section 6.6 concludes the chapter.

6.2 Descriptive Statistics and Preliminary Analysis

The sample selected for analysis is the daily share price information for 106 companies listed on the KSE over the 17-year period from 1995 to 2011. Tables 4.1 and 4.2 reported information about the final sample that was used for this chapter of the thesis (see Chapter 4 for details). Summary statistics for the whole sample of 106 firms were generated for each month of the year based on the Gregorian and Islamic calendars (Table 6.1). Once these summary statistics were estimated, the mean for each individual year from 1995 – 2011 for the sample companies were calculated for: (i) the Islamic calendar; (ii) and the Gregorian calendar; these means are presented in Table 6.2A and Table 6.2B respectively. Sorting the data for each year enabled annual comparisons to be made and highlighted any trends which might have been present in the data.

Descriptive statistics were calculated for the whole 17-year period. These statistics include the mean (MEAN), the standard deviation (SD), the minimum (MIN), and the maximum (MAX). In addition, skewness (SKEW), which is a measure of asymmetry in the monthly returns, and kurtosis (KURT), which indicates the extent to which a distribution is peaked or flat, were calculated for the daily returns per month across the sample companies over the 17-year time period for Gregorian and Islamic calendars; the findings for this whole 17-year period are reported in Appendix 6.1 (descriptive statistics for all 106 companies). Summary results from these descriptive statistics are reported in Panels A and B of Table 6.1 in this Chapter.

Table 6.1 Summary Statistics for the Sample Firms' Returns over the 17-year Period

Panel A: Gregorian Calendar

Month	MEAN	SD	MIN	MAX	SKEW	KURT
January	0.00135	0.0386	-0.22	0.22	-0.02	14.57
February	0.00085	0.0408	-0.22	0.24	0.38	15.21
March	-0.00003	0.0401	-0.24	0.22	-0.24	15.70
April	0.00053	0.0356	-0.21	0.19	-0.12	12.36
May	-0.00192	0.0387	-0.23	0.22	-0.21	14.14
June	-0.00033	0.0411	-0.27	0.24	-0.46	19.88
July	0.00082	0.0362	-0.21	0.22	0.26	14.23
August	-0.00102	0.0365	-0.21	0.20	-0.02	11.67
September	0.00044	0.0364	-0.22	0.21	-0.10	16.40
October	0.00007	0.0386	-0.23	0.22	-0.17	16.63
November	0.00045	0.0384	-0.23	0.22	-0.01	15.63
December	0.00056	0.0389	-0.24	0.22	-0.27	18.74

Panel B: Islamic Calendar

Month	MEAN	SD	MIN	MAX	SKEW	KURT
Muharram	-0.00023	0.0376	-0.23	0.20	-0.36	15.77
Safar	-0.00031	0.0422	-0.26	0.24	-0.32	15.56
Rabiul Awwal	0.00060	0.0388	-0.23	0.21	-0.14	14.43
Rabiul Thani	-0.00019	0.0361	-0.21	0.20	-0.13	14.80
Jamatul Awwal	-0.00033	0.0339	-0.18	0.19	0.17	11.24
Jamatul Thani	-0.00026	0.0365	-0.22	0.22	-0.06	15.42
Rajab	-0.00058	0.0385	-0.23	0.22	-0.07	16.82
Shaban	-0.00053	0.0376	-0.21	0.21	-0.03	11.95
Ramadan	0.00175	0.0372	-0.23	0.23	0.00	18.41
Shawwal	0.00116	0.0409	-0.23	0.24	0.24	18.20
Zil Qa'ad	0.00115	0.0400	-0.22	0.23	0.27	12.98
Zil Hajj	-0.00048	0.0406	-0.26	0.22	-0.67	18.12

Note: This table shows the descriptive data for the sample shares according to the Gregorian calendar (Panel A) and the Islamic calendar (Panel B). The mean is the equally-weighted average of all daily observations over the 17-year period. SD, Min and Max donate the standard deviation, the minimum daily return and the maximum daily return, respectively. Skew refers to the Kendall-Stuart measure of skeweness while Kurt is the Kendall-Stuart measure of kurtosis.

A visual examination of Panel A in Table 6.1 highlights a number of interesting points. The table shows that in a majority of the months of the Gregorian calendar (67 percent) had a positive average daily mean return for the sample period. This implies an upward trend in the share returns of the typical company during the 17-year period investigated[158]. It is clear from the table that the highest average mean is reported for the month of January at 0.135 percent; by contrast the lowest mean is documented for the month of May at -0.192 percent. Thus, the findings for this sample of Pakistani companies based on the Gregorian calendar appears similar to the results documented for other developed markets; returns are positive in the first month of the year based on the Gregorian calendar (Rozeff and Kinney, 1976; Gultekin and Gultekin, 1983; Brown et al., 1983; Berges et al., 1984; Agrawal and Tandon, 1994; Boudreaux, 1995). However, the size of this positive return in January is less than that reported in other studies. For example, Rozeff and Kinney (1976) found that share returns in January were statistically higher as compared to the other months of the year for US equities; their test found that the average January monthly return was approximately 3.5 percent while the average return over the other months was only 0.5 percent.

The summary statistics in Panel B of Table 6.1 suggest that investors earn the highest mean return over the 17-year period in the month of Ramadan; the average return for this month at 0.175 percent (higher than the January return for the Gregorian calendar). This result supports the findings of Al-Ississ (2010) who documented a

[158] However, Panel B indicates that a majority of Islamic months (67 percent) had a negative average daily mean return for the sample period; this highlights that most of the positive returns were concentrated in the months of Ramadan, Shawwal and Zil Qa'ad. However, it should be noted that the split is 8/4 (8 months with positive average returns and 4 months with negative average returns); therefore the average returns difference could be due to "noise" in the data. If the sign were determined randomly, which it would be under a no effect null hypothesis, then the number of positive returns would behave like a value from a binomial distribution (n = 12, p = 0.5). Therefore, the probability of commenting on something that is not remarkable but due to noise is approximately 1/6.

0.05 percent increase in daily returns for this month as compared to all other months of the Islamic calendar[159]. The month of Shawal at 0.116 percent recorded the second highest mean return while the month of Zil Qa'ad at 0.115 percent was a close third. A detailed inspection of Panel B in Table 6.1 reveals that the mean daily return for the month of Ramadan was higher as compared to the average mean returns of all the other Islamic months excluding Ramadan; 0.175 percent compared to -0.0001 percent. This result is consistent with the findings of Al-Hajieh et al. (2011) where the authors documented that mean returns in Ramadan were higher than the yearly mean returns (excluding Ramadan) for five out of the six Middle Eastern stock markets that they studied during the period 1992 – 2007. The lowest mean for the sample firms was for the month of Rajab at -0.058 percent followed by the month of Shaban at -0.053 percent[160].

According to finance theory, high levels of return should, on average, be associated with high levels of risk (Merton, 1973; Ghysels et al., 2005; Lundblad, 2007; Chan et al., 1992); but this does not appear to be the case for the current sample[161]. The highest standard deviation occurs in the month of June at 4.11 percent and the lowest level of volatility arises in the month of April at 3.56 percent. Similar results emerged for the Islamic calendar. An inspection of Panel B in Table 6.1 indicates that the highest standard deviation occurred in the month of Safar at 4.22 percent whereas

[159] This result contradicts the findings of Mustafa (2008) who reported the average return in the month of Ramadan was smaller and insignificant than that documented for other months; he therefore concluded that there was no Ramadan effect in the KSE for the time period which he studied.
[160] As mentioned earlier, thinly traded shares were excluded from the data. However, thin trading is a characteristic of emerging markets and therefore the omission of these thinly traded shares may impact the results of the study. Although, this was not the case in the current thesis since Appendix 6.2 reports that the results of the sample with thinly traded shares included were not different from those highlighted here; January and Ramadan still exhibited highest monthly returns whereas May and Rajab exhibited the lowest monthly returns.
[161] In contrast to standard finance theory, some studies have found a negative relationship between return and risk. For example, Campbell (1987) and Nelson (1991) found a significant negative relation between expected return and variance.

volatility in the month of Ramadan (at 3.72 percent) was relatively low as compared to other months in the table; the least volatile month was Jamatul Awwal at 3.39 percent[162].

The volatile nature of equity prices for the KSE is confirmed by an analysis of MIN and MAX values. Across all the Gregorian months, the minimum daily return (in a month) documented for a firm ranges between -0.21 (April, July, August) and -0.27 (June) whereas the maximum daily return values reported, varied from 0.19 (April) to 0.24 (February; June). A similar picture emerges for the minimum and maximum daily returns for the Islamic calendar months. Across all the Islamic calendar months, the minimum daily return documented for a firm ranged between -0.18 (Jamatul Awwal) and -0.26 (Safar, Zil Hajj) whereas the maximum daily returns values reported varied from 0.19 (Jamatul Awwal) to 0.24 (Safar, Sahawwal). This finding that the daily returns for the sample firms are characterised by large changes is not surprising since share price volatility is a characteristic of emerging market securities (Harvey, 1995; Li and Hoyer-Ellefsen, 2004; Fifield et al., 2005; 2008). Indeed, what is surprising about the current results is that return volatility is not as high as that documented in other studies; for instance, Fifield et al. (2008) reported that the minimum – maximum daily return for Argentina over the 15-year time period changed between -0.93 and 0.44[163]. This difference may be due to a number of factors. For example, the data in the current study were "trimmed" to remove extreme

[162] No strong link was found between the average means and standard deviations for different months. For example, the best performing month (January) and the worst performing month (May) had a SD of 3.86 and 3.87 percent respectively, for the Gregorian calendar whilst, the best performing month (Ramadan) and the worst performing month (Rajab) had a SD of 3.72 and 3.85 percent respectively, for the Islamic calendar.

[163] An earlier study by Fifield et al. (2005) reported that the average minimum daily return for Hungary and Turkey over the 10-year period ranged between -19.05 to 13.32 percent and -16.00 to 17.91 percent, respectively.

observations which will have limited the MIN and MAX values reported (see Chapter 4). In addition, the KSE is a relatively liquid market (see Chapter 2) and companies had to be in existence for 17 years to be included in the sample.

The last two columns in Panel A and B of Table 6.1 suggest that the return data may not be normally distributed – even after taking natural logs. Returns were negatively skewed in 10 of the 12 Gregorian months; out of the 106 firms, 97 of these negative skewness statistics were significant at the 5 percent level[164]. In the case of the Islamic calendar, returns were negatively skewed in 8 of the 12 months. This suggests that the majority of months had a large tail of negative values; from the perspective of a risk-averse investor, investing in the KSE may be relatively unattractive as the distribution of returns for shares traded in the KSE has a tail of negative values in most months. In addition, the kurtosis statistics were all higher than the critical value of 3 suggesting that the return distributions were characterised by fat-tails; there were more observations in the tail than one would normally expect. Thus, some caution may need to be exercised when interpreting parametric tests since the kurtosis values suggest that the data may be non-normal.

[164] Values of skewness were deemed significant if they were more than twice their standard errors. In the current analysis, the standard error values documented for the skewness statistics varied from -4.97 for PK:FZM to 1.47 for PK:PNS.

Table 6.2A

Month-to-Month Mean Returns (Islamic Calendar)

Month	Muh	Safar	Rab-Aw	Rab-Th	Jam-Aw	Jam-Th	Rajab	Shaban	Rama	Shawwal	Zil-Q	Zil-Haj
1995	0.00039	0.00414	0.00443	-0.00335	-0.00210	-0.00795	0.00087	-0.00473	0.00047	-0.00527	-0.00342	-0.00345
1996	-0.00482	-0.00345	-0.00383	-0.00448	0.00100	0.00426	0.00119	-0.00367	0.00683	-0.00742	-0.00426	0.00300
1997	-0.00303	0.00182	0.00408	-0.00756	-0.00021	-0.00088	-0.00424	-0.00097	0.00936	0.00471	-0.00135	-0.00383
1998	-0.00557	-0.00401	-0.00173	-0.00150	0.00156	-0.00340	0.00266	0.00020	-0.00171	-0.00165	-0.00117	0.00020
1999	0.00525	-0.00172	0.00086	0.00237	0.00067	0.00017	0.00165	0.00382	0.00055	-0.00018	0.00418	0.00110
2000	-0.00044	-0.00991	-0.00115	0.00153	-0.00090	0.00176	-0.00055	-0.00377	0.00628	0.00720	0.00506	0.00067
2001	0.00016	-0.00064	0.00079	-0.00143	0.00035	-0.00441	0.00379	0.00375	-0.00118	-0.00210	-0.00084	-0.00409
2002	0.00119	0.00049	-0.00132	0.00093	0.00038	0.00179	0.00199	0.00382	0.00231	0.00517	0.00741	0.00306
2003	0.00489	0.00662	0.00670	0.00572	0.00718	0.00386	-0.00343	-0.00678	0.00179	0.00402	-0.00149	-0.00239
2004	0.00336	0.00485	0.00052	0.00102	-0.00107	-0.00040	-0.00154	0.00337	-0.00016	0.00385	0.00534	0.00138
2005	0.00141	-0.00437	-0.00265	-0.00163	-0.00092	0.00027	0.00008	0.00547	0.00079	0.00569	0.00498	0.00181
2006	-0.00085	-0.00093	-0.00120	-0.00344	-0.00557	0.00390	-0.00170	0.00099	0.00105	-0.00265	-0.00116	0.00484
2007	0.00057	0.00010	0.00364	0.00247	0.00561	0.00524	-0.00557	-0.00058	0.00382	0.00095	0.00234	-0.00004
2008	-0.00304	0.00122	0.00129	-0.00204	-0.00428	-0.00355	-0.00780	-0.00751	N/A	N/A	N/A	-0.01509
2009	-0.00484	0.00049	0.00468	0.00528	-0.00332	-0.00161	0.00279	0.00101	0.00439	0.00308	-0.00300	0.00080
2010	0.00322	0.00122	-0.00318	-0.00003	-0.00130	-0.00615	0.00105	-0.00093	-0.00115	0.00043	0.00347	0.00236
2011	-0.00113	-0.00084	-0.00126	0.00051	-0.00274	0.00118	-0.00120	-0.00250	-0.00363	0.00260	-0.00201	-0.00201

Note: This table show the average yearly mean of 106 sample shares according to the Islamic calendar months over the 17 year period; Muharram (Muh); Safar, Rabiul Awwal (Rab-Aw); Rabiul Thani (Rab-Th); Jamatul Awwal (Jam-Aw); Jamatul Thani (Jam-Th); Rajab; Shaban; Ramadan (Rama); Shawwal; Zil Qa'ad (Zil-Q) and Zil Hajj (Zil-Haj). N/A donates to the period which was omitted from the sample due to the trade suspension imposed on the KSE (see Chapter 2).

An analysis of Table 6.2A indicates that the most consistent feature is the high average returns earned by Pakistani equities during the month of Ramadan. A closer inspection of this table indicates that Ramadan had the least negative mean returns as compared to any other month in the Islamic calendar for the 17 years shown in the table; this provides some evidence that a monthly effect may be present in the data. Ramadan is the only month with 11 or more positive mean values over the 17-year period whereas all the other Islamic months have 9 or more positive mean return values; Muharram, Safar, Rabiul Thani and Jamatul Awwal, Jamatul Thani, Rajab, Shaban and Zil Qa'ad.

An inspection of the whole table reveals that the largest negative mean return was in the month of Safar (-0.99 percent) during 2000. By contrast, the largest positive average return was in the month of Ramadan (0.94 percent) in 1997. An inspection of Table 6.2B indicates that largest negative mean return was in the month of December (-2.53 percent) for 2008 while the largest positive average return was in the month of February (1.46 percent) during 1997. In fact, the results in this table support the findings in Chapter 2 which suggested that the stock market performed poorly in 2008; an analysis of these average returns across the Gregorian and Islamic months confirm this impression. Thus, a look at the summary statistics in these tables reveals that market returns for various months exhibit different effects for both the Gregorian and the Islamic calendars; however, further testing is needed before conclusions can be reached.

Table 6.2B

Month-to-Month Mean Returns (Gregorian Calendar)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995	-0.00551	0.00054	-0.00506	-0.00342	-0.00335	-0.00067	0.00596	0.00261	-0.00435	-0.00181	-0.00798	0.00367
1996	0.00157	0.00221	-0.00625	-0.00253	0.00089	-0.00276	-0.00713	-0.00248	-0.00124	0.00254	0.00357	-0.00392
1997	0.00536	0.01465	-0.00414	-0.00394	-0.00298	-0.00055	0.00691	-0.00683	-0.00176	-0.00064	-0.00456	-0.00112
1998	-0.00181	-0.00165	-0.00088	-0.00036	-0.00698	-0.00403	-0.00071	-0.00086	0.00282	-0.00488	0.00410	-0.00142
1999	-0.00296	0.00200	0.00490	0.00169	0.00324	-0.00301	0.00437	0.00156	-0.00146	-0.00027	0.00321	0.00459
2000	0.01044	0.00544	0.00121	0.00071	-0.00922	-0.00261	0.00106	-0.00035	0.00176	-0.00051	-0.00388	0.00612
2001	-0.00055	-0.00131	-0.00475	0.00145	0.00066	0.00029	-0.00281	0.00012	-0.00407	0.00593	-0.00024	-0.00319
2002	0.00911	0.00008	0.00281	0.00284	-0.00396	0.00209	-0.00041	0.00268	0.00171	0.00483	0.00052	0.00510
2003	-0.00238	-0.00349	0.00502	0.00620	0.00685	0.00572	0.00747	0.00303	-0.00500	-0.00635	0.00533	0.00469
2004	0.00601	-0.00012	0.00384	0.00232	0.00458	-0.00170	-0.00156	0.00225	-0.00166	-0.00003	0.00399	0.00432
2005	0.00205	0.00440	-0.00449	-0.00225	-0.00397	0.00099	-0.00016	0.00048	0.00482	0.00078	0.00620	0.00439
2006	0.00526	-0.00069	-0.00094	-0.00147	-0.00534	-0.00069	0.00157	-0.00139	0.00119	-0.00049	-0.00164	-0.00045
2007	0.00235	-0.00070	0.00078	0.00424	0.00467	0.00504	0.00000	-0.00472	0.00323	0.00423	0.00016	-0.00106
2008	-0.00058	0.00200	0.00006	0.00076	-0.00922	-0.00008	-0.00583	-0.00871	N/A	N/A	N/A	-0.02529
2009	-0.00597	-0.00084	0.00474	0.00191	0.00011	-0.00188	0.00331	0.00136	0.00575	-0.00192	-0.00044	0.00193
2010	0.00116	-0.00149	-0.00014	-0.00092	-0.00774	-0.00063	0.00430	-0.00331	0.00081	0.00172	0.00342	0.00242
2011	-0.00074	-0.00470	0.00300	-0.00038	-0.00137	-0.00101	-0.00233	-0.00363	0.00298	-0.00213	-0.00322	-0.00040

Note: This table show the average yearly mean of 106 sample shares according to the Islamic calendar over the 17 year period. N/A donates to the period which was omitted from the sample due to the trade suspension imposed on the KSE

6.3 ANOVA and Kruskall-Wallis

It is evident from the examination of the summary descriptive statistics performed in the last section that returns in certain months seemed to be different from those in other periods. For example, the returns in the month of January were highly positive whereas the returns in the month of May were strongly negative. A similar picture emerged from an analysis of monthly returns for the Islamic calendar; the returns in the months of Ramadan, Shawwal and Zil Qa'ad seemed to be different as compared to share price changes in the rest of the months of the Islamic year. To investigate this impression and examine whether some months are significantly different from others in terms of return performance a number of tests were performed. Specifically, an ANOVA, Kruskal-Wallis and a two-sample t-test were employed for this purpose[165]. The ANOVA analysis was conducted on the difference in mean returns between various calendar months[166].

Table 6.3 shows the results of the ANOVA test on: (i) the difference between the mean returns across the various months of the Gregorian and Islamic calendars; and (ii) the difference in individual firm returns for the two sets of calendar months being examined. The R^2 statistic indicates the percentage of the variability in mean returns explained by the fitted model based on the null H_0. SS and MS denote the total sum of squares and the mean sum of squares respectively. The F-ratio was employed to test the null hypothesis that the mean returns of different months are not significantly different from the others.

[165] Further details of these tests can be found in Chapter 4.

[166] The ANOVA (Kruskal-Wallis) procedure was employed to test for seasonality in the average mean (median) returns of 12 months for each calendar. The results will indicate whether the mean (median) returns in all the months were significantly different from each or not (details in Section 4.5.2).

Table 6.3

ANOVA Test for the Sample Firms' Returns over the whole period

Average Returns Across All Firms					
Calendar	**SS**	**MS**	**R-Square**	**F-Test**	**p-value**
Gregorian Calendar	0.00304	0.00028	0.58	2.16	0.014
Islamic Calendar	0.00235	0.00012	0.45	1.66	0.075
Individual Firms Returns					
Calendar	**SS**	**MS**	**R-Square**	**F-Test**	**p-value**
Gregorian Calendar	0.32220	0.02930	0.04	15.22	0.000
Islamic Calendar	0.24870	0.02260	0.03	11.75	0.000

The null hypothesis is rejected if the p-value of test statistic takes on small values that are lower than the 0.05 significance level. According to the p-value in Table 6.3 for all sample firms, there is strong evidence that the mean returns across the 12 Gregorian calendar months are different as the p-value is considerably less than 0.05. Thus, investors investing in certain months can gain excess returns which contradicts the weak-form of EMH. On the other hand, the p-value for the Islamic calendar is 0.075; hence, the null hypothesis cannot be rejected implying that the mean returns across all the Islamic calendar months are not significantly different at the 5 percent level. Interestingly however, when the test is done on individual companies, the results are stronger according to the bottom half of Table 6.3. In both cases, there is strong evidence to reject the null hypothesis indicating that both the Gregorian and Islamic calendars' monthly means are significantly different[167]. A comparison of the R^2 results reveals that the test based on individual firm returns is significantly less informative than its counterpart based on average returns across all companies. The

[167] Figures in Appendix 6.3A and 6.3B supply a picture of the months which are different on average; both figures confirm the findings from the descriptive statistics results. For further investigation of which months are significantly different than other, a two-sample t-test was employed in section 6.4.

value of the R^2 test for the Gregorian (Islamic) calendar months declines from 58 percent to 4 percent (45 percent to 3 percent) when the analysis is based on individual company returns rather than average price changes. Such a result is hardly surprising since the averaging process presumably gets rid of a lot of volatility in returns across individual companies.

The existence of seasonality was also tested using non-parametric procedures. Therefore, in addition to the ANOVA, a non-parametric alternative, known as the Kruskal-Wallis test was also employed since the skewness and kurtosis of the sample suggested that the data were not normally distributed. The null hypothesis investigated using the Kruskal-Wallis test examined whether the population medians were all equal and whether any patterns of seasonality existed across the different months. The reported p-value for the H-statistics of the Kruskal-Wallis test will enable H_0 to be investigated. Table 6.4 shows the results of the Kruskal-Wallis test on (i) the difference between the median returns across the various months of the Gregorian and Islamic calendars and (ii) the difference in individual firm returns for the two sets of calendar months being examined. In particular, the table shows the number of observations, the degrees of freedom (DF), the H-statistics and their corresponding p-values.

Table 6.4

Kruskal-Wallis Test for the Sample Firms' Returns over the whole period

Average Returns Across All Firms				
Calendar	**Number**	**DF**	**H Stat**	**p-value**
Gregorian Calendar	4067	11	25.48	0.080
Islamic Calendar	4067	11	18.55	0.070
Individual Firms Returns				
Calendar	**Number**	**DF**	**H Stat**	**p-value**
Gregorian Calendar	431049	11	313.33	0.000
Islamic Calendar	431049	11	233.96	0.000

The results of Kruskal-Wallis tests reveal a similar picture to that which emerged from the ANOVA findings. According to the p-value in Table 6.4 for average price changes across all the sample firms, there is some evidence that the median returns across the 12 Gregorian calendar months are different as the p-value is 0.08 – but only at the 10 percent level. In addition, the p-value for the Islamic calendar is 0.070; hence, the null hypothesis cannot be rejected at the 5 percent level implying that the mean returns of all the Islamic calendar months are not significantly different. Again, interestingly when the test is done on individual companies the results are different. In both cases, there is strong evidence for the rejection of the null hypothesis indicating that the two calendars' monthly medians are significantly different from each other[168]. These results are not too different from the findings from ANOVA.

[168] It should be noted that the upper panel eliminates a lot of volatility due to the averaging process employed where the mean returns are averaged across individual companies.

6.4 Two-Sample t-test

A two-sample t-test was also used to in order to investigate in a more detailed way whether any significant result in the ANOVA or Kruskal-Wallis test may be due to differences in a small number of months. The two-sample t-test should highlight whether returns in a specific month are significantly different from returns in another specific month by examining each pair of months to uncover any significant deviations. The results of two-sample t-test are reported in Tables 6.5A and 6.5B for Gregorian and Islamic calendars, respectively.

The results of the two-sample t-test confirm the initial findings that average returns in certain months are significantly different from average returns in others; they support the findings from the examination of the descriptive statistics over different months of the year for both calendars. A visual inspection of Table 6.5A highlights that the distribution of the significant findings appears to follow a pattern. In the case of the Gregorian calendar, there appears to be a significant difference between the average returns in the month of January, May and August compared to the rest of the months at the 5 percent level throughout the 17 years investigated in this study. For example, the month of May was significantly different from eight of the other 11 months that it was compared with; the month of August was significantly different on four occasions while the month of January was only significantly different on two occasions[169].

[169] However, it should be noted that there may be an issue with multiple comparisons (since there are 66 non-independent comparisons being conducted). One method which could be used to address this issue is the Bonferroni correction which only regards results as statistically significant if the p-values are less than 0.05/66 (0.0008). However, this Bonferroni correction is rather conservative since it sets the hurdle for significance at a very high level; if this method were applied, none of the results appear to be significant. An alternative approach is to use the 1 percent level of significance when determining significant differences. This will lead to less months being significantly different; for example, at this level, the month of May will only be significantly different on 6 occasions whereas the month of August would be significantly different on only 4 occasions.

Table 6.5A Two-sample t-test: Gregorian Calendar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	1											
Feb	0.000502 (0.597)	1										
Mar	0.001375 (0.139)	0.000873 (0.345)	1									
Apr	0.000821 (0.343)	0.000319 (0.711)	-0.000554 (0.508)	1								
May	**0.003268** **(0.001)**	**0.002766** **(0.006)**	0.001893 (0.052)	**0.002447** **(0.008)**	1							
Jun	0.001678 (0.083)	0.001176 (0.223)	0.000303 (0.748)	0.000857 (0.331)	-0.00159 (0.116)	1						
Jul	0.000525 (0.544)	0.000023 (0.979)	-0.000851 (0.310)	-0.000296 (0.699)	**-0.002744** **(0.003)**	-0.001153 (0.190)	1					
Aug	**0.002367** **(0.007)**	**0.001865** **(0.032)**	0.000991 (0.240)	**0.001546** **(0.046)**	-0.000901 (0.327)	0.000689 (0.437)	**0.001842** **(0.017)**	1				
Sep	0.000906 (0.295)	0.000405 (0.639)	-0.000469 (0.577)	0.000086 (0.911)	**-0.002362** **(0.010)**	-0.000772 (0.382)	0.000382 (0.619)	-0.001460 (0.060)	1			
Oct	0.001277 (0.142)	0.000776 (0.370)	-0.000098 (0.908)	0.000457 (0.553)	**-0.001991** **(0.030)**	-0.000401 (0.651)	0.000753 (0.328)	-0.001089 (0.161)	0.000371 (0.631)	1		
Nov	0.000894 (0.314)	0.000393 (0.657)	-0.000481 (0.577)	0.000074 (0.926)	**-0.002374** **(0.011)**	-0.000784 (0.386)	0.000370 (0.641)	-0.001472 (0.066)	-0.000012 (0.988)	-0.000383 (0.631)	1	
Dec	0.000793 (0.380)	0.000291 (0.746)	-0.000582 (0.508)	-0.000028 (0.973)	**-0.002475** **(0.009)**	-0.000885 (0.336)	0.000269 (0.740)	-0.001573 (0.054)	-0.000113 (0.889)	-0.000484 (0.552)	-0.000101 (0.903)	1

Note: This table show the difference in means between each pair of the Gregorian calendar months (January – December) followed by p-values in parenthesis. This table subtracts the column with row (Column – Row). Results in bold are statistically significant at 5 percent level allowing the rejection of null hypothesis.

Table 6.5B Two-sample t-test: Islamic Calendar

	Muh	Saf	R.Aw	R.Th	J.Aw	J.Th	Raj	Sha	Ram	Shw	Z.Qa	Z.Ha
Muh	1											
Saf	0.000076 (0.934)	1										
R.Aw	-0.000839 (0.332)	-0.00091 (0.361)	1									
R.Th	-0.000046 (0.953)	-0.000121 (0.896)	0.000793 (0.365)	1								
J.Aw	0.000098 (0.903)	0.000023 (0.981)	0.000937 (0.294)	0.000144 (0.860)	1							
J.Th	0.000026 (0.975)	-0.000050 (0.960)	0.000865 (0.353)	0.000072 (0.933)	-0.000072 (0.934)	1						
Raj	0.000348 (0.671)	0.000272 (0.777)	0.001186 (0.191)	0.000394 (0.635)	0.000250 (0.769)	0.000322 (0.717)	1					
Sha	0.000299 (0.701)	0.000223 (0.810)	0.001137 (0.192)	0.000344 (0.663)	0.000200 (0.805)	0.000273 (0.749)	-0.000049 (0.952)	1				
Ram	**-0.001980 (0.010)**	**-0.002055 (0.026)**	-0.001141 (0.186)	**-0.001934 (0.014)**	**-0.002078 (0.010)**	**-0.002006 (0.018)**	**-0.002328 (0.005)**	**-0.002278 (0.003)**	1			
Shw	-0.001394 (0.110)	-0.00147 (0.144)	-0.000556 (0.561)	-0.001349 (0.127)	-0.001493 (0.097)	-0.001420 (0.130)	-0.001742 (0.057)	-0.001693 (0.054)	0.000585 (0.501)	1		
Z.Qa	-0.001387 (0.082)	-0.001463 (0.121)	-0.000549 (0.537)	-0.001341 (0.097)	0.001485 (0.073)	-0.001413 (0.104)	**-0.001735 (0.040)**	**-0.001686 (0.037)**	0.000593 (0.456)	0.000007 (0.993)	1	
Z.Ha	0.000249 (0.768)	0.000174 (0.860)	0.001088 (0.242)	0.000295 (0.730)	0.000151 (0.863)	0.000223 (0.806)	-0.000099 (0.912)	-0.000049 (0.954)	**0.002229 (0.008)**	0.001644 (0.080)	0.001636 (0.060)	1

Note: This table show the difference in means between each pair of the Islamic calendar months (Muharram – Zil Hajj) followed by p-values in parenthesis. This table subtracts the column with row (Column – Row). Results in bold are statistically significant at 5percent level allowing the rejection of null hypothesis.

The other clear pattern that emerges from the analysis of Table 6.5A is that the return for the month of January has typically been higher than the return for all the other months in the calendar. In contrast, the return for the month of May has usually been low relative to the returns for all other months of the calendar. For the Islamic calendar, Ramadan stood out as the month with higher returns compared to those achieved in several other months of the Islamic calendar; its returns were significantly higher in eight cases. By contrast, shares performed poorly in the month of Rajab; paired differences were all negative for this month and significant in two cases (for Ramadan and Zil Qa'ad the differences were significant at the 5 percent level[170]). The unique nature of the Islamic calendar makes this finding quite hard to explain; since the Islamic calendar is approximately 11 days shorter than its Gregorian counterpart, the dates (according to the Gregorian calendar) on which Ramadan falls each year keeps moving (see Chapter 2). This variability in the dates of Ramadan relative to the Gregorian calendar makes the finding of a Ramadan effect even more significant since it means that the effect is unlikely to be caused by factors other than those related to Ramadan itself.

The empirical findings in both Table 6.5A and Table 6.5B indicate that January and Ramadan are the months with the highest positive returns whilst May and Rajab are the months where share returns are most negative[171]. These results suggest that seasonality is present in the KSE market for both the Gregorian and Islamic calendars.

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[170] Once the two-sample t-test was estimated, a non-parametric test called Mann Whitney was performed. Mann Whitney test is carried out to see if there is any difference between the population medians for each pair of the months of the year. The test compares the population medians for each month of the year with the other month across the whole period. The results were similar to the findings of the two-sample t-test with a few exceptions; for Gregorian calendar, January was significantly positive in four cases this time whilst for Islamic calendar Zil Qa'ad was significantly positive in two of the cases. However, the overall results documented similar patterns in the data; results are documented in Appendix 6.4A for Gregorian calendar and Appendix 6.4B for its Islamic counterpart.

[171] This finding was also confirmed by the Mann-Whitney test reported in Appendix 6.4A and 6.4B.

This seasonal pattern in January is similar to that documented in most developed markets (Rozeff and Kinney, 1976; Glutekin and Glutekin 1983; Jaffe and Westerfield 1985; Ariel, 1987). However, such a finding contradicts the results of Ali and Akbar (2009), who uncovered no monthly seasonality in the Pakistani stock market. This could be due to the fact that the authors focused on the KSE-100 index and used monthly observations instead of the daily data for individual shares used in the current study. The finding of a Ramadan effect conflicts with the results of Pakistani studies by Husain (1998) and Mustafa (2008). Husain (1998) documented that the average return for Pakistani equities did not change significantly in Ramadan; however he did find that the volatility of price changes was reduced in this month. Likewise, Mustafa (2008) found no Ramadan effect but reported an "after-Ramadan" effect in the Karachi Stock market. Interestingly, Mustafa also noted that Karachi stock market was relatively low risk during the month of Ramadan. Other studies have reported a positive Ramadan effect and have linked the effect to positive investor sentiment. This notion is consistent with the prior expectations of this study that Ramadan has a positive impact on mood and hence on investors' sentiment which in-turn affects their decision making[172] (see Chapter 3 and Chapter 5).

The empirical findings in this section confirm that seasonality is present in the Pakistani equity market for both the Gregorian calendar and the Islamic calendar. The next section of this chapter attempts to explore the impact of both of these calendars

[172] Al-Ississ (2010) documented that the religious period of Ramadan had a statistically significant positive effect on average returns for financial markets in several Muslims countries. The author concluded that Ramadan had a positive impact on daily returns and linked the results to the positive investor sentiments in this holy month. Similarly, Bialkowski et al. (2012), investigated share returns during Ramadan for a broad sample of 129 Ramadan months in 14 predominantly Muslim countries (including Pakistan) over the years 1989 to 2007. Furthermore, they found that there was a significant decrease in the share price volatility in all of the sample countries (except for Turkey) during this month.

(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.

6.5 General Linear Model

The preliminary statistics presented in the previous sections 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. Specifically, the two-sample t-test indicated that January (May) might have higher (lower) returns than other months for Gregorian calendar whereas the returns for the months of Ramadan, Shawwal and Zil Qa'ad might be different from those in other months of the Islamic year. Furthermore, the ANOVA (Kruskal-Wallis) test suggested that there was strong evidence to reject the null hypothesis that the two calendars' monthly means (medians) were equal. 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, the GLM 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 GLM model also investigated the interactions between factors. For this purpose, equation [4.2] was estimated[173].

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[174]. 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:

$$R_{j(g,i,s,t,y)} = \mu + \alpha_g + \beta_i + \gamma_s + \lambda_t + \delta_y + \varepsilon_{j(g,i,s,t,y)} \qquad [6.1]$$

[173] It should be noted that there was a 16 percent overlap in observations between the gregorian months and the islamic months over the 17 – year period considered.

[174] In explaining the variance of returns for the current study, the following model was initially considered:

$$\begin{aligned} R_{j(g,i,s,t,y)} = \ & \mu + \alpha_g + \beta_i + \gamma_s + \lambda_t + \delta_y + (\alpha\beta)_{gi} + (\alpha\gamma)_{gs} + (\alpha\lambda)_{gt} + (\alpha\delta)_{gy} + (\beta\gamma)_{is} \\ & + (\beta\lambda)_{it} + (\beta\delta)_{iy} + (\gamma\lambda)_{st} + (\gamma\delta)_{sy} + (\lambda\delta)_{ty} + (\alpha\beta\gamma)_{gis} + (\alpha\beta\lambda)_{git} \\ & + (\alpha\beta\delta)_{giy} + (\alpha\gamma\delta)_{gsy} + (\alpha\gamma\lambda)_{ist} + (\alpha\lambda\delta)_{gty} + (\beta\gamma\delta)_{isy} + (\beta\lambda\delta)_{ity} \\ & + (\beta\gamma\lambda)_{ist} + (\alpha\beta\gamma\delta)_{gisy} + (\alpha\beta\lambda\delta)_{gity} + (\beta\gamma\lambda\delta)_{isty} \\ & + (\alpha\beta\gamma\lambda\delta)_{gisty} \end{aligned}$$

This model is a full factorial model that contains all the 5 main effects, and all factor-by-factor interactions.

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.

Table 6.6 presents the results from estimating equation [6.1]. From the analysis of Table 6.6, 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 [6.1]. The results of Table 6.6 are explained in detail in the next section. After eliminating the sector factor from the analysis, the final model took the form:

$$\begin{aligned} R_{j(g,i,s,y)} = {} & \mu + \alpha_g + \beta_i + \gamma_s + \delta_y + (\alpha\beta)_{gi} + (\alpha\gamma)_{gs} + (\alpha\delta)_{gy} + (\beta\gamma)_{is} \\ & + (\beta\delta)_{iy} + (\gamma\delta)_{sy} + (\alpha\beta\gamma)_{gis} + (\alpha\beta\delta)_{giy} + (\alpha\gamma\delta)_{gsy} \\ & + (\beta\gamma\delta)_{isy} + (\alpha\beta\gamma\delta)_{gisy} + \varepsilon_{j(g,i,s,y)} \qquad [6.2] \end{aligned}$$

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; 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 1,2 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[175]:

[175] For equation [6.1], 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.

$$F - ratio = \frac{Effect\ Mean\ Square\ Error}{Residual\ Mean\ Square\ Error} \qquad [6.3]$$

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.

6.5.1 Results

The purpose of this section is to investigate any sources of variation in the returns of the KSE market. In particular, this section examines the role of the Gregorian calendar, the Islamic calendar, size, sector and year 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 6.6 presents the results from estimating equation [6.1]. 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 6.6, 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 6.6, 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[176] [6.1].

Table 6.6 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 time period from 1995 to 2011. Sig of F-ration denotes significance of the F-ratio. Table tests whether any of the factors listed are significant.

Table 6.7 presents the results from estimating equation [6.2]. Table 6.7 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.

[176] 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 6.6 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 table with the results of this analysis is presented in Appendix 6.5. The results in Appendix 6.5 reveal 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.

Table 6.7 Analysis of the General linear model: Factor and Interaction effect

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 time period from 1995 to 2011. Sig of F-ration denotes significance of the F-ratio. Table tests whether any of the factors and interactions listed above are significant.

A number of interesting points emerge from an analysis of the table[177]. 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 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

[177] 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.

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 Gregorian calendar months and Islamic months are influential in driving returns. This finding contradicts the results in Chapter 5 since most of the interviewees believed that the Islamic calendar months were more influential than their Gregorian 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.

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 × Islamic calendar × year effect. Table 6.7 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 the analysis. Figure 6.1 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 sections of the current chapter. 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)[178].

[178] 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.

Figure 6.2 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; the month of Ramadan recorded positive average returns for a majority of years; this is consistent with the results from previous sections of this chapter. 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 6.3, 6.4 and 6.5 represent the interactions between 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 6.3 and 6.4 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 sections emerged; Ramadan was the best performing month for all size categories. A graphical analysis of Figure 6.5 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. In fact, the results in these figures confirm the findings in Chapter 2 which suggested that the stock market performed well in 2002 while the poorest performance was in 2008. 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 6.5 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. These results suggest that there is a calendar effect in the KSE market and patterns exists that could be exploited to yield abnormal returns for Pakistani investors. 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[179].

6.6 Conclusion

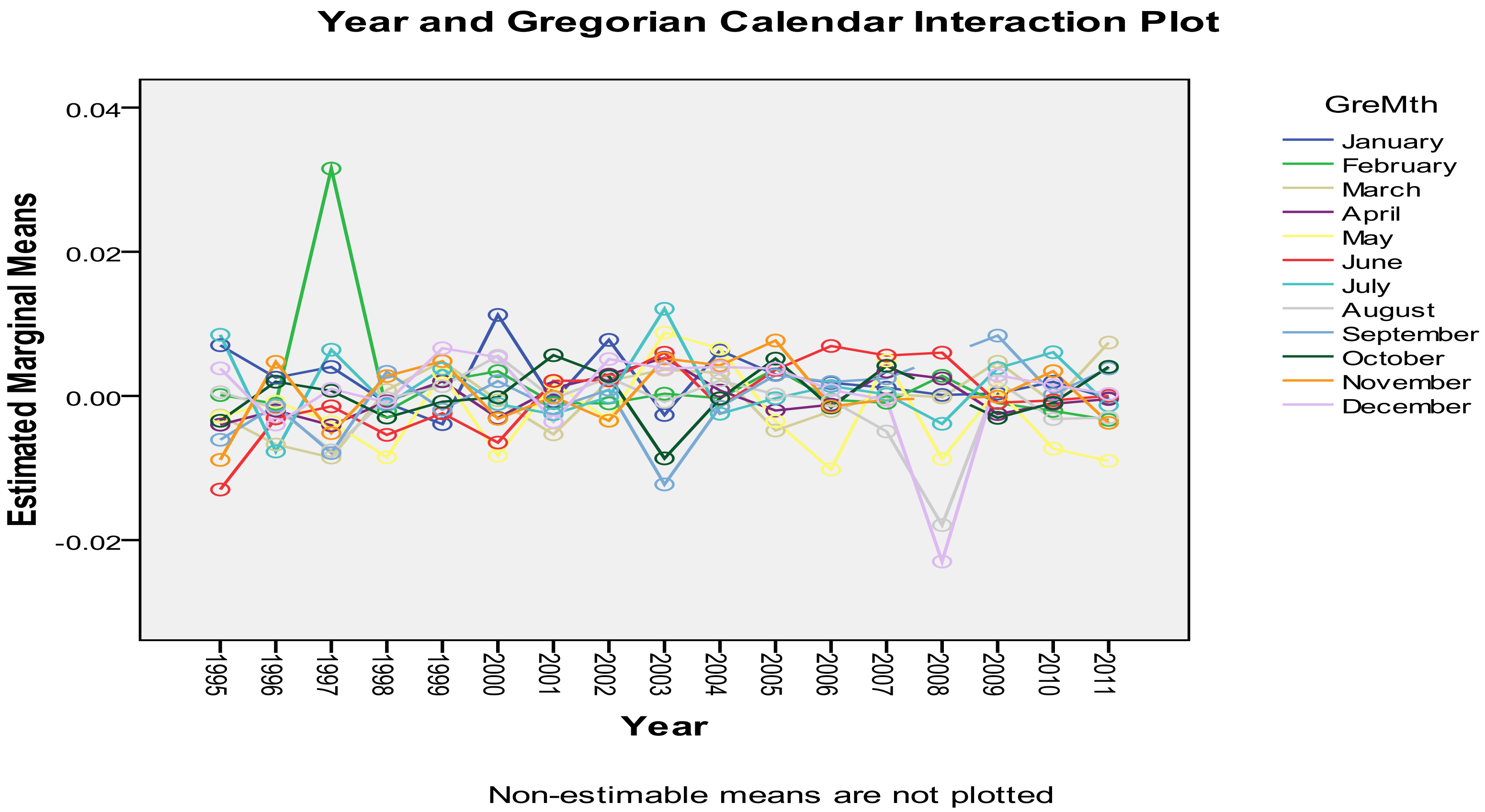
This chapter has examined the case of calendar anomalies in the Pakistani stock market. In particular, this chapter employed daily share returns over the period 1995 – 2011 of the KSE market. Initially, descriptive statistics and preliminary testing was performed to see whether any calendar anomalies are present in the market. The ANOVA and Kruskal-Wallis test hinted towards inefficiency in the market. The two-

[179] 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.

sample t-test then confirmed that certain months were different from the others and discrepancies remain in the market that could be exploited by developing specific investment strategies to gain abnormal returns. Furthermore, this chapter has investigated the different factors which might explain variations in the returns of the KSE market by using a GLM model in section 6.4. Specifically, this section has investigated the source of variation in the KSE share returns by examining the importance of Gregorian calendar, Islamic calendar, company size, sector and the year factors. A few important points emerged from the analysis. Firstly, sector factor is not significant in driving share returns and size factor is relatively not as significant as compared to Gregorian calendar, Islamic calendar and year factors. This indicates that investing on a sectoral or size basis is less effective than allocating the funds to firms in different months of calendar. Secondly, the strong year effect indicates that the returns of the KSE market vary significantly from year-to-year; this indicates the volatile situation of the country as explained in Chapter 2.

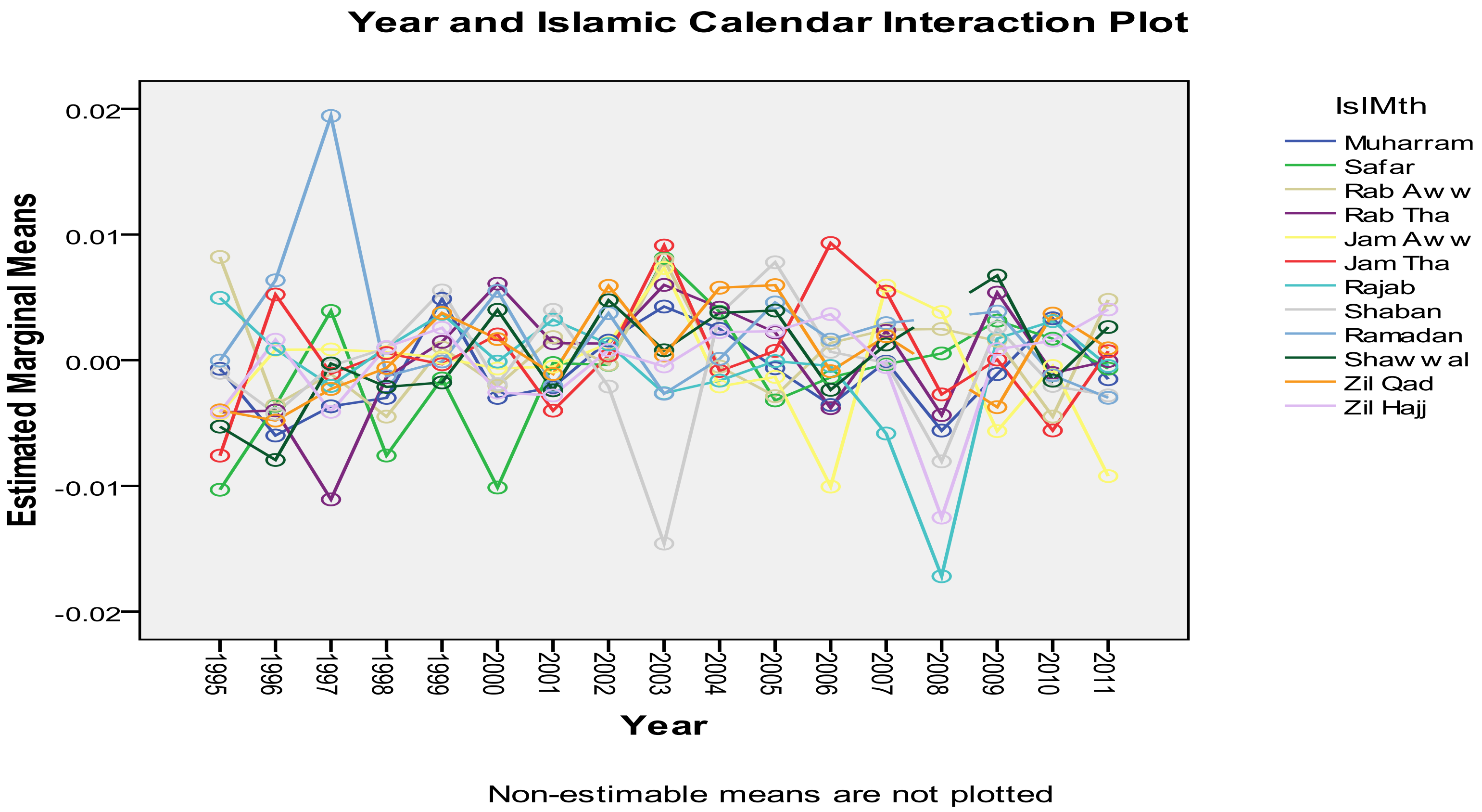
The results obtained so far in this chapter are based on the returns, which do not take into account the varying daily volatility in the market returns; untreated volatility of the returns in the testing might help explain the seasonality better. Such volatility needs to be modelled in order to provide a clearer picture of the monthly seasonal anomalies in the Pakistani equity markets. For this purpose, the next chapter employs a GARCH model to examine this calendar anomaly under time varying return volatility of the KSE market. Hence, both the risk and return, which constitute the fundamentals of investment decision making process, will be accounted for. As a result, investors can use the monthly seasonality information to avoid and effectively, reduce the risk when investing in the Pakistani stock markets.

Figure 6.1 Year and Gregorian Calendar Interaction Plot



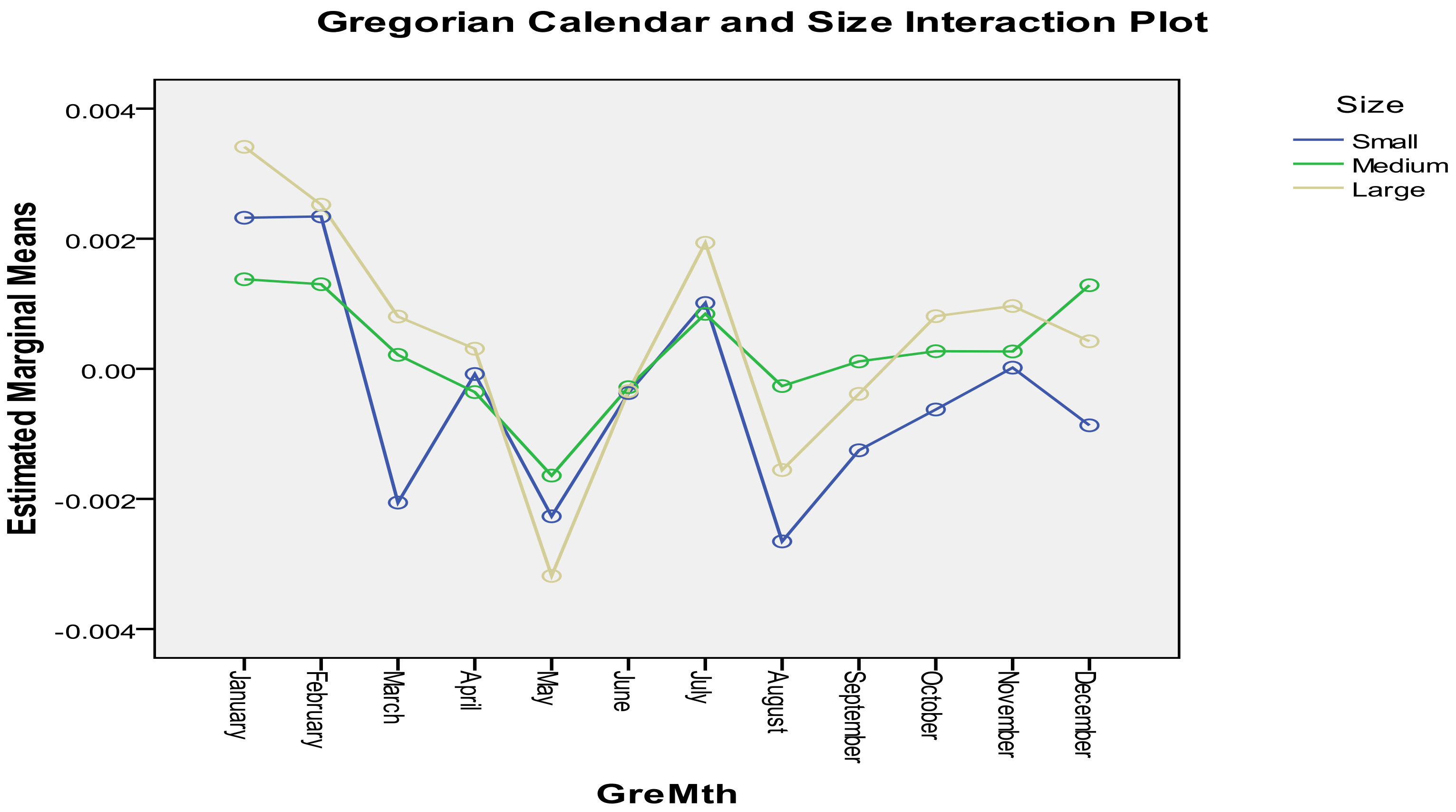
Note: Figure shows the year and month interaction for daily returns of the KSE market. The horizontal axis relates to the month while the vertical axis relates to the mean returns.

Figure 6.2 Year and Islamic Calendar Interaction Plot



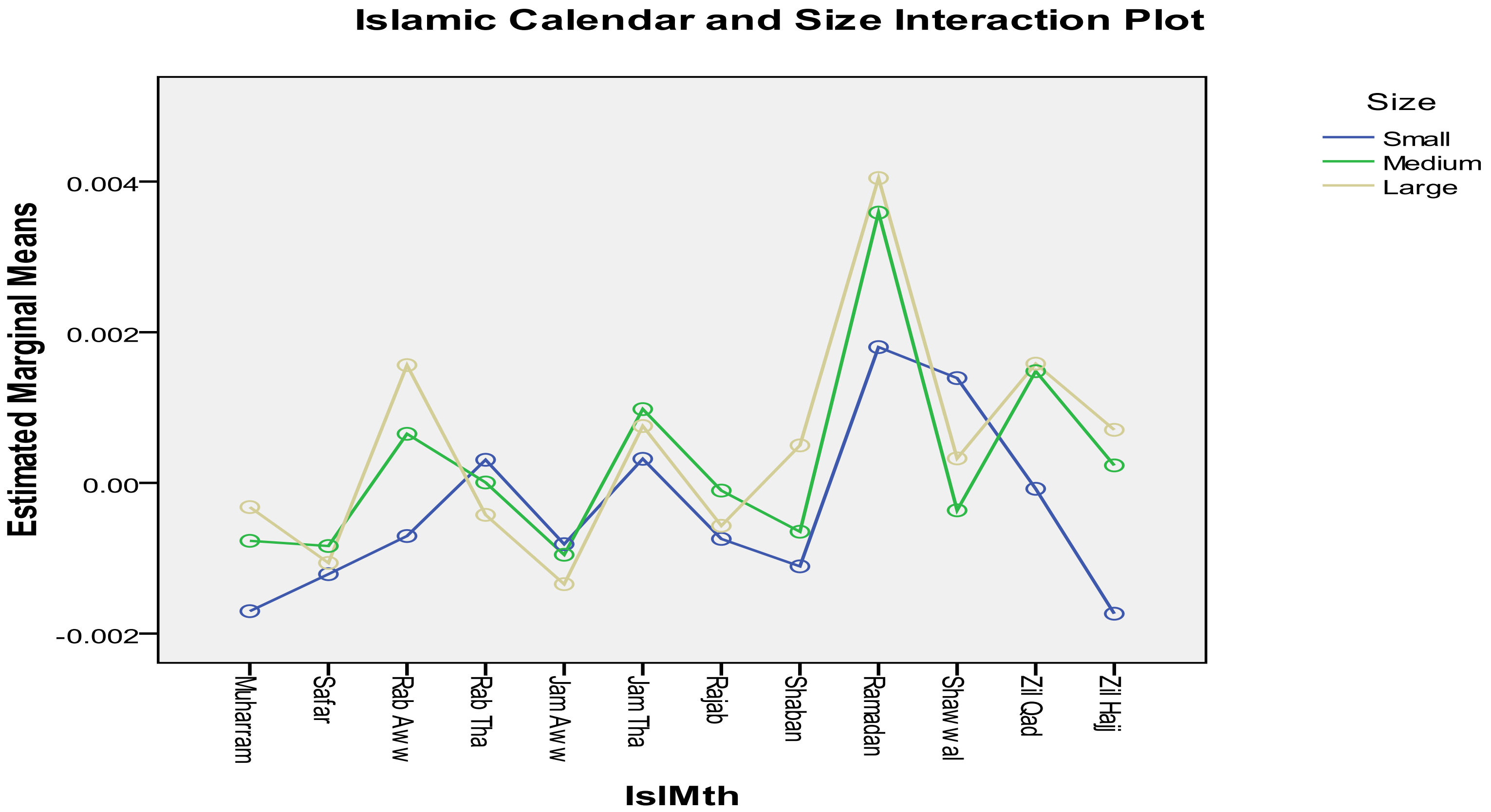
Note: Figure shows the year and month interaction for daily returns of the KSE market. The horizontal axis relates to the month while the vertical axis relates to the mean returns.

Figure 6.3 Gregorian Calendar and Size Interaction Plot



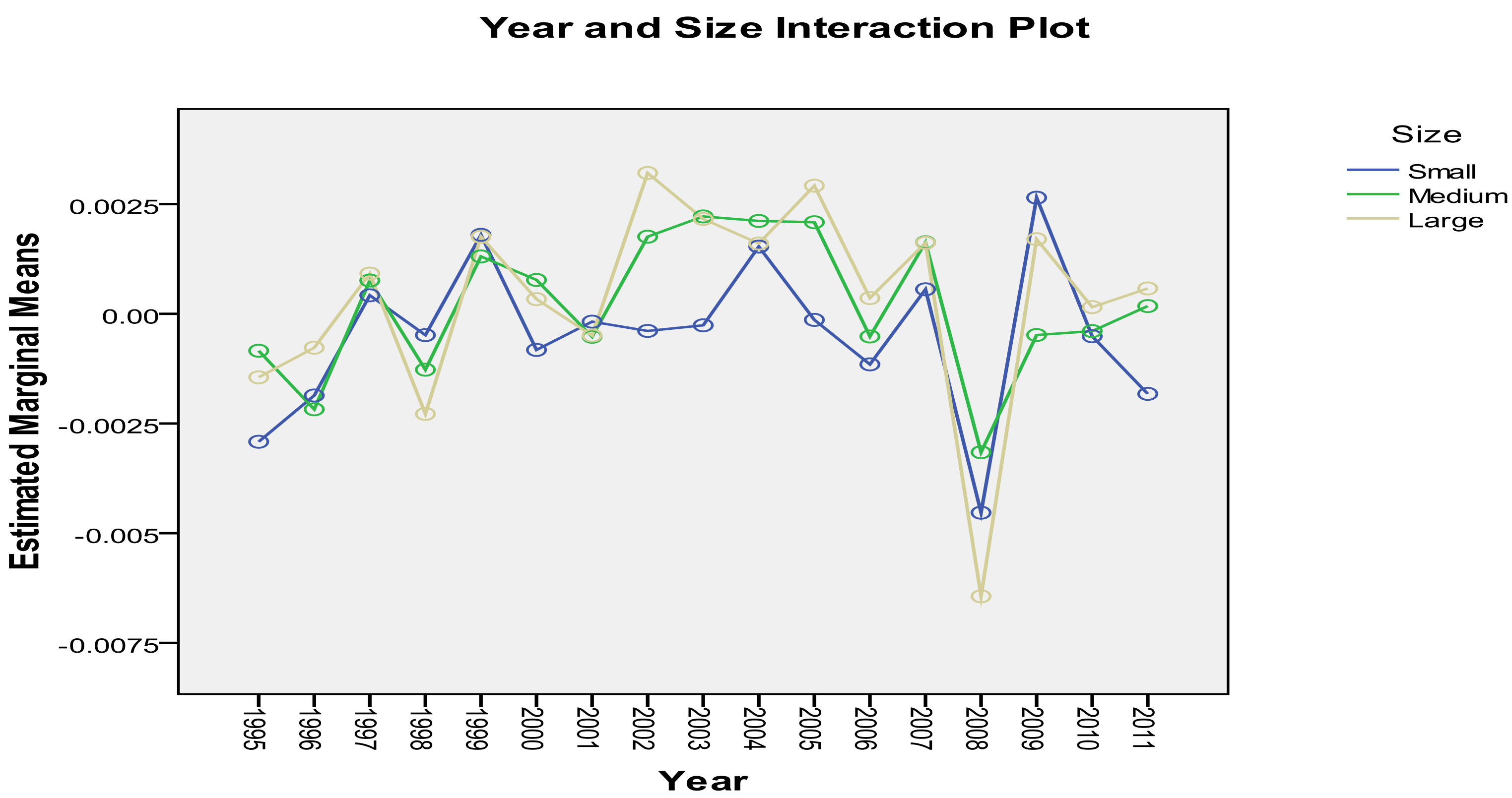
Note: Figure shows the month's o the Gregorian calendar and size interaction for daily returns of the KSE market. The horizontal axis relates to the month while the vertical axis relates to the mean returns.

Figure 6.4 Islamic Calendar and Size Interaction Plot



Note: Figure shows the month's o the Islamic calendar and size interaction for daily returns of the KSE market from 1995 – 2011. The horizontal axis relates to the months while the vertical axis relates to the mean returns.

Figure 6.5 Year and Size Interaction Plot



Note: Figure shows the year and size interaction for daily returns of the KSE market from 1995 – 2011. The horizontal axis relates to the years while the vertical axis relates to the mean returns.

Chapter 7

GARCH

7.1 Introduction

The results obtained in the previous empirical chapters of this thesis have documented that calendar anomalies may be present in the share returns of the Pakistani stock markets. However, these results are based on average returns, which do not take into account of any time-varying volatility[180] in the equity prices; the absence of any consideration of volatility in the testing throughout Chapter 6 might limit any conclusions that could be reached about the seasonality results which emerged. Such volatility needs to be modelled in order to provide a clearer picture of the monthly seasonal anomaly in the Pakistani equity markets. Although the tests in the previous Chapter concluded that returns in certain months (using both Gregorian and Islamic calendars) are significantly different from their counterparts in other months, this conclusion is not robust; any monthly effect could be due to higher/lower risk levels in certain time periods since finance theory suggests that risk is positively associated with returns (Fama and Schwert, 1977; Glosten et al., 1993). The solution to this problem is to incorporate risk into the testing process. Volatility cannot be ignored, especially for the Islamic calendar since previous research has documented that equity price changes in Ramadan, the 9th month in the Islamic calendar, are significantly less volatile than returns in other months in the year (Husain, 1998; Seyyed at al., 2005). Further, this chapter builds on the interviews which were conducted in Chapter 5; these interviews suggested that volatility is a feature of Pakistani stock markets; specifically, the interviewees suggested that the volatility changes in the Pakistani market at certain times of the year. Thus, this needed to be taken into consideration when investigating calendar anomalies in Pakistan

[180] Volatility, as measured by the standard deviation or variance of returns is a measure of the total risk of financial equities in mainstream finance (French et al., 1987)

This chapter employs a generalized autoregressive conditional heteroskedasticity (GARCH) model to study whether calendar anomalies are present in both mean price changes and return volatility for the KSE market. Hence, both the risk and return, which constitute the fundamental elements of the equity investment decision making process, will be examined; as a result, investors can discern more accurately whether the market is weak-form efficient in the sense that average price changes or their associated volatilities cannot be predicted on the basis of historic data. It should also allow investors to see whether any inefficiency is present in either average returns or return volatility thereby enabling arbitrage strategies to be implemented which could exploit any predictability detected. Investors can use the results of this analysis about monthly seasonality to reduce their risk when investing in the Pakistani stock markets.

This chapter builds upon the previous findings of thesis since all of the models that have been discussed in the prior chapters have been both homoscedastic and linear in nature; the variance was assumed to be constant. However, according to Campbell et al. (1997), investors' willingness to trade off returns and risk is non-linear; therefore, a non-linear model might work better to capture the salient features of the data being examined. Brooks (2008) agrees with this view; he suggested that in the context of financial time series it is unlikely that the variance of the errors will be constant over time[181]. The homoscedasticity assumption is likely to be violated. Rather, he suggests that innovations in returns are probably heteroscedastic, and a failure to recognise this feature of the data could have serious implications for the results and any inferences

[181] Unlike the classical OLS approach to estimating relationships (Draper and Smith, 1998) the GARCH model does not assume that the variance of the errors is constant (Bollerslev, 1986).

that might be drawn[182]. Therefore it is vital that the researcher test the data before attempting to model the character of returns[183].

The remainder of the chapter is organised as follows; Section 7.2 describes the data and outlines the findings from the preliminary analysis undertaken. The next section discusses the pilot study that was undertaken in order to select the most appropriate GARCH model for investigating the time series nature of Pakistani returns. In Section 7.4, the empirical methodology used in the chapter is explained. Section 7.5 then documents the empirical findings of the investigation undertaken while Section 7.6 summarises.

7.2 Data and Preliminary Analysis

The same dataset that was employed in Chapter 6 was used for this chapter[184]. A detailed descriptive analysis of the data is therefore not repeated; it can be found in Chapter 6. However, certain additional tests were conducted for this chapter prior to any GARCH modelling of the data; these sought to determine whether the price series were stationary or non-stationary and involved tests for a unit root. The stationarity of a series can characterise its behaviour or properties and influence the choice of any statistical analysis which should be performed (Brooks, 2008). It can impact on the testing procedures that are employed when investigating data and the modelling

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[182] For a detailed discussion on the consequences of heteroscedasticity, see Hill et al. (1997).

[183] According to Brooks (2008) it is unlikely that the variance of the errors will be constant over time in the context of financial time series. This is because an important feature of financial series is known as volatility clustering or volatility pooling (Engle, 2001). Furthermore, French et al. (1987) documented that share volatility is highly persistent and unexpected increases in volatility are associated with negative shocks suggesting that volatility is not constant. GARCH models treat heteroskedasticity as a variance to be modelled.

[184] Details of the dataset can be found in Table 6.1

approach adopted when building empirically relevant models. If the data are non-stationary then any analysis of the data may give spurious results and lead to false conclusions (Granger and Newbold, 1974). For example, the standard ordinary least squares (OLS) estimation procedure relies on the assumption of stationarity of both the dependent and explanatory variables. If this assumption is violated then any OLS estimates may be biased and inconsistent. A series is stationary when its mean, variance and autocovariances do not change over time or are constant for each given lag[185].

Tests for a unit root have been proposed by Dickey and Fuller (1979, 1981) and Phillips and Perron (1988). The most popular and the most widely employed of these tests is the Augmented Dickey-Fuller (ADF) test[186]. This test is initially performed on the original series. If each series turns out to be stationary, the task is complete. Otherwise, the test is applied to the first difference of the series. If the first difference is also non-stationary, the test is applied on the second difference and so forth. Since most time series in economics and finance follow stationary exponential growth processes, the first difference of the natural log of the data set usually turns out to be stationary (Mamoon, 2007)[187]. In order to perform the ADF test, the null hypothesis is that the time series has a unit root against the alternative that no unit root is present

[185] It is important to determine whether the series are stationary or not for the current study since this research will be using a GARCH model. One of the assumptions for a GARCH model is that the data is stationary. According to Brooks (2008, p. 319), "if two variables are trending over time [non-stationary series], a regression of one on the other could have a high R^2 even if the two are totally unrelated. So, if standard regression techniques are applied to non-stationary data, the end result could be a regression that 'looks' good under standard measures (significant coefficient estimates and a high R^2), but which is really valueless."

[186] ADF is an augmented version of the Dickey–Fuller test for a larger and more complicated set of time series models (Greene, 1997). For this thesis, the unit root test is restricted to ADF test since the PP unit root test gives the same conclusions and suffers from most of the same limitations as the ADF test (Brooks, 2008).

[187] All the testing in this research is based on the first difference of the natural log of the price series.

(and the series is stationary)[188]. To test the null hypothesis, three equations have to be estimated:

$$\Delta Y_t = \delta\, Y_{t-1} + \sum_{i=2}^{\kappa} \theta_i \Delta Y_{t-i} + \varepsilon_t \tag{7.1}$$

$$\Delta Y_t = \mu + \delta\, Y_{t-1} + \sum_{i=2}^{\kappa} \theta_i \Delta Y_{t-i} + \varepsilon_t \tag{7.2}$$

$$\Delta Y_t = \mu + \beta t + \delta\, Y_{t-1} + \sum_{i=2}^{\kappa} \theta_i \Delta Y_{t-i} + \varepsilon_t \tag{7.3}$$

Where, δ is a coefficient, μ is a constant (intercept), t is a linear trend and ε_t is a zero-mean white noise from a stationary series. Equation (7.3) is the most general version of the test which contains an intercept (μ) and a time trend (t). Equation (7.2) contains only an intercept term (μ) whereas equation (7.1) is the most basic equation where the data is assumed to contain neither an intercept nor a time trend. Including the lagged differences in the model ensures that the residuals follow a zero-mean, white-noise, stationary process. In equations (7.1) to (7.3), i is the number of lagged first-differenced terms such that ε_t is white noise and Δ is the first difference operator.

Following the procedure adopted by Gilmore and McMannus (2002), the least restrictive model (7.3) with both a constant and trend are initially used. If the time trend is not significant, equation (7.2) is then used. If the constant is not significant in equation (7.2) than equation (7.1) is employed. If a series has to be differenced once in order to be rendered stationary then it is referred to as integrated of order one, also

[188] The null hypothesis is $\delta = 0$. If δ is significantly different from zero, the hypothesis that Y_t contains a unit root is rejected. If the test on the level series fails to reject, the ADF procedure is then applied to the first difference. If the null hypothesis can be rejected on the first difference, it will suggest that the series is now stationary and integrated of order one, I(1).

known as, I(1)[189] (Granger and Newbold, 1974). If the ADF-statistics exceed the critical value[190], then the null hypothesis that the series is non-stationary (has a unit root) can be rejected. The results of the ADF unit root test for the 106 sample companies are reported in Table 7.1.

The table provides the results of the ADF test for both the level and the first difference of each time series. The analysis of these results reveal that the series were non-stationary for most of the sample companies in their level form but became stationary after the first difference was considered; 16 of the sample companies were already stationary in level form (PK:ART, PK:ASB, PK:DAD, PK:DAN, PK:DES, PK:DSM, PK:ENL, PK:ETU, PK:GSM, PK:GWC, PK:MLC, PK:PLC, PK:TAJ, PK:TSM, PK:TRP, PK:UMC)[191]. In the case of these companies the p-values were less than 0.05 such that the price series were integrated of order zero. For the vast majority of cases however, the null hypothesis that the price series are nonstationary cannot be rejected. When the price series are differenced, the t-statistic values ranged from a low of -77.3336 to a high of -9.1660 indicating that the share price are I(1). The test also revealed that the constant term was significant for 11 of the sample companies and for these series equation (7.2) was used; for all the other companies, equation (7.1) was employed[192].

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[189] In general, if a series has to be differenced 'k' times before it is stationary it is referred to as I(k).

[190] The critical values for this test are based on MacKinnon (1996). Specifically, MacKinnon (1996) documented p-values and critical values to reject (or not to reject) the unit root hypothesis.

[191] Three quarters of these 16 firms were small in size and for a large proportion of these firms (9) share trading was "thin" relative to transactions for other firms in the sample. Specifically, 12 of these firms were in the bottom decile in terms of size and only had an average market value of Rs. 84.43 million. This may explain why the prices of these securities were stationary in levels rather than in first difference.

[192] The companies with a significant constant were PK:ASB, PK:DAD, PK:DES, PK:DSM, PK:ENL, PK:GSM, PK:KIE, PK:TAJ, PK:TSM, PK:TRP and PK:UMC. Therefore, equation (7.2) was employed which included the constant term.

Table 7.1

Unit root test results for daily share prices over the entire period (01/01/1995 to 31/12/2011).

Companies	ADF (Level)		ADF (First Difference)	
	t-statistic	p-value	t-statistic	p-value
PK:AAC	-1.6426	0.0949	-31.8054	0.0000
PK:ABB	0.0424	0.6963	-58.6147	0.0001
PK:ACB	-0.6262	0.4463	-60.2615	0.0001
PK:ADI	-1.0708	0.2576	-54.3868	0.0001
PK:AGR	0.2721	0.7649	-35.3867	0.0000
PK:AGT	0.7427	0.8748	-48.0270	0.0001
PK:ALN	0.5539	0.8358	-34.9454	0.0000
PK:ALT	-1.7234	0.0805	-61.0207	0.0001
PK:ART	-3.8589	0.0001	-42.2881	0.0001
PK:ASB	-5.1489	0.0000	-68.7964	0.0001
PK:ATH	0.5297	0.8303	-61.3268	0.0001
PK:ATR	-0.7451	0.3939	-52.5068	0.0001
PK:BAP	0.9622	0.9114	-58.4705	0.0001
PK:BKP	-0.8570	0.3448	-60.3684	0.0001
PK:BOC	-0.3971	0.5410	-67.1652	0.0001
PK:CCB	-2.1978	0.0270	-65.2684	0.0001
PK:CEI	-0.4368	0.5255	-33.0590	0.0000
PK:CPB	-0.7442	0.3943	-40.6433	0.0000
PK:CSA	-0.8042	0.3678	-59.3963	0.0001
PK:CTC	-0.9438	0.3081	-64.3238	0.0001
PK:CTX	-1.1866	0.2158	-41.3519	0.0000
PK:DAD	-4.5029	0.0002	-68.7384	0.0001
PK:DAN	-7.7844	0.0000	-77.3336	0.0001
PK:DDH	-0.5529	0.4779	-33.1339	0.0000
PK:DEG	-1.0258	0.2750	-59.8121	0.0001
PK:DES	-3.8964	0.0021	-60.8598	0.0001
PK:DSM	-3.5173	0.0076	-66.4627	0.0001
PK:ENL	-4.0018	0.0014	-53.7747	0.0001
PK:ERO	-0.3316	0.5661	-60.2294	0.0001
PK:ETU	-2.5511	0.0104	-9.1660	0.0000
PK:FAU	3.2832	0.9998	-12.3172	0.0000
PK:FEC	-1.5906	0.1053	-61.0305	0.0001
PK:FZM	-1.1086	0.2435	-45.9255	0.0001
PK:GAI	-0.7734	0.3814	-43.2209	0.0001
PK:GAT	-0.5077	0.4967	-62.0229	0.0001
PK:GLT	-0.2026	0.6134	-58.3279	0.0001
PK:GOP	0.3452	0.7847	-76.6365	0.0001
PK:GSM	-4.0228	0.0013	-71.8020	0.0001
PK:GTR	-0.7187	0.4056	-41.2956	0.0000
PK:GWC	-3.2729	0.0010	-87.7762	0.0001
PK:HAB	0.6855	0.8637	-70.4552	0.0001
PK:HPM	-1.2966	0.1802	-15.8711	0.0000
PK:HPN	-0.7561	0.3890	-41.6333	0.0000
PK:HSM	0.0288	0.6920	-41.6323	0.0000
PK:HUB	1.6730	0.9776	-65.3956	0.0001
PK:HUF	-0.7654	0.3849	-66.7786	0.0001
PK:ICI	-1.0456	0.2673	-61.5951	0.0001
PK:ICP	-0.1782	0.6221	-63.1374	0.0001
PK:IMO	0.2864	0.7689	-56.0328	0.0001
PK:INI	-0.2950	0.5798	-56.3161	0.0001
PK:JIN	-0.2421	0.5992	-21.7827	0.0000
PK:KIE	-2.3292	0.1628	-31.4368	0.0000
PK:KNR	-1.0379	0.2702	-63.7039	0.0001

PK:KWG	-1.0894	0.2506	-34.2687	0.0000
PK:LAK	-0.8056	0.3672	-38.2996	0.0000
PK:LDP	-0.4087	0.5365	-57.3869	0.0001
PK:MAL	-1.0728	0.2568	-45.8109	0.0001
PK:MBK	-0.3717	0.5508	-56.1863	0.0001
PK:MET	-0.1863	0.6192	-61.1556	0.0001
PK:MIR	-0.8474	0.3490	-40.6824	0.0000
PK:MLC	-2.3373	0.0188	-62.8615	0.0001
PK:MRB	0.3138	0.7763	-41.4042	0.0000
PK:MTT	0.7988	0.8850	-12.6411	0.0000
PK:NAR	0.1003	0.7144	-60.4829	0.0001
PK:NAT	-1.3958	0.1517	-55.1469	0.0001
PK:NHT	-0.9229	0.3168	-35.4806	0.0000
PK:NMI	-0.6794	0.4229	-56.1216	0.0001
PK:NON	-0.7472	0.3929	-27.2070	0.0000
PK:NPK	1.0020	0.9171	-23.9360	0.0000
PK:ORI	-0.8584	0.3442	-71.2324	0.0001
PK:PAC	-0.7391	0.3965	-57.8219	0.0001
PK:PAL	-1.4668	0.1333	-70.7740	0.0001
PK:PBS	-0.1995	0.6145	-43.2096	0.0001
PK:PCT	-1.4438	0.1391	-56.6576	0.0001
PK:PEN	-1.6394	0.0956	-66.9002	0.0001
PK:PET	-1.0336	0.2719	-41.9943	0.0000
PK:PLC	-2.9855	0.0028	-21.5253	0.0000
PK:PNC	-0.7029	0.4125	-55.3737	0.0001
PK:PNS	-1.0779	0.2549	-54.9846	0.0001
PK:POF	2.1516	0.9929	-64.6693	0.0001
PK:PRE	-1.0013	0.2847	-32.8670	0.0000
PK:PSC	-1.8827	0.0570	-72.9820	0.0001
PK:PSM	-0.6842	0.4208	-56.5932	0.0001
PK:PSO	-0.1994	0.6146	-64.9492	0.0001
PK:PTC	-0.6131	0.4520	-62.0666	0.0001
PK:SEA	-0.2656	0.5906	-27.2915	0.0000
PK:SEC	-1.3659	0.1599	-51.6024	0.0001
PK:SEP	-0.2262	0.6050	-64.9595	0.0001
PK:SER	-0.0564	0.6640	-35.9946	0.0000
PK:SHA	-0.6018	0.4569	-44.2058	0.0001
PK:SHK	-1.2286	0.2017	-25.6149	0.0000
PK:SIT	-0.6067	0.4548	-27.8570	0.0000
PK:SME	0.0920	0.7119	-44.7517	0.0001
PK:SNG	-0.8257	0.3584	-21.0694	0.0000
PK:SON	-0.9402	0.3096	-24.7409	0.0000
PK:SPP	-0.9649	0.2994	-24.3369	0.0000
PK:STM	-1.1666	0.2227	-65.4989	0.0001
PK:SUI	-0.2888	0.5821	-61.4003	0.0001
PK:TAJ	-2.9477	0.0402	-43.8778	0.0000
PK:TLM	-0.8268	0.3579	-64.6328	0.0001
PK:TSM	-5.3608	0.0000	-44.4011	0.0000
PK:TRP	-6.8936	0.0000	-35.8265	0.0000
PK:TRU	-1.1155	0.2409	-66.5638	0.0001
PK:ULV	4.9542	1.0000	-26.1918	0.0000
PK:UMC	-3.9450	0.0017	-46.3185	0.0001
PK:WYP	-0.7022	0.4129	-43.1663	0.0001

Note: This table presents the unit root tests for the 106 sample companies using the Augmented Dicky-Fuller (ADF) tests; the critical values were based on MacKinnon (1996) 1 percent level (-3.4641). P-values indicates the significance.

Thus, the unit root test findings for this sample of Pakistani equities are similar to the results obtained elsewhere in the literature which suggested that share prices tend to be I(1) while share returns are I(0) (Egert and Koubaa, 2004; Qayyum and Kemal, 2006; Brooks, 2008; Butt et al., 2010; Mahmud and Mirza, 2011)[193].

Further analysis was undertaken to determine whether the data could be modelled as a GARCH process. After analysing the price changes for all the sample firms, 'volatility clustering' or 'volatility pooling' was found in the time series. Volatility clustering occurs when large changes in share prices are followed by similar large returns and small changes in share prices followed by small returns. This implies that the current volatility tends to be positively correlated with its level in preceding periods; under a GARCH process, volatility clustering is modelled as the conditional variance is allowed to be dependent upon previous lagged values[194]. Figures 7.1 to 7.4 present daily price changes during the period 31st December 1994 to 31st December 2011 of four firms that were randomly selected from the whole sample[195]. An analysis of these figures reveals that some firms exhibit higher levels of volatility than others during the time frame considered[196]. This feature of high levels of volatility among

[193] One of the limitations with ADF test is that it involves an unknown number of lagged first differences of the dependent variable to capture auto-correlated omitted variables that would otherwise, by default, enter the error term. Therefore, ADF loses its power after a large number of lagged values implying that for a stationary process the null hypothesis of a unit root will be rejected less frequently than would otherwise have been the case. According to Brooks (2008, p. 329), "including too few lags will not remove all the autocorrelation, thus biasing the results, while using too many will increase the coefficient standard errors … this will result in a reduction in the power of test".

[194] This is known as a GARCH (1,1) model. The GARCH (1,1) model can be extended to a GARCH (p,q) formation where the current conditional variance is parameterised to depend upon q lags of the squared error and p lags of the conditional variance. However, according to Bollerslev, (1986), a GARCH (1,1) model is typically sufficient to capture the volatility clustering in the data.

[195] Due to the large amount of sample firms, only four graphs are shown in Figures 7.1 to 7.4. However, all the firms were tested and all of them showed signs of volatility clustering. Results of all sample firms are available on request.

[196] The SECP introduced circuit breakers in 2001 in an attempt to counter excessive volatility and to avert panic selling (Hameed and Ashraf, 2006; Nawazish and Sara, 2012). After the share price has risen or fallen by a certain percentage, the exchange might activate restrictions or trading halt; currently, only share price fluctuations of five percent upper and lower level limit around the opening

equity returns is common among emerging markets; Harvey (1995) noted that shares in emerging market countries normally exhibit larger price changes than their developed market counterparts. An analysis of Figures 7.1 to 7.4 reveals evidence of volatility clustering; that is, high (low) volatility in one period is followed by high (low) volatility in a subsequent period; GARCH models are designed to deal with this characteristic of returns (Engle, 2001)[197]. A visual inspection of the data confirms that the variances of returns are not constant over time; even a quick look at Figures 7.1 to 7.4 suggests that price changes in some time periods are riskier than in others[198]. For example, from the figures it is evident that volatility was relatively high at the start of the period in 1998. However, the level of volatility fell during the years 2004 to 2005. For instance, the unconditional variance of returns for PK:ULV was 0.1691 in 1998 but declined to -0.0347 in 2004; similar observations can be made for other firms not shown in this chapter.

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share price of the security are allowed, if the share price is more than Rs. 20. In the case of prices less than Rs. 20, a fluctuation of one rupee above or below on the opening share price is allowed (Investor Guide, KSE website, 2011).

[197] An ARCH model is also appropriate to deal with the above issues but due to its limitations GARCH models are now considered more popular than ARCH and it is now common to estimate a GARCH instead of an ARCH model (Brooks 2008). Before deciding to use a GARCH model, the Engle (1982) test of ARCH effects was computed to make sure that a GARCH model is appropriate for the data. A pilot test on 30 sample firms at the lags of 6, 12 and 20 confirmed that an ARCH effect was present in the data. Hence, the use of GARCH-type model was deemed appropriate for this research.

[198] An analysis of the volatility of the sample firms, a structural break was identified in the time series during the 9/11 crisis period; strong evidence in support of the existence of the 9/11 structural break was found – the data indicated that volatility behaviour during the post-9/11 period was significantly different from its pre-9/11 counterpart. Thus it was decided to introduce a 9/11 dummy crisis into the variance equation of the GJR GARCH model. Further details can be found in Section 7.4 of the current chapter.

Figure 7.1 Returns of the PK:MBK during January 1995 and December 2011

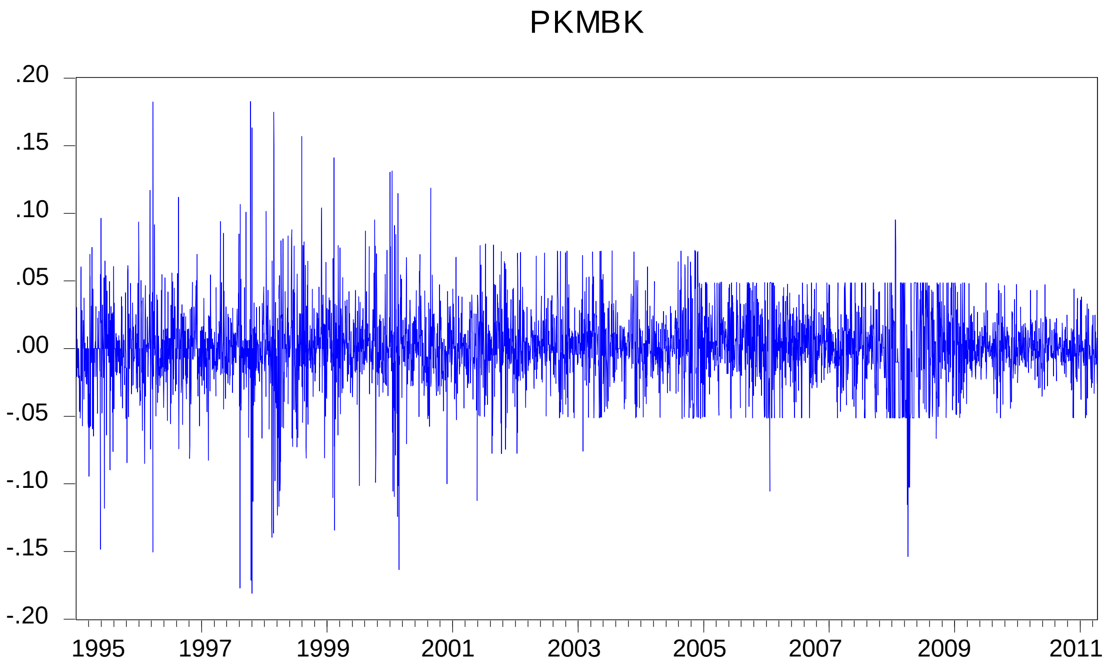


Figure 7.2 Returns of the PK:MLC during January 1995 and December 2011

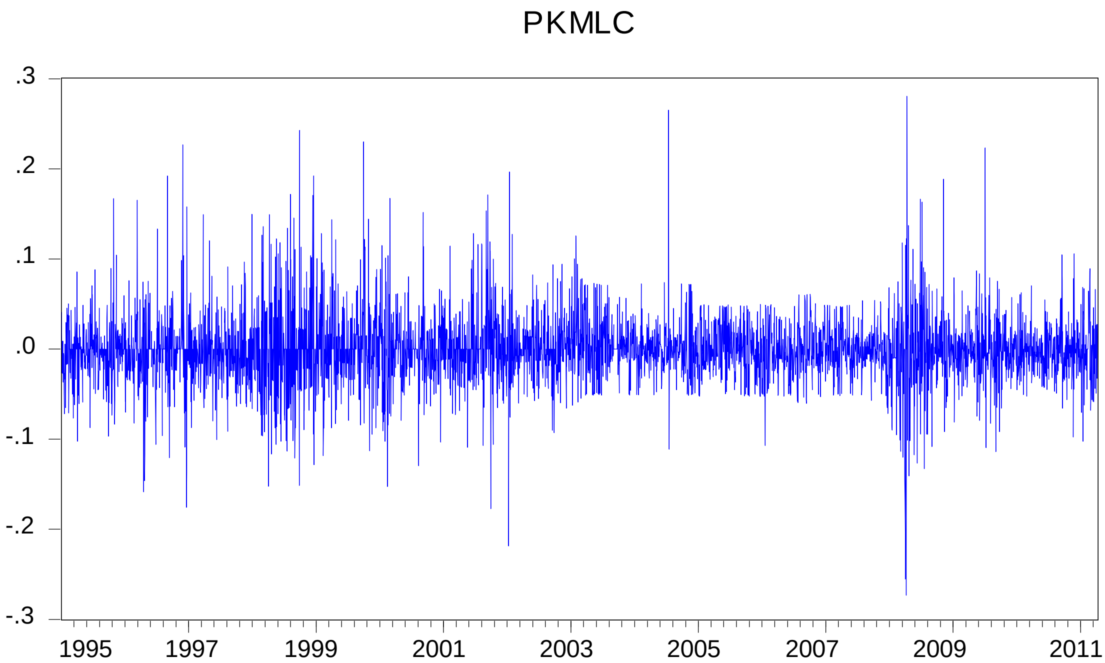


Figure 7.3 Returns of the PK:PCT during January 1995 and December 2011

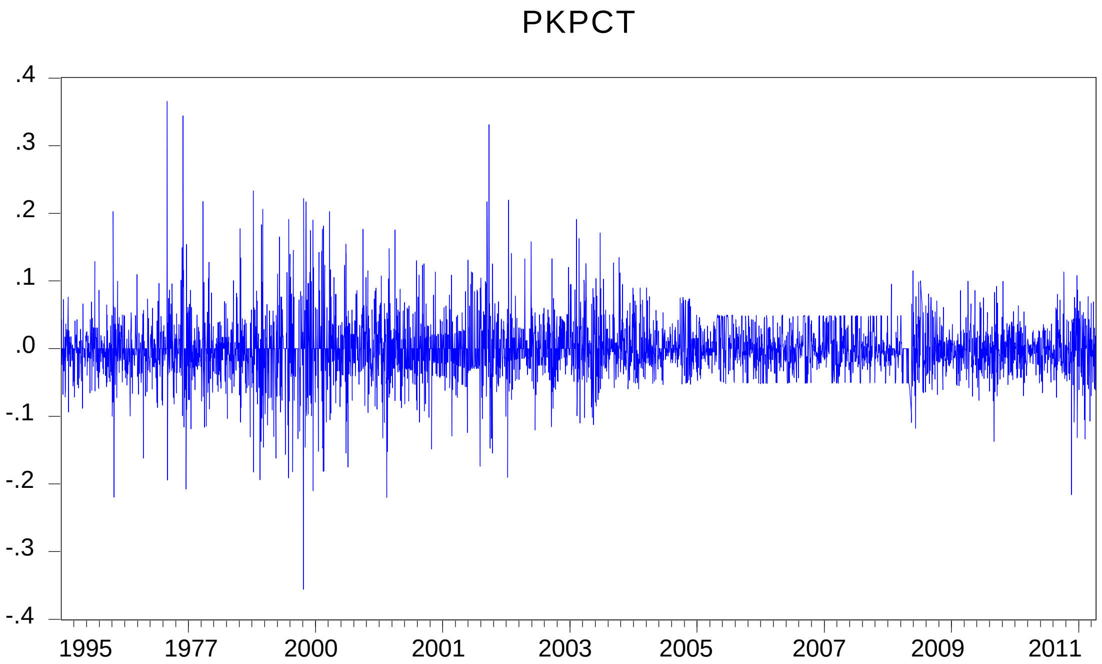
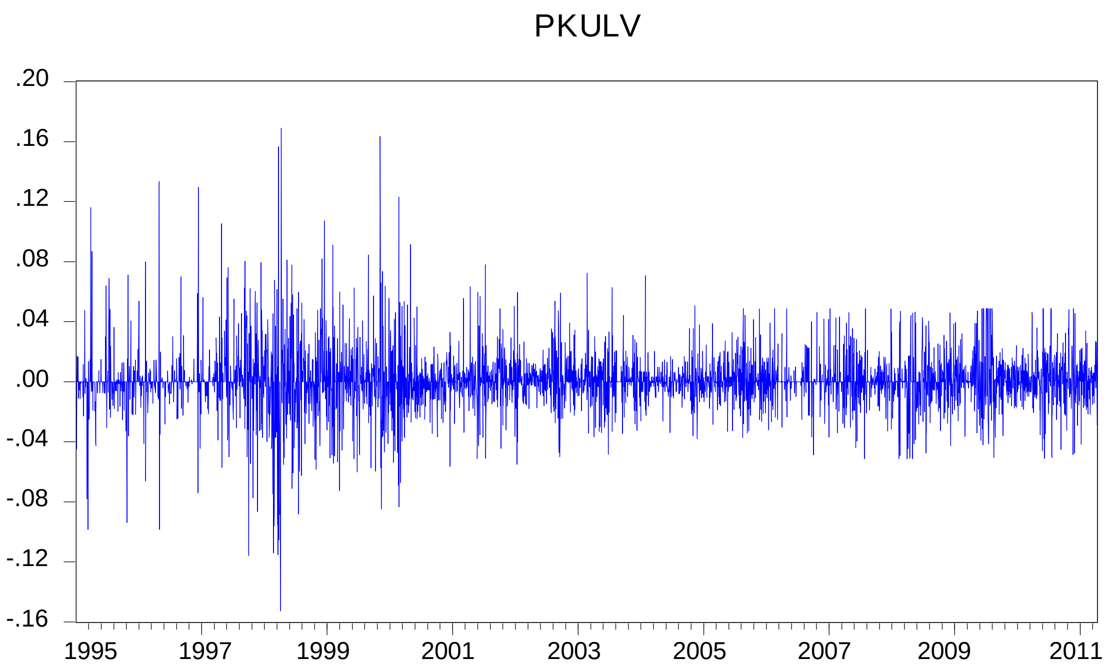


Figure 7.4 Returns of the PK:ULV during January 1995 and December 2011



7.3 Selecting an Appropriate GARCH Model

The original GARCH model was originally developed by Bollerslev (1986) and Taylor (1986) (see Chapter 4 for details) but since their initial contribution a vast literature has emerged highlighting different possible GARCH processes which a time series might follow (Engle et al., 1987; Nelson, 1991; Glosten et al., 1993; Rabemananjara and Zakoian, 1993; Engle and Ng, 1993; Zakoian, 1994)[199]. GARCH models have an advantage over the OLS regression when analysing share price changes since they take into consideration not only the mean but also the risk or volatility of returns; both risk and returns are accounted for simultaneously in the model. Therefore, GARCH models may help the researcher to arrive at a more accurate characterisation of calendar effects in equity returns and discern whether a high average daily return in one month can be attributed to a correspondingly high level of volatility. Furthermore, volatility patterns might also be uncovered which might essentially help investors to manage the risk of their portfolios.

Since its introduction, several modifications and extensions have been made to the basic GARCH model. Many of the extensions to the GARCH model have been suggested as a consequence of problems with the standard approach proposed by Bollerslev (1986). The standard GARCH model has proved useful for modelling a variety of time series phenomena. However, this symmetric GARCH model can only control for the conditional heteroskedasticity in the time series; it does not capture any leverage effect which may be present since it assumes that the market behaves in a

[199] A GARCH model is an extension to the time varying heteroskedasticity model (ARCH) proposed by Engle (1982). Bollerslev (1986) extended the ARCH specification by making the conditional variance a function of lagged values of the conditional variance in addition to the lagged values of squared residuals.

symmetrical fashion towards good and bad news and attaches equal weight to recent price changes and to more distant returns. Recognising that such effects may be present in a time series has led to the development of asymmetric GARCH models known as the exponential GARCH (or EGARCH) models by Nelson (1991) and GJR GARCH models by Glosten et al. (1993)[200]. These models recognise that the market may respond differently to good and bad news. The concept of a leverage effect, first introduced by Black (1976), is related to the notion that a negative shock to a financial time series causes volatility to rise more than a positive shock of the same magnitude; in other words, the effects of a shock on the volatility of a series are asymmetric (Christie, 1982; Glosten et al., 1993; Zakoian, 1994). Furthermore, Schwert (1989) presents evidence that stock volatility is higher during recessions and financial crises. One explanation of the leverage effect is that a reduction in the equity value from a bad news will raise the debt-to-equity ratio of the firm and, hence increase the riskiness of the firm and lead to higher future volatility (Brown et al., 1988). Schwert (1990) provides an alternative explanation for this asymmetric negative effect; "if increases in predictable volatility increase discount rates of future cash flows to stockholders, but not the expected cash flows, then unexpected increases in volatility will cause a drop in stock prices" (p.86).

Engle et al. (1987) introduced a GARCH model to incorporate the tradeoff between risk and return which underpins modern finance theory – the GARCH-in-mean (GARCH-M) model. This model allows the return of the security to be partly determined by its own risk; in other words, the conditional variance of equity returns

[200] There are several GARCH models available that can capture the asymmetric effect in volatility. However, according to Brooks (2008) the two most popular asymmetric GARCH models used in financial analysis are the GJR and the EGARCH models. Therefore, for the purpose of this thesis, only these two asymmetric GARCH models will be used for the pilot study.

enters into the conditional mean equation. This allows the conditional mean return to depend on the conditional variance of the return; therefore, the conditional mean becomes an explicit function of the conditional variance[201]. It is also possible to combine together more than one GARCH-type model to obtain a 'hybrid model'. For example, a GJR model can be combined with the GARCH-in-mean model to obtain a GJR GARCH-M model that takes into account both the leverage effect as well as the risk return tradeoff[202].

Several studies have investigated the time-varying volatility of equity returns using different types of GARCH models to capture the various possible behaviours of the time-varying volatility in the return series for different stock markets in different sample periods (Borges, 2009). A univariate rather than a multivariate GARCH model was selected for the current study because the presence of calendar anomalies is being examined for each individual firm independently of all the other series[203]. A pilot study on 30 sample firms was initially conducted for both the Gregorian and Islamic calendars in order to determine which GARCH model best fit the KSE data[204]. For this purpose, the standard GARCH (1,1), the EGARCH, the GJR GARCH and the GJR GARCH-M models were estimated for the 30 sample firms. With all of these GARCH models, a first-order autoregressive GARCH term and a first-order moving

[201] The mean equation includes a coefficient that represents the price (reward) for taking risk (as measured by variance). Therefore, the intercept term in the model will represent the return that is not explained by the risk premium. An extensive research of GARCH and GARCH-M models in finance is discussed by Bollerslev et al. (1992).
[202] This type of GARCH model was tested in the pilot study; since the initial pilot study revealed that a GJR GARCH model fits the data best, it was decided to test the risk and return tradeoff using the GJR GARCH-M specification.
[203] A multivariate GARCH model takes into account the 'volatility spillovers' between firms and provides the covariances between series. None of this was required for this study hence a univariate model was deemed appropriate.
[204] The 30 sample firms were: PK:ACC, PK:ABB, PK:ACB, PK:ADI, PK:AGR, PK:AGT, PK:ALN, PK:ALT, PK:ART, PK:ASB, PK:ATH, PK:ATR, PK:BAP, PK:BKP, PK:BOC, PK:CCB, PK:CEI, PK:CPB, PK:CSA, PK:CTC, PK:CTX, PK:DAD, PK:DAN, PK:DDH, PK:DEG, PK:DES, PK:DSM, PK:ENL, PK:ERO and PK:ETU.

average ARCH term was selected; that is the variances were assumed to follow (1, 1) process[205]. In other words, the variance estimate in a period was thought to be conditional on the previous variance and the previous forecast error. According to Brooks (2008) a GARCH (1, 1) model will usually be sufficient to capture any volatility clustering that is present in financial data; a higher order model is rarely estimated in the academic literature[206]. Brooks and Burke (2003) are of the view that the lag order described by a (1, 1) model should capture all the volatility clustering available in data[207]. Furthermore, a Pakistani study by Saleem (2007) on data from the KSE-100 index found that a GARCH (1, 1) model best captured the persistence in volatility that was present.

The appropriate model was identified by examining the autocorrelation function (ACF), partial autocorrelation function (PACF) and Ljung-Box statistics for the standardised residuals and the squared standardised residuals of each equation[208]. The Q-statistics for the autocorrelation and partial autocorrelation of the standardised residuals is used to test for any remaining serial correlation in the mean equation; they check whether the mean equation is correctly specified. If the mean equation is correctly specified, all the Q-statistics should be statistically insignificant. On the other hand the LB test on the squared standardised residuals investigates whether there is any ARCH effect remaining in the variance equation. If the variance equation is correctly specified, all the Q-statistics should not be significant.

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[205] An ARCH model is a special case of a GARCH model in which there is no lagged forecast variance in the conditional variance equation. In other words, it can be referred to as a GARCH (0, 1).

[206] Higher order GARCH models, denoted GARCH (p, q), can also be estimated by choosing either p or q greater than 1 where p is the order of the moving average and q is the order of the autoregressive term.

[207] According to Engle (2001), higher-order models are often useful when a long span of data is used; such as several decades of daily data or a year of hourly data. For example, Engle and Lee (1999) used a GARCH (2 ,2) specification for their analysis.

[208] These tests are able to detect model failures (Engle, 2001).

The results of the pilot study revealed that the leverage term for the GJR GARCH and the EGARCH was significant for most of the subset firms; hence the standard GARCH (1, 1) model was ruled out as the best model. In fact, some 20 out of 30 sample firms had a significant leverage effect when both the Gregorian and Islamic calendars were investigated according to GJR GARCH and EGARCH models[209]. The leverage coefficients reported varied from a low of -0.3646 (-0.1215) to a high of 0.1645 (0.1319) for GJR GARCH (EGARCH) model. These results suggested that an asymmetric GARCH model should be used to analyse the time series for the sample firms.

Further tests were performed to determine which asymmetric model fitted the data best. Specifically, the Ljung – Box Q statistics for the standardised and the squared standardised residuals suggested that the GJR model provided a better fit for the data than the EGARCH approach since the Q-statistics for most of the sample firms were not significant when the EGARCH model was employed; 19 firms had a higher p-value for the Q-statistic when the GJR GARCH model was compared to its EGRACH counterpart. These findings suggested that the GJR GARCH specification successfully captured the serial correlation in the squared residuals for most of the sample firms.

Finally, a GJR GARCH-M model was tested to discover whether the conditional risk-return significantly influenced the mean for the pilot subset of Pakistani securities

[209] The GJR GARCH model also had higher Q-statistic p-values as compared to the GARCH (1, 1) model for most of the sample firms. Studies such as Brailsford and Faff (1996) reported evidence that favoured the GJR GARCH model for predicting monthly Australian stock volatility, compared with the standard GARCH (1, 1) model.

studied. The results indicated that only 6 firms for the Gregorian calendar (PK:AGT, PK:ATH, PK:BAP, PK:CCB, PK:DSM and PK:ETU) and only 4 firms using the Islamic calendar (PK:AGT, PK:ALN, PK:ATH and PK:BAP) had a significant GJR GARCH-M coefficient; in all cases, the Ljung – Box Q statistics for the standardised and the squared standardised residuals suggested that the standard GJR approach was better at correctly modelling the mean and variance equations than its GARCH-M counterpart. Hence, the GJR GARCH model was selected as the most appropriate specification to use in the analysis.

Overall, the GJR model seemed to outperform all other models in capturing the dynamic behaviour of the Pakistani equity returns since it gave rise to the highest log-likelihood ratios and lower Ljung-Box statistics overall. Therefore, GJR GARCH (1, 1) was applied to the equity time series for the whole sample of 106 Pakistani firms listed on the KSE in order to test for monthly seasonality using both the Gregorian and Islamic calendars[210]. The next section outlines the specific methodology that was employed in this testing process.

7.4 Empirical Methodology

The return series of 106 Pakistani firms listed on the KSE from 31st December 1994 to 31st December 2011 is investigated for monthly seasonality in this Chapter[211]. The return series were computed as the first difference of the natural logarithm of all the sample firms' prices as discussed in Section 7.2. On the basis of the features discussed in Section 7.3, a nonlinear (asymmetric) GJR GARCH model developed by Glosten et

[210] These 106 firms includes the 30 firms investigated for the pilot study

[211] The same dataset that was employed in Chapter 6 was used for this chapter and a detailed descriptive analysis of the data can be found in Chapter 6

al. (1993) was deemed appropriate for the analysis. This model allows for time-varying volatility and takes account of any leverage effect which may be present where the impact of good news may be different from the effect of bad news on the variance of returns[212].

To estimate the monthly seasonality in share returns and share volatility, the following GJR GARCH model was estimated for the Gregorian calendar:

$$R_t = \mu + \sum_{i=1}^{11} \lambda_i D_{it} + \varepsilon_t \qquad [7.4]$$

$$h_t = \theta + \sum_{i=1}^{11} \delta_i D_{it} + \beta_i D_{ic} + \alpha\varepsilon_{t-1}^2 + \beta h_{t-1} + \gamma\varepsilon_{t-1}^2 \mathrm{I}_{t-1} \qquad [7.5]$$

And the following GJR GARCH model was estimated for the Islamic calendar:

$$R_t = \mu + \sum_{i=1}^{11} \vartheta_i D_{it} + \varepsilon_t \qquad [7.6]$$

$$h_t = \theta + \sum_{i=1}^{11} \varphi_i D_{it} + \beta_i D_{ic} + \alpha\varepsilon_{t-1}^2 + \beta h_{t-1} + \gamma\varepsilon_{t-1}^2 \mathrm{I}_{t-1} \qquad [7.7]$$

Equation [7.4] and Equation [7.5] are the mean equations (for Gregorian and Islamic calendars, respectively) where $\mathrm{R_t}$ is the log returns at time t for each firm examined. ε_t is the random error term where $\varepsilon_t \sim N(0, \sigma^2)$ which is normally distributed with a mean of zero and a variance of h_t. Equation [7.5] and equation [7.7] are the variance

[212] In this model, good news and bad news have differential effects on the conditional variance; i.e., the news impact is asymmetric.

equations (for the Gregorian and Islamic calendars, respectively) that capture the time-varying volatility in the return series where h_t is the conditional variance since it is a one-period ahead estimated for the variance calculated on the basis of past information[213]. ε_{t-1}^2 is the information about volatility during the previous period (measured as the lag of the squared residuals from the mean equation) and is also known as the 'ARCH term' (α is the coefficient to be estimated). h_{t-1} is the conditional variance obtained from the model during the previous period (lag of variance), also referred to as the 'GARCH term' (β is the coefficient to be estimated). γ is the term which accounts for the asymmetric leverage effect in the response to good and bad news. I_{t-1} is a dummy variable for the leverage effect, such that I_{t-1} = 1 if $\varepsilon_{t-1} < 0$ (bad news), $I_{t-1} = 0$ otherwise. For the leverage effect if $\gamma > 0$, then negative shocks have a larger impact on volatility than positive shocks whereas if $\gamma < 0$, then the positive shocks have a larger impact on volatility than their negative counterparts. The news impact is symmetric if $\gamma = 0$.

The model was initially specified according to the Gregorian calendar; eleven monthly dummy variables in the mean and variance equations of the share returns were included to proxy for January through November with an intercept term (μ in equation [7.4] and θ in equation [7.5]) representing December[214]. In other words, the omitted dummy variable for December became the reference category against which all the other dummy variables were compared. In both equations, D_{it} is a set of 11 dummy variables for each of the 11 months from January to December where $D_{1t} = 1$

[213] Instead of calling the variance σ_t^2, in the literature it is usually called h_t.
[214] This is consistent with the study by Beller and Nofsinger (1998) that had 11 dummy variables and December as the intercept (constant) term. December dummy variable is excluded to avoid the perfect multicollinearity problem also known as the dummy variable trap.

for all January observations and 0 otherwise, D_{2t} = 1 for all February observations and 0 otherwise and so on.

The model was then specified to take account of the Islamic calendar; eleven dummy variables were included in the mean and variance equations for the Islamic months from Muharram to Zil Qa'ad; the intercept term (μ in equation [7.6] and θ in equation [7.7]) represented Zil Hajj[215]. In both equations, D_{it} is a set of 11 dummy variables for each of the 11 months from Muharram to Zil Qa'ad where D_{1t} = 1 for all Muharram observations and 0 otherwise, D_{2t} = 1 for all Safar observations and 0 otherwise and so on.

Furthermore, after analysing the volatility of the sample firms, a 9/11 crisis dummy "D_{ic}" was introduced into the variance equation as a structural break was identified in the time series after that date which effected the volatility of the shares; strong evidence in support of the existence of the 9/11 structural break was found. This observation is consistent with previous studies that documented a significant shift in the volatility of share returns in Pakistan after 9/11 (Hameed and Ashraf, 2006; Ahmed and Farooq, 2008; Nguyen and Enomoto, 2009; Suleman, 2012; Khan et al., 2012) as highlighted in Chapter 2. The data indicated that volatility behaviour during the post-9/11 period was significantly different from its pre-9/11 counterpart (the 9/11 coefficient was significant for 93 percent of the 30 sample firms used in the pilot study); hence a 9/11 crisis dummy was introduced in the variance equation[216]. This

[215] It was decided to omit the dummy variable for the last month of Islamic calendar as well to be consistent with the Gregorian calendar.
[216] A study by Ahmed and Farooq (2008) found that the ARMA characteristics, the conditional variance risk premium, and the asymmetric response of the conditional variance to innovations of the KSE changed significantly from their pre-9/11 levels during the post- 9/11 period. Therefore, a 9/11 crisis dummy had to be included in the variance equation.

dummy variable took the value of zero for the period before 11th September 2001 and the value of 1 for all the observations after that date[217]. This method is consistent with the study by Hameed and Ashraf (2006) who investigated the 9/11 incident on the volatility of share returns in Pakistan. The mean and the time varying variance equations are estimated simultaneously (for both the Gregorian and Islamic calendars) allowing both risk and return to vary across the months of the year for both calendars in order to uncover whether any seasonality is present in both stock returns and volatility[218]. The results from this investigation are discussed in the next section of the current chapter.

7.5 Empirical Results

In this Chapter, the GJR GARCH model is used to estimate whether monthly seasonality may be present in the Pakistani stock market based on both the Gregorian and Islamic calendars. The model will facilitate the testing for seasonality in both the mean and volatility of returns. An interesting feature of this study is that it employs individual company data rather than details for the KSE index; the time series of returns for each individual firm is tested using the GJR model. All previous studies that have examined monthly seasonality in the risk and returns from the Pakistani stock market have focused on KSE-100 index (Husain, 1998; and Mustafa, 2008). Thus, the analysis in this chapter provides a more realistic view of whether exploitable anomalies are present where investors could outperform by investing in certain companies' shares for specific months of the year. Furthermore, this study

[217] The study also examines the GJR GARCH model without the inclusion of the 9/11 crisis dummy and found that the results were somewhat identical and would have led to the same conclusion. The corresponding results are available upon request.

[218] Equations 7.4 and 7.5 are estimated simultaneously for Gregorian calendar while equations 7.6 and 7.7 are estimated simultaneously for the Islamic calendar.

employs a relatively complex modelling procedure which examines whether returns exhibit patterns based on all the months of both the Gregorian and Islamic calendars. In contrast, Husain (1998) only focussed on the month of Ramadan in his study whereas Mustafa (2008) only included six of the twelve Islamic months (including Ramadan) in his investigation. Evidence about the persistence of seasonality in stock market returns according to some prior studies has prompted a small number of researchers to examine seasonal patterns in share price volatility using a GARCH-modelling process[219]. Indeed, only one study (Husain, 1998) has employed a GARCH model to investigate whether monthly seasonality is present in share returns. The current chapter will therefore contribute to the literature in this area[220].

The results of the analysis for mean returns and the conditional variance of returns using the GJR model estimated for each individual firm are presented in Appendix 7.1 for the Gregorian calendar and in Appendix 7.2 for the Islamic calendar[221]. For the sake of simplicity, only the overall findings are reported in the body of this Chapter; summary results are presented in Table 7.2 for Gregorian calendar and in Table 7.3 for the Islamic calendar. Each of these tables is divided into three panels. The first panel reports monthly results for the mean equation while the second panel documents monthly findings from the variance equation. The final panel presents statistics for the coefficients of ARCH, Leverage and GARCH terms in the models estimated. Each panel has nine columns, the first simply highlights the name of the variables for which statistics of the coefficients are being provided; in the first two panels, the variables

[219] It is important to note that early studies of calendar anomalies in the Pakistani stock market typically investigated this topic by regressing returns on monthly dummies using the OLS approach.
[220] This chapter will add to the literature on the monthly seasonality in the Pakistani stock market by using the GJR GARCH model for both the Gregorian and the Islamic calendars.
[221] Figures in Appendix 7.3 and 7.4 provide a complete picture about the distribution of the estimated parameters provided in Appendix 7.1 and 7.2, respectively.

include the constant term (for December in Table 7.2 and for Zil Hajj in Table 7.3) and the 11 months for which dummy variables are included. The second column highlights the average coefficients for each variable across all 106 companies. The next two columns report the percentage of these coefficients that were (i) significant and (ii) negative. The fifth and sixth columns document the minimum and maximum values for each coefficient respectively while the seventh column highlights the standard deviation for each coefficient around its mean. Finally, the last two columns describe the distributions of each coefficient; specifically, the skewness and kurtosis measures are given.

A visual inspection of Table 7.2 and Table 7.3 reveals a number of interesting points. First, the tables indicate that the ARCH term has statistically significant coefficients for all of the firms. In addition, the GARCH term's coefficient were statistically significant for most of the sample companies (99.06 percent significant for Gregorian calendar and 98.11 percent significant for Islamic calendar); these findings suggest that volatility of share returns depends on previous unexpected returns as well as lagged variances[222]. The results vindicate the decision to employ the GARCH approach when modelling share returns. Second, the GJR GARCH model uncovered the fact that Pakistani investors appear to respond in an asymmetric fashion to positive and negative news; this finding cast doubts on the appropriateness on previous research that has ignored this characteristic when employing GARCH models in their analysis of calendar anomalies in the Pakistani stock markets[223]. From Table 7.2 (Table 7.3), the results indicate that the average values of the coefficient on the

[222] The time varying characteristics of conditional volatilities of stock returns was documented by Liow (2004) and Liow et al. (2006).

[223] Husain (1998) employed a GARCH (p, q) model and therefore assumed symmetrical behaviour of the Pakistani market towards positive and negative news, whereas the results of this Chapter show that the Pakistani market reaction towards news is asymmetrical.

leverage variable is 0.0011 (0.0013) when the Gregorian (Islamic) calendar is being tested. Furthermore, 72.64 (69.81) percent of firms reported a significant leverage effect for the Gregorian (Islamic) calendar. Moreover, this effect was positive and statistically significant for most companies (58.49 percent for Gregorian calendar and 57.55 percent for Islamic calendar) suggesting that bad news induced higher volatility in the returns than good news. This finding is in contrast to the results of Saleem (2007) who reported that positive returns were associated with higher volatility than negative returns of equal magnitude when price changes for the KSE-100 index were studied.

Third, an analysis of the Ljung – Box Q statistics for all the sample firms in Appendix 7.1 and Appendix 7.2 confirms that the GJR GARCH model was appropriate for analysing the data under investigation; the LB Q (8) and LB Q(16) statistics show that there was no serial dependence in the standardized and the squared standardized residuals indicating the appropriateness of the modelling undertaken; all of the ARCH and GARCH present in the returns has been captured with GJR model specification[224]. An analysis of the 9/11 crisis dummy revealed that the volatility of the of the shares listed in the KSE market changed considerably due to the 9/11 crisis; the results indicated that 89.62 (92.45) percent of the sample firms had a significant coefficient of 9/11 crisis dummy in the variance equation for Gregorian (Islamic) calendars. In both Table 7.2 and Table 7.3 a majority of firms (71.70 and 70.75 percent respectively) had a negative coefficient; this finding suggests that the

[224] There appears to be a number of situations where the LB statistics were highly significant (50.94 percent for LB statistic and 5.67 percent for LB-Qs statistic) implying model inadequacy; however, this was the best model fit available as compared to other GARCH models examined as part of the pilot study based on a sample of 30 companies conducted in Section 7.3. Thus, some caution needs to be exercised when interpreting the results for the firms where the LB statistic was significant. In these cases, there is some evidence that autocorrelation is still present in the residuals.

volatility of most companies' share returns was lower in the post-crisis period. This finding is consistent with the study by Hameed and Ashraf (2006) who evaluated the impact of 9/11 event on the KSE by using a GARCH model and reported that the incident reduced volatility of share returns in Pakistan[225]. More recently, Nguyen and Enomoto (2009) also documented a decline in share return volatility in Pakistan after the 9/11 crisis. Furthermore, Ahmed and Farooq (2008) reported that volatility behaviour changed significantly after the terrorist attacks of 9/11; they documented that the sudden shift in the volatility dynamics of the KSE was not due to the reforms initiated by the SECP (see Chapter 2) but due to the unexpected effects of the terrorist attacks of 9/11. For example, Ahmed and Farooq (2008, p. 71) argued that "Some of the benefits, such as surge in remittances via formal channels, increase in export quotas for textiles to the EU and US, and debt rescheduling of country's debt, not only helped in improving the firm performances but also enhanced the liquidity and investor participation in the KSE."

[225] The authors associated this decline to a number of initiatives taken by SECP such as implementation of T+3 settlement procedure (see Section 2.5), rationalization of risk management measures and imposition of circuit breakers. Suleman (2012) contradicted the findings of Hameed and Ashraf (2006) as the author documented an increase in the volatility of the KSE-100 index after the 9/11 incident.

Table 7.2

GJRGARCH Summary Table: Gregorian Calendar – All Sample Firms

Mean	Avg	% Sig	% Neg	MIN	MAX	SD	SKEW	KURT
μ	0.0856	8.49	33.01	-0.4373	0.6771	0.17	0.33	1.82*
Jan	0.0113	6.60	45.28	-0.7823	0.6818	0.26	-0.23	0.21
Feb	-0.0806	3.77	59.43	-2.2348	0.7031	0.32	-2.95*	19.02*
Mar	-0.1127	3.77	66.98	-1.1985	0.3572	0.24	-0.99*	3.18*
Apr	-0.0710	3.77	58.49	-0.6858	0.4198	0.23	-0.34	0.15
May	-0.2723	12.26	86.79	-2.2155	0.1662	0.35	-3.36*	15.96*
Jun	-0.1303	4.72	73.58	-0.9358	1.1090	0.25	0.73*	5.84*
Jul	-0.0751	2.83	62.26	-0.9063	0.4193	0.25	-0.74*	1.05*
Aug	-0.1628	8.49	76.42	-0.8767	0.2594	0.24	-0.62*	0.37
Sep	-0.0829	4.72	64.15	-1.0886	0.5945	0.25	-1.03*	2.58*
Oct	-0.0812	6.60	65.09	-1.0192	1.3359	0.31	0.40	4.62*
Nov	-0.0836	1.89	55.66	-1.6798	0.3912	0.27	-2.87*	13.57*
Variance								
θ	0.0277	97.17	3.77	-0.0265	0.5486	0.06	5.94*	42.93*
Jan	0.0002	82.08	49.06	-0.2664	0.5089	0.06	4.80*	51.91*
Feb	0.0021	70.75	43.40	-0.2579	0.1989	0.04	-1.36*	23.92*
Mar	0.0000	87.74	52.83	-0.2387	0.1077	0.04	-2.94*	21.02*
Apr	-0.0050	75.47	59.43	-0.2621	0.1067	0.03	-4.06*	31.24*
May	-0.0014	78.30	43.40	-0.2640	0.2157	0.05	-1.91*	17.21*
Jun	0.0042	77.36	49.06	-0.2617	0.5898	0.07	5.84*	57.28*
Jul	-0.0035	69.81	58.49	-0.2575	0.3735	0.05	2.96*	42.25*
Aug	-0.0038	76.42	52.83	-0.2647	0.2151	0.04	-1.25*	26.02*
Sep	-0.0035	75.47	52.83	-0.2285	0.0869	0.03	-3.84*	27.77*
Oct	0.0005	73.58	40.57	-0.2502	0.1803	0.04	-2.13*	31.01*
Nov	0.0043	87.74	59.43	-0.2356	0.4216	0.06	3.65*	25.57*
9/11	0.0047	89.62	71.70	-0.0871	0.9068	0.09	9.20*	90.50*
ARCH	0.1253	100.00	0.00	0.0171	0.3695	0.07	1.01*	1.13*
Leverage	0.0011	72.64	41.51	-0.1929	0.1457	0.06	-0.58*	0.99*
GARCH	0.7464	99.06	1.88	-0.0935	0.9757	0.20	-2.10	5.38*

Note: This summary table shows the average coeffcients for the 106 sample firms. μ and θ represents the effect of December. Mean and Variance of the coefficients of Jan – Nov, the 9/11 coefficient and the constant terms are multiplied by 100 for clarity reasons. 9/11 is a dummy variable representing the observations in the period after 9/11. % Sig refers to the percentage of statistical significant of sample firms at 1 and 5 percent level while % Neg implies the percentage of negative values for all the sample firms across different months. Min, Max and SD donate the minimum daily return, the maximum daily return and the standard deviation, respectively. Skew refers to the Kendall-Stuart measure of skeweness while Kurt is the Kendall-Stuart measure of kurtosis. * notes the rejection of the null hypothesis of the normality at the 0.05 significance level.

Fourth, the first panel in Table 7.2 shows that apart from January all the other months had a negative average return for the sample firms relative to the return in December; the January coefficient was the highest at 0.0133. January also reported the least negative number of coefficients; relative to the month of December, only 45.28 percent of the sample firms had a negative January mean return. Furthermore, an inspection of the MIN and MAX values in the table reveals that the January variable had the second lowest minimum return of -0.7823 and the fourth highest maximum return among the monthly returns for all the sample firms. These results are consistent with the findings of Chapter 6 which suggested that there was a pronounced January seasonal anomaly based on the Gregorian calendar; however it is important to note that the coefficient on the January dummy variable was only significant for 6.60 percent of the sample firms (PK:ACC, PK:FAU, PK:IMO, PK:NPK, PK:PRE, PK:SNG, PK:SUI). Thus, while January mean returns (relative to December) are higher, on average, as compared to the other months of the Gregorian calendar, this outperformance is only significant in a small minority of cases. For the vast majority of the sample firms, the January seasonality does not significantly affect the average returns in the Pakistani stock market. Hence, after modelling the volatility of returns, evidence about the January affect in mean returns is no longer as strong as that documented in Chapter 6.

A fifth feature of the results is that the mean returns for the month of May are the lowest reported for the Gregorian calendar; at -0.2723 the average coefficient for the May dummy in panel A of Table 7.2 is 67 percent larger in absolute terms than the next biggest coefficient (August). This finding is again consistent with the results of Chapter 6 where a strong negative May seasonality was reported. According to Table

7.2, a staggering 86.79 percent of the sample firms had a negative coefficient in May. Furthermore, an analysis of the MIN and MAX values for this month reveal that it had the second highest minimum coefficient at -2.2155 percent among all the sample firms. In addition, some 12.26 percent of the sample firms had a statistically significant negative coefficient values for May (PKACB, PK:ADI, PK:AGT, PK:BAP, PK:DDH, PK:ENL, PK:GLT, PK:MBK, PK:NMI, PK:NPK, PK:PAC, PK:PLC, PK:PRE). Not surprisingly, therefore, the skewness and kurtosis statistics reveal that (relative to December) May returns were significant negatively skewed (SKEW = -3.36) and had a higher proportion of extreme coefficient values relative to the normal distribution.

Sixth, what is most surprising about the findings in the table is that although there is very little statistical evidence of a seasonal anomaly in mean returns, a different picture emerges when the variances of returns are analysed. The results of the variance equations in Table 7.2 confirm that the January coefficient was positive (mean = 0.0002) and was significant for 82.08 percent of the sample firms. The conditional volatility of returns in this month was positively skewed at 4.80 which was significant. However, January was not the only month with a significant positive volatility coefficient (relative to volatility in December). In fact, four other months had higher coefficients; for example, the average coefficient for November was 0.0043 and the dummy variable for this month was significant in 87.74 percent of cases. For five months (April, May, July, August and September) the average coefficient for the dummy variable was negative. What these results confirm is that whatever monthly seasonality may be present in the equity prices of Pakistani companies, it is more pronounced in the volatility data than in the mean return number.

Table 7.3

GJRGARCH Summary Table: Islamic Calendar – All Sample Firms

Mean	Avg	% Sig	% Neg	MIN	MAX	SD	SKEW	KURT
μ	-0.0142	0.00	44.33	-1.2861	0.7469	0.20	-1.96*	15.06*
Muh	0.0027	1.89	48.11	-0.8237	1.0758	0.28	0.04	1.95*
Saf	-0.0017	2.83	44.34	-0.7407	0.8044	0.25	-0.25	1.84*
RabA	0.0378	1.89	42.45	-0.8630	1.8034	0.27	2.31*	18.20*
RabT	-0.0504	4.72	53.77	-0.8120	1.2351	0.29	0.30	3.50*
JamA	-0.0373	0.94	59.43	-0.8608	1.3810	0.24	1.57*	10.69*
JamT	-0.0500	2.83	49.06	-3.4655	0.8219	0.44	-4.67*	34.12*
Raj	-0.0941	2.83	65.09	-1.2908	1.2531	0.29	0.14	5.48*
Sha	0.0049	2.83	50.94	-0.8570	0.8699	0.23	0.11	2.94*
Ram	0.1250	5.66	24.53	-0.9953	0.9133	0.26	-1.06*	5.23*
Shaw	0.0461	4.72	40.57	-1.3209	2.0501	0.36	0.71*	10.62*
ZilQ	0.0899	1.89	35.85	-0.9317	1.7113	0.29	1.19*	8.90*
Variance								
θ	0.0257	96.23	6.60	-0.0314	0.2031	0.04	2.55*	7.31*
Muh	-0.0024	72.64	53.77	-0.1251	0.1196	0.03	-0.29	5.40*
Saf	0.0003	79.25	48.11	-0.0933	0.2084	0.03	3.37*	26.70*
RabA	-0.0034	74.53	56.60	-0.1230	0.0832	0.03	-0.80*	4.50*
RabT	-0.0042	67.92	60.38	-0.1573	0.1690	0.03	0.95*	13.31*
JamA	-0.0074	71.70	58.49	-0.1214	0.0423	0.02	-2.72*	10.25*
JamT	-0.0039	75.47	51.89	-0.1929	0.1579	0.03	-0.96*	13.81*
Raj	-0.0035	75.47	50.94	-0.1247	0.0648	0.02	-1.88*	8.30*
Sha	-0.0029	72.64	51.89	-0.1461	0.1359	0.03	-1.08*	12.23*
Ram	-0.0048	77.36	39.62	-0.1333	0.0651	0.03	-2.23*	8.25*
Shaw	0.0006	65.09	52.83	-0.1637	0.1368	0.03	-0.20	8.78*
ZilQ	-0.0043	75.47	53.77	-0.1307	0.0822	0.03	-1.56*	7.83*
9/11	-0.0051	92.45	70.75	-0.1183	0.1083	0.02	-1.07*	11.38*
ARCH	0.1252	100.00	0.94	-0.0164	0.4405	0.07	1.12*	4.08*
Leverage	0.0013	69.81	42.45	-0.3646	0.1645	0.07	-1.39*	5.89*
GARCH	0.7532	98.11	0.00	0.0293	0.9778	0.17	-1.75*	4.22*

Note: This summary table shows the average coeffcients for the 106 sample firms. μ and θ represents the effect of Zil Hajj. Mean and Variance of the coefficients of Muh – ZilQ, the 9/11 coefficient and the constant terms are multiplied by 100 for clarity reasons. 9/11 is a dummy variable representing the observations in the period after 9/11. % Sig refers to the percentage of statistical significant of sample firms at 1 and 5 percent level while % Neg implies the percentage of negative values for all the sample firms across different months. Min, Max and SD donate the minimum daily return, the maximum daily return and the standard deviation, respectively. Skew refers to the Kendall-Stuart measure of skeweness while Kurt is the Kendall-Stuart measure of kurtosis. * notes the rejection of the null hypothesis of the normality at the 0.05 significance level.

Seventh, a notable feature of the results in Table 7.3 is the positive Ramadan effect. Different studies have documented evidence of a Ramadan effect in various Islamic countries. For example, Al-Ississ (2010) discovered that daily returns were 0.05 percent higher for this month as compared to all other months of the Islamic calendar across 17 Muslim financial markets. In addition, Bialkowski et al. (2012) reported that share returns during Ramadan were almost nine times higher and less volatile than during the rest of the year for 14 predominantly Muslim countries (including Pakistan) thoughout the world. More recently, Al-Hajieh et al. (2011) documented that mean returns in Ramadan were higher than the yearly mean returns (excluding Ramadan) for five out of the six Middle Eastern stock markets that they studied. Almudhaf (2012) also found evidence of seasonality in equity returns for different months of the Islamic calendar; his results indicated that a significant Ramadan effect was present (higher returns during Ramadan) in Jordan, Kuwait, Pakistan, and Turkey. Seyyed et al. (2005) who studied the Saudi Arabian stock market using a GARCH (p, q) specification disagreed slightly with the findings of previous investigations; they argued that the average rates of return were unaffected during Ramadan; however, there was a significant decline in volatility during Ramadan, implying predictable changes in risk for this month of the Islamic calendar. Interestingly, a Pakistani study conducted by Mustafa (2008) reported that the Karachi stock market had relatively low levels of risk during the month of Ramadan. This was consistent with the findings of an earlier Pakistani study by Husain (1998) who documented that the volatility of price changes declined in the month of Ramadan.

It is clear from the results of the mean equation in Table 7.3 that investors earn the highest mean return during the month of Ramadan; the average coefficients for this month (relative to that of Zil Hajj) at 0.1250 percent was nearly 40 percent higher than that documented for the month with the next highest coefficient (Zil Qa'ad). However, it was only statistically significant at the 5 percent level for 5.66 percent of the firms in the sample (PK:GTR, PK:HPM, PK:MRB, PK:PSM, PK:SME, PKSUI). Not surprisingly, Ramadan also reported the least negative coefficient; only 24.53 percent of the sample firms had a negative Ramadan coefficient even after taking volatility into account. These results are consistent with the findings of Chapter 6 although the relatively small percentage with a significant coefficient for this month is surprising. The non-significance of the coefficient for the month of Ramadan in a lot of cases suggests that the results in Chapter 6 may be due to the varying market volatility which the GJR GARCH models incorporate into their specification. After allowing the volatility to vary, the Ramadan affect is no longer as strong as that documented in Chapter 6[226]. Furthermore, the results suggest that the two months following Ramadan (Shawwal and Zil Qa'ad) also reported positive coefficients which were third and second highest respectively; Zil Qa'ad had the second highest coefficient at 0.0899 followed by Shawwal at 0.0461 although these coefficients were only significant for 1.89 and 4.72 percent of the sample firms respectively. This finding is consistent with the results of Mustafa (2008) who documented an 'after Ramadan' effect in the Pakistani market based on his analysis of data for the KSE-100 index. However, in the current investigation, this 'after Ramadan' effect is not significant for most firms. Furthermore, the results revealed that Rajab reported the lowest coefficient as compared to all the other months (relative to Zil Hajj); none of the prior studies have examined this month.

[226] One explanation for the positive Ramadan effect in some of the firms may be explained by a change in investor sentiment and investor mood which previous research has documented. This investor sentiment explanation is consistent with the studies mention in Chapter 3. Further details on investor sentiments and investor mood and how it changes in the month of Ramadan can be found in Chapter 3 of this thesis.

Eight, the results of the variance equations of the Table 7.3 for the Islamic calendar confirm that equity prices in Pakistan were volatile; although less so than in the month of Zil Hajj for nine of the remaining 11 months of the Islamic calendar. The volatility is especially high in the months of Safar and Shawwal; all of the coefficients with the exceptions of Safar and Shawwal were negative (relative to Zil Hajj) in the second panel of Table 7.3. Indeed, the overall Ramadan coefficient in the variance equation was, on average, negative (-0.0048) and was significant for 77.36 percent of the sample firms; Ramadan's volatility was the second lowest (after Jamatul Awwal's -0.0074) as compared to any other month in the Islamic calendar. The distribution of the coefficient for the month of Ramadan was negatively skewed at -2.23 suggesting that there was a decline in the volatility of equity returns in this month relative to volatility in Zil Hajj. This is consistent with the findings of previous studies that have examined the monthly calendar anomaly in the Pakistani stock market by accounting for both risk and return (Husain, 1998; Mustafa, 2008). The decline in the volatility may be due to the reduced trading hours in the month of Ramadan, or to the fact that investors are devoting more time to religious activities than the market in this month. Or the result may simply be due to the general slow pace of economic activity in the country more generally (see Chapter 2). Overall, the results suggest that whatever monthly seasonality may be present in the equity returns of Pakistani companies, it is more pronounced in the volatility data than in the mean return numbers. Unlike previous studies, the results suggest that patterns may me identified in other months as well. For example, the results suggest that Shawwal is the most volatile month with the third highest mean coefficient (relative to Zil Hajj). The month of Safar is the second most volatile month followed by the month of Zil Hajj; both months have the highest SD (3.37 and 2.55, respectively).

As a result of the findings documented in this analysis, investors can formulate their investment strategies and time their trading thereby earning abnormal returns; investors can buy the shares in the month of May and sell the shares in the month of January. Alternatively, they can buy the shares in the month of Ramadan and benefit from the typical uplift in prices which arises; even if the positive Ramadan returns are not significant for most of the firms, the significant reduction in volatility may offer an attractive opportunity to investors.

7.6 Conclusion

This chapter has employed the GJR GARCH model to analyse share price changes for 106 Pakistani firms listed on the KSE in order to test for the existence of monthly calendar anomalies in both average returns and volatility; both the Gregorian and the Islamic calendars are studied when investigating the different time-varying behaviour of volatility in the return series of the sample firms. After conducting a pilot study on a random selection of 30 sample firms, it was concluded that the GJR GARCH model best fitted the data for this investigation. The results indicated that positive returns are present in some of the months in the the market (especially for January, Ramadan, Shawwal, Zil Qa’ad) however, these are not significant for most of the firms; hence it appears that the monthly effect for average returns from Pakistani shares documented in Chapter 6 may be explained by seasonality in market volatility. By contrast, the calendar anomaly on return volatility is significant for both calendars. Furthermore, the GJR GARCH model discovered that the KSE market exhibits asymmetric behaviour for good and bad news; in average bad news result in higher volatility of the returns than good news. Moreover, the results suggest that the return volatility has been significantly reduced in Pakistan after 9/11 casting doubts on the appropriateness of the previous research that neglected this effect in their analysis of monthly anomalies in Pakistan.

These findings about monthly patterns in mean returns and the volatility of returns may have useful implications for trading strategies and investment decisions; investors may look for misaligned monthly prices due to time varying volatility based on these findings. Furthermore, investors may be able to use the monthly seasonality information supplied to avoid (or reduce) risk when investing in the Pakistani stock market; Jamatul Awwal seems to be the best month for employing such a strategy, followed by Ramadan. The month that the investor would have a higher chance to make loss is May (Rajab) and the month that the investor would face the higher risk is November (Shawwal) for Gregorian (Islamic) calendar. These results also have interesting implications for our understanding of the dynamics of volatility in the Pakistani stock market. The significance of estimators in GJR GARCH models reflects that in the Pakistani stock market volatility clustering and asymmetric response to news are present, so risk needs to be adequately modelled.

Chapter 8:

Conclusion

8.1 Introduction

This thesis has conducted a comprehensive examination of calendar anomalies for the Pakistani stock market using both qualitative and quantitative research methods. In particular, this study has attempted to provide an overview of monthly seasonality in the KSE with regards to both the Gregorian and Islamic calendars; this is one of the first studies to investigate both calendars for monthly seasonality in one investigation on the same dataset. This thesis has therefore sought answers to the following research questions: (i) are Pakistani stock markets weak-form efficient or can security price changes be predicted from the knowledge of monthly occurrences?; (ii) do practitioners believe that investor sentiment plays a role in explaining any anomalous behaviour in market prices in terms of trading behaviour and attitude to risk during certain months of the year?; (iii) do share prices exhibit particular patterns in different months (both Gregorian and Islamic calendars are investigated) – and, if so, can these patterns be exploited to achieve excess returns?; and (iv) is there a change in the risk (volatility) of shares in different months?

To answer these questions, various quantitative tests were carried out namely: a two-sample t-test, ANOVA and its non-parametric counterpart (Kruskal-Wallis), A General Linear Model (GLM) was developed to investigate variations in KSE share returns by examining the importance of different factors such as the Gregorian calendar, the Islamic calendar, company size, sector and the year. A GJR GARCH (1, 1) model was also employed to investigate the nature of any seasonality in the KSE using daily price data. In addition to these quantitative analyses, the thesis also ascertained qualitative views about the performance of the KSE in different Gregorian as well as Islamic months. Interviews with experienced brokers, regulators and investors at the KSE were conducted to obtain some insights into the behaviour of Pakistani investors and to gain an in-depth understanding of investor perceptions about the efficiency of the stock markets in Pakistan. In addition, no previous research in this area had sought the views of the stock market participants when investigating the calendar anomalies in the Pakistani equity markets; the current study fills this gap in the literature. Thus, it was hoped that the limitations of one research approach (i.e. quantitative analysis) would be compensated for by the strengths of the other method (qualitative analysis)[227].

The number of tests employed in this thesis has rarely been conducted in one investigation with the same dataset; therefore, the current research represents a comprehensive study of the research questions being examined. This thesis also contributes to the literature since it employs daily returns data for 106 companies listed on the KSE over the 17 year period from 1995 to 2011. An interesting feature of this study is that it employs individual companies' data rather than details about a KSE index. To date, the majority of previous studies in this area have analysed index returns (including those for the KSE-100 index in particular) when conducting their investigations (Kamal and Nasir, 2005; Mustafa, 2008; Zafar et al., 2010; Ali and Akbar, 2009; Hussain et al., 2011). Yet, the ability to trade an index is relatively restricted in Pakistan since the futures market has, until recently, been underdeveloped. Thus, the analysis of the current thesis provides a more realistic view

[227] The purpose of the qualitative method (interviews) in this research was exploratory in that the views of people involved in share trading on a daily basis were sought about the efficiency of the market with regards to calendar anomalies. It was hoped that the interview findings might help to explain the findings from the statistical analysis. In addition, it was hoped that the mixed-method approach might facilitate a more comprehensive evaluation of the research questions being examined. Furthermore, the use of a qualitative method provides some interesting insights which were missing in the previous studies regarding the stock market in Pakistan.

of whether investors can perform by investing in particular months for individual companies. Furthermore, most of the studies in Pakistan about calendar anomalies have focussed on the day-of-the-week effect (Hussain, 2000, Ali and Mustafa, 2001; Nishat and Mustafa, 2002; Kamal and Nasir, 2005; Shaheen, 2006; Ullah et al., 2010; Hussain et al., 2011). Only a handful of studies have looked at a monthly seasonal effect for the KSE; yet monthly seasonality is arguably a more realistic strategy for investors to follow since the transaction costs associated with the implementation of a day-of-the-week effect would be sizeable. Even those studies that have investigated the monthly anomaly have reached different conclusions about the predictability of Pakistani equity returns at different times within a year. Since the findings from this small number of investigations are mixed, further work on this topic was needed to offer some clarity in this area; this thesis provides such work and arrives at a firm conclusion about the monthly calendar anomaly[228]. In addition, a limited number of studies have investigated seasonality in the Pakistani market while allowing the risk to vary over time (Husain, 1998 and Mustafa, 2008). Husain's relatively old paper examined only a limited time span, while Mustafa focused on index data and only investigated data for six of the 12 Islamic months of the year. The current research resolves the issues highlighted in earlier works by testing data for a large number of firms listed on the KSE and examining a longer time period for Gregorian and Islamic calendars using the GJR GARCH model which takes account of variations in both risk and return. Thus, the current thesis extends the existing literature and adds to our knowledge about financial markets in Pakistan.

[228] Nevertheless, further work in this area should facilitate comparison with the findings of the current study and add to our understanding about the efficiency of the KSE.

The thesis initially reports the results from interviews that were conducted with investors, brokers and regulators who were involved in the KSE. Insights were sought about the behaviour of Pakistani investors and investor perceptions were ascertained about the efficiency of the stock markets in Pakistan. Furthermore, the interviews sought views about the role of investor sentiment in the Pakistani stock markets. It was hoped that the interview findings could help identify and inform the statistical investigations conducted for this doctoral research. Further, it was thought that the interview results might help to explain any of the findings that emerged from the statistical analyses.

After the interviews were completed, quantitative analyses were performed to identify whether the KSE was weak-form efficient with regards to monthly calendar anomalies. The quantitative analyses were based on share returns for 106 companies listed on the KSE over the 17 year period from 1995 – 2011. A number of statistical tests were carried out to ascertain whether the KSE market was efficient in the second empirical chapter (Chapter 6) namely: ANOVA, Kruskal-Wallis and a two-sample t-test; these tests are commonly used for investigating the weak-form of the EMH with regards to calendar anomalies. The findings from these tests should indicate whether average returns in certain months are different as compared to other months of the year. If average returns for certain months are found to be different from others, this would indicate that investors could make superior returns by trading at specific times of the year; implying that the KSE market is weak-form inefficient. Furthermore, Chapter 6 sought to uncover whether any variations in share returns earned by the equities from the KSE were related to the size of the firms, the sector in which the firms are located or the particular year in which the price change occurred. Thus, a

GLM model was fitted to the data to investigate the sources of variation in the returns of the KSE market. In particular, this model examined the roles of Gregorian calendar months, Islamic calendar months, company size, sector and year effects in explaining the returns earned by investors in the KSE. In addition, the GLM model also investigated whether the interactions between factors explained share price changes. Any findings from this analysis would provide further insights into calendar anomalies, either on their own or in combination with other factors might suggest that equity returns are predictable.

Finally a GJR GARCH model was also employed to examine whether calendar anomalies were present in the Pakistani stock market. This model examined not only the mean price changes but also the return volatility for the KSE market in an effort to detect possible patterns in the data. Hence, both the risk and return, which constitute the fundamental elements of the equity investment decision making process, were examined. Findings from these models should discern more accurately whether the market is weak-form efficient in the sense that average price changes or their associated volatilities in certain months can be predicted on the basis of historic data. It should also allow investors to see whether any inefficiency is present in KSE prices or whether systematic differences in average returns can be explained by changes in volatility.

The remainder of this chapter is organised as follows. Section 8.2 outlines the key findings that have emerged for this study and documents the major conclusions that have been drawn. The main limitations of this thesis are discussed in Section 8.3.

Finally, Section 8.4 highlights areas for future research in the Pakistani equity markets.

8.2 Main Findings and Contribution to Knowledge

The current section summarises the findings of the empirical chapters of this research. A number of conclusions have emerged from the empirical analysis in these chapters. Overall, the findings suggest that the KSE is not weak-form efficient for the daily share price changes of the 106 companies' studied for the period 1995 – 2011; monthly anomalies have been identified for both the Gregorian and Islamic calendars. The results therefore suggest that investors may earn above-average returns by investing in certain months of the year. This finding supported the interviews results which highlighted that past prices and technical analysis seemed to be widely used among Pakistani investors; past trends in prices were considered useful by practically all the interviewees; they all believed that past prices could help to predict future patterns in monthly returns. For example, some 79 percent of interviewees believed that share prices exhibited patterns in certain months of the year; as such, the responses of the interviewees indicated that a profitable trading strategy existed where an investor only traded in certain months which contradict the weak form of the EMH. Further, interviewees suggested that Pakistani investors studied previous chart patterns to predict future share price changes and therefore developed trading strategies to exploit this profitability in returns because they believed that chart patterns repeated themselves frequently.

Interview respondents believed that, to some extent, Islamic principles underpinned the security analysis and equity decision making of investors in Pakistan. Further, most interviewees suggested that the trading environment changed in certain Islamic months of the year; for instance, some 18 of the 19 interviewee's mentioned that the period of Ramadan had an effect on the stock market in Pakistan; most respondents argued that the overall trend in price changes was positive during the month of Ramadan. Interviewees also mentioned that volatility declined in this religious month; they attributed these changes to investor sentiment and religious duties. Some interviewees mentioned three other months when they believed that share prices could be predicted; these months were Muharram (due to the law and order situation in the country associated with the mourning observed by only Shia Muslims), Safar (which Muslims believe is a difficult month as a lot of difficulties were experienced by Muslims in this month at the time of Prophet Muhammad) and Zil-Hajj (when Muslim investors go to Makkah for the pilgrimage); Nevertheless, although some interviewees mentioned that returns in other Islamic months could be predictable, the most common pattern highlighted related to the month of Ramadan.

Overall, the comments of the interviewees suggested that the Pakistani stock market was not weak-form efficient. The respondents argued that the Pakistani stock market was inefficient – especially for religious months like Ramadan – because investor mood was positive as a result of positive feelings associated with observing the fast and intensified worship. For instance, one of the interviewee stated that there are "positive feelings of goodwill throughout the nation [in the month of Ramadan] because people are generally happy; they are out shopping for their families for Eid and socialise more". One of the interviewees went as far as suggesting that in

Pakistan, investment is “all about emotions”. Thus, the interviewees suggested that investor sentiment appeared to account, in part, for any calendar anomalies in the market.

Several interviewees highlighted the influence of “Memon” community on share trading in the KSE; they suggested that individuals from this community essentially influenced the level of trading around Muslim festivities, especially during the month of Ramadan. According to the interviewees, this community were deeply religious and concentrated more on Islamic practices rather than their equity investments in Ramadan. As a result, the volume of share trading declined during certain Islamic months and equity returns became less volatile as a result. Further, the reduced share trading hours during Ramadan combined with the fasting requirements as well as other religious observances were all thought to draw investor attention away from security transactions.

Results from the quantitative analysis in Chapter 6 tended to confirm the findings from the interviews in Chapter 5. A detailed analysis of the ANOVA results suggested that there was strong evidence to suggest that returns during Islamic months mean varied significantly which suggested that the market might not be efficient. The descriptive statistics suggested that this assumption was violated for most shares. The results of a Kruskal-Wallis test together with the findings from a two-sample t-test revealed a similar picture to that which emerged from the ANOVA findings.

The results of the two-sample t-test confirmed the initial findings that certain months are significantly different from others; they support the findings from the examination of the descriptive statistics, ANOVA and Kruskal-Wallis. In particular, the two-sample t-test suggested that the average returns in the month of January were typically higher than the returns for all the other months in the calendar. In contrast, the returns for the month of May were low relative to the returns for all other months of the calendar at the 5 percent level throughout the 17 years investigated in this study. A pattern was also present when the data were analysed according to the Islamic months of the year: a clear pattern that emerged which suggested that the average return in the month of Ramadan was higher compared to mean price changes documented in other months of the Islamic calendar. These results suggest that seasonality is present in the Pakistani equity market for both the Gregorian and Islamic calendars. This seasonal pattern in January is similar to that documented in most developed markets (Rozeff and Kinney, 1976; Glutekin and Glutekin 1983; Jaffe and Westerfield 1985; Ariel, 1987). However, such a finding contradicts the results of Ali and Akbar (2009), who uncovered no monthly seasonality in the Pakistani stock market. This could be due to the fact that the latter two authors focused on the KSE-100 index and used monthly observations in their study. The finding of a Ramadan effect conflicts with the results of Pakistani studies by Husain (1998) and Mustafa (2008). Husain (1998) documented that the average return for Pakistani equities did not change significantly in Ramadan however the author found that the volatility of price changes was reduced in this month. Likewise, Mustafa (2008) found no Ramadan effect but reported an "after-Ramadan" effect in the KSE. Interestingly, Mustafa also noted that the risk of the Karachi stock market was relatively low during the month of Ramadan. Other studies have reported a positive Ramadan effect and have linked this effect to positive investor sentiment (Al-Ississ, 2010; Bialkowski et al., 2012). This notion is consistent with the findings from the interviews that Ramadan has a positive impact on investor mood which in-turn affects their decision making.

Thus, the empirical findings from initial empirical analysis confirmed that seasonality was present in the Pakistani equity market for both the Gregorian and Islamic calendars. Chapter 6 attempts to explore the impact of both of these calendars effects further (while taking account of the influence of other factors). Specifically, (i) the Gregorian calendar, (ii) the Islamic calendar, (iii) company size, (iv) the sector in which the firm is located and (v) the year effects for the sample period were examined to investigate whether these factors have a role to play in influencing the returns available on the Pakistani equity market. Therefore, a GLM was fitted to the data for this investigation. In doing so, the GLM model also investigated the interactions between the different factors. The results indicated that Sector was not a significant factor in explaining share returns. In addition, the size factor was not as significant (F-statistic = 1.064, p-value = 0.381) as compared to other influences (Gregorian calendar, Islamic calendar and year factors); this contradicted the findings of the interviews since the respondents suggested that sectors such as Oil and Gas usually generated a profitable return. However, the GLM analysis indicated that investing on a sectoral or size basis is less effective than allocating the funds to firms in different months of the Gregorian or Islamic calendar year. Thus, the results confirm that there is a calendar effect in the KSE market and patterns exist that could be exploited by Pakistani investors to again abnormal returns. The findings of this analysis suggest that Pakistani investors should invest in the "right" months (results suggest that returns in the month January and Ramadan were positive on average) of the calendar rather than investing in any particular sector or size of company. Specifically, an investor would have outperformed if they had invested in "right" year (F-statistic = 15.925). Furthermore, most interactions between factors were significant. 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; the F-ratio varied from a low of 1.592 (Gregorian calendar and Size) to a high of 9.992 (Gregorian calendar and Year). These findings, therefore, provide insights into how investors can structure investments to maximise their returns.

The results obtained in Chapter 6 were based on returns and did not take any variation in the daily volatility of the market returns into account; such volatility of returns might help explain the seasonality detected. This volatility would have to be modelled in order to provide a clearer picture of the monthly seasonal anomalies in the Pakistani equity markets; any judgement about the efficiency of the KSE cannot be made based on evidence from statistical tests in Chapter 6 as all these methods only take account of returns. For this reason, Chapter 7 employs a GARCH model. In particular, a GJR GARCH (1, 1) model was used to examine whether calendar anomalies were present when time varying volatility was modelled. Volatility was considered to be important according to the interviewees consulted; in addition, a number of prior studies have suggested that KSE volatility changes over time (Farid and Ashraf, 1995; Ahmed and Rosser, 1995; Kanasro et al., 2009; Iqbal, 2012). Hence, both the risk and return were included in the analysis. As a result, investors can discern more accurately whether the market is weak-form efficient in the sense that average price changes or their associated volatilities cannot be predicted on the basis of historic data. Further, investors can use the results of this analysis about monthly seasonality to reduce the risk when investing in the Pakistani stock markets. For example, Engle (1993) argued that investors who dislike risk may adjust their portfolios by reducing their investments in those shares whose volatility is expected to increase.

The GJR GARCH model that facilitated the testing for seasonality in both the mean and volatility of returns offered conflicting evidence on the sample of daily returns data. According to the mean equation of the GJR GARCH model, only 6.60 percent of the January dummy variable coefficients for the sample firms were significant. Thus, while January mean returns (relative to December) are higher, on average, compared to the other months of the Gregorian calendar, this outperformance is only significant in a small minority of cases; for the vast majority of the sample firms, January seasonality does not significantly affect the average returns in the Pakistani stock market. Hence, after modelling the volatility of returns, evidence about the January effect in mean returns is no longer as strong as that documented in Chapter 6. A similar picture emerges for the month of May; only 12.26 percent of the sample firms had statistically significant negative coefficient values for May. Further, the results indicated that investors earned the highest mean return during the month of Ramadan; the average return for this month (relative to that of Zil Hajj) at 0.1250 percent was nearly 40 percent higher than that documented for the month with the next highest coefficient (Zil Qa'ad). However, it was only statistically significant at the 5 percent level for 5.66 percent of the firms in the sample. Furthermore, the results suggest that the two months following Ramadan (Shawwal and Zil Qa'ad) also reported positive coefficients which were third and second highest respectively; Zil Qa'ad had the second highest coefficient at 0.0899 followed by Shawwal at 0.0461 although these coefficients were only significant for 1.89 and 4.72 percent of the sample firms respectively. Thus, there was a very little statistical evidence of a seasonal anomaly in the mean returns of the KSE.

Although there seemed to be very little statistical evidence of a seasonal anomaly in mean returns, a completely different picture emerged when the conditional variances of returns were analysed. The results of the variance equation indicated that equity prices in Pakistan were volatile; most of the coefficients in the variance equation were significant. In particular, the results indicated that there was a decline in the volatility of equity returns in the month of Ramadan (relative to the volatility in Zil Hajj); Ramadan's volatility is the second lowest (after Jamatul Awwal's -0.0074) as compared to any of the other months in the Islamic calendar. The overall Ramadan coefficient in the variance equation was, on average, negative (-0.0048) and was significant for 77.36 percent of the sample firms. Furthermore, the distribution of the coefficient for the month of Ramadan was negatively skewed at -2.23 suggesting that there was a decline in the volatility of equity returns in this month relative to volatility in Zil Hajj. This finding was consistent with the results of previous studies that have examined the monthly calendar anomaly in the Pakistani stock market (Husain, 1998; Mustafa, 2008). Overall, these results confirm that whatever monthly seasonality may be present in the equity prices of Pakistani companies, it is more pronounced in the volatility data than in the mean return numbers. Unlike previous studies, the results suggest that patterns may be identified in other months as well. For example, the results suggest that Shawwal is the most volatile month with the third highest mean coefficient (relative to Zil Hajj). The month of Safar is the second most volatile month followed by the month of Zil Hajj; both months have the highest SD (3.37 and 2.55, respectively.

As a result of the findings of the GJR GARCH model, investors can formulate their investment strategies and time their trading thereby outperforming on a (conditional) risk adjusted basis; investors can buy the shares in the month of May, can sell the share in the month of January. Alternatively, they can buy the shares in the month of Ramadan and benefit from the typical uplift in prices which arises; even if the positive Ramadan returns are not significant for most of the firms, the significant reduction in volatility may offer an attractive opportunity to investors. The month that the investor would have a higher chance to make loss is Rajab and the month that the investor would face the higher risk is Shawwal. Furthermore, investors may be able to use the monthly seasonality information supplied to avoid (or reduce) risk when investing in the Pakistani stock market; Jamatul Awwal seems to be the best month for employing such a strategy followed by Ramadan.

Further, the GJR GARCH model uncovered that Pakistani investors appear to respond in an asymmetric fashion to positive and negative news; the results suggest that bad news induces higher volatility in the KSE returns than good news. This finding casts doubt on the appropriateness on previous research that has ignored this characteristic when employing GARCH models in their analysis of calendar anomalies in the Pakistani stock markets; the only paper that has investigated monthly seasonality in Pakistani using a GARCH model (Husain, 1998) assumed that the market reacted in a symmetric manner to good and bad news. Moreover, the results suggest that the return volatility has been significantly reduced in Pakistan after 9/11 casting doubts on the appropriateness of the previous research that neglected this effect in their analysis of monthly anomalies in Pakistan. Thus, this thesis adds to the literature by taking asymmetric market reactions and the 9/11 crisis into consideration when investigating calendar anomalies in Pakistan.

Overall, these results can be summarised into 5 main findings and our contribution to knowledge from the thesis. First, the KSE is weak-form inefficient according to all of the empirical work conducted in this study; past returns appear to help in predicting future share price changes. Second, monthly calendar seasonality is present in the market for both the Gregorian and Islamic calendars; the returns in the month of January and Ramadan were reported as positive, on average, whereas the returns in the month of May were sizeable and negative. These findings appear to contradict the weak-form of the EMH since the monthly patterns in returns may be exploited by an appropriately designed trading strategy in order to achieve abnormal profits. Third, when the volatility of returns is taken into consideration (using the GJR GARCH model), the results were less supportive of the notion that a monthly seasonality is present in the Pakistani stock market. However, the results indicated that patterns were present in the volatility of returns for the Pakistani stock market thereby suggesting that arbitrage opportunities may exist; investors may look to gain from managing the risk of their portfolios due to time varying volatility according to these findings. Further, these results have interesting implications for our understanding of the dynamics of volatility in the Pakistani stock market. They suggest that volatility may be influenced by investor sentiment or mood. Fourth, the GJR GARCH model reported that bad news induced higher levels of volatility in KSE returns than equivalent good news; this result indicates that Pakistani investors appear to respond in an asymmetric fashion to positive and negative news. Fifth, investor sentiment in the Pakistani market may help to explain any Islamic calendar anomalies according to the interviewees; this was particularly true of Ramadan where they suggested that a positive mood induced by religious festivals dampened down equity volatilities.

8.3 Limitations of the Study

Although the thesis has made every attempt to provide a comprehensive and detailed analysis of the issues, it is nevertheless incomplete and remains subject to a number of limitations. The current work assumes that the level of market efficiency has remained unchanged throughout the investigated period. Thus, there is no sub-period analysis to see whether the month-of-the-year calendar anomaly altered during the time frame of this research. Thus, sub-period analysis is one of the further areas of work that can be explored in the future. Indeed, the investigation of Khan (2012) suggested that such sub-period analysis is vital since he discovered that the dynamics of equity prices changes in Pakistan altered following the terrorist attack in the USA on September 11, 2001. Although a 9/11 crisis dummy was accounted for in the GJR GARCH model as a structural break was identified in the time series after that date which affected the volatility of the shares (Ahmed and Farooq, 2008). The results suggested that volatility behaviour during the post-9/11 period was significantly different from its pre-9/11 counterpart.

Second, as with any academic study, there are a number of limitations relating to the sample analysed. Any company which was listed after 1995 was not included in the sample. Furthermore, only actively traded shares (adjusted for any stock dividends, stock splits or share issues) listed on the KSE were investigated; this meant that a large number of securities were excluded from the investigation. Of course, having thinly-traded securities in the analysis might have biased the findings in terms of the returns available. However, any claims made about the generalisability of the results must be tempered by the fact that data for only a subset of securities were considered. Third, due to the time constraints associated with arranging and conducting interviews and because of financial difficulties only a relatively small sample of interviews was conducted in this study; 19 interviews all from the city of Karachi. Therefore caution must be exercised by the reader as the opinions expressed may not be generalisable. Perhaps more interviews with those involved in other stock exchanges in the country, or a large-scale questionnaire, might arrive at different conclusions. In addition, most of the interviewees were well experienced in the operations of the KSE, and highly educated, with professional qualifications. Other less experienced interviewees may have expressed different opinions about the research questions examined in this research. However, the purpose of the interviews in this research was exploratory in that the views of people involved in share trading on daily basis were sought about the efficiency of the market. Furthermore, the literature and the comments from the interviewees suggested that the KSE is the main and biggest stock market in Pakistan and that the LSE and the ISE just mimic any changes in the KSE index. Hence, the interviewees argued that by investigating the performance of the KSE market, any findings would be generaliseable to all the stock markets in Pakistan. Thus, an informed decision was taken to only investigate securities listed on the KSE for statistical analysis.

Fourth, transaction costs have been overlooked in this thesis. This decision was made due to the fact that transaction costs are freely negotiated between members and clients in Pakistan. According to Khan (2011), transaction costs vary from 4.0 – 10.0 percent in Pakistani stock markets. Thus, due to the varying nature of such information, trading costs were reluctantly ignored in this thesis. Of course, any excess returns earned by investing in certain months as suggested by the research in this thesis could be eliminated by transaction costs. A more detailed investigation of this issue is therefore needed.

Fifth, only a limited number of previous studies test the weak-form efficiency of the KSE with regards to the monthly calendar anomalies. This was particularly true in the case of the Islamic calendar; only two prior studies have investigated Islamic calendar anomalies to date; Table 3.1 in Chapter 3 presents all the studies conducted in Pakistan for monthly calendar anomalies. Had there been more literature for the weak-form efficiency of the KSE, a more comprehensive comparison could have been undertaken.

Nevertheless, despite these limitations, the current thesis remains one of the first comprehensive examinations of a very important topic where very little analysis has been previously undertaken; this research examines monthly seasonal anomalies in the Pakistani stock market using a large sample of equities and a relatively long period of data. Further, both qualitative and quantitative analyses were used for the Gregorian and Islamic calendars. Also, the results obtained are based on individual securities rather than analysing market index data which most of the previous researchers have tended to use. Furthermore, monthly calendar anomalies are studied for both average returns and the volatility of returns. Thus, while acknowledging the limitations of the study, this thesis represents one of the most comprehensive investigations to date regarding monthly calendar anomalies in the Pakistani equity market.

8.4 Further Research

Monthly calendar anomalies have been tested in the current thesis by conducting interviews and employing an ANOVA test, Kruskal-Wallis test, a two-sample t-test and a GJR GARCH model for securities listed on the KSE. Further work may examine this issue using more recently KSE listed companies and employing comprehensive methods. Such a follow-up study could be used to find out if different results are arrived at. In addition, future work could also employ other quantitative and qualitative tests which are not used in this thesis. In addition, transaction costs could be incorporated in the analysis and different trading strategies considered (for example, technical rules or a simple buy-and-hold strategy) to examine whether investors can really beat the market using the information provided in this research.

Indeed, subsequent research might consider large scale questionnaires to ascertain the views and perceptions of a wide range of participants in the Pakistani equity markets to see if the current findings are generalisable. Of course, increasing the number of interviews would not only improve the reliability of any conclusions reached by this thesis but will also help improve our knowledge of the Pakistani stock market. Overall, while this thesis has made a significant contribution to our understanding of the efficiency of the Pakistani equity markets, further work needs to be undertaken.

A third line of enquiry may be to test specifically for the role of investor sentiment in the Pakistani stock market; possibly by constructing an investor sentiment index and regressing the index's values on returns. For example, a number of variables have been used in prior studies as a proxy for investor sentiment (Baker and Wurgler, 2007). Although, to date, no consensus exists on such measures (Ahmed et al., 2012). These investor sentiment indices have mostly been constructed for developed markets when examining the impact of investor sentiment and its influence on stock markets returns (Stambaugh et al., 2012; Baker and Wurgler, 2007; Baker et al., 2012; Li and Yu, 2012). More recently, a Pakistani study attempted to replicate the work of Baker and Wurgler (2007) in Pakistan. For example, Ahmed et al. (2012) investigated the impact of investor sentiment on the mean-variance tradeoff in Pakistan. In doing so, the authors constructed a composite index of investor sentiment for the KSE. Perhaps this kind of index could then be regressed against the returns in Ramadan, for instance, to see whether investor sentiment has a Ramadan effect. The current thesis does not address this issue as this research alone would probably be worthy of a doctoral thesis in its own right.

Further, during the interviews conducted for this research, both the day-of-the-week and month-of-the-year effects were investigated. However, it was decided to concentrate on the monthly seasonal anomalies due to the time constraints associated with completing a doctoral thesis; investigating daily data for 106 companies over a 17 year period for both the Gregorian and Islamic calendars was indeed fairly time consuming. Thus, further work on this topic could test for the day-of-the week effect in Pakistani stock markets using both calendars.

Overall, these recommendations for future research should build upon the work that the current thesis has made to the understanding about the efficiency of the KSE; this research should act as a starting point for further work on this topic.

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APPENDICES

Appendix 4.1

Appendix 4.1 Companies and Sectors

Sectors	Sector Name	No.
Sector 1	Automobiles & Parts	6
Sector 2	Banks, Financial Services , Equity Investment Instruments, Non-life Insurance	23
Sector 3	Food Producers, Food & Beverage, Tobacco	11
Sector 4	General Industries, Construction & Materials, Industrial Engineering, Industrial Metals & Mining, Industrial Transportation	24
Sector 5	Oil & Gas Producers, Electricity, Gas, Water & Multi-utilities, Fixed Line Telecommunications	12
Sector 6	Personal Goods, Leisure Goods, Household Goods & Home Construction, Forestry & Paper	17
Sector 7	Chemicals, Pharmaceuticals & Biotechnology	13
Total companies		106

Note: This table shows the sectors of the sample companies and the number of sample companies in each sector.

Appendix 5.1

A Study of Trading Behaviour in the Pakistani Stock Market

Semi-Structured Interview Questionnaire for Brokers and Regulators

By

Anwar Halari
School of Business
University of Dundee

Section A: Background Information

1. Name: ....
2. Job description: ....
3. Age: ....
4. Gender: ....
5. How many years have you been involved in the Pakistani stock market: …….
6. Educational qualification: ....
7. Religion: ....

Section B: Calendar Anomalies

8. What is the average investment size of Pakistani Investors?
   ....

9. Which sectors do investors usually invest in?
   ....

10. What information sources do investors employ when they value equities for investment?
    ....

11. To what extent do you think that all the shares in the KSE, LSE and ISE move together?
    ....

12. Do you believe that share prices exhibit patterns on different days of the week or in various months in a year and if so, what do you think these patterns are?
    ....

13. Do you believe that investors try to predict these patterns or trade on the basis of these regularities?
    ....

14. Do you believe that investors look at past trends in prices or trading volume at specific times of the year when deciding their equity investment strategies?
    ....

15. Do you think investors examine graphs or charts of past share price movements for different times of the week/year? If so, how and why?
    ....

16. Are the KSE, LSE and ISE different from each other as regards share price patterns for specific days or months? If yes, how?
    ....

Section C: Islamic Calendar Anomalies

17. Do certain types of investors only invest in the shares of sharia-complaint companies?
 ....

18. To what extent do Islamic principles underpin investors' security analysis and equity investment decisions in Pakistan?
 ....

19. How do investors go about evaluating the performance of Islamic securities when making buy/sell/hold decisions?
 ....

20. Do you agree that Islamic teachings influence equity investment and stock market performance in Pakistan? If so, how and why?
 ....

21. Do you think securities' trading varies with the Islamic calendar? If so, how and do you think that investors factor this into their investment decisions?
 ....

22. Why do you think that security trading might vary with Islamic religious events:
 ....

23. Are Islamic calendar events more or less important than Western calendar events such as Christmas or New Year to security trading and stock market performance in Pakistan?
 ....

Section D: Psychological Aspects

24. Do emotions and moods have any effect on the decision making, risk assessment and equity valuation of investors in Pakistan?
    ....

25. Do different religious events affect investor mood differently?
    ....

26. In your opinion, are market prices influenced by investor mood?
    ....

27. In your opinion, is trading of shares influenced by investor mood?
    ....

28. What factors do you believe to influence investor mood?
    ....

29. Do you think that the performances of stock markets in Muslim countries such as Pakistan differ from the performances of stock markets in non-Muslim countries? If so, why
    ....

30. Has the influence of Islamic events on the Pakistani stock markets changed over recent years? If so, how?
    ....

Appendix 5.2

A Study of Trading Behaviour in the Pakistani Stock Market

Semi-Structured Interview Questionnaire for Investors

By

Anwar Halari
School of Business
University of Dundee

Section A: Background Information

1. Name: ....
2. Job description: ....
3. Age: ....
4. Gender: ....
5. How many years have you been investing in Pakistani equities: ....
6. Educational qualification: ....
7. Religion: ....

Section B: Calendar Anomalies

8. What is your average investment size?
   ....

9. Which sectors do you usually invest in?
   ....

10. What information sources do you employ when you value equities for investment?
    ....

11. To what extent do you think that all the shares in the KSE, LSE and ISE move together?
    ....

12. Do you believe that share prices exhibit patterns on different days of the week or in various months in a year and if so, what do you think these patterns are?
    ....

13. Do you try to predict these patterns or trade on the basis of these regularities?
    ....

14. Do you look at past trends in prices or trading volume at specific times of the year when deciding your equity investment strategy?
    ....

15. Do you examine graphs or charts of past share price movements for different times of the week/year? If so, how and why?
    ....

16. Are the KSE, LSE and ISE different from each other as regular share price patterns for specific days or months? If yes, how?
    ....

Section C: Islamic Calendar Anomalies

17. Do you only invest in the shares of sharia-complaint companies?
    ....

18. To what extent do Islamic principles underpin your security analysis and equity investment decisions?
    ....

19. How do you go about evaluating the performance of Islamic securities when making buy/sell/hold decisions?
    ....

20. Do you agree that Islamic teachings influence equity investment and stock market performance in Pakistan? If so, how and why?
    ....

21. Do you think securities' trading varies with the Islamic calendar? If so, how and do you factor this into your investment decisions?
    ....

22. Do you change your security trading with Islamic religious events?
    ....

23. Are Islamic calendar events more or less important than western calendar events such as Christmas or New Year to security trading and stock market performance in Pakistan?
    ....

Section D: Psychological Aspects

24. Do emotions and moods have any effect on your decision making, risk assessment and equity valuation?
    ....

25. Do different religious events affect your mood differently?
    ....

26. In your opinion, are market prices influenced investor mood?
    ....

27. In your opinion, is trading of shares influenced by investor mood?
    ....

28. What factors do you believe to influence investor mood?
    ....

29. Do you think that the performances of stock markets in Muslim countries such as Pakistan differ from the performance of stock markets in non-Muslim countries? If so, why
    ....

30. Has the influence of Islamic events on the Pakistani stock markets changed over recent years? If so, how?
    ....

Appendix 6.1

Appendix 6.1

Descriptive Statistic for the sample companies

Companies	MEAN	SD	MIN	MAX	SKEW	KURT
PK:AGR(RI)	0.00065	0.0441	-0.39	0.49	0.09	17.58
PK:SER(RI)	0.00045	0.0248	-0.36	0.35	-1.81	45.56
PK:ATH(RI)	0.00090	0.0296	-0.48	0.37	-2.35	73.54
PK:GTR(RI)	0.00022	0.0313	-0.25	0.37	0.97	15.57
PK:IMO(RI)	0.00079	0.0276	-0.16	0.18	0.33	3.83
PK:PSM(RI)	0.00032	0.0277	-0.18	0.25	0.40	7.78
PK:ACB(RI)	0.00026	0.0260	-0.21	0.19	0.10	6.04
PK:BKP(RI)	0.00008	0.0386	-0.41	0.25	-0.30	10.86
PK:MET(RI)	0.00062	0.0234	-0.20	0.17	0.14	7.30
PK:MBK(RI)	0.00077	0.0298	-0.18	0.18	-0.12	4.57
PK:NAT(RI)	-0.00028	0.0378	-0.22	0.25	0.34	5.36
PK:CCB(RI)	-0.00071	0.0428	-0.54	0.51	-0.30	25.62
PK:SON(RI)	0.00019	0.0266	-0.34	0.23	-0.36	13.86
PK:MRB(RI)	0.00047	0.0251	-0.27	0.19	-0.73	19.49
PK:LDP(RI)	0.00037	0.0228	-0.17	0.34	1.33	21.78
PK:DDH(RI)	0.00074	0.0282	-0.25	0.37	0.67	16.81
PK:DES(RI)	-0.00091	0.0408	-0.53	0.35	0.15	17.17
PK:ERO(RI)	0.00042	0.0254	-0.15	0.30	0.48	9.07
PK:FAU(RI)	0.00079	0.0216	-0.23	0.14	-0.61	8.38
PK:GAI(RI)	0.00042	0.0310	-0.36	0.28	-0.24	16.51
PK:ICI(RI)	0.00011	0.0275	-0.31	0.23	-0.01	7.89
PK:SIT(RI)	0.00024	0.0266	-0.34	0.28	-0.34	21.75
PK:AAC(RI)	-0.00041	0.0464	-0.40	0.41	0.24	12.67
PK:CTC(RI)	-0.00026	0.0327	-0.36	0.34	0.23	9.96
PK:DAD(RI)	-0.00072	0.0601	-0.46	0.74	0.45	16.35
PK:DAN(RI)	-0.00095	0.0679	-0.71	0.64	0.31	17.12
PK:PLC(RI)	-0.00115	0.0428	-0.58	0.47	-0.51	22.99
PK:DEG(RI)	-0.00007	0.0357	-0.28	0.26	-0.08	6.47
PK:FEC(RI)	-0.00050	0.0401	-0.33	0.30	-0.19	11.53
PK:GWC(RI)	-0.00059	0.0483	-0.82	0.46	-2.10	43.40
PK:MLC(RI)	-0.00071	0.0398	-0.27	0.28	0.47	5.62
PK:PCT(RI)	-0.00043	0.0448	-0.36	0.37	0.43	7.03
PK:SHA(RI)	0.00052	0.0314	-0.28	0.29	0.41	14.70
PK:HUB(RI)	0.00061	0.0268	-0.39	0.23	-0.97	20.22
PK:KIE(RI)	-0.00068	0.0402	-0.44	0.32	0.27	11.61
PK:PNC(RI)	0.00050	0.0252	-0.49	0.45	-0.81	114.58
PK:ALN(RI)	0.00028	0.0463	-0.54	0.69	0.24	40.36
PK:ART(RI)	-0.00013	0.1222	-0.92	0.92	0.05	14.07
PK:ICP(RI)	0.00049	0.0291	-0.26	0.20	0.06	6.06
PK:MAL(RI)	-0.00028	0.0727	-0.74	0.66	-0.57	17.37
PK:GOP(RI)	0.00030	0.0245	-0.28	0.19	-0.31	15.01
PK:TMS(RI)	-0.00042	0.0833	-0.69	0.68	0.20	16.08
PK:UMC(RI)	-0.00147	0.1074	-0.92	0.98	-0.15	18.41
PK:ENL(RI)	-0.00028	0.0718	-0.76	0.76	0.01	22.60
PK:ASB(RI)	-0.00132	0.0846	-0.69	0.64	0.22	8.97
PK:ORI(RI)	-0.00014	0.0269	-0.26	0.22	-0.35	12.81
PK:SEC(RI)	-0.00035	0.0646	-0.55	0.69	0.48	18.76
PK:TRU(RI)	-0.00085	0.0644	-0.88	0.83	-1.30	39.26
PK:TLM(RI)	-0.00008	0.0263	-0.19	0.25	-0.05	6.64
PK:DSM(RI)	-0.00081	0.0460	-0.43	0.43	-0.28	21.06
PK:HAB(RI)	0.00067	0.0332	-0.47	0.38	0.15	21.16
PK:HSM(RI)	0.00054	0.0275	-0.40	0.47	0.52	51.74
PK:MIR(RI)	0.00024	0.0319	-0.43	0.30	-2.14	40.86
PK:NPK(RI)	0.00111	0.0251	-0.27	0.20	0.03	19.28

PK:NON(RI)	0.00044	0.0308	-0.29	0.40	0.33	18.49
PK:SHK(RI)	-0.00024	0.0427	-0.44	0.43	-0.07	26.61
PK:ULV(RI)	0.00070	0.0200	-0.15	0.17	0.45	9.65
PK:SEP(RI)	0.00024	0.0226	-0.47	0.22	-3.64	77.86
PK:CPB(RI)	0.00019	0.0318	-0.38	0.34	-0.17	17.22
PK:SNG(RI)	0.00006	0.0285	-0.17	0.22	0.16	5.38
PK:SUI(RI)	0.00018	0.0288	-0.27	0.32	0.37	9.96
PK:PAC(RI)	0.00019	0.0255	-0.56	0.18	-3.16	70.00
PK:SME(RI)	0.00065	0.0258	-0.28	0.22	0.10	20.07
PK:PET(RI)	-0.00038	0.0428	-0.56	0.49	0.49	32.80
PK:AGT(RI)	0.00092	0.0254	-0.27	0.28	0.24	20.82
PK:BOC(RI)	0.00055	0.0336	-0.46	0.57	1.11	77.67
PK:ALT(RI)	0.00035	0.0982	-0.98	0.94	0.10	25.72
PK:HPM(RI)	0.00024	0.0232	-0.41	0.20	-1.94	45.05
PK:MTT(RI)	0.00122	0.0236	-0.43	0.22	-1.53	49.66
PK:PEN(RI)	0.00021	0.0552	-0.75	0.84	0.22	75.23
PK:CSA(RI)	0.00015	0.0332	-0.36	0.37	0.05	20.05
PK:HUF(RI)	0.00026	0.0475	-0.97	0.69	-1.91	69.93
PK:INI(RI)	0.00087	0.0240	-0.29	0.25	-0.17	23.64
PK:PNS(RI)	0.00027	0.0471	-0.37	0.69	1.47	25.40
PK:ADI(RI)	0.00028	0.0328	-0.29	0.22	-0.05	6.74
PK:CEI(RI)	0.00077	0.0280	-0.76	0.61	-3.17	207.60
PK:ETU(RI)	0.00042	0.0259	-0.20	0.22	0.25	7.33
PK:JIN(RI)	0.00077	0.0251	-0.25	0.25	0.06	22.04
PK:ATR(RI)	0.00051	0.0264	-0.31	0.23	-0.45	14.85
PK:NAR(RI)	0.00057	0.0284	-0.51	0.22	-1.11	30.84
PK:POF(RI)	0.00104	0.0267	-0.19	0.23	0.99	14.57
PK:PRE(RI)	0.00008	0.0319	-0.28	0.24	-0.29	11.93
PK:PSO(RI)	0.00040	0.0263	-0.36	0.22	-0.79	18.56
PK:PBS(RI)	0.00039	0.0228	-0.23	0.15	0.11	7.40
PK:ABB(RI)	0.00039	0.0204	-0.21	0.22	-0.05	15.68
PK:GLT(RI)	0.00029	0.0222	-0.21	0.22	0.43	14.76
PK:HPN(RI)	0.00013	0.0273	-0.56	0.49	-2.50	112.43
PK:WYP(RI)	0.00004	0.0233	-0.26	0.19	-1.33	22.63
PK:SEA(RI)	0.00024	0.0271	-0.24	0.22	0.19	5.48
PK:PTC(RI)	0.00011	0.0312	-0.26	0.34	0.12	15.62
PK:LAK(RI)	0.00088	0.0239	-0.46	0.43	0.28	74.19
PK:PAL(RI)	-0.00043	0.0403	-0.44	0.37	0.22	12.77
PK:BAP(RI)	0.00072	0.0237	-0.29	0.18	-1.05	19.26
PK:CTX(RI)	0.00001	0.0376	-0.37	0.41	0.02	11.77
PK:FZM(RI)	0.00021	0.0376	-0.84	0.36	-4.97	106.40
PK:GAT(RI)	0.00016	0.0314	-0.42	0.32	-0.75	22.28
PK:GSM(RI)	0.00002	0.0450	-0.36	0.47	-0.05	15.19
PK:KWG(RI)	0.00006	0.0577	-0.63	0.55	-0.75	21.65
PK:KNR(RI)	-0.00024	0.0497	-0.56	0.75	1.07	30.46
PK:NHT(RI)	0.00083	0.0336	-0.28	0.25	0.37	7.02
PK:NMI(RI)	0.00035	0.0345	-0.29	0.32	0.74	12.50
PK:PSC(RI)	-0.00007	0.0427	-0.33	0.34	0.17	6.90
PK:STM(RI)	-0.00025	0.0481	-0.45	0.42	-0.27	13.23
PK:SPP(RI)	0.00026	0.0303	-0.44	0.22	-1.56	29.55
PK:TAJ(RI)	-0.00086	0.0889	-0.85	0.85	-0.48	29.22
PK:TRP(RI)	-0.00059	0.1232	-0.88	0.81	0.07	11.96

Note: This table shows the descriptive statistics for the companies in the sample. The Mean is the average return over the period while StDev is the standard deviation of the values around the mean. Min and the Max refers to the minimum and maximum monthly returns over the sample period respectively. Skewness is a measure of the symmetry of the distribution while kurtosis examines whether the data are peaked or flat relative to a normal distribution.

Appendix 6.2

Appendix 6.2

Summary Statistics for the Sample Firms' Returns over the Whole Period

Panel A: Gregorian Calendar

Month	MEAN	SD	MIN	MAX	SKEW	KURT
January	0.00084	0.0370	-0.24	0.23	-0.29	25.11
February	0.00071	0.0371	-0.23	0.24	0.13	24.85
March	-0.00027	0.0399	-0.28	0.24	-0.73	30.03
April	0.00047	0.0365	-0.24	0.23	-0.26	25.85
May	-0.00140	0.0376	-0.25	0.24	-0.35	23.70
June	-0.00023	0.0404	-0.28	0.25	-0.41	26.40
July	0.00068	0.0365	-0.24	0.23	-0.16	23.61
August	-0.00096	0.0343	-0.22	0.20	-0.35	21.32
September	0.00021	0.0354	-0.23	0.23	-0.11	27.41
October	0.00021	0.0363	-0.24	0.23	0.10	26.98
November	0.00044	0.0355	-0.24	0.23	0.04	28.71
December	0.00057	0.0365	-0.25	0.22	-0.36	27.79

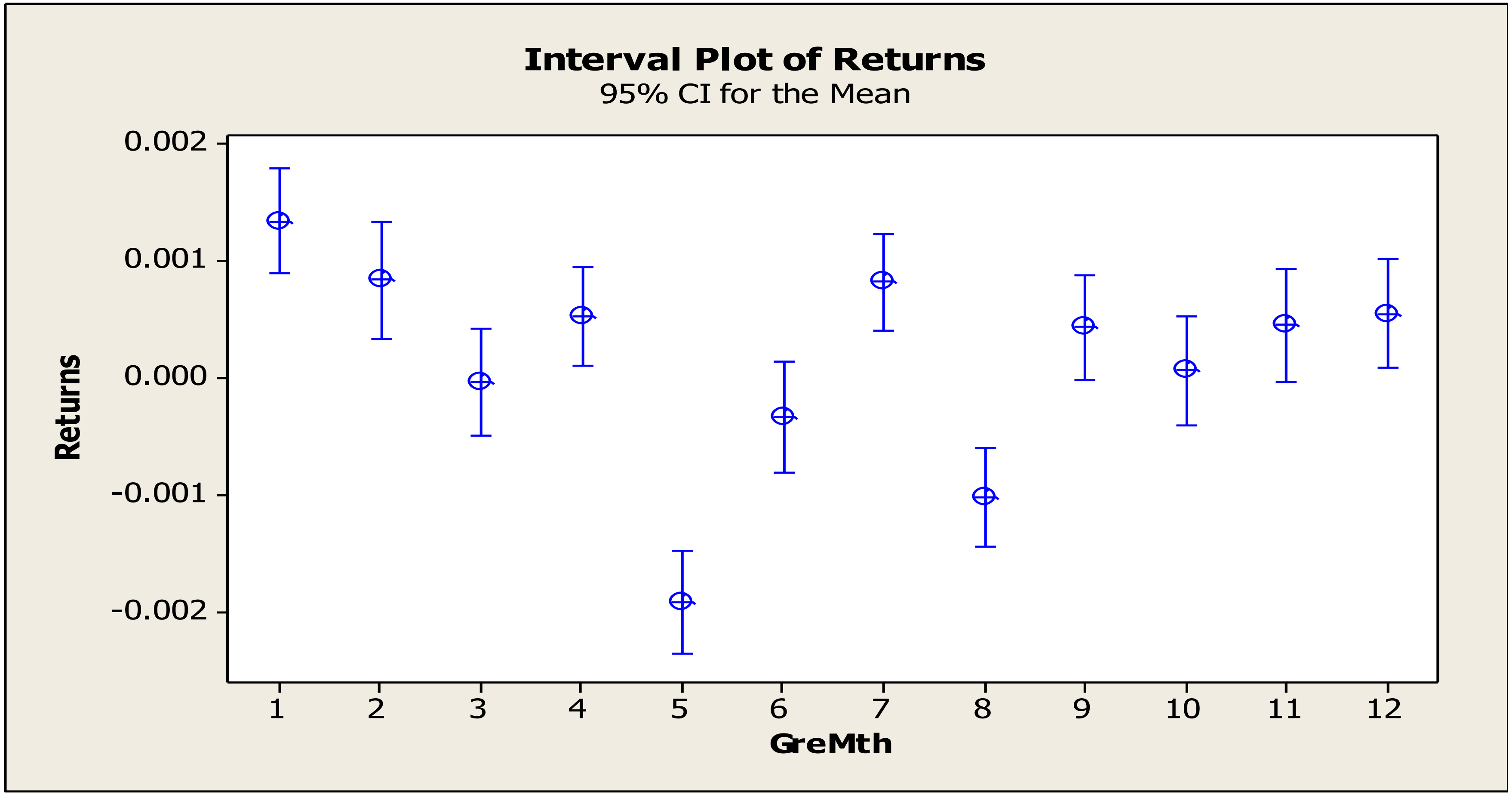
Panel B: Islamic Calendar

Month	MEAN	SD	MIN	MAX	SKEW	KURT
Muharram	-0.00008	0.0363	-0.24	0.21	-0.36	24.57
Safar	-0.00025	0.0412	-0.27	0.26	-0.14	26.39
Rabiul Awwal	0.00032	0.0381	-0.25	0.23	-0.45	27.52
Rabiul Thani	-0.00016	0.0363	-0.25	0.22	-0.63	28.54
Jamatul Awwal	-0.00016	0.0337	-0.20	0.21	0.00	20.82
Jamatul Thani	-0.00026	0.0359	-0.23	0.23	-0.13	25.60
Rajab	-0.00057	0.0373	-0.25	0.23	0.00	27.51
Shaban	-0.00041	0.0368	-0.24	0.22	-0.27	22.59
Ramadan	0.00099	0.0346	-0.25	0.23	-0.40	32.47
Shawwal	0.00097	0.0371	-0.24	0.26	0.36	31.09
Zil Qa'ad	0.00098	0.0394	-0.25	0.26	0.10	22.56
Zil Hajj	-0.00035	0.0361	-0.26	0.22	-0.83	29.34

Note: This table shows the descriptive data for the sample shares according to the Gregorian calendar (Panel A) and the Islamic calendar (Panel B). The mean is the equally-weighted average of all daily observations over the 17-year period. SD, Min and Max donate the standard deviation, the minimum daily return and the maximum daily return, respectively. Skew refers to the Kendall-Stuart measure of skeweness while Kurt is the Kendall-Stuart measure of kurtosis.

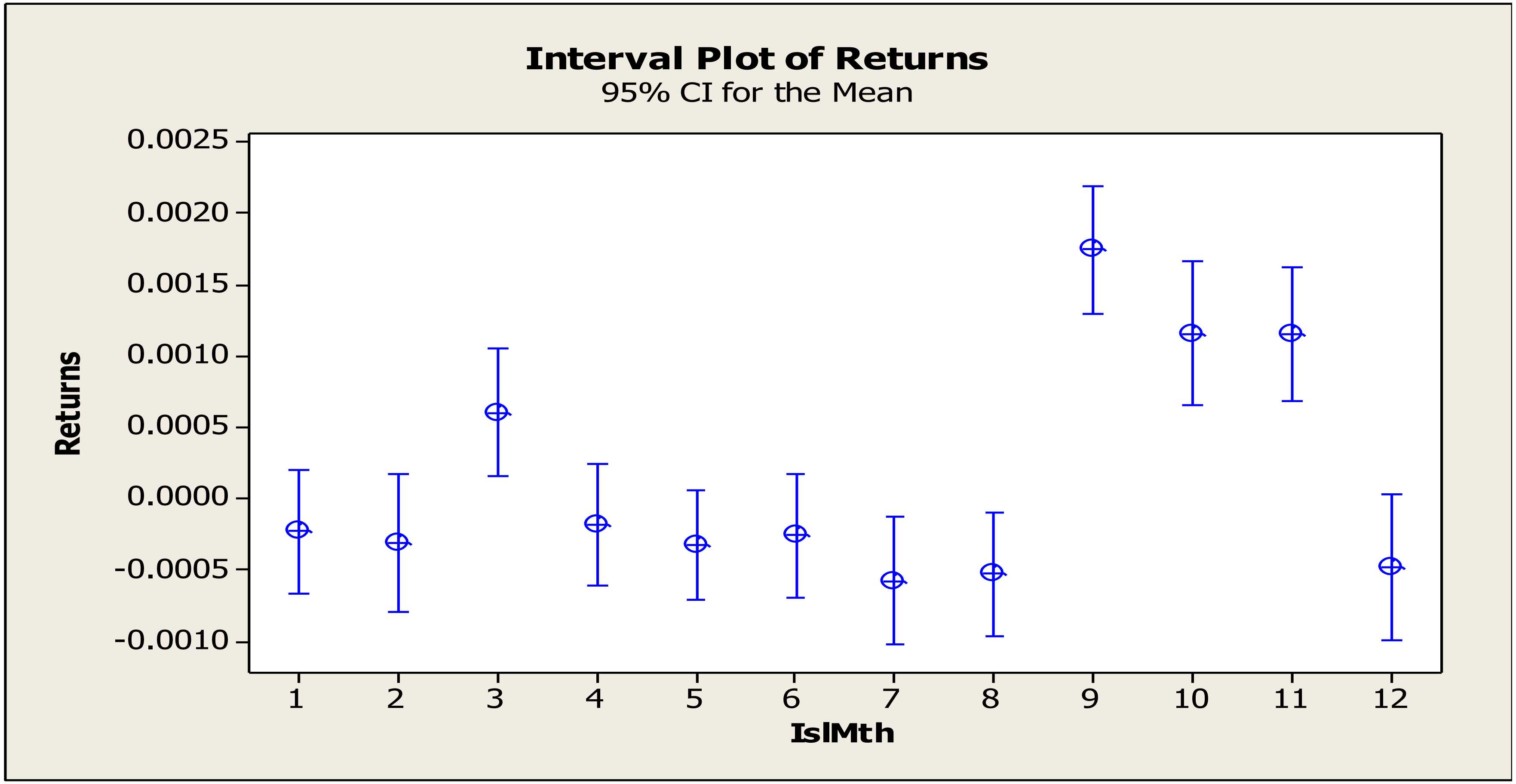
Appendix 6.3

Appendix 6.3A: Interval Plot of Average Returns (Gregorian Calendar)



Note: this figure show the distribution of mean returns for the whole sample period for Gregorian calendar. Numbers on x-axis denote 12 Gregorian calendar months from January – December.

Appendix 6.3B: Interval Plot of Average Returns (Islamic Calendar)



Note: this figure show the distribution of average mean returns for the whole sample period for Islamic calendar. Numbers on x-axis denote 12 Islamic calendar months from Muharram – Zil Hajj.

Appendix 6.4

Appendix 6.4A Mann-Whitney test: Gregorian Calendar

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Jan	1											
Feb	0.00123 (0.1362)	1										
Mar	**0.00161 (0.0476)**	0.00038 (0.6162)	1									
Apr	0.00104 (0.1640)	-0.00027 (0.7175)	-0.00062 (0.4004)	1								
May	**0.00286 (0.0007)**	**0.00171 (0.0457)**	0.00131 (0.1105)	**0.00182 (0.0199)**	1							
Jun	**0.00203 (0.0131)**	0.00085 (0.3092)	0.00043 (0.5755)	0.00106 (0.1498)	-0.00085 (0.3157)	1						
Jul	0.00078 (0.2871)	-0.00049 (0.4903)	-0.00089 (0.2336)	-0.00027 (0.6956)	**-0.00206 (0.0076)**	-0.00131 (0.0769)	1					
Aug	**0.00251 (0.0008)**	0.00124 (0.0949)	0.00092 (0.2226)	**0.00150 (0.0256)**	-0.00034 (0.6693)	0.00048 (0.5392)	**0.00166 (0.0124)**	1				
Sep	0.00126 (0.0845)	-0.00003 (0.9658)	-0.00032 (0.6603)	0.00026 (0.6732)	**-0.00155 (0.0428)**	-0.00080 (0.2719)	0.00041 (0.5249)	-0.00122 (0.0635)	1			
Oct	0.00123 (0.1008)	-0.00000 (0.9949)	-0.00037 (0.6212)	0.00021 (0.7662)	**-0.00160 (0.0453)**	-0.00079 (0.3135)	0.00042 (0.5421)	-0.00126 (0.0647)	-0.00003 (0.9602)	1		
Nov	0.00134 (0.0855)	0.00013 (0.8714)	-0.00029 (0.6991)	0.00034 (0.6493)	-0.00158 (0.0589)	-0.00069 (0.3806)	0.00063 (0.3853)	-0.00117 (0.1082)	0.00011 (0.8860)	0.00011 (0.8796)	1	
Dec	0.00052 (0.4648)	-0.00079 (0.2672)	-0.00109 (0.1228)	-0.00051 (0.4361)	**-0.00227 (0.0028)**	-0.00155 (0.0329)	-0.00034 (0.5886)	**-0.00198 (0.0024)**	-0.00080 (0.2083)	-0.00070 (0.2980)	-0.00084 (0.2195)	1

Note: This table show the difference in medians between each pair of the Gregorian calendar months (January – December) followed by p-values in parenthesis. This table subtracts the column with row (Column – Row). Results in bold are statistically significant at 5 percent level allowing the rejection of null hypothesis.

Appendix 6.4B Mann-Whitney test: Islamic Calendar

	Muh	Saf	R.Aw	R.Th	J.Aw	J.Th	Raj	Sha	Ram	Shw	Z.Qa	Z.Ha
Muh	1											
Saf	0.00006 (0.9439)	1										
R.Aw	-0.00039 (0.5962)	-0.00043 (0.5705)	1									
R.Th	0.00077 (0.2821)	0.00067 (0.3758)	0.00109 (0.1483)	1								
J.Aw	0.00048 (0.4770)	0.00041 (0.5899)	0.00086 (0.2541)	-0.00029 (0.6802)	1							
J.Th	0.00042 (0.5475)	0.00037 (0.6315)	0.00080 (0.2894)	-0.00034 (0.6446)	-0.00010 (0.8862)	1						
Raj	0.00043 (0.5433)	0.00039 (0.6233)	0.00085 (0.2797)	-0.00029 (0.7083)	-0.00003 (0.9708)	0.00008 (0.9075)	1					
Sha	0.00055 (0.4329)	0.00049 (0.5214)	0.00094 (0.1994)	-0.00019 (0.8031)	0.00009 (0.8933)	0.00015 (0.8252)	0.00009 (0.8966)	1				
Ram	-0.00132 (0.0540)	-0.00140 (0.0598)	-0.00097 (0.1862)	**-0.00211 (0.0024)**	**-0.00183 (0.0069)**	**-0.00168 (0.0110)**	**-0.00181 (0.0100)**	**-0.00187 (0.0054)**	1			
Shw	-0.00070 (0.3476)	-0.00078 (0.3742)	-0.00029 (0.7062)	-0.00141 (0.0701)	-0.00115 (0.1424)	-0.00108 (0.1613)	-0.00116 (0.1475)	-0.00124 (0.1052)	0.00069 (0.3634)	1		
Z.Qa	-0.00106 (0.1461)	-0.00110 (0.1628)	-0.00064 (0.4067)	**-0.00176 (0.0172)**	**-0.00149 (0.0395)**	**-0.00146 (0.0491)**	**-0.00149 (0.0500)**	**-0.00160 (0.0273)**	0.00031 (0.6787)	-0.00034 (0.6642)	1	
Z.Ha	0.00005 (0.9543)	0.00001 (0.9923)	0.00048 (0.5537)	-0.00068 (0.3721)	-0.00041 (0.5656)	-0.00033 (0.6391)	-0.00037 (0.6243)	-0.00047 (0.5151)	0.00141 (0.0542)	0.00078 (0.3479)	0.00109 (0.1393)	1

Note: This table show the difference in medians between each pair of the Islamic calendar months (Muharram – Zil Hajj) followed by p-values in parenthesis. This table subtracts the column with row (Column – Row). Results in bold are statistically significant at 5 percent level allowing the rejection of null hypothesis.

Appendix 6.5

Appendix 6.5

Analysis of the General linear model: Factor and Interaction effect (Sector included)

Variables	Degree of freedom	Sum of squares	Mean square	F-ratio	Sig of F-ratio
Islamic	11	0.157	0.014	7.471	0.000
Gregorian	11	0.198	0.018	9.461	0.000
Year	16	0.532	0.033	17.458	0.000
Sector	6	0.008	0.001	0.711	0.641
Islamic * Gregorian	12	0.086	0.007	3.755	0.000
Islamic * Year	110	1.176	0.011	5.608	0.000
Gregorian * Year	110	1.824	0.017	8.701	0.000
Islamic * Gregorian * Year	3	0.039	0.013	6.740	0.000
Islamic * Sector	66	0.135	0.002	1.074	0.319
Gregorian * Sector	66	0.094	0.001	0.745	0.940
Islamic * Gregorian * Sector	72	0.104	0.001	0.755	0.940
Year * Sector	96	0.168	0.002	0.915	0.711
Islamic * Year * Sector	660	1.115	0.002	0.886	0.984
Gregorian * Year * Sector	660	1.123	0.002	0.892	0.978
Islamic * Gregorian * Year * Sector	18	0.026	0.001	0.748	0.763
Error	428305	816.499	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 time period from 1995 to 2011. Sig of F-ration denotes significance of the F-ratio. Table tests whether any of the factors and interactions listed above are significant.

Appendix 7.1

Appendix 7.1A

GJR GARCH Model: Gregorian Calendar 1 – 7 firms

Mean	PK:ACC	PK:ABB	PK:ACB	PK:ADI	PK:AGR	PK:AGT	PK:ALN
C	0.5140*	0.1017	0.1624	0.2207	0.1066	0.2161*	0.1609
Jan	-0.7823*	-0.0145	0.1196	-0.0090	0.1064	-0.1004	-0.0348
Feb	-0.5381	-0.0164	-0.1922	-0.1854	-0.1232	-0.0647	-0.3639
Mar	-0.1511	-0.1727	-0.1500	-0.0520	-0.0056	-0.2647	-0.4394
Apr	-0.6054*	-0.0158	-0.1492	-0.1593	0.2645	-0.0106	0.0606
May	-0.5326	-0.2167	-0.3812*	-0.4850*	-0.2971	-0.3275*	-0.0736
Jun	-0.9358*	-0.1277	-0.3595*	-0.0393	-0.1031	-0.1475	-0.2658
Jul	-0.6286*	0.0309	0.0251	-0.2185	0.1146	-0.1138	-0.0279
Aug	-0.7919*	-0.1997	-0.1890	-0.4702*	-0.2592	-0.2379	-0.3336
Sep	-0.3666	-0.0662	-0.0528	-0.1418	0.1160	-0.2831	-0.2793
Oct	-1.0192*	-0.1344	0.1723	-0.2409	0.2748	-0.2357	-0.0511
Nov	-0.4096	-0.0531	-0.0124	-0.1536	-0.0643	-0.1118	-0.0363
Variance							
C	0.0106*	0.0094*	0.0056*	0.0104*	0.0057*	0.0153*	0.0056*
Jan	-0.0093*	0.0081*	0.0002	0.0005	0.0027*	0.0028*	-0.0031*
Feb	0.0064*	0.0040*	0.0001	0.0001	0.0004	0.0095*	0.0067*
Mar	-0.0122*	0.0294*	0.0024*	0.0009	-0.0005	-0.0012	-0.0082*
Apr	-0.0071*	0.0076*	-0.0011	-0.0003	0.0012*	0.0000	-0.0008*
May	-0.0044*	0.0091*	0.0033*	0.0064*	0.0006	0.0050*	0.0060*
Jun	-0.0021*	0.0078*	-0.0012*	0.0021	0.0004	-0.0005	-0.0027*
Jul	-0.0096	0.0071*	-0.0006	-0.0012	-0.0001	0.0011*	-0.0003
Aug	-0.0052*	0.0054*	0.0019*	0.0025	0.0016*	0.0003	0.0014*
Sep	-0.0122*	0.0032*	-0.0003	-0.0015	0.0005	0.0081*	-0.0034*
Oct	0.0066*	0.0116*	0.0006	0.0035*	0.0017*	0.0045*	0.0019*
Nov	-0.0131*	-0.0014*	-0.0017*	0.0017	-0.0004*	0.0189*	-0.0083*
Crisis	-0.0007*	0.0008	-0.0024*	-0.0027*	-0.0057*	-0.0088*	-0.0016*
ARCH	0.0462*	0.2153*	0.1068*	0.1507*	0.0569*	0.2461*	0.0282*
Leverage	0.0098	-0.0457	0.0460*	0.0627*	-0.0185*	-0.0754*	0.0070*
GARCH	0.9273*	0.4049*	0.8087*	0.7301*	0.9411*	0.5873*	0.9533*
L	7116.25	10330.23	9509.84	8556.13	7952.13	9718.88	7204.09
LB (8)	10.949	5.351	21.176	116.740	9.479	7.158	91.744
p.val	0.205	0.720	0.007	0.000	0.304	0.520	0.000
LB (16)	20.764	7.890	26.262	127.060	23.202	22.040	99.494
p.val	0.188	0.952	0.050	0.000	0.108	0.142	0.000
LB-Qs (8)	18.703	2.915	21.894	10.090	22.027	2.873	16.091
p.val	0.017	0.940	0.005	0.259	0.005	0.942	0.041
LB-Qs (16)	25.833	16.340	24.935	18.736	35.671	7.469	19.115
p.val	0.056	0.430	0.071	0.283	0.003	0.963	0.263

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1B

GJR GARCH Model: Gregorian Calendar 8 – 14 firms

Mean	PK:ALT	PK:ART	PK:ASB	PK:ATH	PK:ATR	PK:BAP	PK:BKP
C	0.0153	0.3120	-0.0811	-0.0019	-0.0254	0.0872	0.0023
Jan	0.6818	-0.3712	0.0406	0.1952	0.0610	-0.1566	0.2830
Feb	-0.6932	-0.0252	0.1337	0.1329	0.0389	0.2434	0.1541
Mar	-0.1567	-1.1985	-0.1039	0.0202	0.0676	-0.0489	-0.1452
Apr	-0.3629	-0.2231	-0.6237	0.2002	0.0440	0.0813	0.1196
May	-0.7743	-1.2877	-0.1775	0.0185	-0.1688	-0.5013*	-0.1115
Jun	-0.1698	1.1090	-0.1974	0.0716	-0.2051	-0.0551	-0.0651
Jul	-0.0384	-0.9063	-0.0973	0.0349	0.0275	-0.0884	-0.0551
Aug	0.1458	-0.8767	-0.4926	-0.0214	0.0403	-0.1122	0.1639
Sep	-0.0983	-0.0431	-0.3964	-0.0208	-0.0670	-0.1802	0.0556
Oct	-0.1657	-0.0789	0.6424	0.4157	-0.0300	-0.2123	-0.0253
Nov	0.1072	-1.2313	-0.6909	0.1680	0.0366	-0.1587	0.0676
Variance							
C	0.0190*	-0.0265*	0.0831*	0.0023*	0.0743*	0.0150*	0.0201*
Jan	0.5089*	0.0800*	-0.0901*	0.0207*	-0.0404*	-0.0085*	0.0015
Feb	0.0822*	0.0353*	-0.0443*	0.0300*	-0.0667*	0.0096*	0.0121*
Mar	0.0927*	0.1077*	-0.0499*	0.0034*	-0.0389*	0.0108*	0.0022
Apr	0.0139*	0.0111*	-0.0268*	0.0040*	-0.0606*	-0.0017	0.0036*
May	0.0903*	0.1095*	-0.0373*	-0.0010*	-0.0396*	0.0030*	0.0160*
Jun	0.0417*	0.1095*	-0.0741*	0.0287*	0.0041	-0.0096*	0.0028*
Jul	0.0517*	0.0313*	-0.0504*	-0.0025*	-0.0636*	-0.0150*	-0.0001
Aug	0.0320*	0.1110*	-0.0390*	0.0010*	-0.0651*	-0.0065*	0.0051*
Sep	0.0398*	0.0508*	-0.0454*	0.0021*	-0.0534*	-0.0094*	0.0041*
Oct	0.0263*	0.0792*	-0.0523*	0.0144*	-0.0523*	0.0118*	0.0093*
Nov	0.4216*	0.1898*	-0.0408*	0.0074*	-0.0669*	-0.0070*	-0.0022*
Crisis	-0.0282*	0.0352*	0.0023	0.0039*	0.0339*	0.0056*	-0.0147*
ARCH	0.1258*	0.0430*	0.0834*	0.2168*	0.3296*	0.0765*	0.1257*
Leverage	-0.0262*	0.0165*	0.0245	-0.1929*	-0.0960*	0.0460*	0.0510*
GARCH	0.8240*	0.9097*	0.8585*	0.7648*	0.0814*	0.6649*	0.7505*
L	4437.79	3124.16	4687.95	9149.98	9536.55	9981.26	8048.88
LB (8)	40.238	46.282	89.093	11.133	59.230	24.429	47.135
p.val	0.000	0.000	0.000	0.194	0.000	0.002	0.000
LB (16)	49.017	54.918	95.133	25.088	76.100	27.328	69.734
p.val	0.000	0.000	0.000	0.068	0.000	0.038	0.000
LB-Qs (8)	7.511	6.542	6.396	6.587	9.245	4.412	4.660
p.val	0.584	0.587	0.603	0.582	0.322	0.818	0.793
LB-Qs (16)	40.581	29.287	8.873	9.922	44.210	7.658	12.609
p.val	0.001	0.022	0.919	0.871	0.000	0.958	0.701

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1C

GJR GARCH Model: Gregorian Calendar 15 – 21 firms

Mean	PK:BOC	PK:CCB	PK:CEI	PK:CPB	PK:CSA	PK:CTC	CTX
C	0.1000	-0.0528	0.0454	0.2082	0.0988	0.0402	0.3822*
Jan	-0.0134	0.1483	-0.0305	-0.1685	0.1764	0.0849	-0.4994
Feb	-0.0703	0.0706	0.1804	-0.1081	0.1177	0.0157	-0.3761
Mar	-0.1585	-0.1065	0.0478	-0.0745	-0.1767	0.1791	-0.1164
Apr	-0.1081	0.0327	0.1767	-0.2716	0.0966	-0.1346	-0.6858*
May	-0.0722	-0.2014	0.0127	-0.2340	-0.3942	-0.2084	-0.4729
Jun	-0.0829	-0.0236	-0.0642	-0.5073*	-0.0650	-0.3002	-0.3305
Jul	0.0161	0.1896	-0.0257	-0.0646	0.0077	0.0721	-0.3922
Aug	-0.0995	0.0416	-0.0325	-0.3070	-0.1750	-0.1140	-0.5914*
Sep	-0.0667	-1.0886*	-0.1174	-0.1655	-0.1276	-0.0075	-0.6261*
Oct	-0.3567	-0.1143	0.0235	-0.1323	-0.1438	-0.0304	-0.2811
Nov	-0.0392	-0.0317	0.1454	-0.1951	0.0131	-0.1452	-0.3225
Variance							
C	0.0913*	0.0119*	0.0077*	0.0336*	0.0297*	0.0144*	0.1599*
Jan	-0.0046*	-0.0014	0.0160*	0.0048*	-0.0174*	-0.0007	0.0108
Feb	0.0057*	0.0025	0.0039*	0.0021	-0.0101*	0.0189*	-0.0008
Mar	0.0678*	0.0050*	0.0220*	-0.0015	-0.0193*	0.0050*	0.0222*
Apr	0.0018	-0.0043*	0.0391*	0.0000	-0.0131*	0.0013	-0.0236*
May	-0.0028	0.0021	0.2157*	0.0043*	-0.0173*	0.0059*	-0.0025
Jun	-0.0045*	-0.0039*	0.0268*	0.0056*	-0.0160*	0.0007	0.0130
Jul	-0.0014	-0.0044*	0.0020*	0.0014	-0.0180*	-0.0011	0.0023
Aug	-0.0016	-0.0058*	0.0010*	-0.0015	-0.0180*	0.0005	-0.0044
Sep	0.0149*	0.0328*	0.0718*	-0.0037*	-0.0190*	0.0025	0.0093
Oct	0.0190*	0.0014	0.0072*	0.0072*	-0.0167*	0.0054*	-0.0173*
Nov	-0.0055*	0.0004	0.0669*	-0.0055*	-0.0179*	-0.0006	0.0201*
Crisis	-0.0722*	-0.0062*	0.0278*	-0.0210*	-0.0074*	-0.0078*	-0.0871*
ARCH	0.1855*	0.0727*	0.2373*	0.1369*	0.1228*	0.1271*	0.2214*
Leverage	-0.0693*	0.0740*	-0.1216*	-0.0335*	-0.0190	0.0249	-0.1022*
GARCH	0.4052*	0.8563*	-0.0249*	0.6690*	0.8019*	0.7524*	0.0417
L	8676.24	7505.11	9681.35	8586.81	8604.52	8451.64	7868.10
LB (8)	13.056	8.291	19.958	17.023	13.941	19.556	21.653
p.val	0.110	0.406	0.010	0.030	0.083	0.012	0.006
LB (16)	20.939	15.008	43.474	25.847	18.756	33.567	29.360
p.val	0.181	0.524	0.000	0.056	0.282	0.006	0.022
LB-Qs (8)	2.910	6.930	1.297	26.810	2.158	5.639	5.382
p.val	0.940	0.544	0.996	0.001	0.976	0.688	0.716
LB-Qs (16)	5.334	11.989	203.510	31.340	6.028	19.157	13.322
p.val	0.994	0.745	0.000	0.012	0.988	0.261	0.649

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1D

GJR GARCH Model: Gregorian Calendar 22 – 28 firms

Mean	PK:DAD	PK:DAN	PK:DDH	PK:DEG	PK:DES	PK:DSM	PK:ENL
C	-0.0287	0.0286	0.3307*	0.0064	-0.0931	-0.0150	-0.3447
Jan	-0.1039	-0.4236	-0.1339	0.0691	0.2787	0.2276	0.1513
Feb	0.0844	-0.5186	-0.0250	0.0317	0.3557	0.0946	0.4568
Mar	-0.1510	-0.5607	-0.3688	0.3192	0.1102	-0.1268	-0.4180
Apr	0.1590	0.3773	-0.3372	0.0304	-0.1766	0.2290	0.4198
May	-0.2303	-0.0922	-0.5232*	-0.2619	-0.2664	-0.8007	-2.1633*
Jun	-0.3198	-0.1176	-0.2829	-0.0599	-0.1202	-0.1389	-0.4472
Jul	-0.0962	-0.1209	-0.2864	0.1824	0.2499	-0.0202	0.4193
Aug	-0.2824	-0.1809	-0.4221*	-0.2159	-0.1378	-0.3767	0.1981
Sep	-0.1244	-0.4021	-0.0665	0.1095	-0.0256	0.0352	0.5945
Oct	-0.4998	-0.3117	-0.2556	-0.0602	-0.1530	0.0272	0.0512
Nov	-0.0069	0.1916	-0.2787	0.1073	-0.0424	0.0057	0.3608
Variance							
C	0.0127*	0.0086*	0.0247*	0.0062*	0.0048*	0.0131*	0.0404*
Jan	0.0076*	0.0328*	0.0074*	-0.0009	0.0044*	-0.0051*	-0.0303*
Feb	-0.0008	0.0079*	-0.0010	0.0034*	0.0059*	-0.0047*	0.0025
Mar	0.0254*	0.0371*	0.0250*	-0.0020*	-0.0005	-0.0096*	0.0564*
Apr	-0.0017	0.0053*	0.0026	0.0004	-0.0026*	-0.0066*	-0.0387*
May	0.0146*	0.0239*	0.0006	0.0060*	0.0144*	0.0271*	0.0589*
Jun	0.0084*	0.0133*	0.0056*	-0.0031*	-0.0039*	-0.0103*	-0.0235*
Jul	0.0058*	0.0085*	-0.0014	-0.0006	0.0041*	-0.0036*	-0.0306*
Aug	0.0080*	0.0043*	0.0002	-0.0002	-0.0030*	0.0149*	-0.0187*
Sep	0.0042*	0.0237*	0.0041*	-0.0009	0.0023*	-0.0137*	-0.0330*
Oct	-0.0008	0.0049*	0.0009	0.0019	0.0010	-0.0126*	-0.0211*
Nov	0.0137*	0.0438*	-0.0008	-0.0024*	0.0021*	-0.0081*	-0.0396*
Crisis	-0.0049*	-0.0106*	-0.0120*	-0.0038*	0.0001	0.0032*	-0.0011*
ARCH	0.0435*	0.0695*	0.2505*	0.0875*	0.0758*	0.1420*	0.1418*
Leverage	0.0641*	-0.0046	0.0334	0.0184	0.0548*	-0.0526*	0.0064
GARCH	0.8814*	0.8929*	0.4722*	0.8755*	0.8599*	0.8366*	0.8201*
L	6057.88	5623.31	9299.15	8296.34	7818.70	8051.32	5978.54
LB (8)	52.500	28.862	5.666	26.164	11.955	12.078	44.401
p.val	0.000	0.000	0.685	0.001	0.153	0.148	0.000
LB (16)	54.836	37.626	13.633	30.993	15.881	19.087	57.645
p.val	0.000	0.002	0.626	0.013	0.461	0.264	0.000
LB-Qs (8)	11.785	6.071	3.901	18.262	3.391	1.014	1.649
p.val	0.161	0.639	0.866	0.019	0.907	0.998	0.949
LB-Qs (16)	14.428	25.133	11.059	34.346	7.251	3.034	5.900
p.val	0.567	0.068	0.806	0.005	0.968	1.000	0.989

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1E

GJR GARCH Model: Gregorian Calendar 29 – 35 firms

Mean	PK:ERO	PK:ETU	PK:FAU	PK:FEC	PK:FZM	PK:GAI	PK:GAT
C	0.1340	0.1898	0.1278	-0.0642	-0.0364	-0.0374	0.1281
Jan	0.1660	-0.2536	0.2832*	-0.0540	0.2313	0.2129	0.0767
Feb	0.1116	-0.0135	-0.0005	0.2417	-0.1012	0.1382	-0.2564
Mar	-0.0933	-0.2492	0.0647	0.2060	-0.3757	0.1265	-0.0967
Apr	-0.1480	0.1459	-0.0022	-0.3128	0.0122	0.1518	-0.0783
May	-0.1775	-0.3160	-0.1481	-0.3053	0.0256	-0.1337	-0.3561
Jun	-0.3052	-0.1790	-0.1713	-0.0321	0.0674	0.1248	-0.2118
Jul	-0.1881	-0.3241	0.1507	0.0220	-0.0361	-0.2716	-0.1433
Aug	-0.1462	-0.2960	-0.0419	-0.0758	0.0437	0.1483	-0.3137
Sep	-0.0034	-0.3201	-0.0979	0.1679	-0.0716	0.1611	0.1539
Oct	-0.1688	-0.0666	0.0062	-0.0647	0.0622	0.1215	-0.0564
Nov	-0.0072	0.0460	0.0142	-0.2283	0.0181	-0.1534	0.0406
Variance							
C	0.0096*	0.0185*	0.0050*	0.0014*	0.0524*	0.0112*	0.0036*
Jan	-0.0038*	-0.0036*	0.0010*	0.0038*	-0.0142*	-0.0038*	-0.0018*
Feb	0.0002	-0.0032*	0.0005	0.0079*	0.0547*	-0.0025*	-0.0015*
Mar	-0.0018*	0.0030*	-0.0010*	0.0049*	0.0524*	-0.0041*	-0.0008
Apr	-0.0042*	0.0058*	-0.0014*	0.0026*	-0.0150*	0.0091*	-0.0028*
May	-0.0055*	-0.0003	0.0014*	0.0046*	-0.0168*	-0.0057*	0.0001
Jun	-0.0036*	0.0044*	-0.0001	0.0017*	-0.0151*	-0.0035*	-0.0023*
Jul	-0.0053*	0.0002	-0.0005	0.0009	-0.0088*	0.0011	-0.0015*
Aug	-0.0054*	0.0006	-0.0016*	0.0076*	-0.0178*	-0.0025*	-0.0022*
Sep	-0.0034*	-0.0031*	0.0005	0.0029*	-0.0117*	-0.0021*	-0.0022*
Oct	-0.0022*	0.0000	-0.0002	0.0068*	-0.0182*	0.0040*	-0.0001
Nov	-0.0055*	-0.0047*	-0.0019*	0.0059*	-0.0132*	-0.0022*	-0.0005
Crisis	-0.0015*	-0.0054*	-0.0023*	-0.0024*	-0.0298*	-0.0027*	-0.0010*
ARCH	0.1418*	0.1270*	0.1495*	0.0512*	0.2005*	0.1290*	0.0504*
Leverage	0.1457*	0.0126	0.0053	-0.0146*	-0.1270*	-0.0775*	0.0154*
GARCH	0.7166*	0.6465*	0.7821*	0.9328*	0.6787*	0.8258*	0.9271*
L	9770.30	9262.85	10390.90	7680.50	8398.92	8667.05	8719.43
LB (8)	36.685	41.440	17.765	7.567	3.014	11.042	13.681
p.val	0.000	0.000	0.023	0.477	0.933	0.199	0.090
LB (16)	56.103	54.169	23.417	17.516	19.634	17.110	21.558
p.val	0.000	0.000	0.103	0.353	0.237	0.378	0.158
LB-Qs (8)	6.911	2.778	6.009	13.566	2.276	3.566	15.964
p.val	0.546	0.948	0.646	0.094	0.971	0.894	0.043
LB-Qs (16)	12.588	8.913	8.126	18.516	4.419	21.460	21.474
p.val	0.703	0.917	0.945	0.295	0.998	0.162	0.161

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1F

GJR GARCH Model: Gregorian Calendar 36 – 42 firms

Mean	PK:GLT	PK:GOP	PK:GSM	PK:GTR	PK:GWC	PK:HAB	PK:HPM
C	0.1785	0.1381	0.1653	0.0558	0.1064	0.0833	0.2434
Jan	-0.2175	-0.0522	-0.2583	0.1143	0.1015	-0.1190	-0.3523
Feb	-0.1795	-0.1874	-0.0407	-0.1787	-0.2078	0.0663	-0.3253
Mar	-0.2117	-0.1080	-0.3233	-0.1304	-0.0277	-0.2435	-0.3231
Apr	-0.1105	-0.1231	0.0687	-0.0523	-0.1391	0.0454	-0.3464
May	-0.3143*	-0.1365	-0.1246	-0.1337	-0.4540	-0.1559	-0.2402
Jun	-0.0595	-0.1523	0.1332	0.0189	0.0834	-0.1957	-0.3724
Jul	-0.1920	-0.0131	-0.5491	0.0918	-0.5072	0.1805	-0.3257
Aug	-0.2399	-0.1574	-0.5200	-0.1917	-0.0217	-0.1741	-0.2522
Sep	-0.1717	-0.5013	-0.3601	-0.1936	-0.2243	-0.0108	-0.0026
Oct	-0.0750	-0.3143	0.0716	-0.1423	-0.5128	-0.2516	0.3454
Nov	-0.2459	-0.0939	-0.2111	0.0192	-0.0158	0.0599	0.2799
Variance							
C	0.0058*	0.0058*	-0.0031*	0.0165*	-0.0018*	0.0047*	0.0394*
Jan	-0.0026*	-0.0007	0.0030*	-0.0021*	0.0065*	0.0247*	-0.0306*
Feb	-0.0004	-0.0003	0.0108*	-0.0027*	0.0334*	0.0032*	-0.0382*
Mar	-0.0029*	-0.0011*	0.0023*	-0.0049*	-0.0018*	0.0023*	-0.0007
Apr	-0.0027*	-0.0027*	0.0049*	-0.0022*	0.0138*	0.0045*	-0.0090*
May	-0.0007*	-0.0011*	0.0004*	-0.0030*	0.0314*	0.0072*	-0.0394*
Jun	-0.0013*	-0.0017*	0.0083*	-0.0017	0.0082*	0.0015*	0.0011
Jul	-0.0026*	-0.0009	0.0011*	-0.0008	0.0026*	0.0060	-0.0249*
Aug	0.0002	-0.0035*	0.0030*	-0.0028*	0.0072*	0.0080*	-0.0157*
Sep	-0.0027*	0.0187*	0.0047*	-0.0011	0.0061*	0.0106*	-0.0267*
Oct	-0.0017*	0.0092*	0.0112*	-0.0022*	0.0073*	0.0131*	-0.0085*
Nov	-0.0030*	0.0043*	0.0049*	-0.0066*	0.0710*	0.0057*	-0.0168*
Crisis	-0.0022*	-0.0023*	0.0010*	-0.0069*	-0.0003	-0.0008	0.0057*
ARCH	0.1522*	0.1615*	0.0186*	0.2085*	0.0880*	0.0841*	0.0251*
Leverage	-0.0570*	0.0566*	0.0089*	-0.0824*	-0.0380*	0.0514*	0.1063*
GARCH	0.8260*	0.7698*	0.9686*	0.7386*	0.8957*	0.7900*	0.6304*
L	10339.19	9714.65	7382.97	8848.50	7116.73	8438.89	10022.20
LB (8)	9.716	34.199	28.681	20.069	4.396	34.002	95.223
p.val	0.286	0.000	0.000	0.010	0.820	0.000	0.000
LB (16)	17.543	42.016	32.913	27.778	11.283	43.185	112.320
p.val	0.351	0.000	0.008	0.034	0.792	0.000	0.000
LB-Qs (8)	10.085	9.309	12.640	7.476	0.832	6.195	43.100
p.val	0.259	0.317	0.125	0.486	0.999	0.625	0.000
LB-Qs (16)	17.399	13.944	14.597	11.798	21.906	9.735	81.624
p.val	0.360	0.603	0.554	0.758	0.146	0.880	0.000

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1G

GJR GARCH Model: Gregorian Calendar 43 – 49 firms

Mean	PK:HPN	PK:HSM	PK:HUB	PK:HUF	PK:ICI	PK:ICP	PK:IMO
C	0.0506	0.3105	-0.0093	0.1888	-0.0110	0.2221	-0.0298
Jan	0.0006	-0.4497	0.2342	-0.1178	0.1157	-0.0440	0.3904*
Feb	-0.1050	-0.2819	0.1119	-0.1493	0.1022	-0.0757	-0.1780
Mar	-0.3254	-0.1868	0.0542	-0.2909	0.1953	-0.2756	0.1329
Apr	-0.0632	-0.2789	0.0449	-0.1942	0.0300	-0.1929	0.3063
May	-0.1387	-0.2132	-0.1101	-0.1735	-0.1815	-0.3536	-0.0138
Jun	0.0900	-0.3764	0.0219	-0.2857	0.0664	-0.1387	0.0587
Jul	-0.0748	-0.2740	0.1354	-0.1304	0.1509	0.0236	0.2687
Aug	0.0496	-0.2874	0.1667	-0.2303	-0.0078	-0.2876	0.0605
Sep	-0.1179	-0.2716	0.1216	0.2605	0.0942	-0.2814	0.1691
Oct	0.0697	-0.4966	-0.0143	-0.1090	0.0998	-0.2520	0.3249
Nov	-0.0627	-0.4270	0.1293	-0.0319	0.0934	0.0302	0.1965
Variance							
C	0.0175*	0.0236*	0.0027*	0.0045*	0.0081*	0.0059*	0.0050*
Jan	-0.0035*	-0.0073*	0.0005	0.0120*	-0.0033*	0.0004	0.0026*
Feb	0.0670*	-0.0076*	0.0006	-0.0034*	-0.0025*	0.0004	0.0036*
Mar	0.0268*	0.0201*	-0.0011*	-0.0005	-0.0049*	-0.0030*	0.0008
Apr	0.0092*	-0.0083*	-0.0001	0.0026*	-0.0028*	-0.0020*	0.0016*
May	0.0014*	-0.0175*	-0.0001	0.0029*	-0.0028*	0.0010	0.0010
Jun	0.0219*	-0.0091*	0.0003	0.0002	-0.0039*	-0.0013	0.0010
Jul	-0.0041*	-0.0129*	-0.0004	0.0032*	-0.0028*	-0.0013	0.0020*
Aug	0.0054*	-0.0202*	0.0010*	0.0028*	-0.0007	-0.0016*	0.0019*
Sep	-0.0030*	-0.0033*	-0.0004	0.0009	-0.0051*	0.0055*	0.0008
Oct	0.0088*	-0.0041*	0.0007	0.0034*	-0.0010	-0.0012	0.0015*
Nov	0.0083*	-0.0158*	-0.0006*	0.0029*	-0.0056*	0.0020*	0.0038*
Crisis	-0.0089*	0.0050*	-0.0018*	-0.0053*	-0.0030*	-0.0022*	-0.0032*
ARCH	0.2329*	0.0650*	0.0794*	0.0275*	0.0820*	0.1839*	0.1564*
Leverage	-0.0829*	0.0117	0.0525*	-0.0161*	0.0161	-0.0080	-0.0189
GARCH	0.5821*	0.6773*	0.8755*	0.9667*	0.8720*	0.7875*	0.7992*
L	9285.03	9171.40	9958.80	7179.77	9233.51	9126.21	9195.11
LB (8)	12.922	13.570	14.752	13.063	35.304	19.606	34.362
p.val	0.115	0.094	0.064	0.110	0.000	0.012	0.000
LB (16)	19.768	20.026	23.076	15.800	45.324	32.808	44.804
p.val	0.231	0.219	0.112	0.467	0.000	0.008	0.000
LB-Qs (8)	1.000	2.430	12.674	1.912	3.913	27.465	22.448
p.val	0.998	0.965	0.124	0.984	0.865	0.001	0.004
LB-Qs (16)	2.420	6.736	16.524	4.180	7.060	34.006	26.184
p.val	1.000	0.978	0.417	0.999	0.972	0.005	0.051

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1H

GJR GARCH Model: Gregorian Calendar 50 – 56 firms

Mean	PK:INI	PK:JIN	PK:KIE	PK:KNR	PK:KWG	PK:LAK	PK:LDP
C	0.0736	0.0088	-0.0455	0.3371	-0.0059	0.2278*	-0.0179
Jan	-0.1043	0.1179	0.2362	-0.0952	0.1219	-0.2994	0.0758
Feb	0.0139	0.0081	-0.0278	-0.5765	0.0590	-0.2839	-0.0643
Mar	0.0783	0.1564	-0.3326	-0.4135	-0.1259	-0.5207*	0.1337
Apr	0.0153	0.1421	-0.0022	-0.2381	0.1414	-0.1209	0.0613
May	-0.0075	-0.1623	-0.2025	-0.5836	-0.4306	-0.1727	-0.0535
Jun	-0.1075	0.0258	-0.1175	-0.4207	-0.1807	-0.0803	0.0733
Jul	0.0172	-0.1197	0.0028	-0.4799	0.1708	-0.1725	0.0755
Aug	-0.0878	-0.0600	-0.1906	-0.6402*	-0.1361	-0.2399	-0.1331
Sep	0.0241	-0.1541	-0.0914	-0.2902	-0.0466	-0.0083	0.2099
Oct	-0.0915	-0.0188	-0.0743	-0.3312	0.1577	0.0037	0.1612
Nov	0.1050	-0.0602	0.0369	-0.2610	-0.0617	-0.2222	0.0593
Variance							
C	0.0062*	0.0214*	0.0138*	0.1119*	0.0031*	0.0037*	0.0471*
Jan	0.0037*	0.0093*	0.0017	0.0137*	-0.0013*	0.0057*	-0.0282*
Feb	0.0036*	0.0190*	-0.0020	-0.0048	0.0048*	-0.0040*	-0.0297*
Mar	0.0018*	0.0048*	-0.0069*	0.0257*	0.0122*	0.0139*	-0.0357*
Apr	-0.0051*	0.0033*	-0.0079*	-0.0032	0.0012	-0.0040*	-0.0327*
May	0.0019*	0.0065*	0.0040*	0.0033	0.0647*	-0.0003	-0.0341*
Jun	0.0025*	0.0125*	-0.0058*	0.0147*	-0.0066*	-0.0011*	-0.0350*
Jul	-0.0012*	0.0092*	0.0024	0.0002	0.0021*	0.0132*	-0.0353*
Aug	-0.0043*	0.0022	-0.0061*	0.0201*	0.0251*	-0.0004	-0.0361*
Sep	-0.0019*	0.0250*	-0.0012	-0.0023	0.0006	0.0024*	-0.0332*
Oct	0.0013*	-0.0007	0.0010	0.0080	0.0028*	0.0091*	-0.0319*
Nov	0.0186*	0.0023*	-0.0100*	0.0085	0.0189*	-0.0043*	-0.0333*
Crisis	0.0035*	-0.0123*	-0.0011	-0.0801*	-0.0026*	0.0008*	-0.0036*
ARCH	0.3695*	0.1285*	0.1380*	0.1814*	0.0673*	0.0574*	0.2532*
Leverage	-0.1632*	0.1257*	0.0426*	-0.0186	0.0281*	-0.0186*	0.0034
GARCH	0.6116*	0.4744*	0.7894*	0.5706*	0.8867*	0.8598*	0.4939*
L	10049.31	9628.51	7790.69	6836.24	7132.31	9739.97	10083.91
LB (8)	6.835	17.388	3.967	5.462	7.386	27.723	4.315
p.val	0.555	0.026	0.860	0.707	0.496	0.001	0.828
LB (16)	22.675	31.100	26.359	10.606	10.425	35.131	20.745
p.val	0.123	0.013	0.049	0.833	0.844	0.004	0.189
LB-Qs (8)	15.222	7.135	10.888	1.538	5.188	0.640	2.625
p.val	0.055	0.522	0.208	0.992	0.737	1.000	0.956
LB-Qs (16)	18.556	25.973	15.127	2.634	11.256	1.731	4.065
p.val	0.292	0.054	0.515	1.000	0.793	1.000	0.999

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1I

GJR GARCH Model: Gregorian Calendar 57 – 63 firms

Mean	PK:MAL	PK:MBK	PK:MET	PK:MIR	PK:MLC	PK:MRB	PK:MTT
C	0.5174*	0.2067	0.1696	-0.0347	0.0923	0.1538	0.1857
Jan	-0.4476	0.0794	0.1229	0.0648	-0.2484	-0.2446	0.0476
Feb	-0.5632	-0.1464	0.1127	0.0270	-0.1331	-0.0955	-0.0886
Mar	-0.7528*	0.0858	-0.2333	-0.0071	0.2407	-0.2264	-0.0807
Apr	-0.6091	0.0572	-0.1194	-0.1908	-0.3031	-0.0394	-0.0385
May	-0.4652	-0.4077*	-0.1442	-0.0824	-0.3800	-0.0749	-0.1228
Jun	-0.2879	-0.1132	-0.1660	-0.3454	-0.4281	-0.3361	-0.1736
Jul	-0.6474	-0.1603	-0.0350	0.3185	0.2865	-0.0695	-0.0986
Aug	-0.5455	-0.1637	-0.1705	-0.0202	-0.3534	-0.1055	-0.0589
Sep	-0.5701	0.1152	-0.0560	-0.0731	-0.2375	-0.1671	-0.1549
Oct	-0.8996*	-0.0600	-0.2007	0.1085	-0.2892	-0.1158	0.0667
Nov	-0.3635	-0.1382	-0.0104	0.1329	0.0642	-0.1919	-0.1501
Variance							
C	0.0076*	0.0198*	0.0003	0.0002*	0.0091*	0.0358*	0.0275*
Jan	-0.0093*	-0.0053*	0.0036*	0.0046*	-0.0012	-0.0092*	0.0022*
Feb	-0.0110*	-0.0031	0.0029*	0.0409*	0.0037*	-0.0055*	-0.0042*
Mar	-0.0025*	-0.0035*	0.0049*	0.0294*	0.0061*	-0.0094*	-0.0074*
Apr	-0.0111*	-0.0060*	-0.0010*	0.0371*	-0.0003	-0.0159*	-0.0070*
May	-0.0052*	-0.0017	0.0051*	0.0338*	0.0086*	-0.0213*	-0.0068*
Jun	-0.0047*	-0.0026	0.0021*	0.0414*	0.0005	0.0089*	0.0119*
Jul	-0.0091*	-0.0063*	0.0021*	0.0275*	0.0033*	-0.0202*	-0.0074*
Aug	-0.0087*	-0.0023	0.0013*	0.0194*	-0.0011	-0.0249*	-0.0049*
Sep	-0.0032*	-0.0061*	0.0018*	0.0111*	0.0015	-0.0159*	-0.0009
Oct	-0.0032*	-0.0012	0.0000	0.0033*	0.0010	-0.0264*	0.0048*
Nov	-0.0132*	-0.0059*	0.0075*	0.0129*	0.0112*	-0.0227*	-0.0015
Crisis	-0.0004*	-0.0091*	0.0010*	0.0146*	-0.0052*	0.0017*	-0.0148*
ARCH	0.0171*	0.1406*	0.1107*	0.1278*	0.0847*	0.1653*	0.3285*
Leverage	0.0139*	0.0900*	-0.0418*	-0.0386*	0.0156	-0.0650*	-0.1683*
GARCH	0.9757*	0.6994*	0.8537*	0.6316*	0.8546*	0.5295*	0.4987*
L	6168.37	8993.54	9798.06	8675.84	7742.37	9403.67	9997.79
LB (8)	116.120	31.875	8.898	10.430	10.339	16.841	16.916
p.val	0.000	0.000	0.351	0.236	0.242	0.032	0.031
LB (16)	125.880	40.447	22.553	13.157	15.883	30.636	22.045
p.val	0.000	0.001	0.126	0.661	0.461	0.015	0.142
LB-Qs (8)	30.927	7.630	14.748	5.881	4.914	3.000	0.843
p.val	0.000	0.470	0.064	0.661	0.767	0.934	0.999
LB-Qs (16)	37.331	13.687	17.328	7.920	15.170	8.718	1.717
p.val	0.002	0.622	0.365	0.951	0.512	0.925	1.000

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1J

GJR GARCH Model: Gregorian Calendar 64 – 70 firms

Mean	PK:NAR	PK:NAT	PK:NHT	PK:NMI	PK:NON	PK:NPK	PK:ORI
C	-0.2129	0.2049	0.1711	0.2411	0.1179	0.5383*	-0.0387
Jan	0.3083	-0.3283	0.2947	0.1020	0.1447	-0.4647*	0.0010
Feb	0.2895	-0.4061	-0.2225	-0.2933	-0.0055	-0.4396*	0.1568
Mar	0.2327	-0.4231	-0.1947	-0.1082	-0.0050	-0.3781*	0.0093
Apr	0.2695	-0.3124	-0.0062	-0.0458	-0.0167	-0.4141*	0.0015
May	0.0565	-0.3078	-0.4298	-0.5068*	-0.2746	-0.5891*	0.0053
Jun	0.3517	-0.2371	-0.2531	-0.3599	-0.0293	-0.2101	-0.1227
Jul	0.3879	-0.1739	-0.0744	-0.3221	-0.2118	-0.6801*	0.2022
Aug	0.2594	-0.4695*	-0.2314	-0.4018	0.0684	-0.4988*	0.0104
Sep	0.2830	-0.1705	-0.0925	-0.0611	-0.1865	-0.4410*	0.1420
Oct	0.2809	-0.3390	0.0043	-0.0494	-0.1340	-0.5342*	0.2558
Nov	0.3912	-0.0263	-0.1581	0.0112	0.0229	-0.5752*	-0.4684
Variance							
C	0.0446*	0.0072*	0.0160*	0.0343*	0.0001	0.0033*	0.0066*
Jan	-0.0357*	-0.0029*	0.0014	-0.0032*	0.0047*	-0.0024*	-0.0037*
Feb	-0.0204*	-0.0012	0.0044*	0.0030	-0.0002	0.0011*	-0.0013*
Mar	-0.0347*	-0.0023*	0.0035*	-0.0051*	0.0065*	-0.0033*	-0.0045*
Apr	-0.0327*	0.0014	-0.0002	-0.0084*	0.0036*	-0.0011*	-0.0018*
May	-0.0309*	-0.0009	0.0025	-0.0016	0.0016*	-0.0014*	-0.0042
Jun	-0.0323*	0.0012	-0.0015	-0.0047*	0.0026*	0.0007*	-0.0004*
Jul	-0.0306*	-0.0038*	0.0030*	-0.0099*	0.0018*	-0.0041*	0.0028*
Aug	-0.0339*	-0.0003	-0.0014	-0.0081*	0.0010*	0.0001	-0.0032*
Sep	-0.0344*	0.0023*	0.0100*	-0.0098*	0.0029*	-0.0037*	0.0009
Oct	-0.0291*	-0.0028*	0.0047*	-0.0029	-0.0007*	-0.0027*	-0.0013*
Nov	-0.0315*	-0.0024*	-0.0023	-0.0080*	0.0037*	-0.0016*	0.0029*
Crisis	-0.0041*	-0.0021*	-0.0095*	-0.0188*	0.0002	0.0001	-0.0024*
ARCH	0.1799*	0.0765*	0.1058*	0.1252*	0.0764*	0.0682*	0.0723*
Leverage	-0.0112	0.0120	0.0293*	0.0762*	-0.0402*	-0.0397*	0.0267*
GARCH	0.6864*	0.8868*	0.7768*	0.7036*	0.9230*	0.9237*	0.8709*
L	9061.19	7917.20	8364.25	8320.92	8717.76	9809.29	9313.53
LB (8)	25.444	15.940	39.022	44.615	15.717	6.478	27.701
p.val	0.001	0.043	0.000	0.000	0.047	0.594	0.001
LB (16)	33.135	22.804	52.561	62.093	26.133	11.218	32.568
p.val	0.007	0.119	0.000	0.000	0.052	0.796	0.008
LB-Qs (8)	1.365	9.683	8.764	4.783	4.219	4.521	2.344
p.val	0.996	0.288	0.363	0.781	0.837	0.807	0.969
LB-Qs (16)	3.715	15.126	20.130	5.453	14.108	10.154	7.422
p.val	0.999	0.515	0.214	0.993	0.591	0.858	0.964

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1K

GJR GARCH Model: Gregorian Calendar 71 – 77 firms

Mean	PK:PAC	PK:PAL	PK:PBS	PK:PCT	PK:PEN	PK:PET	PK:PLC
C	0.6771	0.0823	0.0731	-0.0643	0.0734	-0.0548	0.2471
Jan	-0.6163	0.2462	-0.0567	0.1001	-0.3542	0.2410	-0.2896
Feb	-0.6639*	0.0780	0.0195	-0.0587	-0.0421	0.0417	-0.2052
Mar	-0.6255*	-0.0938	0.0437	0.3572	-0.0471	0.0968	0.0162
Apr	-0.6182*	-0.2999	-0.1478	-0.0543	-0.5343	0.0531	-0.2467
May	-0.6845*	-0.3994	0.0019	-0.1837	-0.0541	-0.2587	-2.2155
Jun	-0.7254*	-0.2941	-0.0830	0.1213	-0.0871	0.2425	0.0166
Jul	-0.6793*	-0.0459	-0.0116	0.1646	-0.2694	0.0960	-0.1715
Aug	-0.6555*	-0.3647	-0.0323	-0.0848	0.1561	-0.4509	-0.7447
Sep	-0.6035	-0.1086	0.1077	0.2929	-0.2615	0.2309	0.0429
Oct	-0.8659*	-0.3764	-0.1010	-0.4713	-0.0470	-0.1680	-0.4659
Nov	-1.6798*	-0.0892	0.0530	0.0749	-0.2163	-0.1737	-0.2426
Variance							
C	0.0105*	0.0061*	0.0030*	0.0097*	0.1098*	0.0305*	0.0085*
Jan	-0.0036*	0.0075*	0.0015*	0.0071*	-0.0262*	0.0033*	-0.0075*
Feb	-0.0101*	0.0002	-0.0001	0.0064*	-0.0317*	-0.0012	0.0059*
Mar	-0.0063*	0.0039*	-0.0007*	-0.0003	-0.0072*	0.0110*	-0.0069*
Apr	-0.0101*	-0.0034*	-0.0004	0.0014	-0.0010	-0.0031*	0.0916*
May	-0.0071*	0.0035*	0.0010*	0.0089*	-0.0306*	-0.0035*	0.0887*
Jun	-0.0105*	0.0025*	-0.0005	0.0042*	-0.0162*	0.0002	-0.0052*
Jul	-0.0028	0.0026*	-0.0007	0.0011	-0.0314*	-0.0039*	-0.0065*
Aug	-0.0103*	0.0013	0.0011*	0.0053*	-0.0251*	-0.0011	0.0083*
Sep	-0.0077*	0.0006	0.0005	0.0030*	0.0080*	-0.0028	0.0048*
Oct	-0.0037*	0.0068*	0.0008*	0.0059*	-0.0312*	0.0017	-0.0087*
Nov	0.0417*	0.0047*	-0.0009*	0.0042*	-0.0339*	-0.0023	-0.0085*
Crisis	0.0010*	-0.0023*	-0.0010*	-0.0086*	-0.0741*	-0.0221*	0.0017*
ARCH	0.1121*	0.1046*	0.1375*	0.0761*	0.1658*	0.1054*	0.1488*
Leverage	0.1072*	0.0088	0.0255	0.0038	0.0233*	0.0249*	0.0813*
GARCH	0.7972*	0.8495*	0.8074*	0.8834*	0.7477*	0.7995*	0.7835*
L	9971.67	7781.28	10184.59	7308.76	6830.77	7738.96	7726.03
LB (8)	2.506	19.547	27.194	14.566	5.762	12.092	16.814
p.val	0.961	0.012	0.001	0.068	0.674	0.147	0.032
LB (16)	15.368	39.423	37.575	18.846	11.927	20.125	28.958
p.val	0.498	0.001	0.002	0.277	0.749	0.215	0.024
LB-Qs (8)	1.238	12.547	10.764	8.210	1.771	4.014	14.789
p.val	0.996	0.128	0.215	0.413	0.987	0.856	0.063
LB-Qs (16)	35.338	17.666	18.720	13.484	42.096	16.005	23.965
p.val	0.004	0.344	0.283	0.637	0.000	0.453	0.090

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1L

GJR GARCH Model: Gregorian Calendar 78 – 84 firms

Mean	PK:PNC	PK:PNS	PK:POF	PK:PRE	PK:PSC	PK:PSM	PK:PSO
C	0.2900	0.2253	0.1328	0.3137*	0.1489	-0.1009	-0.0403
Jan	-0.2957	0.0979	-0.0614	-0.3901*	-0.0011	0.3821	0.1957
Feb	-0.3817	-0.5064	0.1910	-0.3271	-0.1323	-0.0278	0.3401*
Mar	-0.2686	-0.3653	-0.1138	-0.3283	-0.0078	-0.1182	-0.0488
Apr	-0.2416	-0.2243	-0.3052	-0.3139	-0.4085	0.3430	0.0126
May	-0.2899	-0.5091	-0.2304	-0.4900*	-0.1852	-0.2008	0.0319
Jun	-0.3508	-0.3625	-0.1260	-0.7074*	-0.3667	0.1243	0.0074
Jul	-0.2406	-0.2391	-0.0232	-0.1427	-0.2226	0.3069	0.2162
Aug	-0.1173	-0.3221	0.2342	-0.5720	-0.1699	0.1793	0.1302
Sep	0.0740	-0.4982	0.1244*	-0.0458*	-0.0683	0.0936	0.1145
Oct	-0.7627	-0.2630	0.1044	-0.2524	-0.4026	0.2536	0.0561
Nov	-0.1814	-0.3629	0.0092	-0.3159	0.0055	0.0097	0.1445
Variance							
C	0.0607*	0.0283*	0.0008*	0.0090*	-0.0010	0.0135*	0.0028*
Jan	-0.0607*	0.0008	0.0014*	-0.0017*	0.0044*	0.0043*	-0.0006
Feb	-0.0575*	-0.0027	0.0106*	0.0011	0.0030*	0.0056*	-0.0003
Mar	-0.0580*	-0.0042*	0.0021*	-0.0037*	0.0067*	0.0140*	-0.0025*
Apr	-0.0210*	0.0004	0.0025*	0.0007	0.0000	0.0026	-0.0016*
May	-0.0476*	-0.0017	0.0032*	-0.0036*	0.0064*	0.0006	0.0002
Jun	-0.0472*	-0.0014	-0.0010*	0.0025*	0.0002	0.0028*	-0.0017*
Jul	-0.0400*	-0.0029	0.0017*	-0.0020*	0.0010	0.0007	-0.0002
Aug	-0.0547*	-0.0006	0.0007*	0.0015*	0.0061*	0.0024	-0.0020*
Sep	-0.0107*	-0.0025	0.0002	-0.0027*	0.0020*	0.0000	-0.0018*
Oct	0.0179*	0.0009	0.0018*	0.0041*	0.0059*	0.0010	0.0008*
Nov	-0.0445*	0.0018	0.0089*	-0.0053*	0.0059*	0.0007	-0.0028*
Crisis	0.0131*	-0.0220*	0.0001	-0.0045*	-0.0004*	-0.0064*	-0.0007*
ARCH	0.1925*	0.1028*	0.1036*	0.1166*	0.0428*	0.2158*	0.0825*
Leverage	-0.1012*	0.0304*	0.0444*	-0.0333*	0.0082	-0.0054	0.0850*
GARCH	0.4811*	0.8316*	0.8398*	0.8495*	0.9414*	0.6366*	0.8669*
L	9955.08	7448.15	9884.21	8729.93	7548.88	9219.28	9864.59
LB (8)	27.525	19.307	32.259	79.171	58.008	37.586	69.049
p.val	0.001	0.013	0.000	0.000	0.000	0.000	0.000
LB (16)	34.566	26.491	46.450	87.309	66.194	58.803	77.396
p.val	0.005	0.047	0.000	0.000	0.000	0.000	0.000
LB-Qs (8)	2.515	14.559	4.636	8.305	20.492	3.612	2.413
p.val	0.961	0.068	0.796	0.404	0.009	0.890	0.966
LB-Qs (16)	14.334	25.480	6.555	18.776	25.955	25.482	10.107
p.val	0.574	0.062	0.981	0.280	0.055	0.062	0.861

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1M

GJR GARCH Model: Gregorian Calendar 85 – 91 firms

Mean	PK:PTC	PK:SEA	PK:SEC	PK:SEP	PK:SER	PK:SHA	PK:SHK
C	-0.0573	0.0602	0.0705	0.0422	-0.1170*	-0.0231	0.1472
Jan	0.3465	-0.1664	-0.2215	-0.2289	0.1015	-0.0550	0.5616
Feb	-0.0900	-0.2257	0.2507	-2.2348*	0.1166	-0.0390	-0.1310
Mar	-0.0134	0.0205	0.2028	0.2398	0.0383	0.0375	-0.2531
Apr	0.3345	0.0257	-0.0990	-0.0344	0.3945	0.1567	0.2969
May	0.0670	-0.1502	-0.4271	-0.0413	-0.0041	-0.1808	-0.6799
Jun	0.0296	-0.1554	-0.6022	-0.1938	0.0982	0.2768	-0.3088
Jul	-0.0385	-0.0169	-0.2059	-0.0176	0.0632	-0.1322	-0.1693
Aug	0.1851	-0.2705	-0.1739	-0.0896	-0.0462	-0.0036	-0.1086
Sep	0.1294	0.1510	-0.2097	-0.0109	0.0609	0.0732	-0.2752
Oct	-0.1349	0.0406	-0.5309	-0.0350	0.1809	0.2555	1.3359
Nov	-0.0799	0.0010	-0.1178	0.0293	0.1653	0.1251	-0.0096
Variance							
C	0.0102*	0.0019*	0.1493*	0.0210*	0.0003*	0.0071*	0.0839*
Jan	0.0077*	0.0025*	-0.1471*	0.0132*	0.0116*	-0.0035*	0.0116*
Feb	0.0009	0.0020*	-0.0228*	0.0784*	-0.0003*	-0.0003	0.0252*
Mar	0.0026*	-0.0009	-0.0917*	-0.0098*	0.0213*	-0.0062*	0.0127*
Apr	0.0007	0.0013*	-0.1501*	-0.0110*	0.0288*	-0.0004	0.0185*
May	0.0065*	0.0001	-0.1374*	-0.0210*	0.0054*	0.0041*	-0.0113*
Jun	0.0046*	0.0007	-0.0971*	0.0140*	0.0196*	-0.0011*	-0.0273*
Jul	0.0006	0.0001	-0.1366*	0.0052*	0.0022*	-0.0063*	-0.0172*
Aug	0.0027*	0.0001	-0.1312*	-0.0132*	0.0174*	-0.0016*	-0.0481*
Sep	-0.0009	0.0032*	-0.1253*	-0.0203*	0.0144*	-0.0014*	-0.0436*
Oct	0.0059*	0.0006	-0.0559*	0.0254*	0.0429*	-0.0039*	0.0772*
Nov	0.0048*	0.0022*	-0.1052*	-0.0119*	0.0091*	-0.0013*	-0.0094*
Crisis	-0.0069*	-0.0008*	0.0076*	0.0066*	0.0060*	-0.0017*	-0.0358*
ARCH	0.1228*	0.0851*	0.1700*	0.2724*	0.2592*	0.0848*	0.1486*
Leverage	-0.0327*	0.0368*	0.0326*	-0.0009	-0.0500	-0.0254*	0.0309
GARCH	0.8063*	0.8714*	0.7516*	0.4189*	0.5565*	0.8953*	0.6591*
L	8732.15	9251.00	6271.81	10326.14	10156.97	8596.21	7319.47
LB (8)	6.346	10.065	41.533	20.557	31.689	19.812	7.141
p.val	0.609	0.260	0.000	0.008	0.000	0.011	0.522
LB (16)	11.159	15.525	49.024	27.991	39.789	34.687	16.090
p.val	0.800	0.487	0.000	0.032	0.001	0.004	0.447
LB-Qs (8)	2.818	23.191	4.235	3.451	1.020	4.329	12.952
p.val	0.945	0.003	0.835	0.903	0.998	0.826	0.114
LB-Qs (16)	8.630	41.142	27.803	9.114	5.449	12.457	54.778
p.val	0.928	0.001	0.033	0.909	0.993	0.712	0.000

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1N

GJR GARCH Model: Gregorian Calendar 92 – 98 firms

Mean	PK:SIT	PK:SME	PK:SNG	PK:SON	PK:SPP	PK:STM	PK:SUI
C	-0.1070	0.1471	-0.2258	0.0996	0.1483	-0.0047	-0.1732
Jan	0.1340	-0.1066	0.4943*	0.0079	-0.2959	0.2357	0.5328*
Feb	0.1160	0.0786	0.3028	0.0222	-0.0108	-0.4421	0.3393
Mar	0.1270	-0.2384	0.2822	0.0124	-0.2116	0.2730	0.0376
Apr	0.0249	-0.1638	0.2923	-0.2210	-0.2188	0.0065	0.1229
May	0.1492	-0.0004	0.0516	-0.2531	-0.1870	-0.3787	0.1379
Jun	0.1281	-0.0644	0.1499	-0.2443	-0.0549	-0.2065	0.1818
Jul	0.2434	-0.3186	0.1968	0.0276	-0.1261	-0.2798	0.1924
Aug	0.1172	-0.1891	0.0817	-0.0674	-0.2085	-0.2388	0.1492
Sep	0.1221	0.0930	0.2525	0.0320	0.1243	-0.1165	0.1946
Oct	0.3646	-0.0246	0.4502*	-0.0116	0.0818	-0.0746	0.2256
Nov	0.1372	-0.1738	0.0431	0.0292	-0.3245	0.0727	0.2075
Variance							
C	0.0111*	0.0025*	0.0098*	0.0042*	0.0084*	0.0029*	0.0222*
Jan	-0.0065*	0.0016*	-0.0038*	-0.0011	-0.0020*	0.0090*	-0.0115*
Feb	-0.0051*	0.0015*	-0.0007	0.0030*	0.0008	0.0186*	-0.0119*
Mar	-0.0073*	-0.0006*	-0.0054*	0.0019*	0.0030*	0.0016*	-0.0132*
Apr	-0.0054*	0.0009*	-0.0034*	-0.0020*	-0.0038*	0.0021*	-0.0138*
May	-0.0036*	0.0003	0.0037*	0.0004	0.0012*	0.0092*	-0.0058*
Jun	-0.0071*	0.0002*	-0.0054*	0.0005	-0.0038*	0.0097*	-0.0153*
Jul	-0.0054*	0.0007*	-0.0049*	-0.0024*	-0.0044*	0.0036*	-0.0164*
Aug	-0.0071*	0.0039*	-0.0039*	0.0009	-0.0016*	0.0025*	-0.0135*
Sep	-0.0047*	-0.0025*	-0.0056*	-0.0005	0.0035*	0.0020*	-0.0141*
Oct	-0.0047*	0.0038*	-0.0014	-0.0009	0.0018*	0.0145*	-0.0107*
Nov	-0.0071*	-0.0034*	-0.0039*	-0.0023*	-0.0042*	0.0056*	-0.0152*
Crisis	-0.0030*	0.0009*	-0.0023*	-0.0009*	-0.0041*	-0.0040*	-0.0037*
ARCH	0.0718*	0.0736*	0.1192*	0.0612*	0.0640*	0.1007*	0.1284*
Leverage	-0.0335*	-0.0668*	0.0384*	0.0679*	-0.0291*	0.0072	0.0740*
GARCH	0.8916*	0.9041*	0.7967*	0.8659*	0.9008*	0.8668*	0.7481*
L	9321.64	9516.97	9211.60	9279.19	8929.52	7542.27	9097.08
LB (8)	4.258	18.169	24.673	15.209	31.421	12.861	14.430
p.val	0.833	0.020	0.002	0.055	0.000	0.117	0.071
LB (16)	11.312	25.511	33.014	20.237	33.756	25.949	21.694
p.val	0.790	0.061	0.007	0.210	0.006	0.055	0.153
LB-Qs (8)	6.092	8.731	12.394	3.805	16.016	10.709	4.167
p.val	0.637	0.366	0.134	0.874	0.042	0.219	0.842
LB-Qs (16)	21.818	12.174	25.975	6.785	24.493	18.385	6.782
p.val	0.149	0.732	0.054	0.977	0.079	0.302	0.977

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.1O

GJR GARCH Model: Gregorian Calendar 99 – 106 firms

Mean	PK:TAJ	PK:TLM	PK:TRP	PK:TRU	PK:TSM	PK:ULV	PK:UMC	PK:WYP
C	-0.2089	0.0713	-0.0099	0.1762	-0.2230	0.0245	-0.4373	0.1497
Jan	0.4645	0.1726	0.4790	-0.1349	0.3398	0.0253	0.2778	-0.2413
Feb	0.0493	-0.0613	-0.1594	-0.0982	0.2501	0.0746	0.7031	-0.3057
Mar	0.0448	-0.0764	-0.2611	-0.3618	-0.3814	0.2138	-0.3282	-0.1010
Apr	0.0810	-0.0738	-0.1352	-0.3955	0.0670	0.0931	-0.2382	-0.2806
May	0.0729	-0.1093	-0.0025	-0.4361	0.0927	-0.0194	0.1662	-0.3514
Jun	-0.3798	-0.0635	0.1426	-0.3693	0.3655	0.0374	-0.0003	-0.3038
Jul	-0.2510	-0.0527	-0.6914	-0.1035	0.2420	0.1517	0.3697	-0.1784
Aug	0.0345	0.0088	-0.4400	-0.0045	-0.0698	0.0642	0.2572	-0.1563
Sep	0.2758	-0.1120	-0.7412	-0.8755	-0.1270	0.0735	0.2711	-0.2362
Oct	0.0680	-0.1953	-0.3113	-0.1962	0.1805	-0.0172	0.0666	-0.1114
Nov	0.1068	-0.1178	0.0280	-0.5099	0.1757	-0.0080	-0.0887	-0.3955
Variance								
C	0.0446*	0.0048*	0.0297*	0.2880*	0.0288*	0.0026*	0.5486*	0.0009*
Jan	0.0338*	0.0000	0.0224*	-0.2664*	-0.0065*	-0.0001	-0.0044	0.0031*
Feb	0.0992*	-0.0016*	-0.0399*	-0.2579*	-0.0361*	0.0032*	0.1989*	0.0016*
Mar	0.0406*	-0.0018*	0.0089	-0.1175*	-0.0078*	0.0011*	-0.2387*	0.0095*
Apr	0.1067*	-0.0016*	-0.0373*	-0.2621*	-0.0363*	0.0009*	-0.0353	0.0049*
May	0.0226*	-0.0016*	-0.0125*	-0.2534*	-0.0183*	-0.0002	-0.2640*	0.0132*
Jun	0.1370*	-0.0019*	0.0258*	-0.2617*	-0.0079*	0.0018*	0.5898*	0.0175*
Jul	0.0252*	-0.0021*	-0.0328*	-0.2575*	-0.0254*	0.0005*	0.3735*	0.0143*
Aug	0.0405*	-0.0013*	-0.0204*	-0.2647*	-0.0290*	0.0001	0.2151*	-0.0009*
Sep	0.0191*	-0.0018*	-0.0328*	-0.2285*	-0.0208*	0.0001	0.0869*	0.0024*
Oct	0.0357*	0.0011	-0.0029	-0.2502*	-0.0218*	0.0000	0.1803*	0.0011*
Nov	0.0574*	-0.0033*	-0.0403*	-0.2356*	-0.0236*	-0.0001	0.3128*	0.0097*
Crisis	0.1789*	-0.0016*	-0.0008	-0.0233*	-0.0001	-0.0014*	0.9068*	0.0074*
ARCH	0.0919*	0.1062*	0.0323*	0.1740*	0.0446*	0.1116*	0.0218*	0.1770*
Leverage	0.0340*	0.0381*	0.0099*	0.0370*	0.0331*	0.0331*	0.1212*	-0.0371*
GARCH	0.6241*	0.8419*	0.9519*	0.7782*	0.9276*	0.8170*	-0.0935*	0.6912*
L	4633.77	9618.77	3339.66	6311.10	5524.78	10801.36	3528.64	10169.63
LB (8)	44.098	24.547	159.340	34.646	77.971	24.716	96.660	4.246
p.val	0.000	0.002	0.000	0.000	0.000	0.002	0.000	0.834
LB (16)	50.524	42.528	165.950	43.986	82.316	27.488	111.540	17.222
p.val	0.000	0.000	0.000	0.000	0.000	0.036	0.000	0.371
LB-Qs (8)	10.957	10.511	11.440	2.145	11.505	10.852	4.254	3.138
p.val	0.204	0.231	0.178	0.976	0.175	0.210	0.833	0.925
LB-Qs (16)	21.871	13.535	18.574	7.492	18.245	14.469	13.202	34.729
p.val	0.147	0.633	0.291	0.963	0.310	0.564	0.658	0.004

Note: This table shows the monthly effect on stock returns and volatility for the eight sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Jan – Nov are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Jan – Nov represent the effect of months on the returns and on the volatility. C represents the effect of December and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2

Appendix 7.2A

GJR GARCH Model: Islamic Calendar 1 – 7 firms

Mean	PK:ACC	PK:ABB	PK:ACB	PK:ADI	PK:AGR	PK:AGT	PK:ALN
C	-0.1530	-0.1161	0.0285	0.0725	0.1448	-0.0136	-0.0309
Muh	0.2774	0.2712	0.0924	0.1046	-0.2319	0.1706	-0.0681
Saf	0.0788	0.0401	0.1507	0.2831	-0.1465	-0.0468	0.3635
RabA	0.2438	-0.0135	0.0276	0.0606	0.2554	0.1819	-0.0773
RabT	-0.1659	0.1881	-0.3723*	-0.4070*	-0.1003	0.1289	-0.4120
JamA	0.0134	0.1746	-0.0462	-0.3243	-0.1439	0.0050	0.0345
JamT	-0.1165	0.0075	0.0489	0.1464	-0.0342	0.1230	0.1335
Raj	-0.0980	-0.0527	-0.0580	-0.2635	-0.2058	-0.0442	0.3668
Sha	-0.0150	0.1136	0.1346	-0.0942	-0.0354	0.0993	0.0403
Ram	0.1076	0.2587	0.2979	0.1586	0.1721	0.2695	-0.2853
Shaw	-0.0293	0.3603	0.0038	0.0115	0.1856	0.0809	-0.0809
ZilQ	0.1440	0.2839	0.2425	0.0383	-0.0046	0.0773	0.1705
Variance							
C	0.0046*	0.0303*	0.0055*	0.0078*	0.0063*	0.0129*	0.0501*
Muh	0.0064*	-0.0148*	-0.0011	0.0077*	-0.0006	0.0016*	0.0784*
Saf	-0.0029	-0.0216*	0.0020*	0.0108*	0.0027*	0.0064*	0.2084*
RabA	0.0044*	-0.0136*	0.0000	0.0023	-0.0017*	0.0021*	-0.0345*
RabT	0.0002	-0.0188*	-0.0008	0.0019	0.0001	0.0030*	0.1690*
JamA	0.0000	-0.0159*	-0.0008	0.0014	-0.0007	0.0056*	-0.0049*
JamT	0.0072*	-0.0100*	-0.0003	0.0056*	-0.0002	0.0000*	-0.0145
Raj	0.0025	-0.0197*	-0.0008	0.0086*	0.0006	0.0076*	0.0148*
Sha	0.0020	-0.0245*	-0.0005	0.0003	-0.0005	0.0088*	0.0115*
Ram	0.0028	-0.0195*	0.0003	0.0054*	0.0010	0.0136*	0.0071*
Shaw	0.0058*	-0.0116*	0.0009	0.0031	-0.0007	0.0015*	0.0973*
ZilQ	0.0017	-0.0011	-0.0008	0.0047*	-0.0001	0.0009*	0.0822*
Crisis	-0.0029*	0.0011*	-0.0022*	-0.0027*	-0.0057*	-0.0087*	0.0266*
ARCH	0.0329*	0.2414*	0.0980*	0.1565*	0.0598*	0.2156*	0.0643*
Leverage	0.0238*	-0.0424	0.0578*	0.0683*	-0.0210*	-0.0707*	0.0950*
GARCH	0.9303*	0.4207	0.8186*	0.7184*	0.9405*	0.6449*	0.3690*
L	7080.96	10339.06	9499.47	8575.91	7944.58	9705.02	7164.48
LB (8)	10.818	6.569	22.744	118.59	7.3693	7.0074	54.552
p.val	0.212	0.584	0.004	0.000	0.497	0.536	0.000
LB (16)	20.105	9.5046	27.929	130.02	18.99	20.872	65.716
p.val	0.216	0.891	0.032	0.000	0.269	0.183	0.000
LB-Qs (8)	32.727	2.8173	22.744	11.952	23.355	2.4347	4.7244
p.val	0.000	0.945	0.004	0.153	0.003	0.965	0.787
LB-Qs (16)	37.501	33.635	27.929	22.236	34.739	4.5194	19.502
p.val	0.002	0.006	0.032	0.136	0.004	0.998	0.243

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2B

GJR GARCH Model: Islamic Calendar 8 – 14 firms

Mean	PK:ALT	PK:ART	PK:ASB	PK:ATH	PK:ATR	PK:BAP	PK:BKP
C	0.0006	-1.2861	-0.3024	0.0710	-0.0223	-0.1749	0.3089
Muh	-0.0549	1.0758	-0.3704	0.1796	-0.0263	0.3155	-0.3888
Saf	0.0881	0.8044	0.0459	0.0214	0.0224	0.3122	-0.2019
RabA	0.0295	1.8034	0.3734	-0.0024	-0.1490	0.1404	-0.1141
RabT	-0.2376	1.2351	0.3021	-0.0129	0.0171	0.1852	-0.8034*
JamA	-0.2172	1.3810	0.2747	0.0755	-0.1054	-0.0152	-0.2085
JamT	0.3374	0.8219	0.3538	-0.1481	-0.0992	0.0831	-0.2800
Raj	-0.4953	1.2531	-0.5415	0.0651	0.0232	0.0877	-0.3903
Sha	0.5536	0.8699	-0.0131	-0.1015	0.0638	0.3573	-0.4869*
Ram	0.2325	0.3194	-0.9290	-0.0240	0.1999	0.1553	0.0296
Shaw	0.2205	2.0501*	0.5822	0.0234	-0.0180	0.2219	-0.1771
ZilQ	-0.0688	1.7113	0.2437	-0.0266	0.1480	0.5485	-0.0501

Variance	PK:ALT	PK:ART	PK:ASB	PK:ATH	PK:ATR	PK:BAP	PK:BKP
C	0.0175*	0.1045*	0.0621*	0.0077*	0.0265*	0.0754*	0.0169*
Muh	0.0656*	-0.0552*	-0.0551*	0.0471*	0.0009	-0.0679*	-0.0040*
Saf	-0.0197*	-0.0028	-0.0338*	0.0097*	-0.0264*	-0.0584*	-0.0002
RabA	-0.0084*	0.0580*	-0.0630*	0.0049*	0.0290*	-0.0673*	0.0000
RabT	-0.0080*	-0.0878*	-0.0257*	0.0041*	-0.0125*	-0.0736*	-0.0002
JamA	0.0057*	-0.1070*	-0.0299*	-0.0015*	-0.0144*	-0.0546*	-0.0019
JamT	0.1579*	-0.0445*	-0.0398*	0.0003	-0.0200*	-0.0561*	0.0028*
Raj	-0.0141*	-0.1071*	-0.0613*	0.0333*	-0.0222*	-0.0228*	-0.0043*
Sha	0.0286*	0.1359*	-0.0213*	-0.0001	0.0171*	-0.0379*	0.0002
Ram	-0.0184*	-0.0946*	0.0097*	0.0247*	-0.0201*	-0.0695*	0.0040*
Shaw	0.0720*	-0.0338*	-0.0360*	0.0849*	0.0012	-0.0154*	-0.0032*
ZilQ	-0.0005	-0.0121	-0.0656*	-0.0042*	-0.0139*	-0.0078*	-0.0031*
Crisis	-0.0059*	0.0559*	0.0055*	0.0068*	0.0208*	0.0349*	-0.0092*

	PK:ALT	PK:ART	PK:ASB	PK:ATH	PK:ATR	PK:BAP	PK:BKP
ARCH	0.1095*	0.0415*	0.0716*	0.4405*	0.1908*	0.1578*	0.1119*
Leverage	-0.0333*	0.0138*	0.0082	-0.3646*	0.0546*	-0.0489	0.0503*
GARCH	0.8880*	0.8893*	0.8880*	0.5131*	0.3896*	0.0293*	0.7997*
L	4765.76	3137.29	4719.58	9270.96	9614.76	9963.41	8029.83

	PK:ALT	PK:ART	PK:ASB	PK:ATH	PK:ATR	PK:BAP	PK:BKP
LB (8)	22.457	39.834	89.908	7.6846	70.565	23.222	41.928
p.val	0.004	0.000	0.000	0.465	0.000	0.003	0.000
LB (16)	31.17	48.156	94.361	15.758	85.785	27.134	63.238
p.val	0.013	0.000	0.000	0.470	0.000	0.040	0.000
LB-Qs (8)	2.6254	5.1479	12.227	2.2003	14.212	6.851	5.2805
p.val	0.956	0.742	0.141	0.974	0.076	0.553	0.727
LB-Qs (16)	8.0832	13.593	15.342	4.5437	18.785	13.547	13.559
p.val	0.946	0.629	0.500	0.998	0.280	0.632	0.632

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2C

GJR GARCH Model: Islamic Calendar 15 – 21 firms

Mean	PK:BOC	PK:CCB	PK:CEI	PK:CPB	PK:CSA	PK:CTC	CTX
C	-0.2097	0.0929	0.0165	0.0770	-0.1666	0.2068	0.0543
Muh	0.3072	-0.2727	0.3577	-0.1898	0.0899	-0.3742	-0.3065
Saf	0.0922	-0.2434	-0.0810	-0.0604	0.5157	-0.0790	-0.0563
RabA	0.1718	0.0222	0.1109	0.0593	0.3137	-0.3039	0.0067
RabT	0.1518	0.2776	0.1673	-0.0760	0.1092	-0.2059	-0.4320
JamA	0.1785	0.0883	0.0163	-0.2685	-0.0058	-0.2696	0.1065
JamT	0.2523	-0.0893	0.0094	-0.0438	0.2608	-0.2133	-0.1702
Raj	0.3558*	-1.2908*	-0.2250	-0.1400	0.1108	-0.2887	-0.0944
Sha	0.0333	-0.2480	-0.0239	0.0729	0.1152	-0.1056	-0.2095
Ram	0.2331	0.0583	0.0221	0.0896	0.4836	-0.1152	0.0074
Shaw	0.5875*	0.1587	0.0450	-0.0098	0.5618	-0.4413	-0.0501
ZilQ	0.3683	-0.0869	0.3149	-0.0650	0.0485	-0.2421	0.3956
Variance							
C	0.0945*	0.0132*	0.0768*	0.0310*	0.0169*	0.0193*	0.1488*
Muh	-0.0039*	-0.0064*	-0.0638*	0.0020	-0.0098*	-0.0038*	0.0132
Saf	0.0037	0.0021	-0.0619*	0.0130*	-0.0035*	-0.0031	0.0187*
RabA	0.0580*	-0.0084*	-0.0701*	0.0023	-0.0117*	-0.0027	-0.0087
RabT	0.0002	0.0314*	-0.0615*	-0.0017	-0.0097*	-0.0036	0.0004
JamA	0.0004	-0.0085*	-0.0766*	0.0048*	-0.0088*	-0.0067*	0.0216*
JamT	0.0033	-0.0075*	-0.0757*	0.0038*	-0.0073*	-0.0035*	-0.0164*
Raj	0.0004	0.0226*	-0.0614*	0.0025	-0.0099*	-0.0011	0.0233*
Sha	0.0156*	-0.0063*	-0.0768*	-0.0009	-0.0075*	-0.0071*	-0.0057
Ram	0.0052*	0.0029	-0.0750*	0.0020	-0.0018*	-0.0046*	-0.0183*
Shaw	0.0249*	-0.0062*	-0.0732*	-0.0011	-0.0069*	-0.0062*	-0.0026
ZilQ	0.0155*	0.0082*	-0.0728*	0.0000	-0.0096*	0.0064*	0.0120
Crisis	-0.0768*	-0.0057*	0.0031*	-0.0201*	-0.0050*	-0.0076*	-0.0808*
ARCH	0.1827*	0.0927*	0.0977*	0.1392*	0.1010*	0.1235*	0.2212*
Leverage	-0.0568*	0.0562*	-0.0121*	-0.0398*	-0.0121	0.0199	-0.1077*
GARCH	0.3700*	0.8433*	0.7932*	0.6808*	0.8492*	0.7659*	0.0878
L	8648.51	7545.40	9513.77	8581.96	8615.07	8440.86	7870.51
LB (8)	12.604	9.0382	21.614	14.235	11.549	15.721	19.795
p.val	0.126	0.339	0.006	0.076	0.172	0.047	0.011
LB (16)	21.567	18.801	38.378	23.253	15.551	30.316	26.281
p.val	0.158	0.279	0.001	0.107	0.485	0.016	0.050
LB-Qs (8)	2.2038	6.2251	1.141	29.185	2.4294	7.1267	4.0333
p.val	0.974	0.622	0.997	0.000	0.965	0.523	0.854
LB-Qs (16)	3.6709	12.652	40.819	34.303	6.7421	15.637	9.9567
p.val	0.999	0.698	0.001	0.005	0.978	0.479	0.869

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2D

GJR GARCH Model: Islamic Calendar 22 – 28 firms

Mean	PK:DAD	PK:DAN	PK:DDH	PK:DEG	PK:DES	PK:DSM	PK:ENL
C	-0.2494	-0.1726	0.0524	0.0939	0.1372	0.1899	0.0612
Muh	-0.2534	0.3319	0.0379	0.1632	-0.0199	-0.1915	0.0150
Saf	0.3075	-0.1241	0.0585	0.1139	-0.1359	-0.5950	-0.2089
RabA	0.2175	0.3030	0.0942	0.0256	-0.3494	-0.2233	0.0439
RabT	0.2034	0.1564	-0.0278	-0.2608	-0.4995	-0.6308	-0.3391
JamA	-0.0060	-0.0357	-0.1219	-0.3482	-0.1672	-0.1609	0.2154
JamT	0.3475	-0.1212	0.0220	-0.0089	0.0725	-0.1487	-3.4655*
Raj	-0.2610	0.4842	-0.1896	-0.2224	-0.4242	-0.2084	-0.1855
Sha	0.0949	0.2357	-0.0751	-0.0579	-0.3185	-0.1746	-0.3054
Ram	0.2158	-0.0674	0.1866	-0.0071	-0.1157	-0.3542	0.0209
Shaw	0.0079	0.1449	0.3018	-0.2785	-0.3699	-0.1629	-0.0442
ZilQ	0.0775	-0.4502	0.0876	-0.0008	-0.1862	-0.3097	0.1179
Variance							
C	0.0263*	0.0068*	0.0243*	0.0071*	0.0125*	0.1249*	0.0358*
Muh	0.0310*	0.0897*	0.0153*	0.0003	-0.0107*	-0.1251*	-0.0307*
Saf	0.0122*	0.0222*	0.0071*	0.0017	-0.0054*	-0.0933*	-0.0191*
RabA	-0.0028	0.0438*	0.0073*	0.0007	-0.0099*	-0.1230*	0.0143*
RabT	0.0032	0.0322*	-0.0022	-0.0001	-0.0082*	-0.0884*	-0.0312*
JamA	-0.0060*	0.0423*	0.0035*	-0.0009	-0.0074*	-0.1214*	-0.0205*
JamT	0.0120*	0.0194*	-0.0007	0.0010	-0.0026*	-0.1215*	0.0359*
Raj	-0.0095*	0.0533*	-0.0019	0.0003	-0.0100*	-0.1247*	-0.0279*
Sha	0.0054*	0.0134*	0.0021	-0.0011	-0.0069*	-0.1244*	-0.0014
Ram	-0.0068*	0.0357*	0.0010	0.0007	-0.0076*	-0.1078*	-0.0273*
Shaw	-0.0011	0.1368*	0.0063*	0.0001	-0.0060*	-0.0993*	-0.0097*
ZilQ	-0.0078*	0.0294*	0.0045*	-0.0003	-0.0094*	-0.1083*	-0.0247*
Crisis	-0.0056*	-0.0093*	-0.0126*	-0.0046*	-0.0003	0.0153*	-0.0065*
ARCH	0.0524*	0.1121*	0.2458*	0.0974*	0.0657*	0.1545*	0.1246*
Leverage	0.0768*	-0.0177	0.0525	0.0322*	0.0635*	0.0167	-0.0136
GARCH	0.8427*	0.8154*	0.4837*	0.8576*	0.8771*	0.7328*	0.8587*
L	6070.80	5648.92	9285.17	8277.98	7791.37	8256.72	5865.39
LB (8)	50.387	33.93	7.7618	29.864	12.907	10.57	39.708
p.val	0.000	0.000	0.457	0.000	0.115	0.227	0.000
LB (16)	52.886	44.476	16.741	34.39	17.271	20.71	54.448
p.val	0.000	0.000	0.403	0.005	0.368	0.190	0.000
LB-Qs (8)	7.5778	4.7534	3.1252	13.93	3.5764	2.3195	3.3046
p.val	0.476	0.784	0.926	0.084	0.893	0.970	0.914
LB-Qs (16)	10.154	36.178	7.7091	27.224	7.8598	19.313	5.0407
p.val	0.858	0.003	0.957	0.039	0.953	0.253	0.996

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2E

GJR GARCH Model: Islamic Calendar 29 – 35 firms

Mean	PK:ERO	PK:ETU	PK:FAU	PK:FEC	PK:FZM	PK:GAI	PK:GAT
C	0.1489	-0.0096	0.1260	-0.0917	-0.1505	-0.2135	0.1574
Muh	-0.1558	0.0519	-0.0590	-0.0314	0.0157	0.3780	-0.0707
Saf	-0.0031	0.2340	0.0210	0.0578	0.1749	0.0099	-0.4521*
RabA	-0.0889	0.0717	-0.1695	0.0105	0.1632	0.0388	-0.0398
RabT	-0.2347	-0.0100	0.0437	-0.0589	0.0346	0.2607	0.0287
JamA	-0.2413	-0.1703	-0.0373	-0.3426	0.0222	0.5128	-0.0851
JamT	-0.1896	-0.1380	0.0276	0.2662	0.1384	0.2426	-0.1962
Raj	-0.1247	0.0099	-0.1626	-0.0970	0.2464	0.1995	-0.2912
Sha	-0.0167	-0.0165	-0.0103	0.0968	0.2846	0.0078	-0.2381
Ram	0.1451	0.1522	0.1318	0.2501	0.1018	0.4003	-0.0486
Shaw	-0.0576	0.1515	0.0469	-0.1642	0.1726	0.3480	-0.0667
ZilQ	0.0042	0.2358	0.1084	-0.1183	0.2426	0.2037	-0.1088
Variance							
C	0.0064*	0.0168*	0.0049*	0.0096*	0.0496*	0.0222*	0.0000
Muh	0.0015	0.0099*	-0.0001	-0.0020	-0.0036*	-0.0130*	0.0021*
Saf	0.0002	0.0086*	0.0024*	0.0013	-0.0023*	-0.0103*	0.0057*
RabA	-0.0027*	0.0140*	0.0020*	-0.0052*	0.0698*	-0.0117*	-0.0006
RabT	-0.0006	0.0018	-0.0007	0.0001	-0.0015*	-0.0122*	0.0025*
JamA	-0.0027*	-0.0014	-0.0003	-0.0029*	-0.0042*	-0.0062*	0.0008
JamT	-0.0002	0.0047*	0.0002	-0.0043*	-0.0035*	-0.0082*	0.0017*
Raj	-0.0020*	0.0007	0.0015*	-0.0012	-0.0046*	-0.0064*	0.0051*
Sha	0.0020*	0.0020	-0.0002	-0.0005	0.0075*	-0.0076*	0.0013*
Ram	-0.0009	0.0002	0.0003	0.0022*	-0.0075*	-0.0067*	0.0032*
Shaw	0.0018	0.0109*	-0.0008	-0.0006	0.0432*	-0.0096*	0.0013
ZilQ	0.0023*	0.0019	0.0006	-0.0046*	0.0018	-0.0096*	0.0032*
Crisis	-0.0015*	-0.0052*	-0.0027*	-0.0043*	-0.0371*	-0.0044*	-0.0006*
ARCH	0.1521*	0.1520*	0.1688*	0.0501*	0.1808*	0.1462*	0.0558*
Leverage	0.1203*	0.0126	0.0051	-0.0074	-0.1371*	-0.1006*	0.0025
GARCH	0.7149*	0.5860*	0.7572*	0.9210*	0.6796*	0.7929*	0.9262*
L	9766.51	9273.34	10379.94	7660.97	8282.38	8652.67	8735.09
LB (8)	38.98	42.194	17.337	8.5289	2.6036	9.7726	13.67
p.val	0.000	0.000	0.027	0.384	0.957	0.281	0.091
LB (16)	59.718	54.93	24.479	17.806	23.584	18.302	22.427
p.val	0.000	0.000	0.080	0.335	0.099	0.307	0.130
LB-Qs (8)	5.7413	2.2423	5.3636	11.438	1.1742	3.1034	21.726
p.val	0.676	0.973	0.718	0.178	0.997	0.928	0.005
LB-Qs (16)	15.005	9.6989	7.6703	15.857	4.4126	17.359	28.017
p.val	0.524	0.882	0.958	0.463	0.998	0.363	0.031

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2F

GJR GARCH Model: Islamic Calendar 36 – 42 firms

Mean	PK:GLT	PK:GOP	PK:GSM	PK:GTR	PK:GWC	PK:HAB	PK:HPM
C	-0.0090	0.0383	-0.2480	-0.1824	0.2455	-0.1960	0.7469
Muh	0.0669	0.0055	0.2027	0.2478	-0.3599	0.2754	-0.7592
Saf	0.0394	-0.0083	0.0064	0.2634	-0.5699	0.3119	-0.7407
RabA	0.0246	-0.0753	0.0588	0.3601	-0.4335	0.3369	-0.8630
RabT	-0.0040	-0.0734	0.2961	0.0832	-0.2957	0.2971	-0.8120*
JamA	-0.0469	-0.0342	0.1552	0.1271	-0.2073	0.3574	-0.8608
JamT	-0.0163	0.0197	0.5013	0.1775	-0.9064	-0.0675	-0.7471
Raj	-0.0589	-0.0371	0.2242	-0.0155	-0.4588	0.3476	-0.4366
Sha	0.0046	-0.1300	0.5877*	0.1017	-0.3270	0.2944	-0.8570
Ram	0.0152	0.0964	0.1740	0.4836*	-0.3457	0.4472	-0.9953*
Shaw	0.1006	0.1089	0.3619	0.0559	-0.2404	0.2346	-0.5535
ZilQ	0.0018	-0.1182	0.4432	0.1977	-0.3160	-0.1915	-0.9317*
Variance							
C	0.0038*	0.0141*	-0.0058*	0.0148*	0.0644*	0.0081*	0.0338*
Muh	0.0019*	-0.0061*	0.0131*	-0.0003	-0.0403*	0.0004	-0.0311*
Saf	-0.0008*	-0.0029*	0.0184*	0.0068*	-0.0416*	0.0069*	-0.0303*
RabA	-0.0004	-0.0032*	0.0134*	-0.0030*	-0.0646*	0.0072*	-0.0042*
RabT	0.0002	-0.0069*	0.0037*	-0.0029*	-0.0561*	0.0011	-0.0331*
JamA	0.0001	-0.0048*	0.0135*	0.0001	-0.0514*	0.0052*	-0.0206*
JamT	0.0002	-0.0018*	0.0270*	-0.0027*	-0.0360*	0.0104*	-0.0339*
Raj	0.0014*	0.0146*	0.0052*	0.0027*	-0.0570*	0.0079*	-0.0116*
Sha	-0.0007*	0.0095*	0.0169*	-0.0043*	0.0432*	0.0048*	-0.0188*
Ram	0.0014*	0.0020	0.0041*	0.0019	-0.0467*	0.0136*	-0.0313*
Shaw	-0.0006*	-0.0050*	0.0163*	-0.0004	-0.0649*	0.0001	-0.0274*
ZilQ	0.0000	0.0023*	0.0186*	-0.0023*	-0.0414*	0.0068*	-0.0252*
Crisis	-0.0024*	-0.0037*	0.0002	-0.0068*	0.0052*	-0.0030*	0.0010*
ARCH	0.1442*	0.2178*	0.0482*	0.2142*	0.1416*	0.1308*	0.1803*
Leverage	-0.0417*	0.0457*	-0.0001	-0.0902*	-0.0904*	0.0099	0.0009
GARCH	0.8307*	0.6155*	0.9229*	0.7327*	0.8229*	0.7677*	0.7282*
L	10318.39	9676.78	7288.30	8861.33	7112.88	8406.15	10159.21
LB (8)	11.826	33.073	26.154	17.81	6.1027	29.489	57.447
p.val	0.159	0.000	0.001	0.023	0.636	0.000	0.000
LB (16)	20.294	40.956	30.199	25.139	13.526	39.483	71.003
p.val	0.207	0.000	0.017	0.067	0.634	0.001	0.000
LB-Qs (8)	14.145	4.0951	2.5543	7.6667	4.9088	6.1818	8.438
p.val	0.078	0.848	0.959	0.467	0.767	0.627	0.392
LB-Qs (16)	22.793	15.169	6.3404	12.17	59.181	8.3285	27.612
p.val	0.119	0.512	0.984	0.732	0.000	0.938	0.035

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2G

GJR GARCH Model: Islamic Calendar 43 – 49 firms

Mean	PK:HPN	PK:HSM	PK:HUB	PK:HUF	PK:ICI	PK:ICP	PK:IMO
C	0.1313	0.1588	0.1345	0.0389	-0.1052	0.0492	0.0189
Muh	-0.0303	-0.5641	-0.2210	0.0991	0.3502	0.2670	0.0111
Saf	-0.0288	0.0414	-0.0734	-0.1219	0.0933	0.0363	0.2609
RabA	-0.1894	-0.1780	-0.0804	-0.0576	0.2376	-0.0841	-0.0566
RabT	0.0440	0.1287	-0.1002	0.0002	0.1179	-0.0924	0.0984
JamA	-0.3009	-0.2783	-0.1639	-0.3388	0.0347	0.0145	0.0112
JamT	-0.2612	-0.3239	-0.0431	0.0544	0.1068	0.0391	0.2368
Raj	-0.2132	-0.2505	-0.0940	-0.1008	0.0377	-0.2442	0.0789
Sha	-0.1214	0.1809	-0.0050	-0.2149	0.1107	0.0368	-0.0217
Ram	-0.0436	0.0731	0.1187	0.2467	0.3996	0.3039	0.2674
Shaw	-0.3150	-0.0980	-0.1311	0.0829	0.1414	-0.1188	0.2119
ZilQ	-0.3070	0.1087	-0.0535	0.3093	0.1496	0.1153	0.0965
Variance							
C	0.0221*	0.0716*	0.0031*	0.1372*	0.0108*	0.0058*	0.0095*
Muh	-0.0013	-0.0137*	-0.0005	-0.0089*	-0.0046*	-0.0012	-0.0043*
Saf	0.0055*	-0.0223*	0.0002	-0.0107*	-0.0066*	-0.0006	0.0010
RabA	0.0436*	-0.0470*	-0.0006	-0.0086*	-0.0067*	-0.0027*	-0.0006
RabT	-0.0058*	-0.0291*	0.0003	-0.0013	-0.0054*	-0.0010	-0.0014
JamA	-0.0012	-0.0241*	-0.0003	-0.0097*	-0.0062*	-0.0007	-0.0039*
JamT	-0.0042*	-0.0454*	0.0001	-0.0124*	-0.0053*	-0.0011	-0.0008
Raj	0.0106*	-0.0449*	-0.0003	-0.0129*	-0.0054*	0.0053*	-0.0023*
Sha	0.0058*	0.0156*	0.0000	-0.0179*	-0.0059*	0.0012	-0.0019*
Ram	-0.0068*	-0.0315*	0.0004	-0.0130*	-0.0022*	0.0004	0.0019*
Shaw	0.0314*	-0.0026	-0.0007*	0.0917*	-0.0073*	-0.0005	-0.0010
ZilQ	0.0427*	-0.0234*	-0.0003	0.0329*	-0.0071*	-0.0006	-0.0026*
Crisis	-0.0106*	-0.0097*	-0.0020*	-0.0956*	-0.0029*	-0.0021*	-0.0037*
ARCH	0.2395*	-0.0164*	0.0878*	0.1350*	0.0963*	0.1661*	0.1720*
Leverage	-0.0473	0.1645*	0.0530*	-0.0706*	0.0269*	-0.0021	-0.0201
GARCH	0.5364*	0.5307*	0.8654*	0.5634*	0.8474*	0.7962*	0.7707*
L	9274.15	8995.40	9946.24	7133.22	9228.56	9125.81	9200.54
LB (8)	14.924	25.555	16.164	18.021	33.953	21.991	35.106
p.val	0.061	0.001	0.040	0.021	0.000	0.005	0.000
LB (16)	20.968	38.92	24.418	20.597	43.721	35.298	45.527
p.val	0.180	0.001	0.081	0.195	0.000	0.004	0.000
LB-Qs (8)	0.9675	12.849	10.912	0.3657	2.6933	21.92	15.898
p.val	0.998	0.117	0.207	1.000	0.952	0.005	0.044
LB-Qs (16)	2.6313	18.77	14.578	1.2547	5.8037	27.542	19.131
p.val	1.000	0.281	0.556	1.000	0.990	0.036	0.262

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2H

GJR GARCH Model: Islamic Calendar 50 – 56 firms

Mean	PK:INI	PK:JIN	PK:KIE	PK:KNR	PK:KWG	PK:LAK	PK:LDP
C	-0.0078	0.0389	0.0452	0.2660	0.1496	0.0924	-0.0201
Muh	0.1003	0.0132	-0.1223	-0.2666	-0.1184	-0.0584	0.1271
Saf	0.0330	0.0010	-0.0257	-0.3635	-0.2623	0.0034	0.0805
RabA	-0.0356	-0.0255	-0.0028	-0.1576	-0.0143	0.0828	0.1674
RabT	0.1874	0.0833	-0.4230	-0.2322	-0.4424	-0.0742	0.0267
JamA	0.0417	-0.1645	-0.3863	-0.3597	-0.0490	-0.0945	0.0649
JamT	0.0785	-0.1951	-0.0147	-0.5891	-0.5926	-0.0863	0.0391
Raj	0.1135	-0.1670	-0.4268	-0.5767	-0.6335	-0.0750	-0.0373
Sha	-0.0171	-0.1506	-0.1112	-0.3909	-0.2576	-0.1837	0.0659
Ram	-0.0812	-0.0578	0.1111	0.0985	0.1625	-0.0826	-0.0023
Shaw	0.2332	0.1881	-0.1060	-0.2231	-0.2361	0.1222	0.3812*
ZilQ	0.1876	0.0038	-0.2734	-0.3045	0.3313	-0.1807	-0.0709
Variance							
C	0.0041*	0.0327*	0.0130*	0.1137*	0.0536*	0.0064*	0.0062*
Muh	0.0031*	-0.0014	-0.0055*	0.0025	-0.0450*	0.0003	0.0001
Saf	-0.0041*	0.0041*	0.0066*	-0.0108*	-0.0315*	-0.0025*	-0.0017*
RabA	-0.0024*	0.0037*	-0.0060*	-0.0004	-0.0414*	0.0832*	0.0015*
RabT	0.0000	0.0037*	-0.0051*	-0.0053	-0.0115*	-0.0040*	-0.0002
JamA	-0.0023*	0.0044*	-0.0061*	0.0020	-0.0378*	0.0007	0.0026*
JamT	0.0030*	0.0007	-0.0032	-0.0052	0.0938*	0.0219*	0.0000
Raj	0.0194*	-0.0009	-0.0034	-0.0101*	-0.0024	-0.0038*	0.0148*
Sha	-0.0024*	-0.0056*	-0.0039*	-0.0099*	-0.0434*	0.0246*	0.0004
Ram	0.0019*	0.0003	0.0019	0.0021	-0.0392*	-0.0064*	0.0048*
Shaw	-0.0001	0.0042*	-0.0067*	-0.0030	-0.0246*	0.0097*	0.0085*
ZilQ	0.0030*	0.0009	-0.0007	-0.0106*	-0.0356*	-0.0004	0.0008
Crisis	0.0029*	-0.0189*	-0.0004	-0.0756*	-0.0097*	0.0028*	-0.0021*
ARCH	0.2337*	0.1302*	0.1307*	0.1635*	0.0981*	0.1726*	0.1703*
Leverage	-0.1249*	0.1373*	0.0347*	-0.0096	0.0281*	0.0626*	0.0093
GARCH	0.7313*	0.4626*	0.8005*	0.6108*	0.8186*	0.6255*	0.6954*
L	10119.01	9592.24	7783.17	6826.97	6911.61	9986.55	10067.81
LB (8)	6.6832	19.691	4.6408	4.8854	11.864	19.76	6.4579
p.val	0.571	0.012	0.795	0.770	0.157	0.011	0.596
LB (16)	20.664	31.52	26.243	9.387	17.013	32.862	22.117
p.val	0.192	0.012	0.051	0.897	0.385	0.008	0.139
LB-Qs (8)	9.7086	6.0989	14.418	1.5499	3.0395	2.4899	2.6338
p.val	0.286	0.636	0.071	0.992	0.932	0.962	0.955
LB-Qs (16)	15.326	21.263	19.552	2.4818	15.19	4.6798	3.1956
p.val	0.501	0.169	0.241	1.000	0.511	0.997	1.000

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2I

GJR GARCH Model: Islamic Calendar 57 – 63 firms

Mean	PK:MAL	PK:MBK	PK:MET	PK:MIR	PK:MLC	PK:MRB	PK:MTT
C	-0.0713	0.0054	0.1644	0.0112	0.0762	-0.1885	0.0411
Muh	0.0008	0.1976	-0.0248	-0.2351	-0.0695	0.0492	0.1063
Saf	0.5898*	0.1613	-0.0725	-0.0107	-0.0841	0.0309	0.0857
RabA	-0.0707	0.2560	-0.1898	-0.5420	-0.0123	0.3387	0.1162
RabT	0.0591	0.0589	-0.3240	-0.0880	-0.2161	0.1559	0.0044
JamA	0.2510	-0.0081	-0.1389	0.0846	-0.4212	0.2785	0.0033
JamT	-0.0106	0.1962	-0.0847	-0.1025	-0.0256	0.2254	0.0178
Raj	0.0307	0.0040	-0.1958	-0.0444	-0.1883	0.1563	0.0678
Sha	-0.2256	0.2772	-0.0791	0.1175	-0.0454	0.1913	0.2652
Ram	0.5782	0.1773	0.1448	-0.0518	0.0532	0.4253*	0.1453
Shaw	-0.2418	0.0127	0.0378	0.2802	-0.2443	0.3041	0.0566
ZilQ	0.3404	0.2268	0.0998	0.0290	-0.3169	0.2385	0.0100
Variance							
C	0.0008	0.0166*	0.0046*	0.0000	0.0113*	0.0140*	0.0139*
Muh	0.0000	-0.0031*	-0.0019*	0.0724*	0.0009	0.0157*	0.0023*
Saf	0.0019*	-0.0003	-0.0018*	0.0317*	0.0001	0.0222*	0.0254*
RabA	-0.0026*	-0.0067*	-0.0021*	0.0547*	0.0053*	0.0004	0.0037*
RabT	-0.0002	-0.0042*	-0.0022*	0.0320*	0.0041*	0.0058*	0.0000
JamA	-0.0009	-0.0068*	-0.0025*	0.0046*	-0.0011	-0.0107*	0.0012*
JamT	0.0008	-0.0034*	-0.0026*	0.0099*	0.0021	-0.0043*	0.0011*
Raj	-0.0032*	-0.0028	0.0015*	0.0014*	0.0040*	-0.0114*	0.0106*
Sha	0.0110*	-0.0024	-0.0032*	0.0139*	-0.0021	0.0194*	0.0197*
Ram	-0.0046*	-0.0035*	0.0006	0.0045*	0.0041*	0.0039*	0.0176*
Shaw	0.0009	-0.0033*	-0.0030*	0.0207*	0.0121*	-0.0093*	0.0034*
ZilQ	-0.0068*	-0.0039*	-0.0008	0.0405*	-0.0028*	0.0155*	0.0008
Crisis	-0.0001	-0.0071*	-0.0006*	0.0109*	-0.0062*	0.0056*	-0.0098*
ARCH	0.0183*	0.1277*	0.1010*	0.1821*	0.0879*	0.1340*	0.3130*
Leverage	0.0087*	0.0808*	-0.0181	-0.1457*	0.0257*	-0.0322*	-0.1692*
GARCH	0.9778*	0.7339*	0.8616*	0.6447*	0.8411*	0.5807*	0.5433*
L	6175.94	8992.72	9779.29	8926.45	7736.30	9513.93	10050.09
LB (8)	120.11	31.949	8.3173	10.192	9.6247	17.009	13.81
p.val	0.000	0.000	0.403	0.252	0.292	0.030	0.087
LB (16)	128.99	43.085	21.313	12.394	14.624	25.204	17.171
p.val	0.000	0.000	0.167	0.716	0.552	0.066	0.375
LB-Qs (8)	45.687	7.5544	12.301	2.2783	2.948	1.8262	1.1075
p.val	0.000	0.478	0.138	0.971	0.938	0.986	0.997
LB-Qs (16)	54.359	10.39	14.931	4.3293	10.986	11.934	2.4497
p.val	0.000	0.845	0.530	0.998	0.810	0.749	1.000

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2J

GJR GARCH Model: Islamic Calendar 64 – 70 firms

Mean	PK:NAR	PK:NAT	PK:NHT	PK:NMI	PK:NON	PK:NPK	PK:ORI
C	0.0961	-0.1829	-0.0101	0.1923	0.0330	0.0302	-0.0641
Muh	-0.1750	0.2326	0.2911	-0.0446	-0.2855	0.2494	0.0306
Saf	-0.1882	0.0021	-0.1222	-0.0930	-0.0691	-0.0301	-0.1953
RabA	0.1100	0.0788	0.1013	-0.1238	0.1377	-0.0511	-0.0215
RabT	-0.0050	-0.0936	-0.1231	-0.2232	-0.0531	0.0456	0.0931
JamA	-0.1316	0.0750	0.2006	-0.2628	-0.2372	-0.0611	-0.0020
JamT	0.0051	-0.0089	0.0786	-0.3040	0.0365	-0.0506	0.3015
Raj	0.1001	0.1393	-0.2474	-0.4590	-0.1222	-0.1014	-0.1010
Sha	-0.0818	-0.0033	0.1470	-0.1236	-0.0812	-0.0482	0.1512
Ram	0.1143	0.3592	0.2458	0.3301	0.1630	0.1881	0.0624
Shaw	-0.0726	0.3104	0.0264	-0.2328	0.3872	0.1774	0.3082
ZilQ	-0.0795	0.1926	0.2305	0.1729	0.2567	0.4069	0.0474
Variance							
C	0.0279*	0.0065*	0.0192*	0.0475*	0.0037*	0.0094*	0.0041*
Muh	-0.0237*	0.0030*	-0.0006	-0.0171*	0.0077*	-0.0044*	-0.0019*
Saf	-0.0237*	-0.0020*	-0.0015	-0.0145*	0.0017*	-0.0101*	0.0013*
RabA	-0.0218*	0.0004	-0.0018	-0.0186*	-0.0020*	-0.0094*	0.0002
RabT	-0.0233*	0.0014*	0.0025	-0.0139*	-0.0030*	-0.0048*	-0.0014*
JamA	-0.0228*	-0.0003	0.0004	-0.0213*	0.0025*	-0.0060*	0.0067*
JamT	-0.0208*	0.0015	-0.0047*	-0.0195*	-0.0035*	-0.0088*	-0.0018*
Raj	-0.0215*	0.0016	-0.0003	-0.0175*	0.0022*	-0.0082*	0.0026*
Sha	-0.0227*	-0.0020*	-0.0012	-0.0104*	-0.0048*	-0.0044*	0.0049*
Ram	-0.0215*	0.0040*	0.0006	-0.0019	-0.0016*	-0.0086*	0.0026*
Shaw	-0.0213*	0.0007	-0.0002	-0.0073*	0.0006	-0.0072*	-0.0010*
ZilQ	-0.0246*	-0.0048*	0.0017	-0.0174*	0.0047*	-0.0068*	-0.0012*
Crisis	-0.0018*	-0.0019*	-0.0112*	-0.0207*	0.0005*	0.0007*	-0.0025*
ARCH	0.1345*	0.0886*	0.0991*	0.1578*	0.0879*	0.0807*	0.0700*
Leverage	-0.0349*	0.0249*	0.0398*	0.0907*	-0.0496*	-0.0226*	-0.0019
GARCH	0.8235*	0.8657*	0.7825*	0.6419*	0.8987*	0.8913*	0.8928*
L	9059.48	7928.75	8350.43	8340.69	8752.44	9803.81	9318.39
LB (8)	24.793	15.727	39.302	41.664	15.448	5.6073	28.139
p.val	0.002	0.046	0.000	0.000	0.051	0.691	0.000
LB (16)	31.639	22.958	53.273	57.753	26.294	11.299	31.433
p.val	0.011	0.115	0.000	0.000	0.050	0.791	0.012
LB-Qs (8)	1.9023	5.9114	8.379	4.5324	11.986	4.7965	2.186
p.val	0.984	0.657	0.397	0.806	0.152	0.779	0.975
LB-Qs (16)	3.4755	11.545	17.806	5.6326	29.011	15.272	5.8596
p.val	1.000	0.775	0.335	0.992	0.024	0.505	0.990

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2K

GJR GARCH Model: Islamic Calendar 71 – 77 firms

Mean	PK:PAC	PK:PAL	PK:PBS	PK:PCT	PK:PEN	PK:PET	PK:PLC
C	-0.2953	0.1188	0.0242	-0.0351	0.2078	-0.1944	0.0001
Muh	0.2554	-0.0940	-0.1012	0.1837	-0.2768	0.4398	-0.8237
Saf	0.4703	-0.2297	-0.0113	-0.1495	-0.4479	0.1858	-0.6835
RabA	0.1761	0.0419	0.0396	0.2202	-0.2777	0.4841	0.1757*
RabT	0.5030	-0.4544*	0.0175	-0.1690	-0.4890	0.2605	-0.2412
JamA	0.3352	-0.2535	0.0280	-0.2083	-0.1244	0.0303	-0.4305*
JamT	0.3667	-0.2679	0.0980	0.3827	-0.0522	0.0451	-0.2298
Raj	-0.1475	-0.2835	0.0750	-0.1880	-0.3857	-0.0735	0.0563
Sha	0.2428	-0.2677	0.0053	0.1430	-0.3037	-0.0321	-0.1792
Ram	0.2669	-0.0256	0.0936	0.1619	-0.3765	0.0630	0.0837
Shaw	0.3027	-0.0728	-0.0717	-0.2407	0.3059	0.1707	-0.1571
ZilQ	0.4272	-0.0881	0.2444	-0.2235	-0.5283	0.3216	-0.0044
Variance							
C	0.0210*	0.0088*	0.0023*	0.0097*	0.2031*	0.0387*	0.0000
Muh	-0.0164*	-0.0009	0.0005	0.0088*	-0.0849*	-0.0130*	0.1196*
Saf	-0.0190*	0.0049*	-0.0003	0.0063*	0.0057	-0.0123*	0.0649*
RabA	-0.0101*	0.0004	0.0000	0.0040*	-0.0487*	-0.0083*	-0.0002*
RabT	-0.0167*	-0.0042*	-0.0005	0.0035*	-0.0593*	-0.0121*	0.0065*
JamA	-0.0191*	0.0006	0.0013*	0.0024	-0.0610*	-0.0091*	0.0091*
JamT	-0.0115*	0.0006	0.0025*	0.0146*	-0.0789*	-0.0131*	0.0360*
Raj	0.0483*	0.0027*	-0.0002	0.0053*	0.0381*	-0.0116*	0.0218*
Sha	-0.0153*	0.0005	-0.0008*	0.0032	-0.0798*	-0.0086*	0.0008*
Ram	-0.0102*	0.0105*	0.0009*	0.0106*	-0.0819*	-0.0069*	0.0166*
Shaw	-0.0205*	0.0026	0.0001	0.0020	-0.0104	-0.0094*	0.0130*
ZilQ	-0.0147*	0.0026	0.0035*	0.0078*	-0.0775*	-0.0079*	0.0000*
Crisis	-0.0006*	-0.0026*	-0.0007*	-0.0090*	-0.1183*	-0.0215*	0.0001*
ARCH	0.1811*	0.1068*	0.1307*	0.0883*	0.1624*	0.1081*	0.1789*
Leverage	0.0235	-0.0026	0.0450*	0.0106	0.1436*	0.0113	0.0812*
GARCH	0.7507*	0.8402*	0.8083*	0.8601*	0.6735*	0.8080*	0.7415*
L	9769.30	7776.85	10206.38	7311.72	6778.87	7734.98	7858.89
LB (8)	4.9463	20.109	23.663	14.499	7.4627	12.406	11.823
p.val	0.763	0.010	0.003	0.070	0.488	0.134	0.159
LB (16)	17.827	43.639	33.239	19.683	12.86	20.162	24.05
p.val	0.334	0.000	0.007	0.235	0.683	0.213	0.088
LB-Qs (8)	1.5502	13.134	12.543	8.0917	0.9512	4.8895	8.0968
p.val	0.992	0.107	0.129	0.425	0.999	0.769	0.424
LB-Qs (16)	29.128	18.301	21.471	13.261	39.928	15.931	13.799
p.val	0.023	0.307	0.161	0.654	0.001	0.458	0.614

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2L

GJR GARCH Model: Islamic Calendar 78 – 84 firms

Mean	PK:PNC	PK:PNS	PK:POF	PK:PRE	PK:PSC	PK:PSM	PK:PSO
C	0.0036	0.0267	-0.0231	0.1241	0.2167	-0.0334	0.0965
Muh	-0.5578	-0.1807	0.1559	-0.3680	-0.2977	-0.1965	0.0642
Saf	0.0590	-0.3051	0.0033	-0.1764	-0.1325	0.1636	-0.1270
RabA	0.1797	-0.1815	0.1978	-0.0274	-0.2214	0.0568	-0.0203
RabT	0.3053	-0.0693	0.0070	-0.2588	-0.2468	-0.0239	-0.2685
JamA	-0.0628	-0.2440	-0.0169	-0.2053	-0.3412	-0.0731	-0.0379
JamT	0.1025	-0.0785	0.0782	-0.0909	-0.1949	0.0897	-0.0462
Raj	0.0738	-0.0819	0.3688	-0.0903	-0.2531	-0.0714	-0.3369*
Sha	-0.0725	-0.1291	0.0692	-0.3337	-0.4075	0.1742	0.1515
Ram	-0.1186	0.1684	0.2205	-0.1393	0.1002	0.4014*	0.2121
Shaw	0.3614	0.0567	0.2249	0.0045	-0.4975	0.0883	-0.0496
ZilQ	0.1602	0.1644	0.0782	0.0144	-0.1796	-0.0399	-0.0775
Variance							
C	0.0593*	0.0240*	0.0014*	0.0045*	0.0054*	0.0109*	0.0021*
Muh	-0.0164*	-0.0004	-0.0008*	0.0003	-0.0040*	0.0028*	-0.0012*
Saf	-0.0331*	0.0028	-0.0006*	0.0015*	-0.0044*	0.0099*	0.0000
RabA	-0.0295*	0.0012	0.0009*	-0.0004	-0.0035*	0.0014	-0.0014*
RabT	-0.0250*	-0.0001	0.0001	-0.0014*	-0.0045*	0.0038*	-0.0010*
JamA	-0.0480*	0.0002	-0.0014*	0.0012*	-0.0013	0.0009	0.0001
JamT	-0.0242*	0.0012	0.0018*	0.0006	-0.0060*	0.0015	-0.0002
Raj	0.0042	0.0001	0.0080*	-0.0013*	-0.0001	0.0075*	-0.0013*
Sha	-0.0422*	0.0009	-0.0002	-0.0004	-0.0003	0.0004	0.0015*
Ram	0.0051	0.0140*	0.0009*	-0.0002	-0.0044*	0.0028*	-0.0007
Shaw	0.0006	-0.0008	0.0094*	0.0005	0.0008	0.0046*	-0.0008
ZilQ	-0.0430*	0.0010	0.0015*	-0.0022*	-0.0071*	0.0109*	0.0001
Crisis	0.0006	-0.0203*	0.0001*	-0.0024*	-0.0005*	-0.0055*	-0.0008*
ARCH	0.0645*	0.1107*	0.0985*	0.0788*	0.0480*	0.2211*	0.0866*
Leverage	-0.0705*	0.0218*	0.0337*	-0.0311*	0.0071	-0.0150	0.0806*
GARCH	0.5717*	0.8305*	0.8560*	0.9094*	0.9376*	0.6521*	0.8683*
L	9308.98	7461.41	9893.90	8707.13	7541.46	9214.42	9846.49
LB (8)	31.48	16.817	20.818	89.461	53.154	37.577	62.927
p.val	0.000	0.032	0.002	0.000	0.000	0.000	0.000
LB (16)	38.956	24.71	40.757	96.165	63.518	57.909	71.588
p.val	0.001	0.075	0.001	0.000	0.000	0.000	0.000
LB-Qs (8)	1.4205	6.345	4.8969	8.5046	15.9	4.3781	2.9483
p.val	0.994	0.609	0.769	0.386	0.044	0.821	0.938
LB-Qs (16)	3.575	16.176	9.909	19.296	21.053	9.5666	10.729
p.val	0.999	0.441	0.871	0.254	0.176	0.888	0.826

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2M

GJR GARCH Model: Islamic Calendar 85 – 91 firms

Mean	PK:PTC	PK:SEA	PK:SEC	PK:SEP	PK:SER	PK:SHA	PK:SHK
C	0.0252	-0.1462	-0.0639	0.0050	-0.0302	0.0883	-0.0542
Muh	-0.1129	0.0604	-0.1107	0.0291	-0.0764	-0.2008	-0.1101
Saf	-0.2255	0.0328	0.0748	-0.0844	0.1188	-0.0983	0.1117
RabA	0.1593	0.1447	-0.1212	-0.1412	0.0306	-0.0321	0.0073
RabT	0.2652	0.2044	0.0781	-0.1240	-0.1149	-0.2967	-0.0726
JamA	-0.0071	0.0904	-0.1154	-0.0212	-0.1660	-0.1130	-0.1453
JamT	-0.1445	0.1464	-0.2587	-0.4282	0.1138	-0.0644	-0.2013
Raj	-0.3168	0.0129	-0.6118	-0.0843	-0.0022	0.1203	0.2577
Sha	0.0040	0.2058	0.0714	-0.0146	0.0081	0.0414	0.1480
Ram	0.3322	0.3252	0.1685	0.0064	-0.0538	0.0155	0.6684
Shaw	-0.1364	0.1003	-0.0181	-1.3209*	0.0157	-0.0908	-0.1268
ZilQ	-0.1132	0.2602	-0.1011	0.2490	-0.0085	-0.1404	-0.0354
Variance							
C	0.0061*	0.0011*	0.0029*	0.0033*	0.0380*	0.0074*	-0.0058*
Muh	-0.0001	0.0024*	0.0110*	0.0054*	-0.0006	0.0014*	0.0129*
Saf	0.0145*	0.0023*	-0.0013	-0.0007*	-0.0207*	0.0104*	0.0038*
RabA	-0.0028*	0.0027*	-0.0006	0.0270*	-0.0286*	-0.0004	0.0129*
RabT	-0.0007	0.0015*	-0.0036*	0.0014*	-0.0336*	-0.0046*	0.0085*
JamA	0.0031*	0.0017*	0.0031*	0.0041*	0.0085*	-0.0008	0.0057*
JamT	0.0028*	0.0019*	0.0159*	0.0265*	-0.0238*	-0.0030*	0.0132*
Raj	0.0098*	0.0032*	-0.0017	0.0005	-0.0380*	0.0004	0.0049*
Sha	-0.0023*	0.0016*	0.0004	0.0231*	-0.0302*	0.0017*	0.0058*
Ram	0.0092*	0.0059*	0.0254*	-0.0033*	0.0101*	-0.0004	0.0651*
Shaw	0.0000	0.0011	-0.0111*	0.0548*	-0.0226*	0.0050*	-0.0084*
ZilQ	-0.0022*	0.0027*	0.0053*	0.0016*	-0.0372*	-0.0035*	0.0248*
Crisis	-0.0018*	-0.0010*	-0.0004*	0.0029*	0.0031*	-0.0022*	0.0002*
ARCH	0.1259*	0.0862*	0.0410*	0.1697*	0.2240*	0.0822*	0.0414*
Leverage	-0.0406*	0.0528*	0.0419*	-0.1251*	-0.0806*	-0.0236*	0.0016
GARCH	0.8231*	0.8591*	0.9222*	0.6880*	0.6587*	0.8702*	0.9351*
L	8774.58	9247.07	6608.85	10091.62	9857.54	8604.43	7684.05
LB (8)	6.3812	9.1994	35.615	17.034	51.416	21.069	4.0607
p.val	0.605	0.326	0.000	0.030	0.000	0.007	0.852
LB (16)	11.723	15.553	41.303	24.753	60.205	36.732	10.293
p.val	0.763	0.485	0.000	0.074	0.000	0.002	0.851
LB-Qs (8)	2.8114	17.954	12.699	0.7566	0.3823	5.2316	1.6846
p.val	0.946	0.022	0.123	0.999	1.000	0.733	0.989
LB-Qs (16)	7.8741	35.313	27.599	5.691	9.454	18.173	9.5129
p.val	0.953	0.004	0.035	0.991	0.894	0.314	0.891

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.2N

GJR GARCH Model: Islamic Calendar 92 – 98 firms

Mean	PK:SIT	PK:SME	PK:SNG	PK:SON	PK:SPP	PK:STM	PK:SUI
C	-0.0558	-0.2257	-0.1358	-0.2150	-0.1459	-0.2320	-0.2990
Muh	-0.0469	0.3584*	0.3340	0.3930	0.1047	0.0100	0.4073*
Saf	0.1265	0.2193	0.2029	0.1668	0.1850	0.1843	0.5126*
RabA	0.0215	0.0418	0.2890	0.2217	0.1224	0.2255	0.4911*
RabT	0.0764	0.2821	-0.1248	-0.0194	0.2049	0.1475	0.1336
JamA	0.0247	0.3440	0.0643	0.1481	0.1087	0.1192	0.1697
JamT	0.1903	0.2844	0.1937	0.2008	0.2504	-0.0686	0.4529*
Raj	0.0445	0.2600	-0.1862	0.1983	0.1502	-0.1200	0.1372
Sha	0.0078	0.3529	0.0819	0.3102	0.2374	0.2911	0.3422*
Ram	0.1408	0.5926*	0.3036	0.4217	-0.2495	0.1886	0.5788*
Shaw	0.3933	0.6475*	0.2957	0.3227	0.0801	0.3906	0.3461
ZilQ	0.0455	0.4466*	0.1931	0.5340	0.2942	0.3279	0.3253
Variance							
C	0.0037*	0.0015*	0.0062*	0.0276*	0.0067*	0.0028*	0.0103*
Muh	0.0053*	0.0091*	-0.0013	-0.0204*	0.0013*	0.0072*	-0.0047*
Saf	0.0009*	-0.0016*	0.0045*	-0.0212*	0.0032*	-0.0001	-0.0005
RabA	0.0028*	0.0050*	0.0014	-0.0212*	0.0006*	0.0046*	0.0001
RabT	0.0025*	0.0037*	-0.0012	-0.0241*	0.0059*	0.0021*	-0.0061*
JamA	0.0007	0.0137*	-0.0020*	-0.0240*	-0.0006*	0.0025*	-0.0050*
JamT	0.0046*	0.0027*	0.0000	-0.0211*	0.0006*	0.0061*	-0.0041*
Raj	0.0021*	0.0033*	-0.0001	-0.0219*	-0.0004*	0.0014*	-0.0042*
Sha	0.0032*	0.0068*	-0.0014	-0.0206*	0.0040*	0.0035*	-0.0025*
Ram	0.0022*	0.0024*	0.0051*	-0.0220*	0.0048*	0.0026*	0.0028*
Shaw	0.0064*	0.0132*	0.0008	-0.0208*	0.0023*	0.0097*	-0.0021
ZilQ	0.0020*	0.0060*	-0.0003	-0.0187*	0.0074*	0.0040*	-0.0037*
Crisis	-0.0032*	0.0026*	-0.0027*	0.0002	-0.0064*	-0.0038*	-0.0025*
ARCH	0.0854*	0.1265*	0.1152*	0.0954*	0.0787*	0.0665*	0.1040*
Leverage	-0.0420*	-0.0973*	0.0537*	0.1100*	-0.0286*	0.0220*	0.0830*
GARCH	0.8743*	0.8058*	0.8011*	0.7593*	0.8918*	0.9057*	0.7891*
L	9308.60	9475.95	9209.26	9338.04	8934.50	7508.20	9072.94
LB (8)	4.413	15.477	24.33	12.512	31.274	10.214	12.832
p.val	0.818	0.050	0.002	0.130	0.000	0.250	0.118
LB (16)	12.54	25.048	34.722	18.835	33.374	23.376	21.477
p.val	0.706	0.069	0.004	0.277	0.007	0.104	0.161
LB-Qs (8)	3.9961	1.9387	7.8732	6.0055	11.659	13.974	5.2783
p.val	0.857	0.983	0.446	0.647	0.167	0.082	0.727
LB-Qs (16)	20.058	5.6234	22.119	7.2445	20.975	24.191	8.5563
p.val	0.218	0.992	0.139	0.968	0.179	0.085	0.931

Note: This table shows the monthly effect on stock returns and volatility for the seven sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

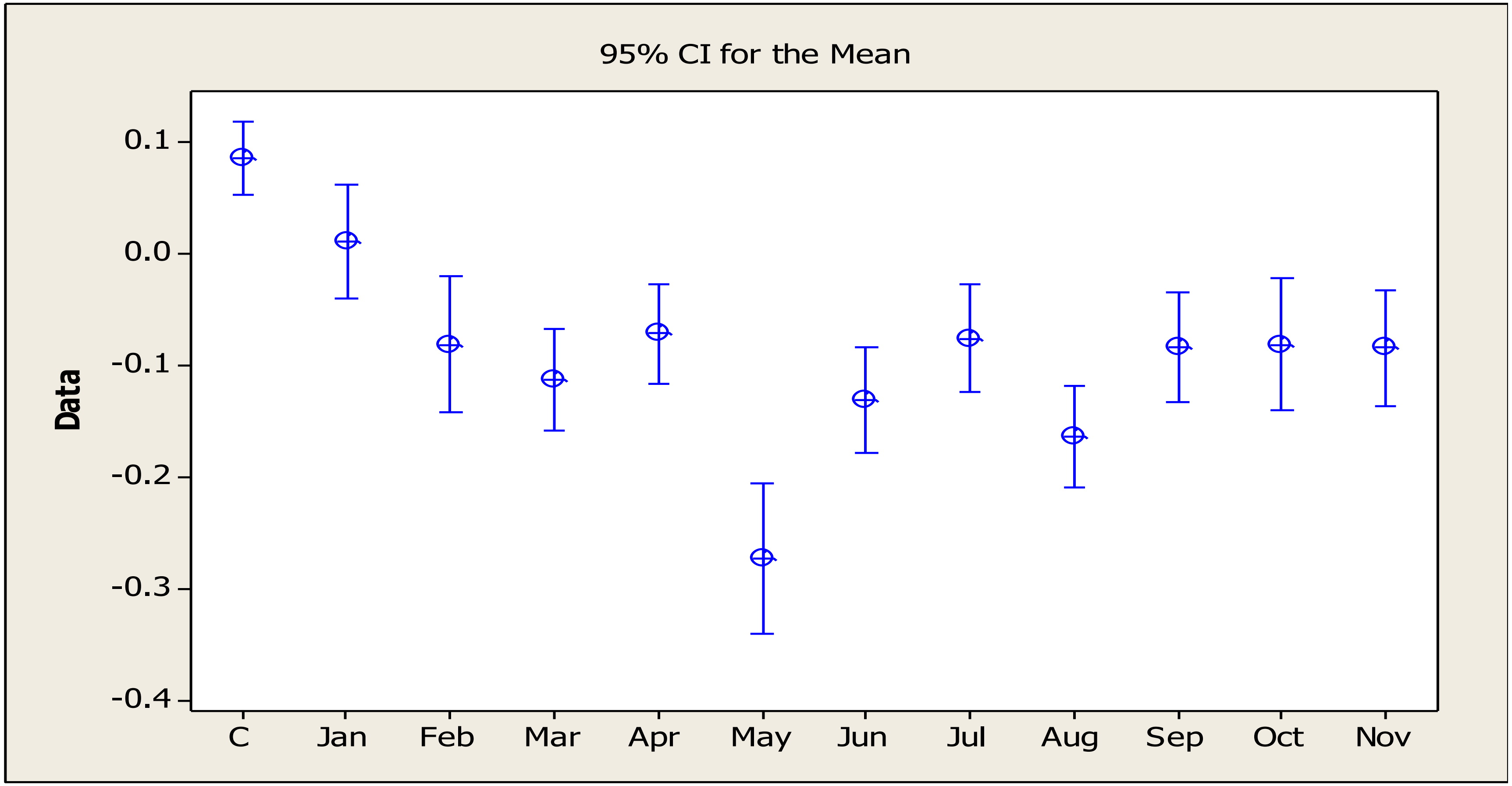
Appendix 7.2O

GJR GARCH Model: Islamic Calendar 99 – 106 firms

Mean	PK:TAJ	PK:TLM	PK:TRP	PK:TRU	PK:TSM	PK:ULV	PKUMC	PK:WYP
C	-0.1100	0.0233	0.1937	0.0125	-0.2969	0.0134	-0.3952	0.1005
Muh	0.4635	-0.0126	-0.3709	-0.0092	0.2916	0.1028	0.2752	-0.4511
Saf	-0.3158	0.0634	0.0752	0.0073	0.2011	0.1876	-0.6544	-0.2291
RabA	-0.0874	0.0688	-0.3864	-0.1140	0.2441	0.0194	-0.2187	-0.2051
RabT	-0.1998	-0.0682	-0.2848	-0.7238	0.1768	0.0994	0.3948	-0.5580
JamA	0.1884	-0.0184	-0.2534	-0.0494	0.1010	0.1458	0.2104	-0.1032
JamT	0.0863	0.0011	-0.9708	-1.0594*	0.5050	0.0574	-0.5978	-0.1056
Raj	-0.7972	-0.2558	-0.1988	0.1664	-0.4918	0.0256	0.2520	-0.0600
Sha	0.2209	-0.0734	-0.2949	-0.1547	0.0598	0.0343	-0.0356	-0.0652
Ram	0.2541	0.2146	-0.0652	0.3170	0.9133	-0.0121	0.0798	-0.0776
Shaw	-0.0820	-0.0208	-0.9696	0.0682	-1.0360	0.0507	0.1531	-0.2252
ZilQ	0.0665	0.0083	0.3929	0.2575	0.8013	0.0821	0.4163	-0.1892
Variance								
C	0.1927*	0.0022*	-0.0314*	0.0195*	0.0607*	0.0022*	-0.0144*	0.0117*
Muh	-0.1240*	0.0002	0.0680*	0.0015*	-0.0644*	0.0010*	0.0232*	0.0121*
Saf	-0.0162*	0.0014*	0.0233*	0.0082*	0.0117*	0.0040*	0.0823*	0.0147*
RabA	-0.0985*	0.0001	0.0445*	0.0062*	-0.0613*	0.0007*	-0.0007*	0.0097*
RabT	-0.1573*	-0.0002	0.0490*	0.1562*	-0.0331*	0.0015*	0.0310*	0.0290*
JamA	-0.0355*	0.0006	0.0274*	0.0029*	-0.0406*	0.0013*	0.0001*	-0.0117*
JamT	-0.1929*	0.0018*	0.0289*	0.0318*	-0.0474*	0.0009*	0.0471*	-0.0038*
Raj	-0.0655*	-0.0001	0.0648*	0.0015*	0.0077*	0.0006*	-0.0040*	-0.0095*
Sha	-0.1461*	0.0017*	0.0142*	0.0088*	-0.0539*	0.0015*	0.0594*	0.0044*
Ram	-0.1333*	0.0048*	0.0571*	0.0076*	-0.0105*	0.0012*	0.0146*	-0.0078*
Shaw	-0.1637*	-0.0006	0.0567*	0.0069*	-0.0542*	0.0007*	0.0363*	-0.0101*
ZilQ	-0.1307*	0.0010*	0.0657*	0.0106*	-0.0463*	0.0018*	0.0077*	-0.0042*
Crisis	0.1083*	-0.0014*	0.0004	-0.0205*	0.0004	-0.0019*	0.0084*	0.0054*
ARCH	0.0822*	0.0978*	0.0326*	0.1724*	0.0693*	0.1004*	0.0020*	0.1582*
Leverage	0.0406*	0.0357*	0.0071	0.0394*	0.0428*	0.0410*	0.0249*	0.0238
GARCH	0.7072*	0.8550*	0.9584*	0.8022*	0.8654*	0.8216*	0.9726*	0.6396*
L	4745.75	9631.17	3332.23	6469.24	5405.01	10795.84	3601.09	10099.50
LB (8)	42.85	23.056	160.63	24.356	62.648	23.821	100.38	3.9931
p.val	0.000	0.003	0.000	0.002	0.000	0.002	0.000	0.858
LB (16)	49.03	41.882	168.41	33.684	68.224	26.371	113.84	16.834
p.val	0.000	0.000	0.000	0.006	0.000	0.049	0.000	0.396
LB-Qs (8)	9.9256	10.659	14.831	2.9288	5.5486	10.534	10.109	0.4673
p.val	0.270	0.222	0.063	0.939	0.698	0.230	0.257	1.000
LB-Qs (16)	19.199	13.472	22.983	13.041	8.1228	14.438	13.551	25.112
p.val	0.258	0.638	0.114	0.670	0.945	0.566	0.632	0.068

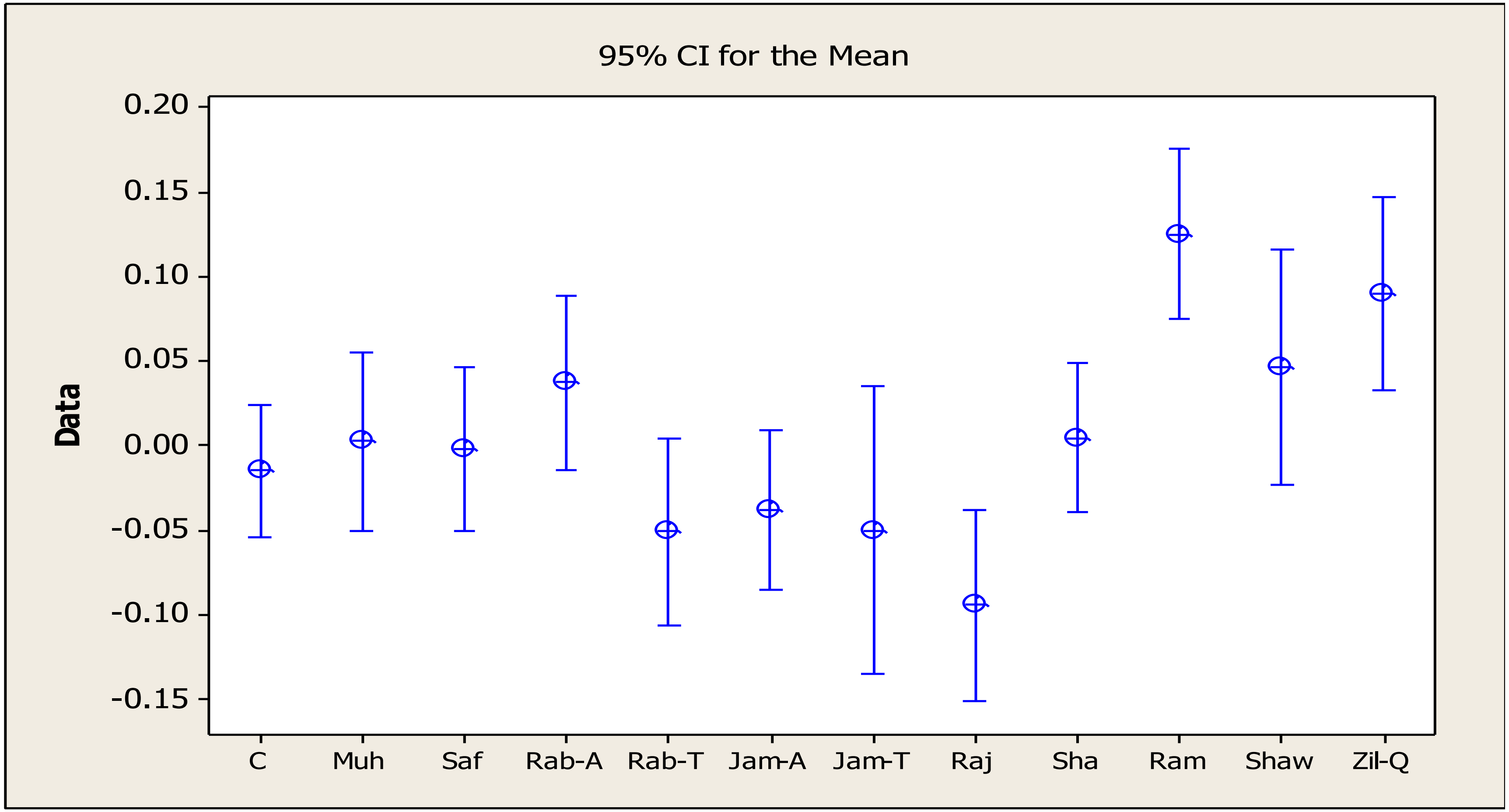
Note: This table shows the monthly effect on stock returns and volatility for the eight sample firms by using the GJR GARCH model. Mean and Variance equations are presented above where Muh – ZilQ are dummy variables coefficient for each equation multiplied by 100 for clarity reasons. Muh – ZilQ represent the effect of Islamic months on the returns and on the volatility. C represents the effect of Zil Hajj and is held constant. Crisis is the 9/11 dummy variable in the variance equation. L is the log likelihood value and and LB and LB-Qs indicate Ljung – Box Q statistics values for the standardised and squared standardised residuals, respectively. * imply the statistical significance at 5 percent level.

Appendix 7.3: Interval Plot for GARCH model coefficients (Gregorian Calendar)



Note: this figure summarise the distribution of the estimated parameters presented in Appendix 7.1 for the Gregorian calendar for January (Jan) – November (Nov). C on x-axis denote the constant term (December).

Appendix 7.4: Interval Plot for GARCH model coefficients (Islamic Calendar)



Note: this figure summarise the distribution of the estimated parameters presented in Appendix 7.2 for the Islamic calendar for Muh (Muharram) – Zil-Q (Zil Qa'ad). C on x-axis denotes the constant term (Zil Hajj).