**THE UNIVERSITY OF HULL**

# Three Empirical Studies on Market Efficiency – Evidence from the Pakistan Stock Exchange

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**by**


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## Dedication

I dedicate this research to:

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# Abstract

The thesis is comprised of three interrelated empirical chapters on the Pakistan stock exchange which effects on the market efficiency. In the first empirical chapter, **'Is the Market Efficient – Evidence from Pakistan stock exchange'**. It is evaluating the short and long run market efficiency of the stock market from the period of Jan-2005 to Dec-2014. The chapter examines the market efficiency through using notable methodology of event study and also implementing the parametric and non-parametric test such as CAAR, t-test, Patell Z, Boehmer et al., Corrado rank and sign test. Within the chapter I have arranged the dataset based on firm size in order to evaluate whether the top 25% companies have more influence on market price in comparison with bottom 25% companies. Moreover, my data set also used the technique of market efficiency curve where my analysis is giving understanding of market reaction either it is over reacting or slow response towards the dividend announcement information. Another useful technique also implemented on the dividend announcement to identify the respective information as the good news, bad news or neutral. The results indicate strong evidence in support of dividend announcement towards market reaction. The results from this chapter show evidence in support of weak form of market efficiency in the context of the Pakistan stock exchange.

The next empirical chapter entitled **"Implementation of new price impact ratios: Evidence from the Pakistan stock Exchange"** examines the liquidity measures, and, getting inspiration of the recent research of Florackis et al. (2011). The empirical chapter analyse two latest liquidity measures developed by Amihud (2002) return-to-volume (RtoV) and Florackis et al. (2011) return-to-turnover (RtoTR). Both the measures implemented into the Pakistan stock exchange. The results are more align with Florackis et al. (2011) (RtoTR) which suggests that lower RtoTR values indicates higher returns in contrast of high RtoTR ratio. Moreover, the results are also consistent with the work of Florackis et al. (2011) and Amihud

and Mendelson (1986a) where trading frequency and trading cost are important features for evaluating the returns. In addition, the findings relating to RtoV ratio indicates the negative correlation with market capitalisation which explains that small stocks are illiquid.

In the third empirical chapter, **“Market Efficiency and Anomalies: Evidence from the Pakistan Stock Exchange”** analysis is based on examining any existence of market anomalies in the Pakistan stock exchange. The analysis is considering three major anomalies i.e. day of the week effect which includes weekend effect as well, month of the year effect and holiday effect in Pakistan stock market. The importance of the particular study is to scrutinise the market anomalies by using one data set through implementation of ARCH and GARCH models. The results indicate that Pakistan stock exchange has a seasonality effect on weekend (Friday), Monday and Tuesday. The major anomalies exist in the month of August which explains the year end effect and in Pakistan the tax year ends in the month of June, additionally the announcement of budget from Government announced during the June (Federal) and July in (Provinces). However, holiday effect has no particular trend in the Pakistan stock market.

## Working Papers from Thesis:

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# Chapter 1: Introduction

## 1 Introduction

Following economic liberalization in 1990, a great deal of interest has emerged among researchers in studying and analysing stock market behaviour in Pakistan. Nishat and Sagir (1991) built an argument suggesting that the stock market in Pakistan is fully capable of channelling funds to productive sectors of the economy. They analysed and measured the link between stock prices and aggregate macroeconomic activities in Pakistan through two components of aggregate demand, namely investment and consumption expenditure, using the standard Granger causality technique. Using monthly data from 1964 to 1987 for the share index, investment expenditure, consumption expenditure and industrial production, they concluded that there is a weak relationship between economic activities and stock prices. Thus, the stock market in Pakistan appears to be informationally efficient with respect to real economic activity. The main equity market in Pakistan, the Pakistan Stock Exchange (PSX; formerly known as the Karachi Stock Exchange), has been in operation for almost half a century. However, it was not an active market until the beginning of 1991. Frequent crashes of the stock market between 1994 and 1999 showed that the PSX had rapidly become a volatile market (Mamoon 2007). Heavy fluctuations in stock prices are not an unusual phenomenon, however; such fluctuations have been observed for almost all big and small exchanges of the world. Focusing on the reasons for such fluctuations is vital, and they are likely to have important implications. According to Mamoon (2007), in 1990s the Pakistan was also associated with macro-economic uncertainty with high budget deficits, stagnant economic growth, inadequate foreign reserves and a struggling financial sector, as stock markets are the barometers of real economic activity in an economy. In last four years, the PSX has been well on the way towards becoming one of the best-performing markets in the world, as declared by the international magazine *Business Week*[1]. Similarly, the US newspaper *USA Today*[2] has termed the Karachi Stock Exchange one of the best performing in the world. The PSX emerged as one of the most profitable markets in the year 2002, and it is growing at a rapid pace. It is worth mentioning that the PSX enjoyed a return of more than 70% in 2002. The PSX has trounced both the New York Stock Exchange and the S&P 500 over three and five years in year 2002. However, like other emerging capital markets, the PSX can best be characterized as a small, thinly traded market with a low level of liquidity and a low trading volume.

### 1.1 Brief History of the Pakistan Stock Exchange (Formerly Known as the Karachi Stock Exchange)[3]

The Pakistan Stock Exchange (PSX) was founded on 11 January 2015 after the merger of all Pakistan's individual stock exchanges, that is, Karachi, Lahore and Islamabad. The earlier PSX, the Karachi Stock Exchange (Guarantee) Limited (KSE), the major and most liquid stock exchange in Pakistan, was established on 18 September 1947. It was integrated on 10 March 1949. Only 5 companies were listed at first, with total paid-up capital of 37 million rupees. The first index introduced on the KSE was based on 50 companies and was called the KSE 50 Index. Trading was carried out in an open outcry system. With the expansion in the number of listed companies and trading activities, a genuine need for a true representative index and the computerization of trading activities was felt. As a result the KSE 100 Index was initiated on 1 November 1991. A computerized trading system called the Karachi Automated Trading System (KATS) was launched in 2002 with a capacity of 1.0 million trades per day and the capability to provide connectivity to an unlimited number of users. To

[1] BusinessWeek, B., April 10, 2003.
[2] USA Today, September 19, 2002.
[3] Mainly historical information extracted from officially website of Pakistan Stock Exchange (www.psx.com.pk)

reconfirm the KSE 100 and to provide the basis of index trading in the future, an all-share index was introduced in 1995, which became operational on 18 September. To address the needs of the investor community, two other indexes were introduced later, called the KSE 30 Index and the KMI 30 Index. The Karachi Stock Exchange is located on Stock Exchange Road in the heart of the business district of Karachi. The premises are known as Stock Exchange Building.

## 1.2 Listing on the PSX

As of 20 July 2017, 582 companies are listed on the KSE, and the total market capitalization is PKR 6.426 billion. The listing is performed on the basis of the strict rules and regulations laid out by the Securities Exchange Commission of Pakistan (SECP) and the Pakistan Stock Exchange. The listed companies are classified into various main business sectors. There are in total 36 sectors listed on the Pakistan Stock Exchange. Of these, 32 sectors contribute to the market capitalization, and all the listed companies (excluding their future contracts) are divided among these; the remaining 4 sectors are allocated to indexes, futures, bonds and so on. These non-market-capitalization-contributing sectors are as follows;

- Bonds; Futures Contracts; Non-Equity Investment Instruments; and Stock Index Futures Contracts.

## 1.3 Market Indexes

### 1.3.1 KSE 100 Index

The KSE 100 Index was introduced in November 1991 with a base value of 1,000 points. The index comprises 100 companies selected on the basis of sector representation and the highest market capitalization, capturing over 90% of the total market capitalization of the companies listed on the exchange. Of the above-mentioned 36 sectors, 32 companies are selected, specifically one company from each sector (excluding the non-market-capitalization-contributing sectors) on the basis of the largest market capitalization, and the remaining 68 companies are selected on the basis of the largest market capitalization in descending order. This is a total return index; that is, the dividend, bonus and rights are adjusted.

In 1995 the need was felt for an all-share index to reconfirm the KSE 100 and to provide the basis of index trading in the future. By 29 August 1995, the KSE All Index was constructed, and it became operative on 18 September 1995. Similar to the KSE 100 Index, the KSE All Index is calculated using the market capitalization method.

### 1.3.2 KSE 30 Index

The primary objective of the KSE 30 Index is to have a benchmark by which the stock price performance can be evaluated over a period of time. In particular, the KSE 30 Index is designed to provide investors with a sense of how well the company shares of Pakistan's equity market are performing. Thus, the KSE 30 Index is similar to other indicators that track various sectors of the country's economic activity, such as the gross national product, consumer price index and so on. The KSE 30 Index is calculated using the 'free-float capitalization' methodology. In accordance with the methodology, the level of the index at any point in time reflects the free-float market value of 30 companies in relation to the base period. The free-float methodology refers to an index construction methodology that takes into account only the market capitalization of the free-float shares of a company for the purpose of index calculation.

### 1.3.3 Karachi Stock Exchange and Expanding Requirements

To keep pace with the globalization of securities trading, the KSE has taken dynamic and bold initiatives by developing an overall policy to modernize and automate the trading facilities offered to its members and investors. The aim is gradually to transform the KSE from a local into an international financial market. The most noticeable area of development is the exchange's equity trading and clearing system. The KSE has adopted a fully automated trading system with a T + 3 settlement cycle. With the exponential growth in the Pakistani capital market during the last decade resulting in a manifold increase in trading volumes, the physical handling of paper certificates became not only laborious but also time consuming. It was from this perspective that the Central Depository Company of Pakistan Limited (CDC) was incorporated in 1993 to manage and operate the Central Depository System (CDS), which is an electronic book entry system to record and transfer securities. Derivative products give depth to the capital market, providing investors with basic hedging instruments and investment alternatives. The debut of trading in futures contracts occurred at the KSE on 5 July 2001. Currently, 13 shares being traded are selected for futures trading primarily on the basis of their liquidity. The regulation of the stock exchanges improved with the establishment of the Securities and Exchange Commission on 1 January 1981, which was formed under a special law. The commission administers the compliance of the corporate laws in the country. Members of the stock exchanges are also subject to the discipline of self-regulation under various rules and regulations of the stock exchanges. It may also be noted that Pakistan has started out on the path towards economic liberalization and opened its doors to foreign and non-resident investors.

### 1.3.4 Capital Market Efficiency in Pakistan

The main purpose of a security market is to channel the flow of funds from excess liquidity units to deficit units. The focus of efficiency is to increase the liquidity of capital assets and setting prices to enhance the rate of return by minimizing the transaction cost and allocation of capital efficiently.

There are many noticeable reasons, as follows, to consider the Pakistan Stock Exchange as an underdeveloped market and the flow of information to its investors as asymmetric.

#### 1.3.4.1 Lack of Depth in the Market

The liquidity within the market is very important to the buying and selling of shares; further, the buying and selling of shares require a healthy presence of buyers and sellers in the market. However, many companies listed on the Pakistan Stock Exchange are either family-dominant (shareholding 51%), institutional participants (NIT and ICP)[4] or tightly held by public sector institutions, mutual funds and retail investors. Therefore, the free float of shares on the PSX is very small and results in illiquidity within the market and the inability to present the proper intrinsic value of shares.

#### 1.3.4.2 Lack of Breadth

The PSX has very limited sectors in which the public do participate, because common investors fear the loss of their money due to the speculative and herding mentality. In addition, common investors have very little knowledge and understanding about the market;

[4] National Investment Trust – Pakistan (NIT) and Investment Corporation of Pakistan (ICP)

therefore, they are an easy target for groups of big and seasoned investors to play with their investment. For example; most of the population of Pakistan lives in rural areas and is engaged with agricultural businesses; they are illiterate about stock market products but have investment portfolio and become easy targets. On the other hand, the financial sector is affected by non-performing loans, in which borrowers' capacity to repay the loan becomes a major aspect, so potential investors are restricted in investing their savings in the financial sector. However, many public sector companies are listed on the PSX, but, due to mismanagement and corruption within the Government people, fear that the Government may use the balance sheet and earnings for its own budgetary advantage. Therefore, investors have very little confidence in investing in public listed companies.

#### 1.3.4.3 Low Equity Base of Companies

The overall equity base of companies operating within Pakistan is very low, specifically approximately 25%–35%. Many private companies avoid listing on the Pakistan Stock Exchange, because these companies, owned by big industrialists, have enough disposable capital to manage their companies very well operationally. Many rich and profitable family-owned businesses avoid listing on the PSX, because it would involve sharing their profitability with their shareholders along with the need for more transparency in financial disclosures, requiring strict compliance with the regulations.

Many industries acquire low-cost funding from financial institutions rather than raising capital from the public. Moreover, companies use burecratic and Government influence which helps them to reduce further the cost of funds.

#### 1.3.4.4 Lack of Investors' Confidence

An equal flow of information is essential for an efficient market, but on the PSX the degree of information is relatively low and investors believe in insider news, causing inefficiency within markets and the possibility that the insider news might not be accurate, which may result in huge losses for common investors. This is due to a lack of awareness and no proper information channel for each investor. The rule of the game works with influential investors, because they have certain references and manipulate the market accordingly. Many common investors/small investors follow the trends of large investors blindly in the hope that they have authentic information and lose their valuable savings. It is the responsibility of brokerage houses and media channels to create some awareness regarding the stock market.

## 1.4 Research Motivation

There is little evidence that the Pakistani stock market is a weak form of efficient market based on earnings and profitability announcements, but the first empirical chapter of this study examines the market efficiency based on dividend announcements through the event study methodology. The main motivation of the study is to create awareness of the market efficiency within the Pakistani stock market to help investors to reduce the dominance of inside traders and to establish a transparent flow of information equally to all participants. Therefore, stocks must be traded adequately to reduce the inefficiencies, and it is dependent on the market participants to identify the opportunities (technically or fundamentally) to beat the market, resulting in the market becoming efficient. In another words, markets become efficient based on the behaviour of the investors and market players. It is also important to note that stock exchange rules and procedures play a significant role in building efficient markets.

To date a limited amount of published empirical research has been conducted to examine the market efficiency through the announcement of dividends using the event study methodology in the context of the Pakistani equity market. The concern about market efficiency is an international phenomenon that encourages foreign investors to participate in the Pakistani equity market. Therefore, the first empirical chapter of this study attempts to fill the gap in the empirical literature regarding market efficiency through the announcement of dividends.

Furthermore, the second empirical chapter of this thesis measures the liquidity of the market through Florackis et al.'s (2011) price impact ratio (RtoTR) and Amihud's (2002) price impact ratio (RtoV). These latest liquidity ratios have been evidenced to be better liquidity measures to capture the liquidity of the market in the context of the Pakistani stock market.

The last empirical chapter is based on the seasonality effects, which measure the presence of different anomalies in the market. The main motivation of this particular empirical chapter is to understand the different seasonality effects, such as the day-of-the-week effect, which also includes the weekend effect, month-of-the-year effect, turn-of-the-year effect and holiday effect. Moreover, this study uses the same data set to produce all the seasonality effects, which is new to the literature on the Pakistani stock market.

The stock market in Pakistan plays an important role in the economic growth of the entire country. The results of the present empirical studies can have significant implications for the development of future regulatory policy changes regarding the transparent flow of information, the liquidity price impact ratios will help to measure the liquidity of the market and finally the seasonality effects provide awareness to the market participants to establish their investment strategies based on market anomalies. It is important to note that the regulator of the Pakistani stock market, that is, the SECP, implemented changes in the rules that govern the Pakistan Stock Exchange to make a more transparent and improved economic atmosphere to encourage more national and foreign investors to invest in the market. Therefore, the present study will be helpful in assessing the market efficiency, the market liquidity and the existence of market anomalies, which are important to enable the regulator to design its objectives accordingly.

### 1.5 Research Questions

The research will be answered on the basis of the following research questions (RQs):

**RQ (1) – Efficiency of the Market**

a) Is the Pakistani stock market weak form, semi strong form or strong form of efficiency?

b) Does the size of a firm have an effect on returns through market capitalization? If so, then??

c) Are abnormal returns common in the Pakistani stock market before dividend announcement dates?

d) Is information asymmetric in Pakistan stock exchange market?

**RQ (2) – Liquidity of the Pakistani Stock Market**

a) Are the portfolios performing above the benchmark?

b) Do the mean returns have any relationship with the proxies for liquidity, that is, RtoTR and RtoV?

c) Does the firm size have any relationship with the liquidity measure?

d) Does high volatility exist among low price impact ratio portfolios or high price impact ratio portfolios?

**RQ (3) – Seasonality Effects on the Pakistani Stock Market**

a) Does the day-of-the-week anomaly exist in the Pakistani stock market?

b) Does the weekend effect exist in the Pakistani stock market?

c) Does the month-of-the-year anomaly exist in the Pakistani stock market?

d) Does the turn-of-the-year anomaly exist in the Pakistani stock market?

e) Does the holiday effect exist in the Pakistani stock market?

## 1.6 Research Objectives:

The objectives of the present research will be answered on the basis of the following research objectives (ROs):

**RO (1) – Efficiency of the Market**

a) To examine the market efficiency through flow of information i.e. dividend announcement.

b) To implement the following empirical methods: parametric and non-parametric tests, such as CAAR test, t-test, Patell Z test, Boehmer et al. test and Corrado rank and sign test.

**RO (2) - Liquidity of the Pakistani Stock Market**

a) To examine the liquidity measures through adopting two different price impact ratios by Amihud (2002) (R/V) and Florackis et al. (2011) (R/TR).

b) To compare the two proxies and address the issues highlighted by Florackis et al. (2011).

**RO (3) - Seasonality Effects on the Pakistani Stock Market**

a) To analyse anomalies in Pakistan stock exchange based on three different seasonalities i.e. day of the week effect, which includes weekend effect, month effect which includes turn of the year effect and holidays effect.

b) ARCH and GARCH models will use to examine the varience of returns during the three different seasonality's effect.

## 1.7 Research Contribution

This thesis contributes to the flow of information based on dividend announcements. Chapter three contributes to the market efficiency of the Pakistan Stock Exchange through dividend announcements by using the event study methodology and taking dividend announcements as events. The major contribution of the studies is the use of parametric and non-parametric models and the CAAR, t-test, Patell Z (1976), Boehmer et al. (1991) and Corrado (1989) rank and sign tests to test the presence of abnormal returns for an emerging market economy, Pakistan through three different models, widely used in developed and developing market literature such as Market Model, CAPM Model and Fama and French three factor model. Moreover, the chapter describes the concept of good news, bad news and neutral news to understand the actual returns in comparison with the expected returns. For example, if the actual returns are higher than the expected returns in the analysis, they are considered as good news; similarly, if the actual returns are lower than the expected returns, they are considered as bad news, and when the actual returns match the expected returns, they are considered as neutral news. Another remarkable contribution developed in this chapter is called the market efficiency curve, which helps us to understand whether the flow of dividend announcement information overreacts to the stocks returns or whether a slow response exists in the market based on dividend announcements.

The importance of efficient market hypothesis (EMH) in the context of Pakistan stock exchange is contributing towards the literature through distinctive ways, for example, Pakistan stock exchange has shown magnificent returns to investors during the last one decade and considered as 5th largest stock market in terms of USD returns[5]. Therefore, empirical studies conducted in this chapter will provide clear understanding of market efficiency for prospective investors (local/foreign) and prominent future direction of the market. The analysis are focus and use target methodologies to measure the market efficiency through flow of information i.e. dividend announcement into the market. Announcement of dividends[6] are key and major element for shareholders and reflect into stock returns swiftly which will examine the market efficiency.

The next empirical chapter, that is, chapter four, contributes to examining the liquidity of the Pakistan Stock Exchange through the Florackis et al. (2011) methodology of the price impact ratio (RtoTR) and the Amihud (2002) price impact ratio (RtoV). To the best of the author's knowledge, there is no evidence from the liquidity proxies used by Florackis et al. (2011) and Amihud (2002) implemented specifically on the Pakistan Stock Exchange. Therefore, the major purpose of this chapter is to implement the liquidity proxies in Pakistan and evaluate the authenticity of the claims that Florakis et al.'s (2011) proxy ratio for liquidity is actually better than Amihud's (2002) ratio in the context of the Pakistani stock market.

The main contribution of this empirical chapter is to understand the liquidity of Pakistan stock exchange where traded volume is thin, facing challenges like absence of transparency in the market, illiquidity observed on unpredictable events, slow reaction of investors, lack of corporate information and broken flow of fundamental information.

This paper contributes to literature by knowing all the above-mentioned challenges to examine the market liquidity, as it is interesting to understand the liquidity of Pakistan stock exchange for investors and policy makers. The paper is testing two price impact ratios on

[5] Source: Bloomberg (2017)

[6] The share repurchase in Pakistan stock exchange is uncommon and announcement of share repurchase dates are very rare. Therefore, author only extracted the data based on dividend announcments to examine market efficiency.

Pakistan stock exchange as new towards literature. Moreover, it is also helpful to compare the two proxies and address the issues highlighted by Florackis et al. (2011) in context of developing markets i.e. Pakistan stock exchange.

Finally, chapter five contributes to the knowledge of the seasonality effects on the Pakistan Stock Exchange by adopting the ARCH and GARCH models. In particular, this chapter covers most of the major anomalies that could exist in any market with one data set, for example the day-of-the-week effect and the monthly effect, including the turn-of-the-year effect and the holiday effect. To the best of the author's understanding and following a review of the literature on Pakistani equity markets, no explicit evidence has been found for the same data set used for all three anomalies along with the ARCH and GARCH volatility models as the methodology. Most importantly, this chapter also highlights the argument of market inefficiency due to the existence of seasonality effects.

Moreover, the major contribution is based on two different parallel calendars used in the country i.e. Gregorian calendar and Islamic calendar.

Pakistan is the distinguish Islamic country where these two calendars are used parallel and therefore, evidences and analysis are interesting and contribute new towards literature. In addition, there is a new anomaly introduce in this paper i.e. budget anomaly. It is quite interesting for many other researchers from developed / emerging markets to examine more on budget anomalies which has significant effect on the markets as well. Further, one data set has been used to cover three different anomalies such as day of the week effect, month of the year effect and holiday effects; which is also interesting for fund managers, institutional investors and individual investors to design their strategies to follow three different market anomalies.

## 1.8 Structure of the Thesis

The thesis is formally arranged as follows. Chapter two explains the rules of the exchange and the structure of the Pakistani stock market. It describes the basic functions of the Pakistan Stock Exchange, identifies the stock market players and provides a flow chart of the trade execution process: the T + 3 settlement cycle. Moreover, the chapter includes the organizational structure of the Pakistan Stock Exchange and the role of the Securities and Exchange Commission of Pakistan, a regulatory authority. Finally, the chapter describes the National Clearing and Settlement System control by the National Clearing Company of Pakistan Limited (NCCPL).

Chapter three is based on the studies of market efficiency. This chapter examines the market efficiency through the flow of information, specifically dividend announcements. The chapter explains the event study methodology and considers dividend announcements as events. The studies examine the market efficiency using parametric and non-parametric models, including the CAAR, t-test, Patell Z, Boehmer et al., Corrado rank test and sign test. Additionally, the same data set is arranged by firm size to determine whether the top 25% of companies have more influence on the market returns in comparison with the bottom 25% regarding the dividends announced. Another technique, the market efficiency curve, is used in this chapter; the analysis provides an understanding of whether the market reaction is an overreaction or a slow response to the dividend announcement information. This chapter also defines information as good news and bad news.

Chapter four investigates the liquidity of the Pakistan Stock Exchange through the Florackis et al. (2011) methodology based on the return-to-turnover ratio. Moreover, the chapter includes the Amihud (2002) methodology, which is based on the return to volume and was criticized by Florackis et al. (2011). Therefore, the aim of this chapter is to implement both methodologies for the Pakistan Stock Exchange, which is considered as an emerging market, and to determine whether the claims that Florakis et al. (2011) established are valid and appropriately acceptable for the Pakistan Stock Exchange.

Chapter five examines the seasonality effect on the Pakistan Stock Exchange through the ARCH and GARCH models. In this chapter the analyses are based on the day-of-the-week effect, which also includes the weekend effect, and the monthly effect, which also includes the turn-of-the-year effect and holiday effect. The main characteristics of this chapter are that similar data are used to evaluate all the seasonality effects to provide a rational analysis for policy makers, leading financial analysts to develop their strategy based on the results established.

Chapter six finally concludes the thesis and recommends areas for future research on the Pakistani stock market.

# Chapter 2: The Trading Mechanism of a Stock Market

## 2 How a Stock Exchange Works?

A stock exchange performs a vital role in the national economy in building investment confidence by providing a place for buyers and sellers to trade securities. Companies can issue new securities to raise capital through the primary market of the stock exchange, along with the help of investment bankers, by obtaining the initial issue of new securities from the company at a negotiated price and then making the respective securities available for their clients and other investors in an initial public offering (IPO).

The main focus of the stock exchange is on the secondary market and it plays a supporting, bridging role in the performance of primary markets. The importance of any stock exchange is to enhance investment through the trading of stocks by implementing rules and regulations for investors' safety that endorse fair trade and guarantee the protection of investors . In addition, stock exchanges use the technology and business of brokering through which the buying and selling of stocks can be executed efficiently and effectively. Moreover, stock markets enhance the safety when selling (buying) a security in the secondary market, because investors want to unload (load) quickly while prices are falling (rising) due to the unpredictable future.

## 2.1 Basic Functions of the Stock Exchange

The stock exchange performs the following key functions:


Figure 2-1: Adapted from Pakistan Economic Survey (2005)

### 2.1.1 Generating Capital for Businesses

The core function of the stock exchange is not only to raise capital for new companies but also to enhance existing companies' ability to generate capital for their expansion needs.

### 2.1.2 Organizing Savings for Investment

Stock exchanges provide an additional direction for the utilization of funds and create chances for all kinds of investors to invest their savings rather than keeping them in bank accounts. This channelling of funds enhances business activities, for example agriculture, commerce and industry, creating healthy economic growth.

### 2.1.3 Benefits for Small Investors

The contribution of small investors to trading activities is very significant for the economic development of any country, because the quantity of these small investments accounts for a respectable percentage of the total investment of a country. In addition, stock exchanges offer good prospects for small investors to own shares of various companies, similar to big investors, and perform a key role in the country's progress.

### 2.1.4 Government Raising Capital for Development Projects

Issuing bonds in stock exchanges is a very useful way for a government to raise capital for development projects. The government can avoid additional taxes on its citizens through issuing bonds, compared with financing the same amount from financial institutions, which puts an additional burden on common persons.

## 2.2 Significance of the Stock Exchange for Developing Markets

A strong empirical relationship was observed by Levine and Zervos (1996) between developing stock markets and long-run economic growth. They found that stock market development has a positive correlation with economic growth by adjusting economic growth factors, namely inflation, the black market premium on the exchange rate, the government size and the pre-observed financial depth.

In addition, Claessens et al. (2002) discussed the future of developing countries' stock markets and established that financial markets, particularly stock markets, have grown rapidly in developing countries. Further, their analysis of the previous 20 years found that high economic stability, the strategy of privatization of government-owned enterprises and financial reforms within the domestic markets are the major factors in growth. Moreover, globalization and cross-border capital flows have increased and produced new trends in stock markets.

## 2.3 Stock Market Players[7]

It is important to understand the different players in stock markets and their functionalities. The most common market players are the following.

### 2.3.1 Stockbrokers

A broker is a facilitator between customers. A broker does not share any risk but makes trade possible and easy for his or her clients and charges commission against it.

### 2.3.2 Dealers

A dealer buys and sells his or her own inventory of securities as well as those of others. However, a dealer faces the risk and can move security prices up or down to earn a profit on his or her transactions.

### 2.3.3 Broker–Dealers

A broker–dealer can work in either role but never works simultaneously in both.

### 2.3.4 Registrars

A registrar has the responsibility to maintain a legal record of a company’s shareholders. The registrar records each transaction for the buying back and selling of company shares. It is important to maintain a record of ownership of each share.

[7] Inspiration taken from US securities exchange commission websitelinks.

### 2.3.5 Registered Representatives

Registered representatives are appointed by the brokerage company and have a brokerage license issued by the Security Exchange Commission. They facilitate clients' trading of stocks, mutual funds and bonds.

### 2.3.6 Market Makers

Market makers are accountable for share price movements. They maintain the bid and offer price for a given security; for example AKD securities. When an investor executes an order to buy or sell shares to a broker, he or she transfers the order immediately to a market maker to perform the deal.

### 2.3.7 Central Counterparty

The central counterparty plays an intermediary role between the security market and the investors. The central counterparty is considered as a financial institution, and participants in major stock exchanges trade through the central counterparty. For example, if an investor wants to sell a security, then he or she sells to the central counterparty and instantaneously the central counterparty sells to a buyer. However, in the event of default from any one party, it will be borne by the central counterparty. Figure 2-2 below presents the role of brokers in the securities trading process in the capital market.

**<u>Role of the broker/dealer in trading</u>**

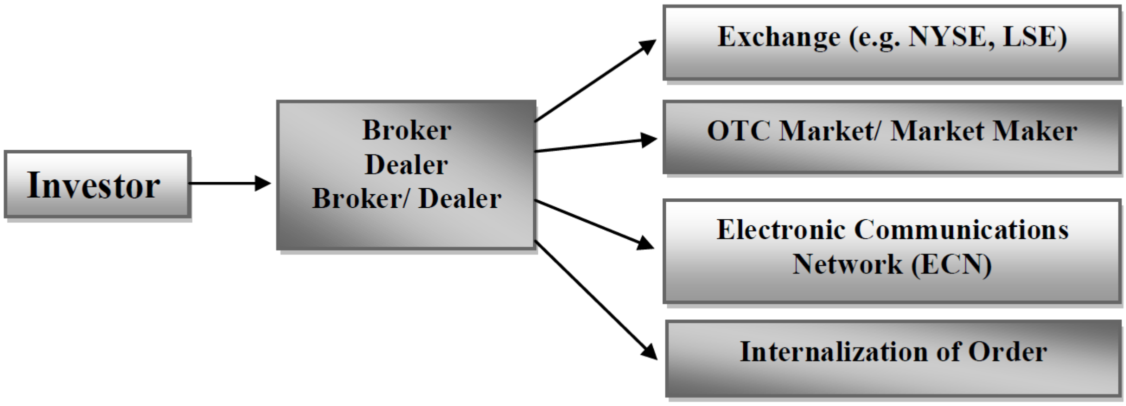



Figure 2-2: Role of Brokers in Trading Sources: Inspiration Taken from the US SEC’s Website

## 2.4 Trade Execution Process: T + 3 Settlement Cycle[8]

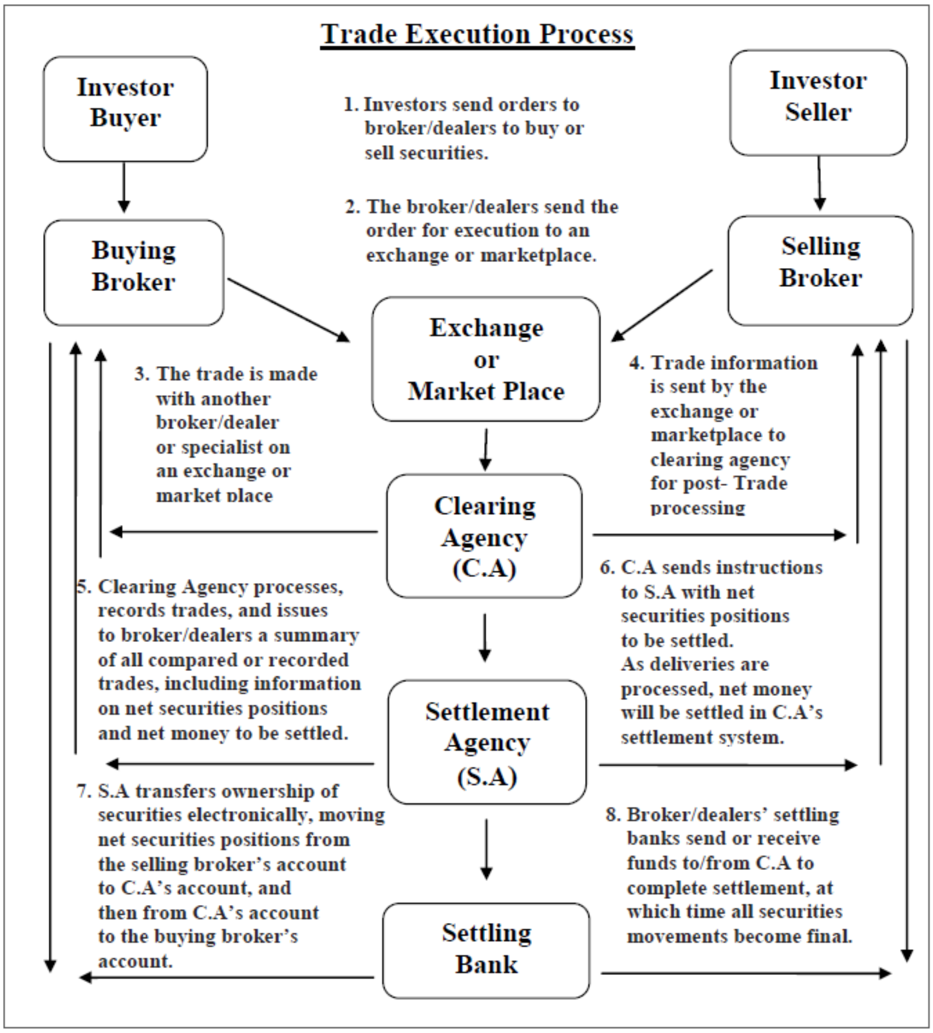



Figure 2-3: Source: Inspiration Taken from DTCC: The T + 3 Settlement Cycle

Figure 2-3 explain the seceurites settlement process.

**T + 3 Settlement Cycle**

T + 3 is usually the standard trade cycle on every stock exchange.

### 2.4.1 Trade Date (T)

The trade date is considered as the day on which an investor orders his or her transaction to buy or sell stocks through a broker and the broker executes the transaction by directing the

[8] Inspiration Taken from DTCC: The T + 3 Settlement Cycle

order to the exchange or marketplace. Normally trades are executed electronically and communicated to the clearing agency.

### 2.4.2 Trade Date + 1 (T + 1)

The major role of the clearing agency is to confirm the share quantity and prices. Afterwards it generates a computerized confirmation report of trade agreements for the involved participants. This report is considered to be legally binding between the buyer and the seller.

### 2.4.3 Trade Date + 2 (T + 2)

On day T + 2 the clearing agency circulates a preliminary report for brokers/dealers to compare all the trade transactions on the T date as well as information about the distribution of securities along with the payment on the settlement date (T + 3).

### 2.4.4 Settlement Date (T + 3)

T + 3 is considered as the settlement day for all transactions. The seller receives his or her payment of the net sale, and the buyer becomes the owner of the security. Normally this process is executed electronically, whereby the bank of the buyer transfers the funds to the settlement agency and then those funds are transferred to the seller's bank account.

## 2.5 Organizational Structure of the Pakistan Stock Exchange

Pakistan's first stock exchange and one of the country's largest stock exchanges was established in Karachi. The Pakistan Stock Exchange is non-profit and is owned by the Government of Pakistan. The PSX was again recognized as an MSCI emerging stock market in May 2017.

### 2.5.1 The governance of Pakistan Stock Exchange

The Pakistan Stock Exchange board of directors consists of 10 members, who include the Managing Director. Within this board only 5 elected directors are selected from 200 members of the PSX, and the remaining directors are selected by the Securities and Exchange Commission of Pakistan. The Chairman of the Board is chosen from the non-member directors. Moreover, the operational and administrative responsibilities fall on the Managing Director, because he is the full-time Chief Executive.

### 2.5.2 The regulation of stock market in Pakistan through Securities and Exchange Commission of Pakistan

The Securities and Exchange Commission of Pakistan (SECP) was established on 1 January 1999 by the dissolution of the Corporate Law Authority (CLA). The SECP is an autonomous regulatory authority that manages and implements the compliance with corporate laws in the country.

### 2.5.3 PSX Business Units

There are three business units in the PSX (formally called the Karachi Stock Exchange – KSE): the operations department, business development and marketing department and IT department.

#### 2.5.3.1 Operations Department

The operations department is responsible for providing the best customer service and maintaining a healthy relationship between listed companies and members through smoothly running operations within the PSX.

#### 2.5.3.2 Business Development and Marketing Department

The main aim of the business development and marketing department is to introduce new products to the market and build a strong research base environment in which the PSX can compete with other emerging markets.

#### 2.5.3.3 The role of IT Department in Paksitan Stock Exchange

The IT department has a very strong trading system with a capacity of over a million trade transactions per day. The main aim of the IT department is to handle the flow of transactions swiftly and provide high-tech services for investors.

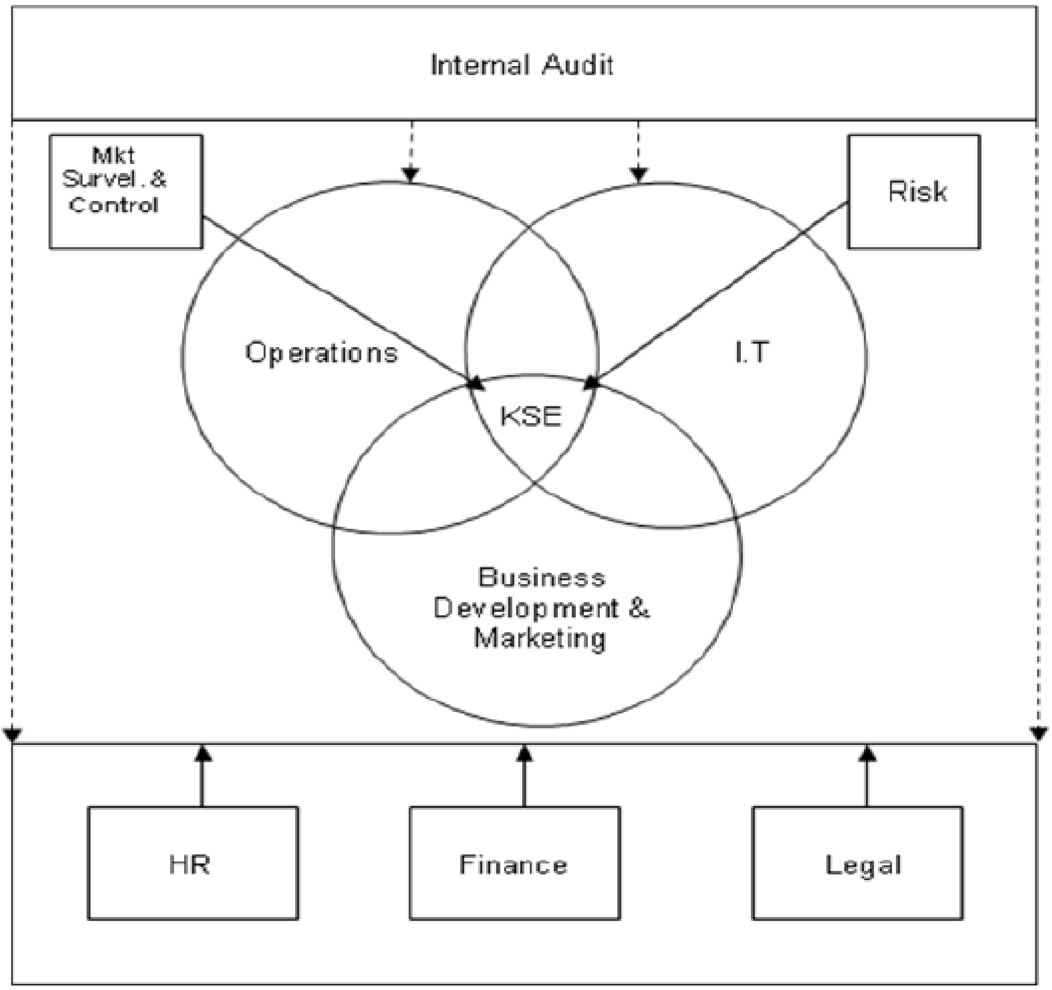



Figure 2-4: KSE Corporate Presentation

### 2.5.4 Clearing and Settlement Process in Pakistan

In Pakistan the Central Depository Company (CDC) and National Clearing Settlement System (NCSS) play a key role in the clearing and settlement of transactions.

#### 2.5.4.1 The role of Central Depository System (CDS) in the Clearing Process

The electronic book entry of securities is guided through the Central Depository System (CDC) to avoid the physical maintenance and transfer of securities. The CDS's purpose is to handle, record and register properly the transfer of securities and ensure transparent and instant transfer of securities' ownership. The electronic system is in accordance with the international standards and practices and switches from physical management to the clearance of shares on stock exchanges. On the Karachi Stock Exchange (KSE), the CDS is handled by the Central Depository Company of Pakistan (CDC), and it is mandatory for all newly established companies to enter their shares into the CDC database.

#### 2.5.4.2 Central Depository Company (CDC)

The main role of the Central Depository Company is to maintain and control the Central Depository System (CDS) properly within a well-defined legal framework. The CDC is the only securities depository in Pakistan and falls under the regulation and supervision of the Securities Exchange Commission of Pakistan (SECP).

#### 2.5.4.3 National Clearing and Settlement System (NCSS)/National Clearing Company of Pakistan Limited (NCCPL)

A transparent and prompt payment is an essential part of the securities trading business. It includes error-free reporting, matching, correct security transactions and finally the transferring and receiving of net balances. The NCSS is established as a one-unit electronic system in place of clearing house for exchange. The main task of the NCSS is to handle all settlements in the system swiftly and provide stability to the market by reducing systematic risk. It improves the efficiency of the market through the one-unit transparent clearing and settlement system.

The Capital Market of Pakistan has a triangular foundation, including the stock exchanges, the Central Depository Company and the NCCPL; the main goal of all is to enable a stronger, more prosperous Pakistani capital market.

**Chapter 3: Is the Market Efficient?**

**Evidence from Pakistan Stock Exchange**

# 3 Introduction

The chapter examines the efficiency of the Pakistan Stock Exchange (PSX) by looking at the impact of dividend announcements on the stock prices of listed companies over the period 2005 to 2014. The measurement of the market efficiency of the PSX is significant for accounting and economic studies regarding investment selection, adherence to regulatory principles, performance valuation and corporate decision making.

An efficient market is considered to be highly liquid and transparent, having an uninterrupted flow of available information that is freely accessible to all the stakeholders at the same time. An equally significant aspect of an efficient market disaffirms the opportunity of access to a superior set of information by any particular investor (Borges, 2010).

The paper examined both parametric and non-parametric techniques to evaluate the better understanding of EMH such as CAAR test, t-test, patell Z test, Boehmer et al. test, and corrado rank and sign test.

The efficient market hypothesis (EMH) indicates that predicting higher returns from studying past information is inadequate and that the outcomes will not outclass the returns created by buy-and-hold methods. In the world of the EMH, any mispricing of securities is swiftly removed after the consideration of transaction costs and the market returns to the equilibrium level. In addition, the latter result is stable according to rational views within the literature that expects slight or no trading in efficient markets (Lo, 1997). Significantly, however, many investors undertake to perform security trading and many continue to engage in active management techniques, implying that their views conflict with the assumptions of the EMH.

The following questions then arise: what is efficiency and what are the main features of an efficient market? An answer is that an efficient market should be informationally, transactionally (operationally) and allocationally efficient in all respects. A market is called informationally efficient when all the market participants receive the same information simultaneously and transparent revelation of that information occurs. The market is considered to be operationally efficient when the transaction costs are minimal (Rothlin & McCann, 2016). Moreover, operationally and informationally efficient markets possess the characteristics of liquidity and price continuity. In addition, allocationally efficient markets consider positive NPV projects that enhance the worth of the firms and the growth rate of the economy; this is because prices reflect value correctly. The EMH contains efficiency in which information is reflected in security prices.

According to Mabhunu (2004), the characteristics of a market are: i) informational support; ii) homogeneity; and iii) taste and location independence. The first feature concerns the availability of quantitative and qualitative information within the market and the speed with which information is distributed to a large number of profit-maximizing market investors. The key aspect is that the transfer of information is supposed to be random, with every item of information independent of the others (Reilly & Brown, 2011). Generally, markets devote considerable efforts to offering accurate and timely information to their participants. It is important to note, however, that the second feature considers that the same products are offered by all security markets, reflecting expected returns subject to risk. According to Damodaran (1996), homogeneity offers substitution and permits market participants to switch between markets as they desire. The feature of holding similar products, that is, homogeneity, leads to market efficiency. The third feature is explained as a selection of securities that is independent of investors' preferences (tastes) and the location of the securities. An equally significant principle is the separation principle, which considers that market participants will invest their funds in the market portfolio and riskless assets; however, the proportion of investment defines their approach to risk. Nevertheless, it should also be considered that investors make investment decisions on the base of location independence, because securities are cross-listed on other exchanges.

Having considered the theory of the EMH, it is also reasonable to look at the terms commonly related to an efficient market. To understand the concept of the EMH, it is important to view the current price of the security as a correct reflection of its intrinsic value. Correspondingly, the current price reflects its fair value based on the expected future cash flows, and the existing market interest rate is used as a discount rate. However, the fair price of the security is anticipated not to forecast the future but to be a rational assessment of the returns expected from holding a security matched with its risks (Shiller, 2014). By the same token, the fair value of security is a subjective matter based on the selection of the pricing model, expectations from the market and equivalency with real life.

Another significant factor that should be taken into account is that market value and the intrinsic value of the security may be different. The market value of a security reflects the market valuation of the particular security based on the existing information. However, if the price between the market value and the fair value becomes equal, it is because the market value reflects the intrinsic value of the security. Fu et al. (2013) emphasized, however, that the accurate intrinsic value of a security is unidentified, since its judgement is based on subjective methods of deciding the firm's earnings projections and the associated risks.

To determine the existence of the (EMH), it is important to test the assumption of the efficient market theory (EMT). Evidently, if the presence of the EMH is confirmed and the series follow a random walk, it is considered that consecutive stock price fluctuations are independently and identically distributed, but not chaotic, indicating that the prices show an uneven pattern. It is important to note, however, that, if the EMH does not exist, it is likely to give rise to riskless profit/arbitrage opportunities. An arbitrage chance is considered to be a riskless profit opportunity with no requirement for original capital. This is a consequence of similar securities either having different prices or being traded on different markets with dissimilar prices. However, if contrary positions on the same security are taken, then the investor avoids experiencing market risk (Borges, 2010).

Certainly, there is wide agreement that it is necessary to assess and interpret the available information in different ways (with noise); moreover, the methods vary in their estimation of a security's intrinsic value and reach dissimilar or opposite positions. However, in the absence of noise, all market participants will have similar expectations about security returns, which ultimately will result in secondary market trading (Black, 1986).

It is important to note, however, that the EMH introduced by Fama (1970) extended the previous studies by Samuelson (1965) and other researchers. Before Fama's work various studies discussed the same idea as the EMH by proving that the predicted returns of the speculative approaches should be zero (Blasco and Rio, 1997). In addition, researchers and practitioners have agreed that, in an efficient market, all the related available information should be reflected in the current price of a security, and any difference should be because of unexpected news.

The efficient market hypothesis has three different forms, based mainly on the set of available information: the weak, semi-strong and strong forms of market efficiency.

### 3.1 Measures of Efficiency

According to Fama et al. (1969), there are three types of market efficiency levels.

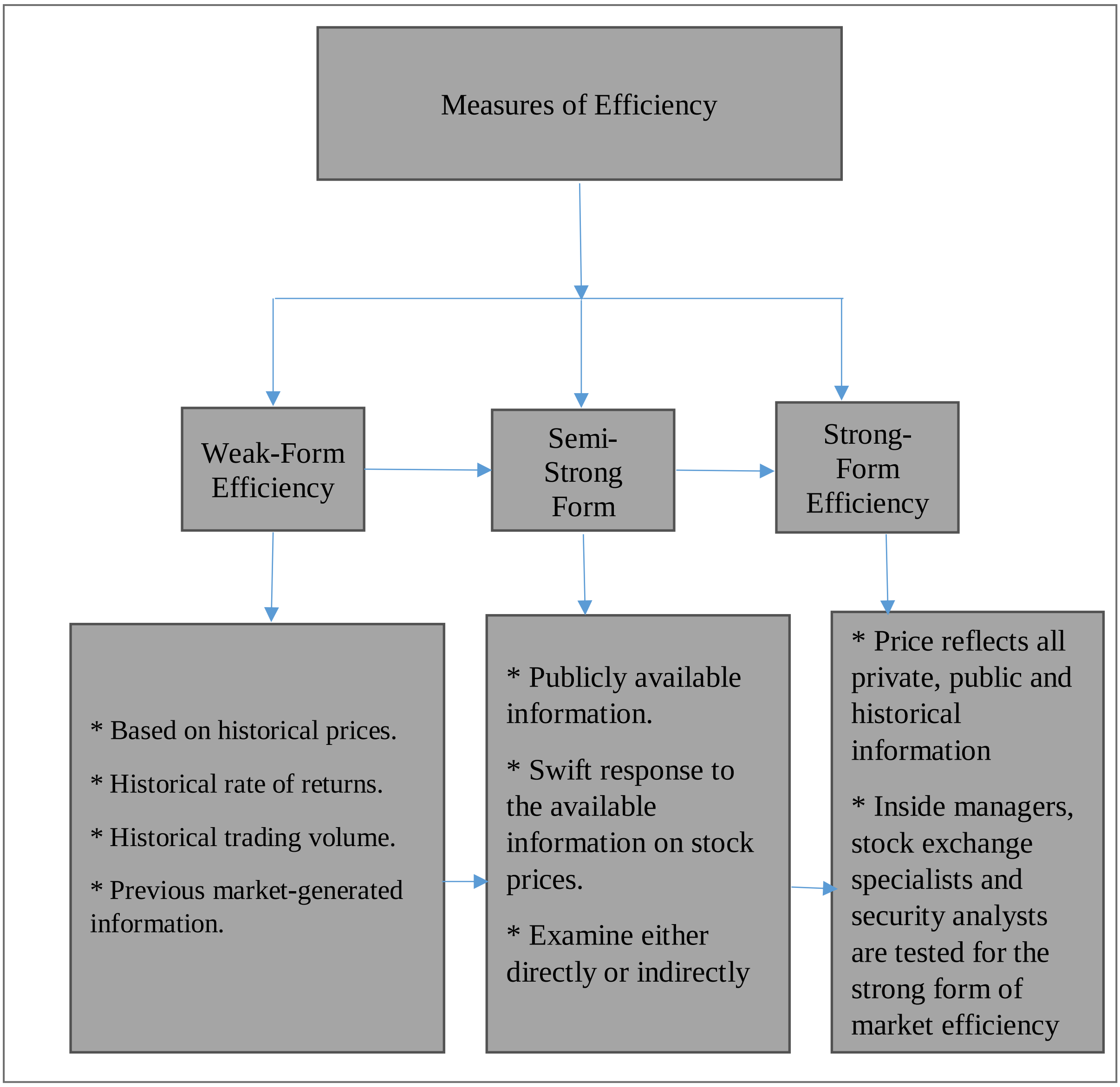



Figure 3-1: Measures of Market Efficiency (Authors' Own Compilation)

The weak form of market efficiency explains that the market reflects the past prices, rate of returns, trading volume and other past market information. However, profits or returns cannot be based only on past prices and trading volumes. Moreover, when the historical prices are assimilated into the stock prices, it is difficult to use a *technical analysis*[9] to forecast the expected price movements. Test for the weak form of market efficiency include autocorrelation tests and tests associated with the act of basic trading rules.

Market efficiency has been examined in many countries using diverse techniques. The empirical evidence is debatable and the findings are largely inconclusive, some support the assumptions of EMH, while others do not. Developed markets are seen as being weak-form efficient, whereas developing markets are concluded to be weak-form inefficient: there is an indication of serial autocorrelation and significant dependence in continuous security price movements. Further, there is evidence that developing countries do not follow the random-walk model.

Lanne and Saikkonen (2004) examined monthly excess US stock returns from January 1946 to December 2002. The results indicate that there is informational inefficiency and stock prices can be easily forecasted. According to Sharma and Kennedy (1977), North American capital markets are well structured and efficient. They further showed that US markets, the NYSE specifically, follow the random-walk model, in contrast to London Stock Exchange, which was indicated to be less random. Freund, Larrain and Pagano (1997) examined the weak form of market efficiency of the Toronto Stock Exchange (TSX), before and after the introduction of electronic trading, and discovered that the outcomes varied based on the frequency of data used. Similarly, Freund and Pagano (2000) examined the market efficiency of the NYSE and the TSX, before and after the presence of electronic trading. They concluded that electronic trading enhanced the efficiency of the TSX, but had no significant effect on the efficiency of the NYSE.

[9] Financial analysis that uses patterns in market data to identify trends and make predictions.

In comparison with the weak form of market efficiency, in the semi-strong form of market efficiency, prices reflect not only past or historical information, but also publicly accessible information. Event studies are conducted to test the semi-strong form of efficiency, typically by observing the swiftness of stock price corrections to particular events, such as company announcements, initial public offerings (IPOs) and stock repurchases or stock splits.

Many empirical studies report that developed markets are semi-strong form efficient, whereas developing markets are not (Branes, 1986; Chan, Gup and Pan, 1992; Dickinson and Muragu, 1994; Ojah and Karemera 1999). The inefficiency observed within developing markets may be due to low standards of information disclosure/processing, low trading and sophisticated investors (Keane, 1983). However, evidence of anomalous behaviour was frequently opposed in developed markets for the semi-strong form of efficiency. The reported anomalies contain the small-firm effect, the neglected-firm effect, the weekend effect and the January effect, among others (Ritter, 1988; Haugen and Lakonishok, 1988).

The semi-strong form of market efficiency can be scrutinized either directly or indirectly. The conventional or direct approach requires the observation of the semi-strong form of efficiency through the reaction to information as it arrives in the market. In an efficient market, share prices respond rapidly. Certainly, there is no disagreement with regards to whether the direct approach is the best way of testing market efficiency, because the available information exactly neutralizes the share prices.

The indirect approach to the semi-strong form of market efficiency generally reflects the assumption that fund managers use the available information within the market when making their investment decisions. At the same time, their performance is measured against certain standards, for example the market index or a passive buy-and-hold strategy, which typically do not require the gathering and examining of information (Reilly and Brown, 2011). Furthermore, the indirect method can be considered as an analysis of all types of market efficiency, because a fund's performance may be due to technical analysis, superior essential techniques or access to insider or private information (Poshakwale, 1996 ; Nourredine Khaba, 1998).

Researchers have applied publicly accessible information to determine market efficiency, such as the firm size, market capitalization, price-to-earnings ratio (P/E) and several other ratios (Damodaran, 1996; Reilly & Brown, 2011). The semi-strong form of market efficiency is present mostly in advanced or developed markets but has been rejected for underdeveloped markets because of the availability of exceptionally advanced systems of information flow and handling time for accessibility of information in developed markets compared with developing markets (Magnusson and Wydick, 2002).

After considering the strong form of an efficient market, it is also reasonable to look at prices, which include past, public and private information (Fama, 1970). The strong form of efficiency includes assessments to determine abnormal returns after including private information (i.e. insider/market specialists' trading information).

This point is also supported by the empirical testing of the strong form of market efficiency by examining the performance of mutual funds, which are generally required by regulations to show all the required information to evaluate the rates of portfolio returns. The analysis of the strong form of market efficiency is mainly based on findings regarding whether any group has private information and constantly makes abnormal returns. Managers within the company, dealers, stock exchange specialists and security analysts are examined for evidence about the strong form of market efficiency. The results are varied when knowledgeable market expert managers are involved, but most of the evidence does not support the strong form of market efficiency hypothesis (Jensen, 1968; Damodaran, 1996; Lee et al. 2010). In addition, the strong-form hypothesis is not as robust as the other two forms of market efficiency, because the principle behind market efficiency is to capture information rapidly as it is published (Keane, 1983).

### 3.2 Understanding the Measures of Market Efficiency

Another significant factor in the efficient market hypothesis is that no one within the market discovers undervalued or overvalued stocks constantly using a pre-decided strategy. There is, however, a further point to be considered; if overvalued securities exist in the market, then arbitrageurs are capable of shorting overvalued securities until the prices reach normal trading values. Failing to do so will reveal the strategy of selling of each investor, and if any superior method were recognized by the market, all investors would follow until the securities' advantage became balanced (Fusaro and Miller, 2002).

This point is also supported by the massive amount of money expended on asset management, for example the many arbitrage activities existing in the current securities markets, making it unconvincing to say that information trading has no place in efficient markets. Conversely, if the markets were sufficiently efficient as to provide no profitable opportunities to information traders, then it would be difficult for money managers to survive. In contrast, the efficient market hypothesis highlights that noise trading will not be sustainable in the market as long as arbitrageurs are present, because, when arbitrageurs are present in the market, there is no room for noise traders and well-informed traders. Pyun, Lee and Nam (2001) also considered that it is reasonable to look at the continuous existence of profit-making prospects, which control and manage the operations and presence of traders, regardless of whether they are informed or uninformed; otherwise, the robustness of the hypothesis is uncertain.

Given that market efficiency is broadly accepted, it is quite surprising that evidence of the inconsistency of market efficiency is increasing, for example the influential nature of behavioural theories, sampling errors and other econometric issues (Kothari, 2001). On the other hand, critics of the EMH consider this as ‘liberating’ and adequate to cast apprehension over the robustness of the efficient market proposition. Evidence in support of this position can be found in the studies conducted by Dyckman, Downes and Magee (1975) and Pyun, Lee and Nam (2001). According to them, price modification is a continuous process and does not occur rapidly. The security market is continuously finding the correct price for the current market. Lo (2004) discusses a new paradigm and introduced with Adaptive Market Hypothesis (AMH) under which the efficient market hypothesis and market inefficiency exist rationally together in a stable manner.

### 3.3 Are Emerging Markets Efficient?

Evidently, there is consensus among researchers that capital markets in developed security markets, for instance the USA, the UK and Japan, approximately achieve the objectives of market efficiency, because they are efficient in their operations and the flow of information at all levels. Evidence of market efficiency has been presented by researchers (Fama, 1970; Stiglitz & Weiss, 1981; Ross & Westerfield, 1988; Bartov et al., 2002). The hypothesis, however, breaks down when the discussion is extended to the stock markets of developing countries. Many researchers argue that these markets are not efficient because of their operating features and the irregular flow of information to the market participants (Drake, 1977; Samuels, 1981; Kitchen, 1986; Huang, 1995; Dahel and Laabas, 1999; Abraham et al., 2002). In addition, at the operational level, the markets are claimed to be inefficient for the reasons indicated in the figure below:

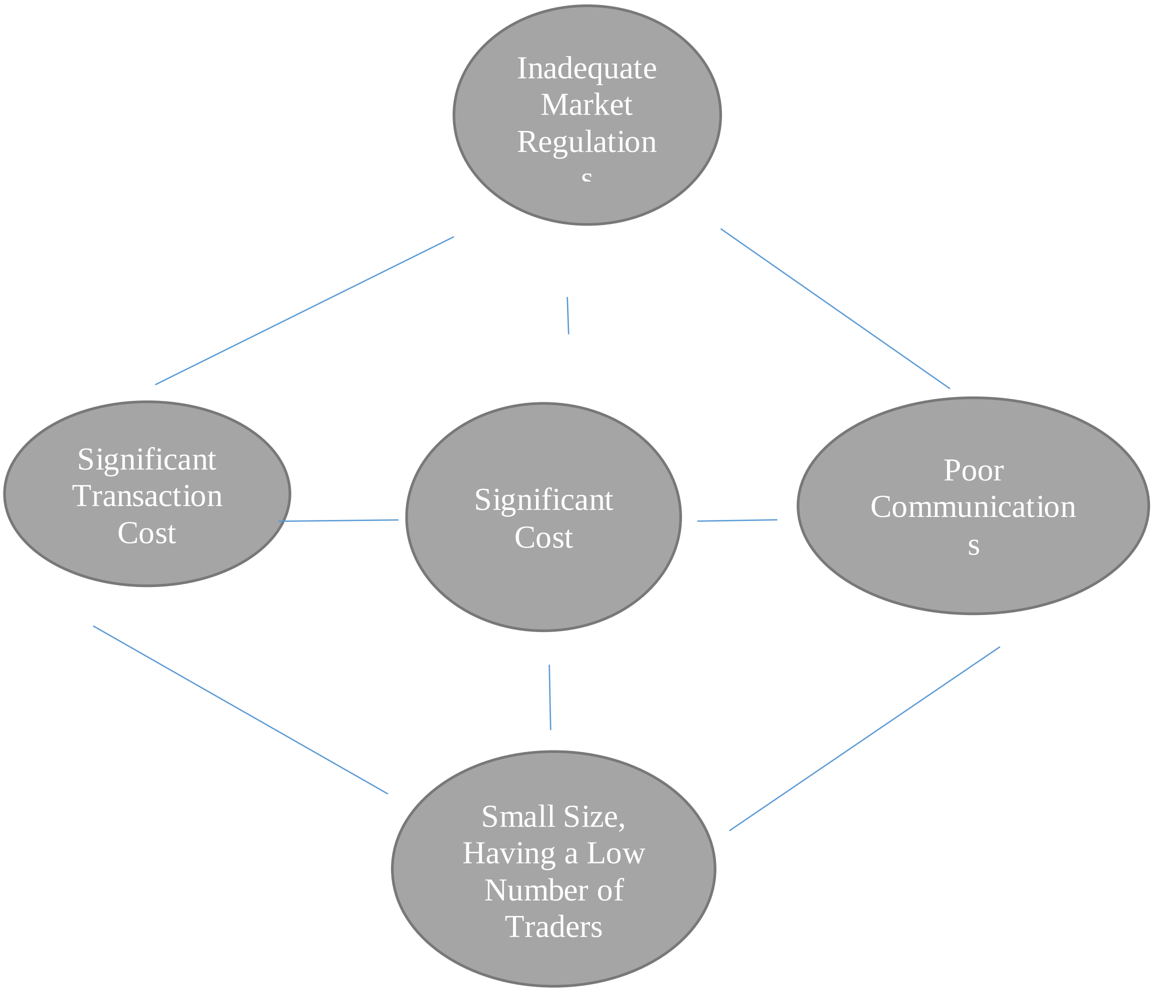



Figure 3-2: Operational Inefficiencies (Authors' Own Compilation from earlier literature)

It could also be said that small markets are thin, with an insufficient number of buyers and sellers to create competition and inadequate market securities to assist them in holding differentiated portfolios of their choosing[10]. It is, moreover, important to note that irregularity

10 The global financial crisis makes a negative significant impact on stock return in Pakistan stock exchange although this effect is not so strong. This crisis is positively contributed to volatility in stock returns of the market stock return of counterpart, i.e. Indian stock return volatility is more affected by this crisis than Pakistan stock market. Hence the impact of the global financial crisis is less pronounced on Pakistan stock market (Ali and Afzal, 2012).

in underdeveloped market regulations is common and the standards of disclosure of companies are not prudent. It can be seen from the developing markets that a lack of communication is very common and that it is easy for some market participants to have an advantage over others (Zhang and Cao, 2006).

The prominent difference between efficient and inefficient markets is the substantial cost of obtaining investment information, particularly in the absence of knowledgeable and capable analysts and expert advisers, leading to differing expectations about the performance of market securities. In contrast, in developed markets the high transaction cost may discourage small investors, thereby reducing the number of market contributors and limiting the market to infrequent large bargains (Timmermann & Granger, 2004; Verousis and ap Gwilym, 2014).

Indeed, at the investor level, in developing markets, it has been argued that most of them are unexperienced and cannot properly understand the information that they obtain (Samuels, 1981). The majority of market participants have also been said to take the view that the market is incompetent and therefore an unpredictable price setter.

In the face of such criticism, observers of emerging markets have suggested that these markets are inefficient and the flow of information is not transparent and clear, leading to abnormal returns, especially for influential groups of market participants who have hidden information. However, the governments of developing countries are currently opening their borders to capital, and foreign investors' interest in developing markets is making a significant difference, so the markets are slowly moving to improve the standards of efficiency.

## 3.4 Basic Inefficiency in Emerging Markets

Having considered the factors of emerging markets, it is also reasonable to look at the factors that obstruct the flow of information. First, illiquidity factors affect the market's ability to accommodate orders (Chordia & Sarkar, 2005). Second factor is the lack of competition; only leading players run the market and cause the stock prices to deviate from their intrinsic value (Mobarek & Mollah, 2008). Third factor is the absence of transparency in markets, which arises from a lack of corporate information (disclosure), poor auditing, the hiding of tax disclosure requirements, weak regulatory bodies that are unable to implement regulations and a broken flow of fundamental information (Blavy, 2002). Fourth, the presence of political and economic uncertainties contributes to low levels of market efficiency (El-Erian & Kumar, 1995). Lastly, the absence of an equity culture weakens efficiency through the slow reaction of investors to the existing information (Bellalah, Aloui & Abaoub, 2005).

In addition, leading market makers, institutional investors and large firm size brokers may control developing stock markets, and overall volatility in the market is observed due to insider trading by influencial market makers. According to Khwaja and Mian (2005), the developing stock markets functions through dominant insiders, specifically stock market brokers, which raises the contribution cost of the market participants and causes a high level of uncertainty, it also builds frustratation in small and corporate investors. Moreover, insider trading directly interrupts the stock market and raising questions about efficiency of developing stock markets.

Several emerging markets face problems of corporate integrity, and this is the most important challenge for public firms in fulfilling their capital demand. The major hurdles in investing are that the public's knowledge of market mechanisms is limited, the transparency of the market is questionable and there are culturally based suspicions of big businesses along with managerial greed and side activities (Godfrey & Merrill, 2009).

### 3.5 Literature Review related to dividend payments

Dividend announcement news and subsequent dividend payments are given to shareholders. Consequently, dividends are considered as an incentive given to shareholders for participating in equity financing. Another key aspect to remember is that the dividend policy within corporate finance is a most extensively and intensively researched topic. To put it another way, many researchers have attempted to resolve the 'dividend puzzle' (Black, 1976); the dividend puzzle refers to an observation in finance that firms which distribute dividends are rewarded by investors with greater valuations, however, according to many economists, it is not a concern to investors whether a company pays dividends or not. A comprehensive view of the issue has not been achieved yet (Brealey et al., 2012). As a matter of fact, a mixed opinion exists about dividends and their influence on the value of firms.

Stated differently, financial researchers have mainly shared three different opinions about the impact of dividend policy on the firm value. The first group believes that dividends contain information, which means a rise in the dividend pay-out increases the firm value (Pettit, 1972; Lonie, Abeyratna & Power, 1996; McCluskey, Burton & Power, 2006). On the other hand, the second group's belief is that an increase in the dividend consequently reduces the share price, because the firm is unable to find any lucrative investment projects with a positive NPV (Woolridge & Ghosh, 1985; Soter, Brigham & Evanson, 1996); however, an equally significant aspect is involved when the tax on income is greater than the capital gains (Litzenberger & Ramaswamy, 1979; Litzenberger & Ramaswamy, 1982; Poterba &

Summers, 1988; Lasfer, 1995; Bell & Jenkinson, 2002; Brealey & Myers, 2008). In addition, the third group believes that the dividend policy does not have any effect on the firm value (Miller & Modigliani, 1961; Black & Scholes, 1974; Miller & Scholes, 1982; Uddin & Chowdhury, 2005; Kaleem & Salahuddin, 2006). The current study emphasizes market efficiency in the context of dividends containing information and moving stock prices in the context of an emerging market.

The central hypothesis of this chapter is that dividend announcements have no abnormal influence on the performance of stock returns.

$$H_o = Cumulative\ abnormal\ return\ is\ equal\ to\ zero$$

The design of this chapter is as follows. Section 3.5.1 examines the assumption of dividend irrelevance theory, while the evidence from major theories are presented in section 3.5.2. The major signalling hypothesis of dividends is explained in section 3.5.3, which includes an examination of the information content of the hypothesis and the associated effect of dividends on earnings, and an alternative information hypothesis is outlined. In addition, other factors that may influence the dividend policy are highlighted in section 3.5.5. Moreover, the signalling effects that are specifically relevant to the South Asian markets are underlined in section 3.5.6. A constructive literature review regarding dividend studies in Pakistan is presented in section 3.6. Finally, section 3.7 concludes the overall chapter.

### 3.5.1 Dividend Irrelevance

Dividend policy is an interesting subject for research, as previous studies have investigated and provided clear evidence of the relationship between dividend policy and the stock market prices; on the other hand, many researchers have disagreed about the relationship.

Miller and Modigliani (1961) provided a major dimension in the form of irrelevance theory, and studies have indicated that the dividend policy is irrelevant and does not affect the value of the firm; rather, the firm's investment policy has an impact on its value. However, this theory is based on the presence of perfect market conditions, no transaction costs, asymmetric information, no floatation cost and no taxes. Many researchers have supported the irrelevance theory, including Black and Scholes (1974), who argued that there is little difference between high- and low-yielding securities. Therefore, shareholders' returns will remain the same. Moreover, Chen, Firth and Gao (2002), Uddin and Chowdhury (2005) and Adesola and Okwong (2009) also supported the dividend irrelevance theory in the presence of all the assumptions mentioned by Miller and Modigliani (1961).

However, many researchers have refuted the argument of Miller and Modigliani, including Benartzi, Michaely and Thaler (1997), DeAngelo and DeAngelo (2006) and Rashid and Rahman (2008), and presented their argument that irrelevance theory has unrealistic assumptions in the presence of taxation and transaction costs.

Moreover, the dividend policy is the key determinant of the valuation of a firm, and, according to Gordon (1959) and Lintner (1962), investors are usually risk averse and prefer stable returns, that is, dividend income over capital gains. Further, the announcement of dividends provides a signal about the growth within the company to shareholders and investors. In addition, a constant and increasing trend of dividends projects positive signals about the prospects of the company. Similarly, declining or no announcement of dividends conveys negative signals to the market. John and Williams (1985) showed a positive relationship between dividend policy and stock prices. Some researchers have disagreed with the concept and provided the argument that the dividend policy does not provide information about the future of the company but highlights its past performance. Ling et al. (2007) studied the characteristics of dividend-paying companies. Their results indicated that the dividend policies of Malaysian companies do not send signals about the future of the company but reflect its past performance.

### 3.5.2 Evidence from major dividend theories

#### 3.5.2.1 Lintner Model (1956) and Miller and Modigliani (1962) dividend irrelevance theory

Another key aspect of finance is that researchers put efforts into explaining the behavioural feature of the dividend policy to resolve the 'dividend puzzle' explained by Black (1976). Another significant factor in behavioural finance is to consider why companies continue to disburse dividends given the fact that disbursement causes heavier tax than comparable capital gains. Certainly, diverse cultures, different economic policies and importantly financial regulations can influence the management's view and cause a company to adopt particular dividend pay-out policies (Frankfurter, Kosedag & Chiang, 2004). Given the current high-profile debate concerning behavioural aspects, Lintner (1956) examined 28 well-known US companies by considering dividends as a prime decision variable, and his results can be explained in two parts. In the first part of the description, the author explained cautious firms' pay-out strategy regarding the dividend policy. However, this cautious strategy highlighted stable dividend payments, because the firms' management did not intend to reduce the pay-out at some time in future, because this expresses a negative signal to investors. It is important to note, however, that most of the interviewees in the field investigation by Lintner (1956) considered that shareholders mainly emphasize earnings; consequently, they are also interested in the regularity of dividend payments. Secondly, firms decide on their dividend pay-outs on the basis of their earnings.

Another significant factor of the Lintner model is that many researchers have failed to improve it; for instance, Darling (1957) established a substitute dividend policy model by including two additional factors, namely current investment and usage of external financing. The findings of Darling (1957) indicated that dividends are based not only on investment and the availability of funds but also on the current year's earnings and prior year's dividend. Similarly, Brittain (1966) developed a superficial adjustment to the model and found that liquidity and the lagged dividend pay-out ratio are vital for the dividend decision-making process. An equally significant aspect of earlier studies, Fama and Babiak (1968) undertook an empirical analysis of 392 US firms from the period of 1946–1964, using regression simulation and prediction methods to examine various dividend models to enhance the Lintner equation. The outcome showed that the performance of the Lintner equation improved; for instance, a maximum overall coefficient of determination, $R^2$, of the Lintner model of 0.432 was achieved. However, the authors established that lagged earnings marginally enhance the explanatory power of Lintner's equation.

Each of these theoretical positions makes an important contribution to our understanding, and a sequence of further studies has approached Lintner's work and reached similar conclusions, for instance in the USA Baker, Farrelly and Edelman (1985), Baker and Powell (1999) and Brav et al. (2005), in the UK Dhanani (2005) and in Ireland McCluskey, Burton and Power (2007). Evidently, the results of these studies backed Lintner's dividend policy behavioural model. However, in the counter-argument to Miller and Modigliani (1961), the dividend was considered as a dynamic variable, supported by evidence from Brav et al. (2005), who found that directors give equal weighting to dividend and investment decisions, albeit showing a superficial preference for dividends.

Considerable evidence in support of this position can be found in the following studies. Baker, Farrelly and Edelman (1985) conducted a postal survey of 562 listed NYSE firms, which resulted in partial support of Lintner's model. Among the survey participants, 85% specified that future earnings were a major factor of the dividend policy; however, 66% also endorsed the consideration of the past dividend pay-out pattern as input while deciding the dividend policy. Consistently, Baker and Powell (1999) acknowledged Lintner's model and stability within dividend pay-outs; the authors stated that 85% of respondents did not want a change in dividends, which has reversed in recent years. According to Brav et al. (2005), directors are cautious while deciding dividend payments. This is due to the fact that the expected change in the return due to a dividend increase is smaller than the expected negative reaction to a dividend cut. Moreover, 65% of the participants agreed that firms reduce their dividend to reduce any dependence on external borrowing (Brav et al., 2005).

Baker and Powell (1999) also endorsed the presence of a target pay-out ratio and the partial adjustment of dividends towards this target, as suggested by Lintner's model; 75% of the respondents supported the secure growth and stability of dividends. Consequently, Baker, Farrelly and Edelman (1985) also found that participants established the implications of Lintner's model, specifically that firms should preserve a continuous record of dividend payments. Furthermore, McCluskey, Burton and Power (2007) stated that the financial managers of quoted firms follow the signalling hypothesis in which dividend and earnings announcements are used to forecast future earnings and affect the share prices. In the same way, Baker and Powell (1999) reported that dividends are considered as a signalling tool to transfer information and affect the future value of shares (Pettit, 1972; Lonie, Abeyratna & Power, 1996; McCluskey, Burton & Power, 2006). Evidence in support of this signalling effect can be found in further studies; for instance, Brav et al. (2005) asserted that 80% of higher management, including executives, are in favour of alterations in dividend payments causing signalling affects that convey information to the stock market.

#### 3.5.2.2 Signalling Theory

Given the current high-profile debate with regard to the signalling effect, it is quite surprising that the tax impact plays a significant role in decision making on dividends. According to Brav et al. (2005), tax is the most significant aspect of dividend payments (Baker, Farrelly & Edelman, 1985; Baker and Powell, 1999); actually 21% of firms keep the tax factor in mind when deciding their dividend payments. However, unquoted firms consider the taxation concerns of owners and the instructions of creditors (McCluskey, Burton & Power, 2007); moreover, authors have stated that some firms decide to pay dividends when it is efficient for shareholders.

It could also be found in other studies that firms' management considers the tax impact before announcing any dividends and provides the maximum benefit to different tax-related clients; however, research has shown that the importance of tax is not the only factor in all cases (Baker, Farrelly & Edelman, 1985; Baker & Powell, 1999; Brav et al., 2005). Baker, Farrelly and Edelman (1985) documented that 44% of participants agreed that firms should take into consideration the tax positions of their shareholders; on the contrary, other participants were indifferent about taxation on dividends comparative to capital gains, which affected their firms' dividend policy.

#### 3.5.2.3 Free Cash Flow Hypothesis, Agency problem and Clientele effects

An equally significant consideration of other influences on dividends has developed within the literature, which includes industry behaviour, the free cash flow hypothesis, the agency problem, firms' credit rating and clientele effects (Ross, Westerfield & Jordan, 2008). According to Baker, Farrelly and Edelman (1985), the industry influence also plays a role in deciding the current level of the dividend policy. Moreover, McCluskey, Burton and Power (2007) found in the Irish market a contrary view from participants in quoted and unquoted firms. However, in a comparison of public firms with private firms, public firms are more hesitant to cut a dividend because of information asymmetry and the agency problem (Brav et al., 2005).

The free cash flow hypothesis involves a strong relationship between dividend change and abnormal returns, which stemmed from the agency theory of the firm (Jensen and Meckling, 1976). According to Jensen and Meckling (1976), the agency problem arises because of the conflict between managers and owners and as a result of information asymmetry and uncertainty. The free cash flow hypothesis indicates that managers want the availability of free cash and try to avoid bankruptcy in the future; therefore, they are unwilling to distribute the profit among shareholders. However, free cash controlling by the management creates not only a chance for investment in highly risky projects or negative NPV but also the availability of cash for management perquisites.

Consequently, a dividend announcement is one of the tools for minimizing the free cash availability for the management and creating the fitted lines of investments. However, the puzzle is still either to satisfy the management by performing with high standards through retaining profits or to distribution dividends to shareholders in an adequate way. In addition, Jensen and Meckling (1976) mentioned that dividends are important factor to evaluate the management operational activities and it established a disciplinary mechanism on management affairs.

Rozeff (1982) and Easterbrook (1984) supported the free cash hypothesis. Moreover, it is debatable that the free cash flow is similar to the signalling effect, in which a change of dividends transmits information to the market; the free cash flow also develops changes in management behaviour instead of future earnings.

The empirical evidence regarding the free cash flow hypothesis is mixed. DeAngelo and DeAngelo (2000) and Porta, Lopez-de-Silanes and Shleifer (2000) established supportive evidence regarding the free cash flow hypothesis. Lang and Litzenberger's (1989) study supported the free cash flow hypothesis more than the signalling hypothesis using the Tobin Q ratio.

The behaviour of specific firms is inclined to affect the dividend payment. It is evident from Fama and French's (2001) study that in 1978 a trend of low dividend payments was observed. They studied data from the period of 1978–1999, documenting that low dividend payments witnessed even listed firms' growth in the US from 3,638 to 5,513 during the same period. There were three main reasons according to Darling (1957), namely the profitability of the firm, the company size and the presence of investment opportunities to decide dividend payments. Moreover, according to Fama and French (2001), dividends declined from 66.5% to 20.8% in the sample firms between 1978 and 1999, respectively. The reasons behind the low tendency to pay dividends among US listed firms during the respective period are the listing of new firms and companies' share repurchase behaviour. In addition, new firms during the period of the 1990s experienced a low level of profitability and substantial investment opportunities due to high growth; therefore, firms were less likely to opt to pay dividends. However, that was not the only main reason for low dividends, as the authors also found some evidence that firms had both substantial profitability and lower investment prospects; therefore, there was quite a behavioural change among the management in terms of low dividend pay-outs.

Given the current high-profile debate with regard to Fama and French (2001), it is quite surprising that Chowdhury and Miles (1987) stated that UK firms distributed dividends of a high percentage during the period of 1970–1984. They collected a sample of 653 companies from 26 sectors and indicated that on average 90% of the companies distributed dividends over the period. More specifically, the dividend distribution reached 98% in the years of 1973, 1984, 1976, 1979 and 1980.

In conclusion, each of these findings makes an important contribution to our understanding of Lintner's model of dividend policy. In addition, these results propose that dividends act as a signal to shareholders and affect share prices. In other words, an incremental increase in dividends is not only interpreted as a positive signal but also informs the future earnings stream of firms; similarly, a reduction in dividends is viewed as a negative signal about firms' earning position (Baker, Farrelly & Edelman, 1985; Baker & Powell, 1999; McCluskey, Burton & Power, 2007). Moreover, tax is an influential factor in deciding dividend payments; it has been observed that tax is a more important factor among unquoted firms (Baker, Farrelly & Edelman, 1985; Baker & Powell, 1999; McCluskey, Burton & Power, 2007).

### 3.5.3 Signalling Hypothesis of Dividend Announcements

The assumption of irrelevance theory has been criticized for stating that all investors already have the available information about firms. According to Bhattacharya (1979, 1980), information is asymmetric because managers are better informed about the future prospects of the company than outside stakeholders; in addition, any changes in dividends could provide information about the future prospects of the firm. It can be seen from the literature that any change in dividends conveys a signal. The influential study by Lintner (1965) claimed that firms increase their dividends once their future earnings are certain. Therefore, any increase in dividends can be considered as a signal, because it not only decreases the uncertainty of future earnings but also affects the market value of the firm (Baker, Farrelly & Edelman, 1985; Baker & Powell, 1999). Indeed, dividend information is freely communicated via the financial press. Moreover, dividends are paid out in the form of cash, and executives use the firm's money as an informational signal. The rationale of this hypothesis is that shareholders assume that an increase in dividends is 'good news' and a reduction in dividends is 'bad news' in relation to the expected earnings of the firm.

It is also interesting to consider the signalling prospects of dividend announcements through the behaviour of share prices surrounding dividend news. Evidently, from the examination undertaken by Pettit (1972), the relationship between dividend announcements and share prices is based on the information content of dividend changes. In his examination he used 1,000 announcements of dividend changes collected from 625 NYSE-listed companies for the period from January 1964 to June 1968. He observed significant price movements in the announcement month (day) and the following month (day).

In the same way, researchers from the UK and Ireland (Lonie et al., 1996; McCluskey et al., 2006) reached consensus on their results. For instance, Lonie et al. (1996) conducted research on 620 UK firms between January 1991 and July 1991 to analyse the signalling effects of dividend announcements. They used the event study methodology to determine abnormal returns before, on and after the announcement of dividends. They observed significant abnormal returns (i.e. 0.6% and 1.4%) on the day of announcement and just after the day of announcement, respectively.

However, on the basis of the evidence, 2% positive abnormal returns were observed for dividend-increasing companies and, on the other side, -2.4% abnormal returns were observed for dividend-decreasing companies. Moreover, on day t-1 1.4% positive abnormal returns were witnessed for no-change dividend companies. An equally significant aspect was evidenced by McCluskey et al. (2006) for the calculation of abnormal returns and excess abnormal returns for the time period of 41 days surrounding the dividend announcement date. In addition, to support the evidence, a significant positive return of 0.82% was found on the announcement day of dividends. Moreover, average abnormal returns were significantly positive for dividend-increasing firms and insignificant for dividend-decreasing firms; however, the results showed positive abnormal returns of no-change dividend firms.

Along similar lines, Watts (1973) argued that there is an insignificant relationship between present dividend changes and future fluctuations in earnings. The author did not support the argument that dividend announcements contain any information. Based on his data of 310 firms collected from the US during the period from June 1945 to June 1968, however, the author used the regression model to forecast the expected earnings and concluded that a flow of dividend information was inefficient after considering the transaction cost. Overall the author considered the content of information to be insignificant. Moreover, Pettit (1972) recognized no earning announcement effect. The results described as earning announcements had insignificant p-values of 0.9 in association with a highly significant value of dividend announcements, specifically 18.0 during the month of the announcement. In comparison with Pettit (1972), Watts (1973) documented that current-year earnings have a signalling effect regarding expected earnings in association with current dividend announcement news. Lonie et al. (1996) produced evidence contrary to Pettit (1972) but in line with Watts (1973). He explained that earnings announcements have a leading impact when dividend and earnings announcements are published together.

Subsequently, McCluskey et al. (2006), through ANOVA statistics, found that the earnings per share (EPS) variable showed significant abnormal returns (16.5, t-value = 0.0); however, the dividend per share (DPS) variable had positive but insignificant F-statistics (2.2 at t-value 0.1) considering the 5% level of significance. In addition, the authors documented that earnings announcements have a more prominent impact on share prices than dividend announcements' counterpart studies (Watts, 1973; Lonie et al., 1996). On the same lines, Watts (1973) asserted that the effect on share prices is higher due to an unpredicted change in earnings in comparison with an unpredicted change in dividends. In connection to this, Watts (1973) examined 'sign tests' and observed an insignificant change in unexpected earnings in comparison with an unpredicted change in current dividends.

Having considered different opinions about news, it is also reasonable to look at the viewpoint of many researchers who agreed that earnings and dividend announcements jointly influence share prices. Evidence supporting this argument was collected by Aharony and Swary (1980), who studied the news of dividends separately from the news of earnings within the same period. In addition, the authors examined quarterly announcements of dividends and earnings that were announced on different dates, at least 11 trading days apart from each other. Data were collected from 149 firms of the NYSE over the period from 1963 to 1976, and the authors concluded that their results based on quarterly cash dividends were significant in comparison with the corresponding quarterly earnings. Brav et al. (2005) also determined that the market response to a dividend decrease was more evident than the reaction to an increase in quarterly earnings. The final analysis showed that dividend announcements provide information about expected earnings but earnings news appears to be a prominent signal in circumstances in which two pieces of information are announced jointly.

### 3.5.4 Dividend Cuts as a Positive Signal

The earlier literature has backed the argument of the dividend information content hypothesis, which suggests that an increase in dividends becomes a positive signal about expected earnings, resulting in an increase in share prices; on the other hand, a decrease in dividends causes a decrease in share prices (Pettit, 1972; Aharony & Swary, 1980; Lonie et al., 1996; McCluskey et al., 2006). With regard to the dividend announcements, it is quite surprising that a different analyst examines the dividend announcement information differently. In connection with this, Woolridge and Ghosh (1985) asserted that increased dividends represent a signal that the firm lacks future investment opportunities; thus, a dividend cut signals future growth opportunities. The authors referred to this approach as the 'alternative information hypothesis'. According to DeAngelo and DeAngelo's (1990) examination of 80 financially distressed firms in the USA for the period from 1980 to 1985a, a reduction in earnings was the important result of a dividend cut or omission. They asserted that dividend-paying firms mostly tend to make dividend cuts rather than omitting to pay dividends.

Woolridge and Ghosh (1985) examined the dividend cut announcements of 408 companies between 1971 and 1982 and divided their sample into 3 categories: a dividend cut with an instantaneous loss or reduction in earnings; a dividend cut with a previous loss or reduction in earnings; and a dividend cut with an instantaneous or previous increase in earnings. The authors' results established that initially the reaction of the market was negative on average to the announcement of a dividend cut. Afterwards, the share prices gradually recovered by 9% in the following quarter and showed an improvement of 16% after one year in dividend cut companies in which the announcement was accompanied by profitable investment news. In addition, an increase in the share price of 10% was also observed for the dividend cut firms in which news of a reduction in earnings was published. However, the authors were in favour of educating shareholders regarding dividend cuts and prudently guiding the market about the future prospects.

Soter et al. (1996) examined the dividend cut case announced by the Florida Power & Light Company (FPL). FPL announced a 32% decline in quarterly dividends, that is, from 62 cents to 42 cents per share. The reason behind the dividend cut was to increase the financial flexibility of the company, and further deregulation in the utility industry changed FPL into a riskier competitive firm from a low-risk regulated company. Subsequently, FPL also declared a $10 million repurchase of shares over three years as an alternative to the dividend payments for shareholders. However, on the announcement day, the share price dropped by 20%. Nevertheless, after the equally significant education of shareholders and analysts about the intentions behind the cutting of the dividend, the share price improved rapidly and rose by 30 cents at the end of month; further, one year and two years after the dividend cut announcement, the share price increased by 23.8% and 52.9%, respectively. From a broader perspective of FPL's case, it backs the MM proposition of the dividend irrelevance theory; in other words, the dividend level was irrelevant when examining the firm value in the long term. However, this case study also determined that the cutting of dividends was not the exact reason for the drop in the firm's share price.

In conclusion, a dividend cut is not a direct indication of negative returns but based on available information on dividend cut suggested, either some healthy investment opportunities or a signal of a reduction in the expected earnings.

### 3.5.5 Other Factors Affecting the Dividend Policy

There are many other factors that may influence dividend policy, mainly clientele theory and agency cost theory. Dividend announcements and abnormal earnings are related to the clientele effect, as some investors want earnings to be paid out in the form of dividends, but, on the other hand, other investors prefer the company to retain its profits to invest in its future growth. These kinds of preferences have emerged from the differences in taxation on capital gains and dividend yield. Similarly, the investors' age group established the preferences for dividends; that is, old people want to receive their dividends at regular intervals rather than the company retaining them (Pettit, 1972).

Another view of the clientele effect is that of Black and Scholes (1974): investors prefer to invest in those companies that follow a cash dividend policy that fulfils the desire without affecting the company's value. However, companies that do not distribute cash dividends or distribute a low level of cash dividends do not affect the share prices, because they attract investors who desire this situation.

Agency cost theory was not considered in the irrelevance proposition hypothesis of Miller and Modigliani (1961), as the assumption was that managers are strong agents of shareholders, but, in agency cost theory, the steps taken by managers are sometimes in their own interest rather than that of the shareholders and create a conflict. Many managers emphasize their personal interest. However, shareholders are very conscious about this fact and may develop means of control (Jensen & Meckling, 1976; Fama & Jensen, 1983; ; Shleifer & Vishny, 1997). Moreover, monitoring managers is one of the major costs in agency theory. Further, agency theory restricts the free cash flow within the hands of managers by the announcements of dividends to shareholders.

### 3.5.6 The Application of Signalling Theory in South Asia

The major stock markets within South Asia are those of Pakistan, India, Bangladesh and Sri Lanka. All these markets are considered as emerging stock markets according to Standard & Poor's *Emerging Market Fact Book, 2012*. This means that these markets are different from developed stock markets because of their slow response to new information. Glen et al. (1995) examined specifically the dividend policies in many emerging markets and asserted that the decision making regarding the dividend policy differs significantly across countries and depends on firms' size and time.

Another significant factor in emerging markets concerns the sharing of similar practices in connection with the dividend policy. For instance, Glen et al. (1995) documented that emerging markets usually follow a target pay-out ratio, like their developed country counterparts; however, the volatility in dividends over the period is a lesser concern along with dividend smoothing. In addition, Narayan et al. (2004) elaborate that Pakistan, India and Bangladesh are approximately similar geographically and economically and share a very strong common historical heritage. On the same lines, Lamba (2005) explained that dividend studies increase our understanding of dividend announcements and the reaction to share prices specifically in the South Asian region.

Uddin and Chowdhury (2005) examined the effect of dividend announcements on shareholder value over the period from September 2002 to October 2003 for 137 companies listed on the Dhaka Stock Exchange (DSE). The authors calculated the market-adjusted abnormal returns (MAARs) and cumulative abnormal returns (CARs) over a 60-day period surrounding the announcement of dividend dates. The mean value of the MAAR showed positive but insignificant results of 0.8% on the day of announcement. However, the authors found statistically significant results on days t - 3 and t - 4, that is, before the dividend announcement date, with mean MAAR values of 2% and 2.9%, respectively. Moreover, no significant results were found after the announcement date. The author concluded that investors gain 4% three to four days prior to the announcement but found no significant results on and after the announcement date. Conversely, the CAR value increased from -4.9% to 10.5% from t - 30 to t - 0 but decreased again to -19.5% on day t + 30. The authors concluded that dividend announcement news does not appear to exert a coherent impact on the share price; therefore, Uddin and Chowdhury (2005) argued that the DSE seems to back Miller and Modigliani's (1961) hypothesis of dividend irrelevance.

By the same token, Rishma and Zahedur (2007) collected larger data on 245 dividend-paying stocks from the DSE for the period from January 2003 to December 2005. The authors found that the mean of the MAAR was not significant prior to and on the day of the announcement. However, slight evidence of significant values was observed in the post-dividend announcement period. Moreover, the CAR value produced similar conclusions. Therefore, the authors analysed the overall results and documented that shareholders will not gain any significant returns prior to as well as on the day of a dividend announcement. However, shareholders managed to gain value after the dividend announcement. Further, the investigation of the return-to-volume analysis (RTVA) values of 18.2 (23) on the day of the announcement (the day after the announcement) showed that they were 166.2% and 237.6% higher than the average RTVA before the announcement period. The conclusion of the analysis indicated that the volume around the dividend announcement day had information content and was the reason behind shareholders' trading of the securities or modification of the arrangement of portfolios. Similarly, Mollah (2001) examined the reaction of stock prices to the dividend announcement from 153 non-financial companies listed on the DSE within the time frame of 1988–1991. The author found insignificant abnormal returns on the day of the announcement; moreover, the returns declined after the announcement date.

Contrary to Mollah (2001), Uddin and Chowdhury (2005) and Rishma and Zahedur (2007) for the Bangladeshi market, Thirumalvalavan and Sunitha (2006) established the argument that dividend announcements have a positive effect on stock prices on the Indian stock market. The authors concluded that on average the cumulative abnormal return is positive in a 10-day event window surrounding the dividend announcements of Indian listed firms, specifying that the presence of positive signals affects the share prices. On the same line, Azhagaiah and Priya (2008) analysed Indian organic and inorganic chemical firms, concluding that there is a significant positive relationship between dividend payments and investors' wealth for both organic and inorganic chemical firms.

### 3.6 Dividend Policy of firms in Pakistan

Each of these theoretical positions makes an important contribution to our understanding of the dividend policy in Pakistan. Many studies have examined the dividend policy in Pakistani firms, for instance Nishat (1992), Nishat and Bilgrami (1994), Kanwer (2002), Nishat and Irfan (2004), Kaleem and Salahuddin (2006b), Naeem and Nasr (2007), Zaman (2007), Ahmed and Javid (2008) and Mubarik (2008). Evidently, the empirical studies contained different methodologies and reached diverse results; Table 3.1 reflects the significant research studies investigated regarding the determinants of the dividend policy of Pakistani firms. Given the current high-profile debate with regard to the signalling effect, Table 3.2 summarizes the key research work on the signalling impact of the dividend policy in Pakistan. Subsequently, for the matter underlying this discussion, the literature on the dividend policy of Pakistani firms can be differentiated into two major parts: i) the determinants of pay-outs and ii) pay-outs and share returns.

#### 3.6.1 Determinants of Pay-Outs

Many studies have examined dividend policies in terms of pay-outs in Pakistan following the structure of Lintner's (1956b) model. For instance, Nishat and Bilgrami (1994) adopted Lintner's (1956b) model, concluding that dividend payments and profit after tax are the two main factors in the dividend policy. They used regression analysis by considering the dividend per share as the dependent variable from a sample of 225 companies listed on the KSE using historical data from 1980 to 1986; they recognized the presence of the partial adjustment method as firms change towards new dividend pay-out levels (Baker et al., 1985; Baker & Powell, 1999).

An equally significant aspect of dividend pay-outs mentioned by the authors was the immense coincidence of influences on pay-outs within large firms, private sector companies and foreign ownership firms that announced higher dividend pay-outs. On the other side, previous-year retained earnings, last-year profitability, the availability of net liquid assets and a change in equity holdings had no associations with dividend announcements.

**Table 3-1: Grid of the Literature Review of the Pakistan Stock Exchange**

| Author(s) | Size of Sample | Data Collection | Research Methodology | Main Findings |
|---|---|---|---|---|
| Nishat and Bilgrami (1994) | 225 firms listed on the KSE | Overall 175 observations collected over the period from 1980 to 1986 | A regression model considering dividends per share as the dependent variable | • The previous year's payment of dividends and net profit after tax have a major role in the current year's dividend decision.<br>• The paper asserted the presence of partial adjustment plans.<br>• Big firms, foreign ownership firms and private sector companies normally announce higher dividends. |
| Naeem and Nasr (2007) | 108 firms listed on the KSE | Overall 540 observations collected from the period from 1999 to 2004 | A regression model considering the dividend pay-out ratio as the dependent variable | • The previous year's dividend pay-out has a major impact on the dividend policy.<br>• The present year's profit does not play any significant role in the dividend decision.<br>• Evidence of inconsistency and instability were observed in the dividend pay-out trend. |
| Ahmed and Javid (2009) | 320 non-financial firms listed on the KSE | Overall 1,920 observations collected from the period from 2001 to 2006 | A regression model considering the present dividend yield as the dependent variable | • To examined Lintner's model for target dividend pay-out ratios between 25% and 39% with firms taking between 1.6 and 2.4 years to reach the target level.<br>• Firms depend on present earnings rather than previous dividends to decide their dividend payments. |
| Khalid (2010) | 374 firms listed on the KSE | Overall 7,854 observations collected from the period from 1988 to 2008 | A regression model | • Earnings are the important factor for the decision making on dividends.<br>• Last year's dividend payments, the size of the firm, the gearing ratio and the reserve position have an influence on the dividend policy. |
| Afza and Mirza (2010) | 100 firms listed on the KSE | Overall 300 observations collected from the period from 2005 to 2007 | Regression analysis | • Earnings are important, but the major contributing factors to the determinants of dividends are firm size, cash flow and ownership structure. |

Souce: (Authors' own compilation)

Evidence in support of Lintner's (1956) model can also be found in Ahmed and Javid's (2008) study, which collected information on 320 non-financial firms listed on the KSE over the time frame of 2001–2006. They found that Lintner's (1956) model explains the dividend behaviour of Pakistani firms. Ahmed and Javid (2008) concluded that the last year's dividend yield, concentration of ownership, current year's net earnings and liquidity are all significantly associated with the dividend yield. In addition, they emphasized that Pakistani listed firms are more dependent on the present earnings than the previous year's dividend to decide their dividend payments.

Consequently, Khalid (2010) indicated that profits are the major determinant of dividend announcements from the KSE. The author collected data from the period of 1988–2008 and established that the reserve levels, gearing ratio, firm size and last year's pay-out levels all had an influence. Naeem and Nasr (2007) adopted a contrary view and suggested that the present profitability position has negative impact on Pakistani firms' decisions on dividend policies. In addition, the authors used a regression model with the dividend pay-out ratio as the independent variable and concluded that last year's dividend pay-outs are the most influential aspect of a company's present dividend policy by collecting data from a sample of 108 KSE listed companies from the time frame of 1999–2004. Earlier Afza and Mirza (2010) collected and examined data for KSE listed firms from the period of 2005–2007 and concluded that the profitability of firms plays a significant role and the major determinants of dividends are the firm size, cash flow and ownership concentration.

It can be seen from the above literature analysis that earlier studies based on large samples of numerical data concerning the disbursement of dividend pay-outs in Pakistan obtained contradictory findings; surprisingly little effort has been made to discuss the dividend decision-making process in practice.

### 3.6.2 Pay-Outs and Share Returns

An equally significant aspect is the influence of dividends on the share prices of Pakistani listed companies. For instance, Nishat and Irfan (2004) analysed 160 listed companies' data from the KSE for the period from 1981 to 2000 and rejected Miller and Modigliani's (1961) dividend irrelevance theory. In addition, the authors concluded that the dividend policy has a positive influence on the share prices of Pakistani listed firms. The authors examined the dividend yield and dividend pay-out as a proxy for the dividend policy; however, these were adopted as independent variables along with size, long-term debt, earnings volatility and growth in a regression model that aimed to describe price volatility. However, their results explained that dividend pay-outs and dividend yields have a significantly negative influence on price volatility.

By the same token, Nishat (1992) examined the combined impact of retained earnings and dividend behaviour on the share prices of KSE listed companies in the period from 1980 to 1986. The author concluded that retained earnings and dividends have a significant impact on share returns in high-growth as well as low-growth firms. Moreover, the author emphasized that the dividend effect is more influential than retained earnings.

**Table 3-2: Grid of the Literature Review of the Pakistan Stock Exchange**

| Author(s) | Size of Sample | Data Collection | Research Methodology | Conclusion |
|---|---|---|---|---|
| Nishat (1992) | 10 sectors picked from major industries of the KSE | Overall 1,344 observations collected from the period of 1980–1986 | Regression model considering share prices as the dependent variable | • Retained earnings and dividends both influence the share prices. However, the dividend effect hypothesis is reasonably stronger than retained earnings. |
| Nishat and Irfan (2004) | 160 firms listed on the KSE | Overall 3,200 observations collected from the period of 1981–2000 | Regression model | • As the proxy for dividends, the dividend yield and dividend pay-out were used.<br>• Share prices are influenced by the dividend policy of Pakistani firms. |
| Kanwer (2002) | 317 firms listed on the KSE | Overall 2,219 observations collected from the period of 1992–1998 | Regression model considering the dividend yield as the dependent variable | • Support the signalling theory that expected earnings tend to be related to an increased current dividend yield. |
| Kaleem and Salahuddin (2006) | 24 firms listed on the Lahore stock exchange | Overall 200 observations collected over the period of 2002–2003 | Event study used as the research methodology and calculated market-adjusted abnormal returns (MAARs) and cumulative abnormal returns (CARs) | • Insignificant MAAR and CAR values were determined; that is, the MAAR values were 0.001 and -0.009 for 2002 and 2003, respectively. Correspondingly, the CAR values were -0.6 and -0.4 in the years 2002 and 2003.<br>• Shareholders in Pakistan do not make a net profit on dividend announcements. The proof from the LSE tends to verify Miller and Modigliani's (1961) hypothesis. |
| Zaman (2007) | 6 top firms based on market cap from three stock markets listed on the KSE. LSE and ISE. Daily stock prices were collected from 6 top firms from 2000-2005. | Overall 7 different specific announcements picked from respective firms and collected over the period of 2000–2005. | Event study, ANOVA and regression | • A significant positive influence of dividend and earnings announcements on share prices in all events.<br>• Non-announcement of dividends for 20 observations was also examined. |
| Mubarik (2008) | 6 firms data collected, based on daily stock prices from oil and gas marketing sector listed on the KSE (2004 – 2008) | 32 number of announcements collected over the period of 2004–2008 | Event study | • On the day of an announcement, insignificant negative AAR values (i.e. -0.002, t-value: -1.8) and a significant negative value of CAAR (-0.04, t-value: -26.8) were observed.<br>• The CAAR is significantly negative around the 20-day event window.<br>• The findings showed that dividend and share prices have a weak and negative relationship with one another. |
| Akbar and Baig (2010) | 79 firms data collected, based on daily stock prices from oil and gas | 129 cash announcements, 24 stock announcements, and 40 simultaneous | Event study methodology used for calculating abnormal returns | • Frequent negative returns for a 41-day window for cash dividends.<br>• Significantly positive abnormal returns for stock dividend and simultaneous stock and cash dividend events. |

| | | | | |
|---|---|---|---|---|
| | marketing sector listed on the KSE (2004 – 2007) | cash and stock dividend announcements collected over the period of 2004–2007 | | • Almost 24 stock dividends and 40 simultaneous events of cash and stock announcements were examined. |

Souce: (Authors' own compilation)

Correspondingly, signalling theory in regard to the dividend policy was supported by Kanwer (2002), who examined 317 companies listed on the KSE in the period of 1992–1998. The author adopted a regression model with the dividend yield as the dependent variable; a dummy variable indicating whether earnings increased or decreased in the future was adopted as a proxy for the signalling effect. The author concluded that the dummy variable was positively related to the dividend yield, which was backed by the signalling theory, which was also examined by Pettit (1972), (Lonie *et al.*, 1996) and McCluskey et al. (2006). Moreover, the results from the regression model specified that size has a positive but insignificant association with payments of dividends; the present year's retained earnings and the market-to-book ratio showed significantly negative relationships with dividends. Similarly, Kaleem and Salahuddin (2006) analysed the influence of dividend announcements on common share prices on the Lahore Stock Exchange – Pakistan using the event study methodology. The authors' findings were based on the calculation of the MAAR and CAR for a sample of 24 companies from the period of 2002–2003. Another significant factor within the empirical results indicated that the average MAAR was 0.001 for the year 2002 and -0.009 for the year 2003, respectively. However, within two years the MAAR did not show significant results. In the same way, the CAR presented insignificant results of -0.6 and -0.4 for the years 2002 and 2003, respectively. The overall consideration of these short-term findings was insignificant, and the results specified that shareholders suffered losses of 2.5% and 1.7% in the years 2002 and 2003, respectively, over a period starting 30 days before the dividend announcement and ending 7 days after the ex-dividend date. The authors determined that shareholders achieved no net gain from dividend payments, as indicated by the LSE and backing Miller and Modigliani's (1961) dividend irrelevance hypothesis theory. A contrary explanation from Zaman (2007) established a significant positive influence of dividend announcements on share prices. Moreover, the author found an influence of diverse events on the stock prices of 6 highly traded firms collected from all 3 stock exchanges of Pakistan over the period from 2000 to 2005. In addition, the author adopted the market-based methodology, for instance ANOVA and multiple regression models, to conduct his research studies. The outcome of his findings indicated a significant positive influence on the announcements of dividends and earnings. On the other side, Mubarik (2008) asserted that share prices do react positively to dividend announcements; moreover, the data specify a negative and weak relationship between announcements of dividends and share prices. The author's data comprised 5 companies from the oil and gas marketing sector of Pakistan, which made overall 32 dividend announcements during the period from August 2004 to February 2008.

It is, however, important to note that Mubarik (2008) computed average abnormal returns (AARs) and cumulative average abnormal returns (CAARs) throughout the 20-day event window around the dividend announcements. On the other side of developed and emerging market studies, for example Pettit (1972), (Lonie *et al.*, 1996), McCluskey et al. (2006) and Zaman (2007), the outcome indicated an insignificant negative AAR value of -0.002 (t-value = -1.8) and a significant CAAR value (-0.04, t-value = -26.8) on the day of announcement. Moreover, significant and negative CAAR results were observed around all 20 days within the event window. However, in connection with Mubarik (2008), Akbar and Baig's (2010) study established that the returns were mostly observed as negative for the 41-day window around the announcement of cash dividends. On the other side, the cumulative abnormal returns observed for days t - 1 and t + 1 were -0.009 with a t-value of -2.3. In addition, the authors established significant positive abnormal returns on stock dividends and simultaneous cash and stock dividend announcements.

### 3.7 Summary of the Literature Review

Many studies have verified Lintner's behavioural model of dividend policy, in which the existing dividend is constructed based on the present year's earnings and the last year's dividend. Many aspects of dividend policy have been discussed in the literature, however, the greater weight is on the signalling hypothesis because the flow of information is a key element in developing markets. The signalling hypothesis is based on the information content, and, specifically in this thesis, the idea that dividends contain information signals, whereby an increase in dividends is considered as a positive signal about expected earnings and, on the other side, a reduction in dividends is viewed as a negative sign about the expected earnings of the firm. Several surveys have suggested that dividends perform as a signal to external stakeholders (Baker et al., 1985; Baker & Powell, 1999; McCluskey et al., 2007). Likewise, the empirical results back the view that dividend announcements comprise information about future earnings (Pettit, 1972; Lonie et al., 1996; Aharony & Swary, 1980; McCluskey et al., 2007). Moreover, the collaboration between dividends and earnings announcements tends to communicate vital information to shareholders (Kane et al., 1984; Easton, 1991; Lonie et al., 1996; McCluskey et al., 2006).

On the other side, the signalling hypothesis differs from the theory of irrelevance presented by Miller and Modigliani (1961); many studies have supported under certain assumptions the idea that the dividend payment by firms should not have an impact on the share prices (Black & Scholes, 1974; Miller & Scholes, 1982; Uddin & Chowdhury, 2005; Kaleem & Salahuddin, 2006). It is clear from the literature on the Pakistani stock market that the share price reacts to dividend announcements; however, a variety of opinions exists among studies. Some researchers have supported MM's irrelevance theory (Kaleem & Salahuddin, 2006); others have agreed with the signalling effect theory (Nishat, 1992; Kanwer, 2002; Zaman, 2007; Mubarik, 2008; Akbar & Baig, 2010). The variation observed in the findings is due to the small sample size collected to examine the impact of dividend announcements on share prices. The current thesis attempts to overcome these limitations by collecting a sample over 10 years, the period from January 2005 to December 2014, from the overall listed companies.

### 3.8 Research Methodology

Financial experts are regularly asked to analyse the effects of financial events on firms' value. This appears to be a challenging assignment, although it can be undertaken easily using an event study. However, it is important to note that, by testing the financial data of the market, an event study examines the impact of a specific event on firms' value. Event studies show that the consequences of event(s) will be reflected swiftly in the security prices.

Nevertheless an event study has various applications. Specifically in finance and accounting research, event studies have been applied to diverse financial and economic events. For example, event studies have been used in economics and law to examine the influence of events on the value of firms in relation to changes in the regulatory environment (Schwert, 1981) and legal circumstances in identifying consequences of those events (Mitchell & Netter, 1994).

Many event studies have analysed the effect of an event on the price of securities. This chapter focuses on the use of this method to measure the market efficiency of the Pakistan Stock Exchange through the announcement of dividends and its impact on stock prices. Event studies have a long history in the finance literature. Dolley (1933) first published event studies and analysed the price effects of stock splits, studying nominal price changes at the time of the split. Based on the selection of 95 splits between 1921 and 1931, he reached the conclusion that the price increased in 57 of the split events and declined in 26 cases. Subsequently, from the early 1930s until the late 1960s, the sophistication level of event studies increased. Myers and Bakay (1948) and Ashley (1962) are historical examples of event studies conducted during this time.

It is important to note that the late 1960s was an influential period on event studies' methodology, because Ball and Brown (1968) and Fama et al. (1969) presented a significant methodology that is fundamentally the same as being practised today. Ball and Brown (1968) measured the information content of earnings, and Fama et al. (1969) examined the effects of stock splits after eliminating the effects of simultaneous dividend increases. Since this important period of event studies, many amendments or variations have been established. It could also be said that general modifications appeared because of the contravention of statistical assumptions in earlier research and the main focus on developing more precise hypotheses. Having considered the earlier research of the 1960s, it is also reasonable to look at the beneficial contributions of the amplification and development of more specific hypotheses by Brown and Warner (1980, 1985). However, the 1980 paper was more focused on implementation issues for data sampled at monthly intervals and the 1985 paper concentrated on issues related to daily data.

### 3.8.1 Event Studies

This study used the event study methodology to investigate the dividend announcement effect on the share prices of companies listed on the Pakistan Stock Exchange. Event studies identify the performance and behaviour of corporate events through stock prices. In financial economics, an enormous literature has been developed during the last few decades regarding event studies. However, from corporate perspective, event studies' importance becomes visible at the time of abnormal performance, which has an impact on the wealth of firms' shareholders/claimholders.

In addition, event studies mostly emphasize announcement effects in the short term and provide a background understanding of any relevant corporate decision policy. In capital markets event studies perform a significant role in the testing of market efficiency, since abnormal security returns after a specific corporate event are inconsistent with market efficiency. Furthermore, focusing on the long-term horizon of events could provide indications of market efficiency (Brown & Warner, 1980; Fama, 1991).

Similar event studies have been conducted by Pettit (1972), Aharony and Swary (1980), Brown and Warner (1980), Masulis (1980), Woolridge (1982), Asquith and Mullins Jr (1983), Venkatesh (1989) and Akhigbe and Madura (1996). A study of the effect of earnings announcements was conducted by Dennis and McConnell (1986), and insider trading research was conducted by Sivakumar and Waymire (1994), Gregory et al. (1997) and Hillier and Marshall (2002).

### 3.8.2 Procedure for Event Studies

It is important to know the process to undertake an event sudy. The starting point for managing an event study is to recognize the event of interest and classify the time period over which the security prices of the companies involved will be examined, called the *event window*. For instance, in this chapter the event is the announcement of dividends and the event window is one day from the dividend announcement. However, it is common to define the event window as longer than the particular period of interest, allowing the investigation of periods around the event. Generally, the period of attention is spread to several days, including at least the announcement day and the day after the announcement. The event window expresses the effects of price movements observed after the stock market closes on the day of the announcement. It is important to note, however, that periods before an event and after an event may also be of interest.

### 3.8.3 Research Data

The present study examines market efficiency by investigating the impact of dividend announcements on the stock price returns of an emerging market, namely the Pakistan Stock Exchange. Therefore, this chapter has the main objective of investigating which form of market efficiency exists by considering the reaction of stock prices before and after the announcement of dividends in the period from 2005 to 2014 (10 years) for a total of 1621 dividend announcements, consist of 332 listed companies data collected from DataStream, and, matched with the official website of the Pakistan Stock Exchange and the closing stock price, stock index and discount rate (risk-free rate) data of listed companies, also collected from DataStream.

### 3.8.4 Model for Estimating Security Returns

For event studies the first step is to find the daily return of the share prices and the PSX by obtaining the closing price of the shares and the closing value of the PSX Index. The following formula is used for the daily return of the $ith$ stock on day t by continuously compounded return (log returns):

$$r_{it} = ln(1 + R_{i,t}) = ln(P_{i,t}) - ln(P_{i,t-1})^{11} \quad (3\text{-}1)$$

$r_{it} = Log\ daily\ return\ of\ stock/index\ i\ on\ day\ t.$

$R_{it} = Daily\ return\ of\ stock/index\ i\ on\ day\ t.$

$P_{it} = Closing\ price\ of\ stock/index\ i\ on\ day\ t.$

$P_{it-1} = Closing\ price\ of\ stock/index\ i\ on\ day\ t - 1.$

The continuous compounded return model was used by Campbell et al. (1997). Abnormal returns are essential to measure the influence of an event. The overall concept of this measure is to separate the impact of the event from other common activities of the stock market. Abnormal or excess daily returns of single stocks and the PSX Index for each day were calculated through the following formula:

$$AR_{i,t} = R_{i,t} - E[R_{i,t} | \Omega_{i,t}] \quad (3\text{-}2)$$

An abnormal return ($AR_{it}$) indicates the daily abnormal return of stock $i$ on day $t$. Further, the equation explains the difference of the realized return and the expected return given the absence of the event. Moreover, during the event study examination, the market-adjusted return model is used to estimate the abnormal returns.

In the next step, the daily average cumulative returns for the event window are calculated as follows:

[11] Relationship between risk and return calculated using logarithmic returns will systematically differ from those calculated using simple returns. Indeed, when logarithmic returns are used, ceteris paribus, higher variance will automatically reduce expected returns as a matter of basic algebra (Hudson and Gregoriou 2014).

$$CAR_{t1,t2} = \sum_{t=1}^{t2} AR_{i,t} \qquad (3\text{-}3)$$

For the calculation of the cumulative abnormal return (CAR) of every stock, the abnormal return is collected over the event window.

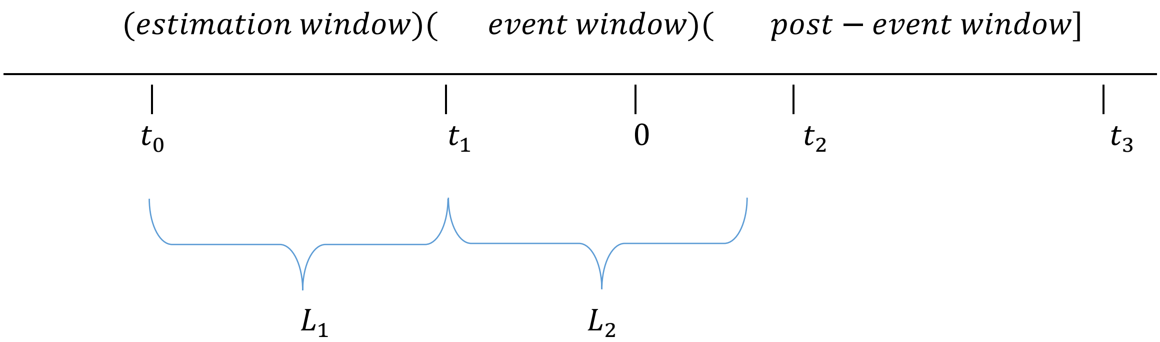
$$AR_{it} = Average\ abnormal\ return\ of\ N\ events\ on\ day\ t$$

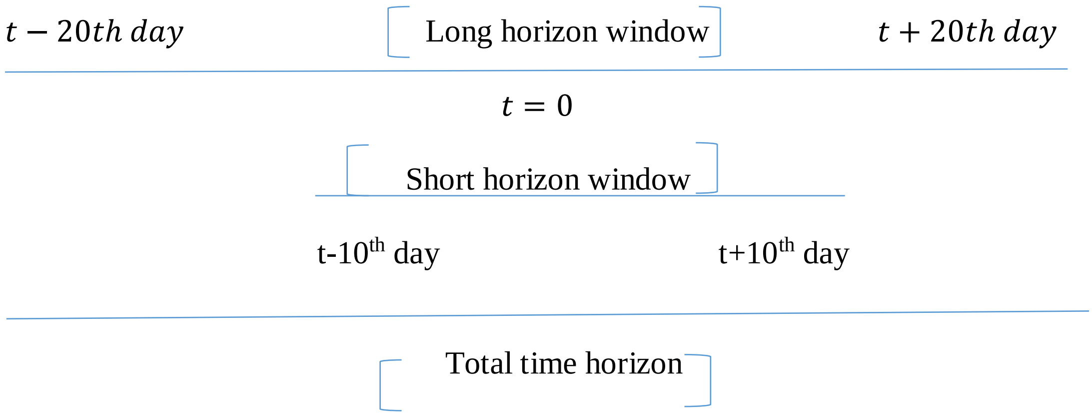
$$CAR_T = Cumulative\ abnormal\ return\ of\ event\ window\ from\ t = 1\ to\ t = T$$

Conversely, the statistical assessment of abnormal returns is usually recognized as the cross-sectional average of each measure. The cross-sectional average for cumulative abnormal returns is:

$$CAAR(t_{1,}t_2) = \frac{1}{N} \sum_{i=1}^{N} CAR_i(t_1, t_2) \qquad (3\text{-}4)$$

In addition, the event window is based on the following timeline:




It should also be taken into consideration that event studies use a number of models. Some models impose parameters that need to be estimated (e.g. the market model, CAPM and multifactor model). This study examines the market model and the CAPM model.

The time period in which the parameters are projected is generally represented as the estimation window. In this chapter the event data are carefully checked to avoid any overlapping of events and estimation windows.

## 3.9 Market Returns

In this chapter abnormal returns are examined by subtracting the simultaneous returns of the market index:

$$AR_{i,t} = R_{i,t} - R_{M,t} \qquad (3\text{-}5)$$

where $R_{M,t}$ $is\ considered\ as\ the\ return\ of\ the\ market\ index\ (i.e.\ the\ KSE\ 100\ Index)$

This model is used as a control model with an alpha equal to zero and a beta equal to one for individual stocks (Mackinlay, 1997).

### 3.9.1 Market Model

This market model[12] is based on the assumption of a constant and linear association between the separate asset returns and the return of a market index. The importance of this model is that it links the return of any specified security to the return of the market portfolio. Further, the model's linear description follows from the supposed normality of the asset returns.

There is a further point to be considered: the market model represents a possible improvement over the constant mean return model, as it eliminates the portion of the return that is connected to the variation in the market return, so the variance of the abnormal return is reduced. It could also be said that it increases the capability to identify event effects efficiently.

$$R_{i,t} = \propto_i + \beta_i R_{M,t} + \varepsilon_{i,t}\ with\ E[\varepsilon_{i,t}] = 0\ and\ VAR\ [\varepsilon_{i,t}] = \sigma^2_{\varepsilon i} \qquad (3\text{-}6)$$

[12] The wild bootstrap approach in terms of further work with event studies could be consider, (for example see; Gregoriou 2014).

In this chapter the model parameters are estimated using ordinary least squares regressions based on the observation of estimation windows.

### 3.10 CAPM Model

Economic models impose constraints on statistical models to offer more restricted normal return models. The two most widely used restricted models are the capital asset-pricing model (CAPM) and arbitrage pricing theory (APT). The CAPM model was established by Sharpe (1964) and Lintner (1965) based on an equilibrium theory in which the expectable return of a given asset is scrutinized using its covariance with the market portfolio. Another significant model, APT, developed by Stephen Ross (1976), is an asset-pricing theory; Ross explained that the expected return of a specified asset is a linear combination of multiple risk factors. The CAPM is very popular in event studies. However, the constraints enforced by the CAPM on the market model are debateable. Furthermore, the results of the studies may be sensitive to the particular CAPM limitations. Therefore, sensitivity can be avoided by using the market model.

However considering the capital asset-pricing model, the expected excess return of asset $i$ is given by:

$$E\left[R_i - r_f\right] = \propto_i + \beta_i \left[R_M - r_f\right] + \varepsilon_{i,t} \qquad (3\text{-}7)$$

$$r_f = risk - free\ return$$

The capital asset-pricing model estimates the model parameters by time-series regression based on realized returns:

$$(R_{i,t} - r_{f,t}) = \propto_i + \beta_i[R_M - r_f] + \varepsilon_{i,t}\ with\ E[\varepsilon_{i,t}] = 0\ and\ VAR\ [\ \varepsilon_{i,t}] = \sigma_{\varepsilon i}^2 \quad (3\text{-}8)$$

In addition, the time series of risk-free returns is not annualized but equals the frequency of the data.

**Fama-French Three Factor Model**

A well established method is the three factor model by Fama and French (1993)[13]. They add two additional factors into the CAPM that should enhance the explanatory power of the model:

$$r_{it} - r_{ft} = \alpha_i + B_{i,MKT} MKT_t + B_{i,SMB} SMB_t + B_{i,HML} HML_t + \varepsilon_{it} \qquad (3\text{-}9)$$

$SMB_t and\ HML_t\ known\ as\ size\ and\ value\ risk\ factors, respectively$

$\beta_{i,SMB}\, and\ B_{i,HML} = factor\ loadings\ (other\ than\ market\ \beta).$ These loading are characterized as the time series regression slope(s).

$$\alpha_{it}\ and\ \varepsilon_{it} = intercept\ of\ regression\ equation\ and\ error\ term, repectively.$$

$\mathrm{SMB_t}$ representing 'small minus big' and $\mathrm{HML_t}$ indicating 'high minus low'. The $\mathrm{SMB_t}$ showing the excess return of small over big stocks (measured by market cap). The $\mathrm{HML_t}$ factor higlighting the excess return of stocks with a high market-to-book ratio over stocks with a low market-to-book ratio (Fama and French 1993).

### 3.10.1 T-Test

Subsequently, the time series t-test is expressed as:

$$T_{time} = \frac{CAAR_t}{(t_2 - t_1 + 1)^{\frac{1}{2}}\, \hat{\sigma}_{AAR_t}} \qquad (3\text{-}10)$$

---

[13] Carhart four-factor model is an extension of the Fama–French three-factor model including a momentum factor for asset pricing of stocks. It is also known in the industry as the MOM factor (monthly momentum). Moreover, five-factor model that adds profitability and investment factors to the three-factor model of Fama and French (1993) suggests the profitability factor is the difference between the returns of firms with robust (high) and weak (low) operating profitability; and the investment factor is the difference between the returns of firms that invest conservatively and firms that invest aggressively.

$$\hat{\sigma}^2_{AAR_t} = \frac{1}{M-d} \sum_{t=Est_{min}}^{Est_{max}} [AAR_t - \frac{1}{M} \sum_{Est_{min}}^{Est_{max}} (AAR_t)]^2 \quad (3\text{-}11)$$

## 3.11 Market Model and CAPM Model

It is important to note that the basic analysis of data begins by screening out good news and bad news from the overall market.

For that reason, the $abnormal\ return\ (AR)$ is calculated for each company under the assumptions of the market model, CAPM model and Fama-French three factor model as explained above. To be able to understand the selection of good news and bad news, it is appropriate to consider positive abnormal returns as good news. Perhaps it could also be said that the actual returns exceeds the expected returns. In a similar way, negative abnormal returns are considered as bad news, because the actual returns are less than the expected returns. However, neutral news events are those in which the actual returns exactly match the expected returns.

**Table 3-3: Categorization of Events in Numbers**

| **Categorization of Events in Numbers on the Dividend Announcement Day (Overall Market)** | | | | |
|---|---|---|---|---|
| **Models** | **Good News** | **Neutral News** | **Bad News** | **Total Events** |
| Market Model | 795 | 3 | 823 | 1621 |
| CAPM Model | 809 | 0 | 812 | 1621 |
| Fama French Three Factor Model | 811 | 3 | 807 | 1621 |

As we have seen from the categorization of events, bad news events are slightly higher in number than good news events in both the models. Evidence of this position can clearly be found in the graphs below.

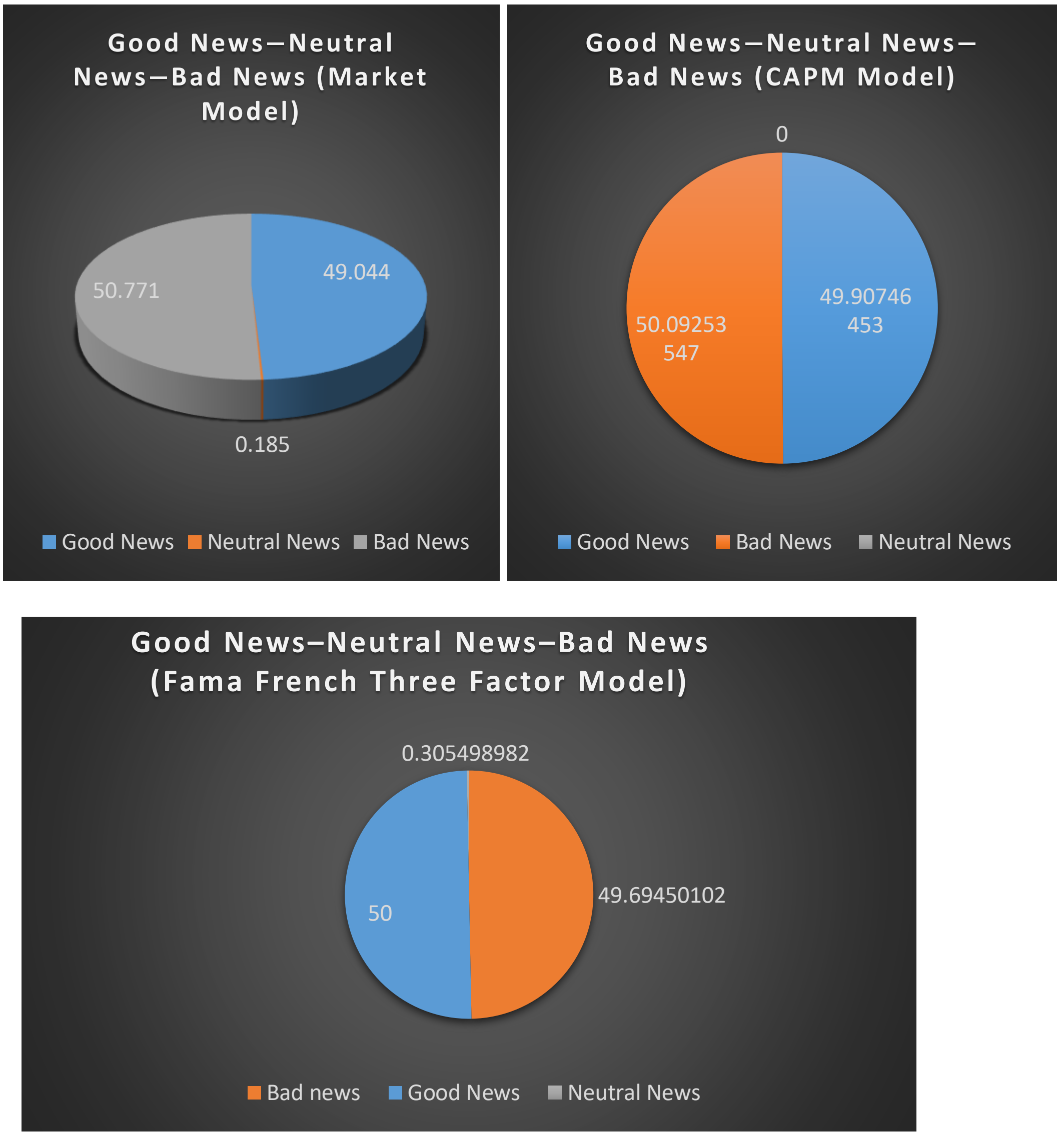


Figure 3-3: Good News, Neutral News and Bad News

A significant aspect indicated by the graph is that 49.044% (market model), 49.907% (CAPM model) and 50% (Fama French model) of the events within the overall market beat the estimated price of the market and resulted in positive abnormal returns. To be able to understand the remaining percentages, 50.771% (market model), 50.092% (CAPM model) and 49.694% (Fama French Model) of the events estimated higher stock price returns than the actual stock price returns, which resulted in negative abnormal returns. However, only a 0.185% (market model), 0% (CAPM model) and 0.3054% (Fama French Model) share belong to neutral news, for which the actual stock prices exactly match the estimated stock prices.

With regard to the percentage share of good and bad news, it is quite surprising that the overall market has a mixed tendency. It could also be concluded that overall the stock market has more or less an equal frequency of good and bad news.

The following tables show the bell curve frequency of the CAPM, Market model and Fama French three factor model analysis, indicating bad and good news. The maximum frequencies of 21 (CAPM model), 21 (market model) and 22 (Fama French three factor model) are observed in the range of 100% to 100.25% for good news, showing the maximum peak in the following graph. Similarly, the maximum frequencies of 13 (CAPM model), 10 (market model) and 17 (Fama French model) are observed for bad news. Further, the shape of the bell curve in the CAPM and Fama French model showing a single peak and good balance; however, the market model bell curves slightly towards the right. As we can observe in the following table, the announcements of good news and bad news are well balanced in terms of the frequency distribution.

**Table 3-4: Bell Curve: CAPM Model on the Day of Announcemnet**

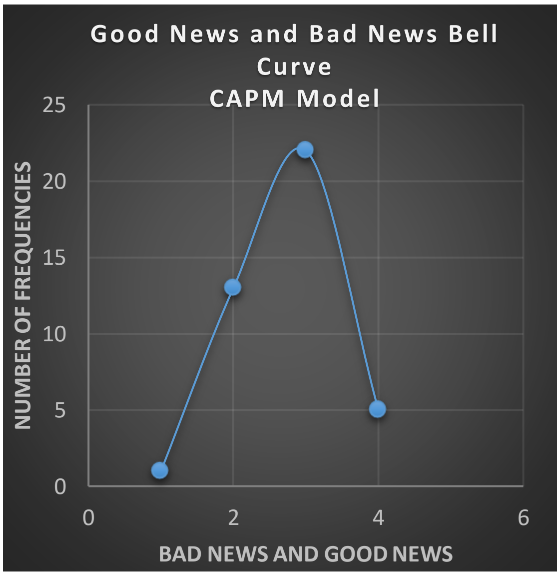
| **CAPM Model** | |
|---|---|
| **Range** | **Frequency** |
| 1) 99.5% to 99.75% (Bad news / Negative values) | 1 |
| 2) 99.76% to 99.99% (Bad news / Negative values) | 13 |
| 3) 100% to 100.25% (Good news / Positive values) | 21 |
| 4) 100.26% to 100.50% (Good news / Positive values) | 5 |
| 5) 100.50% to 100.75% (Good news / Positive values) | 1 |

**Table 3-5: Bell Curve: Market Model on the Day of Announcement**

| Market Model | |
|---|---|
| **Range** | **Frequency** |
| 1) 99.5% to 99.75% (Bad news / Negative values) | 6 |
| 2) 99.76% to 99.99% (Bad news / Negative values) | 10 |
| 3) 100% to 100.25% (Good news / Positive values) | 21 |
| 4) 100.26% to 100.50% (Good news / Positive values) | 3 |
| 5) 100.50% to 100.75% (Good news / Positive values) | 1 |

**Table 3-6: Bell Curve: Fama and French Model on the Day of Announcement**

| Fama French Three Factor Model | |
|---|---|
| **Range** | **Frequency** |
| 1) 99.5% to 99.75% (Bad news / Negative values) | 2 |
| 2) 99.76% to 99.99% (Bad news / Negative values) | 17 |
| 3) 100% to 100.25% (Good news / Positive values) | 22 |
| 4) 100.26% to 100.50% (Good news / Positive values) | 0 |
| 5) 100.50% to 100.75% (Good news / Positive values) | 0 |



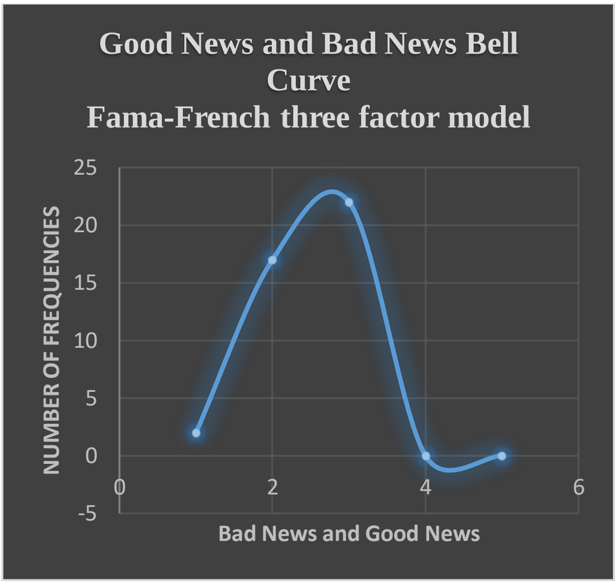




**Figure 3-4: Bell Curve: CAPM Model, Market Model and Fama French three factor model**

## 3.12 Abnormal Returns

Unexpected returns or abnormal returns are calculated over 41 days from -20 to +20 around the dividend announcement dates. Overall 1,621 dividend announcement events are collected over the period of 2005–2014.

The calculation of abnormal returns has been discussed earlier in this chapter. To summarize, average abnormal returns are calculated as the sum of all abnormal returns divided by the total number of events on a particular day. A list of all the average abnormal returns in terms of bad news and good news during the period -20 to +20 is presented in Table 3-7 as follows:

**Table 3-7: Average Abnormal Returns**

| Event Days | Market Model AAR Bad News | Market Model AAR Good News | CAPM Model AAR Bad News | CAPM Model AAR Good News | Fama-French Model AAR Bad News | Fama-French Model AAR Good News |
|---|---|---|---|---|---|---|
| -20 | -0.00453 | | -0.000599572 | | | 0.0007045 |
| -19 | | 0.000455 | | 0.002308154 | | 0.0003154 |
| -18 | | 0.002279 | | 0.00158592 | | 0.0006859 |
| -17 | -0.00275 | | | 0.000839893 | | 0.0017815 |
| -16 | -0.00041 | | | 0.003467135 | -0.0002099 | |
| -15 | -0.00105 | | -0.001971943 | | -0.0003650 | |
| -14 | | 0.000989 | -0.0008447 | | | 0.0009218 |
| -13 | | 0.000594 | | 0.001646924 | | 0.0007365 |
| -12 | | 0.001504 | | 0.002528462 | | 0.0009472 |
| -11 | | 0.000275 | | 0.001536901 | | 0.0000386 |
| -10 | | 0.002334 | | 0.000484723 | | 0.0004174 |
| -9 | | 0.001703 | -0.000134633 | | -0.0009853 | |
| -8 | | 6.04E-05 | -0.000966935 | | | 0.0000392 |
| -7 | | 0.001587 | | 0.002418933 | | 0.0008665 |
| -6 | | 0.004275 | | 0.001939579 | | 0.0011680 |
| -5 | | 0.002269 | -0.000547359 | | -0.0002575 | |
| -4 | | 0.003441 | | 0.000661241 | | 0.0007526 |
| -3 | | 0.002177 | | 0.001314036 | | 0.0015640 |
| -2 | | 0.000385 | | 0.001134876 | | 0.0005311 |
| -1 | | 0.002588 | | 0.002917451 | | 0.0009418 |
| 0 | -0.00141 | | | 0.000693453 | -0.0005679 | |
| 1 | | 0.006764 | | 0.002511897 | -0.0003153 | |
| 2 | | 0.001041 | | 0.000271176 | -0.0019326 | |
| 3 | | 0.001594 | | 0.000535416 | | 0.0000072 |
| 4 | -0.00141 | | -0.002090366 | | -0.0016178 | |
| 5 | -0.00386 | | -0.000100595 | | -0.0000501 | |
| 6 | -0.00113 | | -3.68399E-05 | | -0.0016722 | |
| 7 | -0.00104 | | | 0.002253151 | -0.0006282 | |
| 8 | | 0.000465 | | 0.000207448 | | 0.0004828 |
| 9 | | 0.000721 | | 0.001171849 | | 0.0009273 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 10 | -0.00197 | | | 0.00076462 | | 0.0002764 |
| 11 | -0.00361 | | -6.21099E-05 | 0.001688173 | -0.0011280 | |
| 12 | | 0.001824 | | 0.003132582 | | 0.0013430 |
| 13 | -0.00052 | | | 0.002253151 | -0.0012910 | |
| 14 | -0.00388 | | -0.001206461 | | -0.0024795 | |
| 15 | -0.00186 | | | 0.000439544 | -0.0017032 | |
| 16 | | 0.000176 | -0.00117773 | | -0.0019744 | |
| 17 | | 9.67E-05 | | 0.000943091 | -0.0008565 | |
| 18 | -0.00031 | | -0.000436478 | | -0.0018412 | |
| 19 | | 0.000596 | | 0.001093208 | | 0.0006721 |
| 20 | -0.00399 | | -0.003854589 | | -0.0031635 | |

Having considered good news and bad news, it is also reasonable to examine particular event days. The average abnormal returns are consecutively positive (good news) from day -14 until day -1, excluding event day 0, that is, the dividend announcement day, and the positive AARs continue for days 1 to 3 in the market model. This is probably an indication of the arrival of information into the stock market on the announcement day, as Pettit (1972) also mentioned that the arrival of information changes stock prices' return trend. There is, however, a further point to be considered: on the day of the announcement, that is, day 0, the average abnormal return is -0.141%, which is the only negative return observed within the timeline of good news from day -14 to day 3 (a 16-day window). An equally significant aspect to be considered is that on day 0, when the announcement of the dividend is equally circulated among all the investors, then non-informed investors also reacted to the news, and the impact of the news came to show negative returns. Subsequently, after the event was announced, the impact of positive average abnormal returns dissolved slowly and gradually. The results are more aligned with (Bhattacharya, 1979, 1980; Healy and Palepu 2001).

However, on the other side, the CAPM shows average abnormal returns in the form of good news from the window (-4 to +3), which includes the announcement day as well. This information clearly indicates the arrival of information before the announcement date, and the actual returns are higher than the expected returns. The results can be highlighted as the weak form of market efficiency, because we cannot forecast future prices on the basis of past available prices.

Moroever, Fama French three factor model indicating negative average abnormal returns from day 0 to day 7 excluding day 4. This information illustrating that market has lower actual return than the expectation of the market. However, before the announcement, there is a trend of positive average abnormal returns observed from the event window i.e. from -4 to -1.

The potential explanation of the patterns also observed through cumulative average abnormal returns in the subsequent analysis of the chapter.

**Table 3-8: Average abnormal returns (Good and Bad News) on the day of announcement**

| **Models** | **Average Abnormal Returns (only Bad News) on the day of Announcement (day 0)** | **Average Abnormal Returns (only Good News) on the day of Announcement (day 0)** |
|---|---|---|
| Market Model | -0.037878093 | 0.039408032 |
| CAPM Model | -0.039043769 | 0.039000684 |
| Fama and French Three factor model | -0.039286312 | 0.037680243 |

The above table observing the average abnormal returns on the day of announcement (day 0) of good news and bad news of all models. The interesting fact to consider that average abnormal returns on the announcement day of bad news is negative and consider as similar for Market, CAPM and Fama and Franch models. Similarly, average abnormal returns on the day of announcement (day 0) of good news is positive and similar for all models. In other words, weighted average among good news and bad news equally and approximately shared. Moroever, on the day of announcement, probability of good and bad news is approximately equal.

### 3.13 Absolute Average Abnormal Returns

It is important to consider absolute values to evaluate the volatility of returns. Generally, the calculation of absolute abnormal returns ignores the signs of the returns. Absolute abnormal returns have commonly been examined in the literature and considered as an appropriate proxy for the volatility of returns. According to Forsberg and Ghysels (2007), absolute returns are more persistent than squared returns and have superior sampling error properties. The following table shows the calculated absolute average abnormal returns of the market model for the event window of -20 to +20.

**Table 3-9: Absolute Average Abnormal Returns**

| Event Days | Absolute AAR (Market Model) | Absolute AAR (CAPM Model) | Absolute AAR (Fama French Model) |
|---|---|---|---|
| -20 | 0.004528204 | 0.000599572 | 0.000705 |
| -19 | 0.00045466 | 0.002308154 | 0.000315 |
| -18 | 0.002279313 | 0.00158592 | 0.000686 |
| -17 | 0.002750671 | 0.000839893 | 0.001782 |
| -16 | 0.00040578 | 0.003467135 | 0.00021 |
| -15 | 0.001049238 | 0.001971943 | 0.000365 |
| -14 | 0.000989049 | 0.0008447 | 0.000922 |
| -13 | 0.000594344 | 0.001646924 | 0.000737 |
| -12 | 0.001503529 | 0.002528462 | 0.000947 |
| -11 | 0.000274802 | 0.001536901 | 3.86E-05 |
| -10 | 0.002334222 | 0.000484723 | 0.000417 |
| -9 | 0.001703412 | 0.000134633 | 0.000985 |
| -8 | 0.0000604 | 0.000966935 | 3.92E-05 |
| -7 | 0.001586944 | 0.002418933 | 0.000867 |
| -6 | 0.004275138 | 0.001939579 | 0.001168 |
| -5 | 0.002269264 | 0.000547359 | 0.000258 |
| -4 | 0.003441114 | 0.000661241 | 0.000753 |
| -3 | 0.002177131 | 0.001314036 | 0.001564 |
| -2 | 0.000384606 | 0.001134876 | 0.000531 |
| -1 | 0.002587751 | 0.002917451 | 0.000942 |
| 0 | 0.001412479 | 0.000693453 | 0.000568 |
| 1 | 0.006763611 | 0.002511897 | 0.000315 |
| 2 | 0.001041389 | 0.000271176 | 0.001933 |
| 3 | 0.00159405 | 0.000535416 | 0.0000072 |
| 4 | 0.001411574 | 0.002090366 | 0.001618 |
| 5 | 0.003860927 | 0.000100595 | 0.000052 |
| 6 | 0.001125763 | 3.68399E-05 | 0.001672 |
| 7 | 0.00104464 | 0.002253151 | 0.000628 |
| 8 | 0.000465139 | 0.000207448 | 0.000483 |
| 9 | 0.000721212 | 0.001171849 | 0.000927 |
| 10 | 0.001973344 | 0.00076462 | 0.000276 |
| 11 | 0.003606835 | 6.21099E-05 | 0.001128 |
| 12 | 0.001823822 | 0.001688173 | 0.001343 |
| 13 | 0.000524937 | 0.003132582 | 0.001291 |
| 14 | 0.003880417 | 0.001206461 | 0.00248 |
| 15 | 0.001864952 | 0.000439544 | 0.001703 |
| 16 | 0.000176355 | 0.00117773 | 0.001974 |
| 17 | 0.0000967 | 0.000943091 | 0.000857 |
| 18 | 0.000305594 | 0.000436478 | 0.001841 |
| 19 | 0.000596056 | 0.001093208 | 0.000672 |
| 20 | 0.003987803 | 0.003854589 | 0.003164 |

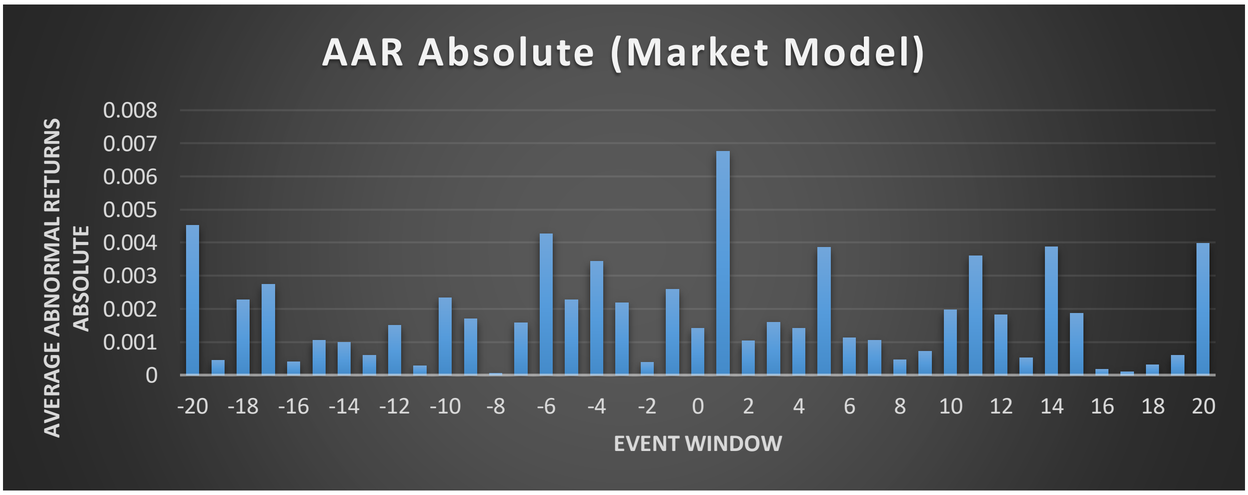
Having considered the absolute average abnormal returns, it is also of interest to look at Figure 3-5, which show the trends. It is important to note, however, that the absolute average abnormal return increased during the event days close to the announcement of dividends, and it could also be said that the dividend announcement caused higher absolute abnormal returns in the market. Another significant factor is that days -1 to 0, that is, just before and on the dividend announcement day, show the highest values of absolute average abnormal returns. Surprisingly, this is a clear indication that the market has some inside information and can be considered as an inefficient market due to the asymmetric information on dividend announcements and the generation of extraordinary abnormal returns. Moreover, inside information earlier than announcnment day is also indication of prices going up before good news and down before bad news. This study supports the evidence of insider trading before the announcement of dividends. This is because institutions or *king makers* enjoy confidential information and understand the industry trends and macroeconomic movements better than general investors (Wermers, 2000; Ke & Ramalingegowda, 2005; Piotroski & Roulstone, 2005).

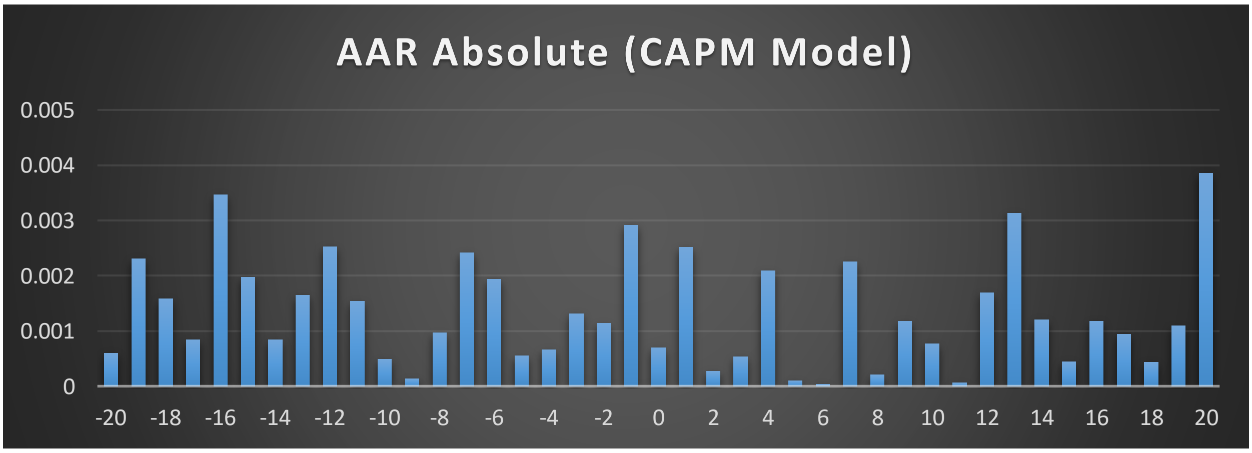
Another piece of evidence in support of this position, particularly on the day of the announcement, can be found in the signalling hypothesis of dividend announcements, whereby the announcement or lack of announcement of dividends conveys information to shareholders about the prospects of the company (Denis et al., 1994). Many researchers have supported the signalling theory, including Charest (1978), Asquith and Mullins Jr (1983), Kalay and Loewenstein (1986), Impson (1997) and Nissim and Ziv (2001), who argued that dividends are a very good predictor of the standing of any company for investors and shareholders.

However, Miller and Modigliani (1961) presented the proposition that all investors and company managers have the same information and the same capability to understand and analyse the available information. The above results of absolute average abnormal returns show movements in stock returns earlier than the announcement date, which might contradict the MM theory; some signs of inside information are conveyed within the market when the dividend announcements originate.

According to Aharony and Swary (1980), the share price surprisingly increases when a company announces an increase in dividends. Similarly, the share price drops sharply as soon as the company reduces its dividends. Kwan (1981) argued that companies do not increase their dividends unless their managers predict future profits on the same or a larger scale.

According to King and Levine (1993), it is very difficult for companies to increase their dividend ratio on the prediction of lower profits compared with those of the last years. However, if the company increases the cash dividend, it means a healthy positive conclusion for investors, and ultimately it will have an impact on the share returns.



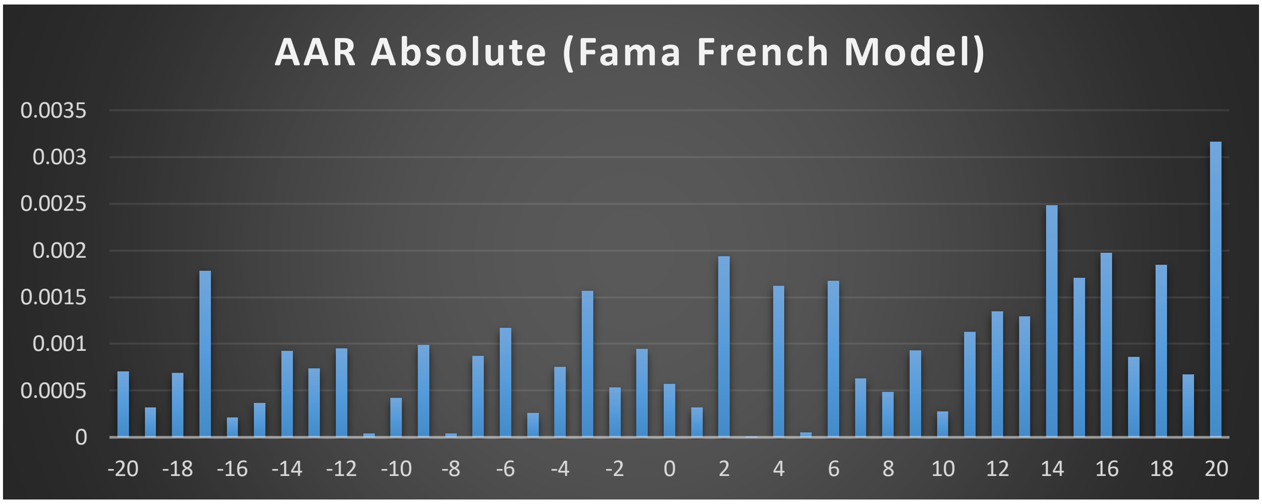



**Figure 3-5: Graphical Representation: Absolute AARs**

## 3.14 Cumulative Average Abnormal Returns (CAARs)

The following table shows the absolute CAARs of the event window from -20 to +20 of the overall events from the Karachi Stock Exchange, followed by a graphical presentation.

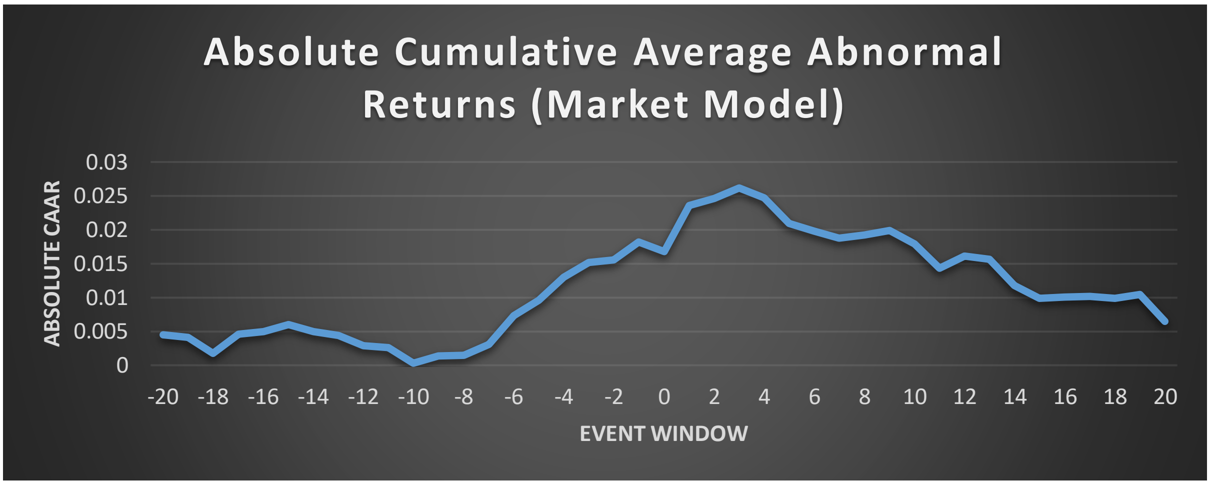
The cumulative average abnormal return (CAAR) is simply calculated with equation 3-4, using a firm's abnormal returns over a specified period before and after an event i.e three days evenly surrounding the event, that is, -1, +1. In that case the calculation of the CARs is basically the summation of a firm's abnormal returns on the day prior to the event, the event day and the day after the event. The averages of each firm's abnormal returns and cumulative abnormal returns over a specified number of trading days within the event window are named the average abnormal return (AAR) for a particular event day and the cumulative average abnormal return (CAAR) (which includes several days within the event window), respectively. The following table illustrates the CAAR of the Market, CAPM and Fama French models.

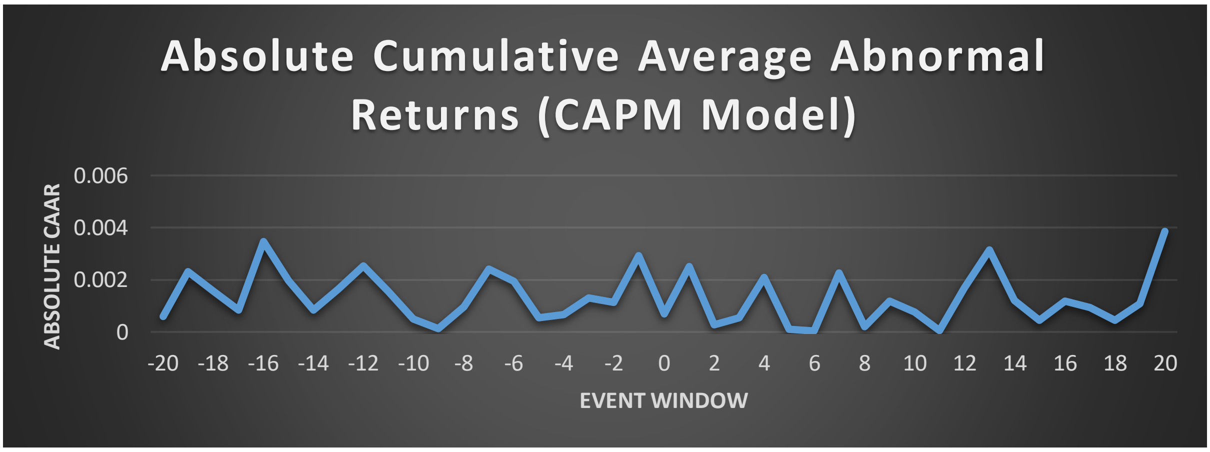
**Table 3-10: Cumulative Average Abnormal Returns**

| Event Days. | CAAR (Market Model) | CAAR (CAPM Model) | CAAR (Fama French Model) |
|---|---|---|---|
| -20 | 0.9992 | 0.9994 | 1.000705 |
| -19 | 0.9986 | 1.0023 | 1.00102 |
| -18 | 0.9987 | 1.0015 | 1.001706 |
| -17 | 0.9979 | 1.0008 | 1.003487 |
| -16 | 0.9981 | 1.0034 | 1.003278 |
| -15 | 0.9987 | 0.9980 | 1.002912 |
| -14 | 0.9992 | 0.9991 | 1.003834 |
| -13 | 0.9994 | 1.0016 | 1.004571 |
| -12 | 1.0004 | 1.0025 | 1.005518 |
| -11 | 0.9999 | 1.0015 | 1.005557 |
| -10 | 1.0009 | 1.0004 | 1.005974 |
| -9 | 1.0009 | 0.9998 | 1.004989 |
| -8 | 1.0012 | 0.9990 | 1.005028 |
| -7 | 1.0006 | 1.0024 | 1.005895 |
| -6 | 1.0030 | 1.0019 | 1.007063 |
| -5 | 1.0059 | 0.9994 | 1.006805 |
| -4 | 1.0074 | 1.0006 | 1.007558 |
| -3 | 1.0087 | 1.0013 | 1.009122 |
| -2 | 1.0114 | 1.0011 | 1.009653 |
| -1 | 1.0135 | 1.0029 | 1.010595 |
| 0 | 1.0178 | 1.0006 | 1.010027 |
| 1 | 1.0188 | 1.0025 | 1.009711 |
| 2 | 1.0185 | 1.0002 | 1.007779 |
| 3 | 1.0189 | 1.0005 | 1.007786 |
| 4 | 1.0183 | 0.9979 | 1.006168 |
| 5 | 1.0192 | 0.9998 | 1.006118 |
| 6 | 1.0197 | 0.9999 | 1.004446 |
| 7 | 1.0209 | 1.0022 | 1.003818 |
| 8 | 1.0219 | 1.0002 | 1.0043 |
| 9 | 1.0220 | 1.0011 | 1.005228 |
| 10 | 1.0207 | 1.0007 | 1.005504 |
| 11 | 1.0190 | 0.9999 | 1.004376 |
| 12 | 1.0171 | 1.0016 | 1.005719 |
| 13 | 1.0160 | 1.0031 | 1.004428 |
| 14 | 1.0109 | 0.9987 | 1.001949 |

| | | | |
|---|---|---|---|
| 15 | 1.0056 | 1.0004 | 1.000245 |
| 16 | 0.9985 | 0.9988 | 0.998271 |
| 17 | 0.9931 | 1.0009 | 0.997414 |
| 18 | 0.9893 | 0.9995 | 0.995573 |
| 19 | 0.9858 | 1.0010 | 0.996245 |
| 20 | 0.9828 | 0.9961 | 0.993082 |

The graphical presentation of the following absolute CAAR is demonstrated below.



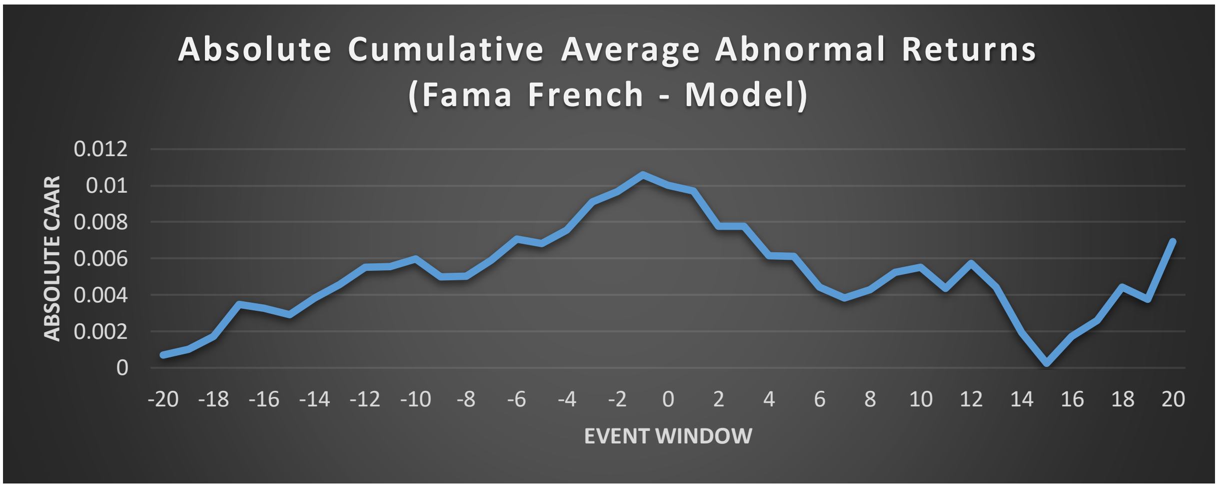



**Figure 3-6: Graphical Representation: Cumulative Average Abnormal Returns**

Evidently, with the price reaction to the dividend announcement, the Pakistan Stock Exchange has not completely reached an efficient level. Moreover, significant abnormal returns surround the dividend announcement date implies that the prices have not completely adjusted to the release of information to the general public. However, as it can be seen from the illustration of the two model charts, the direction of the CAAR (market model) recommends that the Pakistan Stock Exchange shareholders reacted well before the announcement of dividends, that is, day -7; the trend kept rising until day +3 and then the impact of the announcement became diluted. On the other hand, the direction of the CAAR (CAPM model) shows a rising trend from day -8 until day 0 and afterwards the impact of the announcement gradually dissolve. Moreover, Fama French three factor model indicating rising trend from -8 until day 0 and slowly the information getting diluted afterwards.

The results of the cumulative average abnormal returns show that the market has information about the event before the event announcement, and the rapid increase in the cumulative returns before day 0 indicates the weak form of market efficiency, because this reaction of the market is only based on the available historical data without the presence of any public information. However, it is noticeable that there is a sharp decline in the CAARs soon after the announcement in the overall market, indicating that the market cannot sustain the event information after the dividend announcement. Another aspect might be that information takes time to reach all the investors in the market and is a sign of a slow response to the efficiency of the market that afterwards is diluted when it reaches the majority of the market.

**Table 3-11: Parametric Test: Market, CAPM and Fama and French Models**

| **Date** | **CAAR (Market Model)** | **t-Test Time Series** | **Prob.** | **t-Test Cross-Sectional** | **Prob.** |
|---|---|---|---|---|---|
| (-20...20) | 0.0021 | 0.2589 | 0.7957 | 0.3018 | 0.7628 |
| (-20...-1) | 0.008 | 1.4366 | 0.1508 | 1.9338 | 0.0531 |
| (-10...-1) | 0.0033 | 0.8379 | 0.4021 | 1.0207 | 0.3074 |
| (-1...1) | 0.0042 | 1.9459 | 0.0517 | 1.5509 | 0.1209 |
| (0...0) | 0 | -0.0172 | 0.9863 | -0.0116 | 0.9908 |
| (1...20) | -0.0059 | -1.062 | 0.2883 | -1.4338 | 0.1516 |
| (1...10) | -0.0003 | -0.0846 | 0.9326 | -0.1238 | 0.9014 |
| **Date** | **CAAR CAPM Model** | **t-Test Time Series** | **Prob.** | **t-Test Cross-Sectional** | **Prob.** |
| (-20...20) | 0.0265 | 3.2925 | 0.001** | 5.3083 | 0.00** |
| (-20...-1) | 0.0105 | 2.6449 | 0.0082** | 4.5603 | 0.00** |
| (-10...-1) | 0.0092 | 2.3235 | 0.0202** | 3.0537 | 0.0023** |
| (-1...1) | 0.0061 | 2.8166 | 0.0049** | 2.2589 | 0.0239** |
| (0...0) | 0.0007 | 0.5525 | 0.5806 | 0.3725 | 0.7095 |
| (1...10) | 0.0055 | 1.3827 | 0.1668 | 2.1703 | 0.03** |
| (1...20) | 0.0006 | 0.1409 | 0.8879 | 0.1887 | 0.8503 |
| **Date** | **CAAR Fama-French Model** | **t-Test Time Series** | **Prob.** | **t-Test Cross-Sectional** | **Prob.** |
| (-20...20) | -0.0069 | -1.0664 | 0.2863 | -0.8362 | 0.4031 |
| (-20...-1) | 0.0106 | 2.3382 | 0.0194** | 2.3134 | 0.0207** |
| (-10...-1) | 0.005 | 1.5724 | 0.1159 | 1.6465 | 0.0997 |
| (-1...1) | 0.0001 | 0.0334 | 0.9733 | 0.0217 | 0.9827 |
| (0...0) | -0.0006 | -0.5605 | 0.5751 | -0.2499 | 0.8027 |
| (1...10) | -0.0045 | -1.4115 | 0.1581 | -1.3694 | 0.1709 |
| (1...20) | -0.0169 | -3.7397 | 0.0002** | -3.2967 | 0.001** |

*The corresponding *P* is statistically significant at the 10% level
**The corresponding *P* is statistically significant at the 5% level
***The corresponding *P* is statistically significant at the 1% level

It is evident from the above table that more negative CAARs are noticeable after the dividend announcement day, and it is the major sign of a decreasing pattern in the CAARs. Another significant factor to consider while testing the hypothesis on CAARs during respective event windows is that it is possible to determine that the market is inefficient because of the presence of abnormal returns around the announcement day of the event windows. Moreover, the pre and post returns are statistically significant in the market model and in the CAPM model. In other words, the presence of statistical significance in most of the event windows indicates that the CAAR is not equal to zero, and the null hypothesis cannot be accepted. The abnormal returns surrounding the dividend announcement events are the major evidence to reject the null hypothesis.

### 3.15 Non-parametric Test: Market Model

Non-parametric tests have been used in this studies for having some advantages and one of the contribution such as nonparametric test make less stringent demands of the data, moreover, nonparametric procedures can sometimes be used to get a quick answer with little calculation, another advantage of nonparametric methods provide an air of objectivity when there is no reliable (universally recognized) underlying scale for the original data and there is some concern that the results of standard parametric techniques would be criticized for their dependence on an artificial metric, a historical appeal of rank tests is easy to construct tables of exact critical values and finally nonparametric procedures can be applied to data by using randomization models. Moroever, we have examined our results through parametric tests as well which are more appropriate in terms of analysis and providing robust results. Non-parametric tests used in this study as alternative tool to evaluate the existing results.

### 3.15.1 Generalized Sign Test

In non-parametric tests in financial event studies, a generalized sign test observes whether the number of stocks with positive cumulative abnormal returns in the event window exceeds the number anticipated in the absence of abnormal performance. The likely number is established on the division of positive abnormal returns on the estimation period.

The generalized sign test was established by Cowan (1992) for testing CARs by comparing the share of positive ARs close to an event with the proportion from a normal period. It is basically constructed on the ratio of positive cumulative abnormal returns $P_0^+$ over the event window. However, according to the null hypothesis, this ratio should not systematically differ from the fraction of positive cumulative abnormal returns over the estimation window $P_{est}^+$. The following formula is used, which essentially considers that positive cumulative abnormal returns are a binomial random variable.

$$t_{GS} = \frac{p_0^+ - p_{est}^+}{\sqrt{p_{est}^+ \left(1 - p_{est}^+\right)/N}} \qquad (3\text{-}12)$$

The null hypothesis is that the cumulative average abnormal return is not statistically different from zero; therefore, the test statistic approximately follows a normal distribution. From Table 3-11 it can be observed that all the event windows are statistically significant in both models. In other words, it is possible to reject the null hypothesis and conclude that the cumulative average abnormal return is statistically different from zero.

### 3.15.2 Corrado Rank Test

In the rank test recommended by Corrado (1985), the null hypothesis is based on the assumption that average abnormal returns are equal to zero. In the first step, the abnormal returns are converted into ranks. This procedure is completed asset by asset for the combined time period comprising the estimation window and the event window.

$$K_{i,T} = rank\ (AR_{i,T}) \qquad (3\text{-}13)$$

However, tied ranks are considered by the process of mid-ranks (Corrado, 1985). Correspondingly, Corrado and Zivney (1992) recommended uniform transformation of ranks for the correction of missing values:

$$U_{i,t} = \frac{K_{i,T}}{(1+M_i)} \qquad (3\text{-}14)$$

$$M_i\ is\ equal\ to\ the\ number\ of\ non-missing\ returns\ for\ each\ asset.$$

Correspondingly, the one-day test is defined as follows:

$$T_{Corrado} = \frac{1}{\sqrt{N}}\frac{\sum_{i=1}^{N}(U_{i,T}-0{,}5)}{S(U)} \qquad (3\text{-}15)$$

The estimated standard deviation is labelled as follows:

$$S(U) = \sqrt{\frac{1}{L_1+L_2}\ \Sigma_T[\frac{1}{\sqrt{N_T}}\Sigma_{i=1}^{N_T}(U_{i,T}-0.5)]}\ \hat{}2 \qquad (3\text{-}16)$$

where $N_t$ represents the number of non-missing returns (cross-section) at $T = t.$ Therefore, by considering the average of the single-day statistics multiplied by the inverse of the square root of the period's length, it is possible to arrive at a multiday version.

In Table 3-11 the $p$ value becomes significant in the market model for event windows (-20…20), (-20…-1) and (-15…-1). Moreover, the statistically significant windows in the CAPM models are (-20…20), which show the rejection of the null hypothesis and lead to the interpretation that the average abnormal returns are not equal to zero in particular event windows.

### 3.15.3 Standardized Residual Test

According to Patell's (1976) standardized residual test, the null hypothesis considers that the cumulative average abnormal return is equal to zero. Assuming that the abnormal returns are uncorrelated and the variance is constant over time, every abnormal return is standardized by its predicted standard deviation:

$$SAR_{i,T} = \frac{AR_{i,T}}{S(AR_i)} \quad (3\text{-}17)$$

Another key point to remember is that the standard deviation is valued from the time series of abnormal returns over the estimation window:

$$\widehat{\sigma^2}_{AR_i} = \frac{1}{M_i - d} \sum_{t=Est_{min}}^{Est_{max}} (AR_{i,t})^2 \quad (3\text{-}18)$$

$M_i = non - missing\ returns\ in\ numbers$

$d = degrees\ of\ freedom\ (market\ model\ d = 2)$

It is important to note that the event window abnormal returns are an out-of-sample prediction, and the standard error is adjusted by the forecast error:

$$S(AR_i) = \hat{\sigma}_{AR_i} \sqrt{1 + \frac{1}{M_i} + \frac{(R_{m,t} - \bar{R}_{m,Est})^2}{\sum_{Est_{min}}^{Est_{max}} (R_{m,t} - \bar{R}_{M,Est})^2}} \quad (3\text{-}19)$$

For cross-sectional abnormal returns, the standardized version can be calculated as:

$$CSAR_i(T_{1,}T_2) = \sum_{t=T_1}^{T_2} \frac{AR_{i,t}}{S(AR_i)} \quad (3\text{-}20)$$

### 3.15.4 Standardized Residual Test

According to the null hypothesis, the distribution of $SAR_i$ is a student's t-distribution with $M_i - d$ degrees of freedom (Campbell, Lo & MacKinlay, 1997). Importantly, the expected value of $CSAR_i$ is zero, and the standard deviation is:

$$S(CSAR_i) = \sqrt{(T_2 - T_1 + 1) \frac{M_i - d}{M_i - 2d}} \quad (3\text{-}21)$$

The test statistics for the investigation of the null hypothesis that the cumulative average abnormal return is zero are:

$$T_{patell} = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \frac{CSAR_i(T_1,T_2)}{S(CSAR_i)} \quad (3\text{-}22)$$

In Table 3-11 it can be observed that all the windows are statistically significant at $p < 0.05$. Therefore, this study rejects the null hypothesis and concludes that the cumulative average abnormal returns are not zero around all the event windows.

### 3.15.5 Standardized Cross-Sectional Test

Musumeci and Poulson (1991) combined the standardized residual test with an observed variance estimate based on the cross-section of event window abnormal returns to build a test that is robust to the event-driven variance in stock returns.

It was mentioned earlier that abnormal returns are standardized; however, the cross-sectional average of $CSAR_i(T_1, T_2)$ is calculated as:

$$\overline{CSAR}\,(T_1, T_2) = \frac{1}{N}\sum_{i=1}^{N} CSAR_i(T_1\,, T_2) \qquad \text{(3-23)}$$

Moreover, the standard deviation of $\overline{CSAR}\,(T_1, T_2)$ is projected from the cross-section of abnormal returns from the event window:

$$S\overline{CSAR} = \sqrt{\frac{1}{N(N-1)}\sum_{i=1}^{N}[CSAR_i(T_1, T_2) - \overline{CSAR}(T_1, T_2)]^2} \qquad \text{(3-24)}$$

The null hypothesis that the standardized cross-sectional test statistic for the cumulative average abnormal return is equal to zero is:

$$T_{Boehmer\ et\ al.} = \frac{\overline{CSAR}(T_1, T_2)}{S\,(\overline{CSAR})} \qquad \text{(3-25)}$$

### 3.15.6 Standardized Cross-Sectional Test

The null hypothesis of the adjusted standardized cross-sectional test statistic that the cumulative average abnormal return is equal to zero is:

$$T_{Boehmer\ et\ al.,adj.} = T_{Boehmer\ et\ al.}\sqrt{\frac{1-\bar{\rho}}{1+(n-1)\bar{\rho}}} \qquad (3\text{-}26)$$

where $\bar{\rho}$ indicates the average cross-correlation among abnormal returns.

The standardized residual test design is solid for the heteroscedastic event window abnormal returns. It is important to consider that standardized residual tests allocate a lower weight to abnormal returns to securities with larger variances than a simple time series t-test. Boehmer, Musumeci and Poulson (1991) investigated whether the standardized residual test is satisfactorily stated and has suitable power when an event-induced increase in variance is lacking. However, the key point is that, if the variance of stock returns rises around the date of the event, the standardized residual test rejects the null hypothesis too frequently.

To understand Table 3-12, it is quite interesting to note that the event windows of the market models, that is, (-20...-1), (-1...1) and (-10...-1), are statistically significant and the null hypothesis will be rejected, and it is concluded that the cumulative abnormal return is not equal to zero. In other words, if no event occurs, then the CAR equals zero. However, in the CAPM and Fama French models, the results are insignificant for all the available windows.

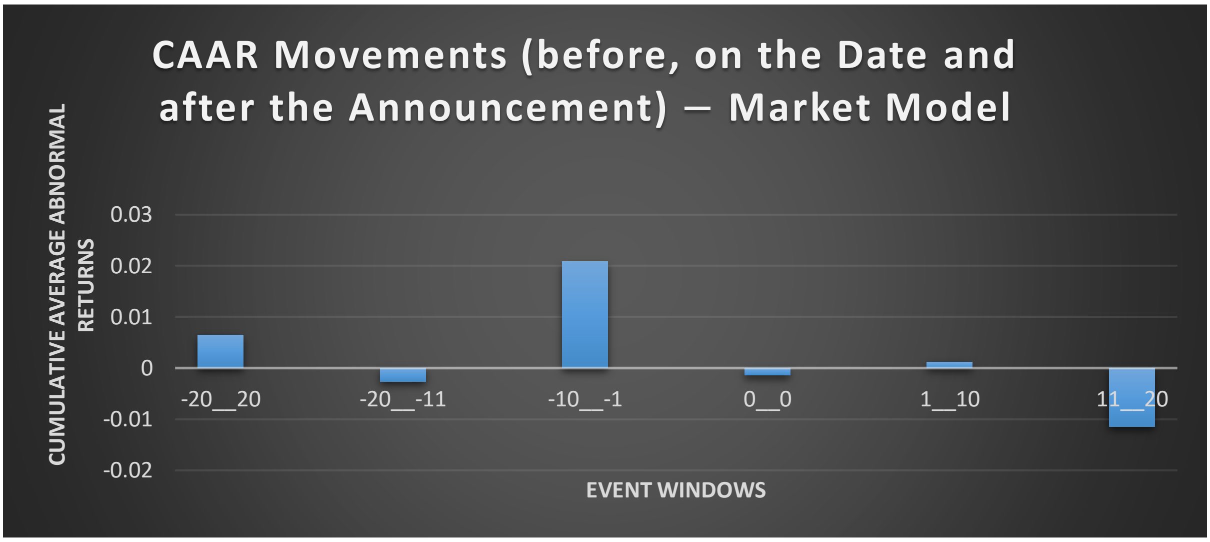
**Table 3-12: Non-Parametric Test: Market, CAPM and Fama and French Models**

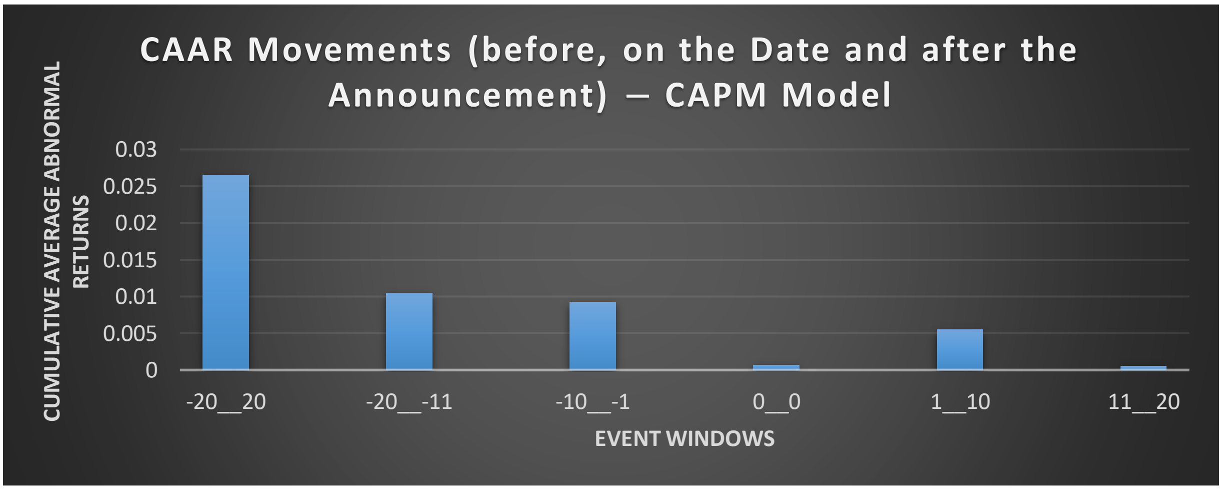
| Date (Market Model) | Patell z | Prob. | Boehmer et al. | Prob. | Corrado Rank | Prob. | Sign Test | Prob. |
|---|---|---|---|---|---|---|---|---|
| (-20...20) | 2.8012 | 0.0051** | 1.1109 | 0.2666 | 2.3948 | 0.0166** | 2.5106 | 0.0121** |
| (-20...-1) | 6.0903 | 0.000** | 4.4517 | 0.000** | 2.8699 | 0.0041** | 5.2898 | 0.000** |
| (-10...-1) | 4.52 | 0.000** | 3.1947 | 0.0014** | 3.2823 | 0.001* | 4.6943 | 0.000** |
| (-1...1) | 5.0792 | 0.000** | 1.8411 | 0.0656 | 0.8663 | 0.3863 | 2.8083 | 0.005** |
| (0...0) | 5.068 | 0.000** | 1.4691 | 0.1418 | 0.342 | 0.7324 | 2.4609 | 0.0139** |
| (1...20) | -3.2129 | 0.0013** | -0.9907 | 0.3218 | 0.4824 | 0.6295 | 1.518 | 0.129 |
| (1...10) | 2.839 | 0.0045** | 1.5866 | 0.1126 | -0.7596 | 0.4475 | 0.4757 | 0.6343 |
| **Date (CAPM Model)** | **Patell z** | **Prob.** | **Boehmer et al.** | **Prob.** | **Corrado Rank** | **Prob.** | **Sign Test** | **Prob.** |
| (-20...20) | 20.6472 | 0.000** | 0.4339 | 0.6644 | 2.388 | 0.0169** | 10.014 | 0.000** |
| (-20...-1) | 1.2083 | 0.2269 | 0.4187 | 0.6754 | 1.0712 | 0.2841 | 8.2488 | 0.000** |
| (-10...-1) | -35.821 | 0.000** | -0.4251 | 0.6708 | 0.4731 | 0.6361 | 6.988 | 0.000** |
| (-1...1) | 1.2578 | 0.2084 | 0.085 | 0.9323 | -1.0029 | 0.3159 | 5.8784 | 0.000** |
| (0...0) | -6.5345 | 0.000** | -0.6011 | 0.5477 | 1.1116 | 0.2663 | 6.6854 | 0.000** |
| (1...20) | 126.3704 | 0.000** | 0.8044 | 0.4212 | 0.8371 | 0.4025 | 7.0888 | 0.000** |
| (1...10) | -35.821 | 0.000** | -0.4251 | 0.6708 | 0.4731 | 0.6361 | 6.988 | 0.000** |
| **Date (Fama French Model)** | **Patell z** | **Prob.** | **Boehmer et al.** | **Prob.** | **Corrado Rank** | **Prob.** | **Sign Test** | **Prob.** |
| (-20...20) | -77.5689 | 0.000** | -1.1461 | 0.2518 | 0.0419 | 0.9666 | -1.8372 | 0.0662 |
| (-20...-1) | -43.2504 | 0.000** | -0.9591 | 0.3375 | 2.5698 | 0.0102** | 2.2475 | 0.0246** |
| (-10...-1) | -49.454 | 0.000** | -0.8526 | 0.3939 | 2.0236 | 0.043 | 1.6731 | 0.0943 |
| (-1...1) | -141.953 | 0.000** | -0.8523 | 0.394 | -0.0294 | 0.9765 | -0.2416 | 0.8091 |
| (0...0) | -163.13 | 0.000** | -0.5324 | 0.5945 | -0.2863 | 0.7746 | 0.2051 | 0.8375 |
| (1...10) | -13.0161 | 0.000** | -0.2322 | 0.8163 | -2.9186 | 0.0035** | -3.6242 | 0.0003** |
| (1...20) | -31.3345 | 0.000** | -0.5929 | 0.5533 | -2.4458 | 0.0145** | -3.8795 | 0.0001** |

*The corresponding *P* is statistically significant at the 10% level
**The corresponding *P* is statistically significant at the 5% level
***The corresponding *P* is statistically significant at the 1% level

## 3.16 Representation of Cumulative Average Abnormal Returns in Each Event Window

It can been seen from the figure 3-7 that, after the dividend announcement day, there are more negative CAARs, and there is evidence of a decreasing pattern in CAARs. Another significant factor to consider while testing hypotheses on the CAAR during respective event windows is that we can determine that the market is inefficient because of the presence of abnormal returns around the announcement day. In other words, the presence of a high peak of CAARs in the event window of (-10_-1) in all models indicates that the abnormal returns surrounding the dividend announcement events are the major evidence for rejecting the null hypothesis.



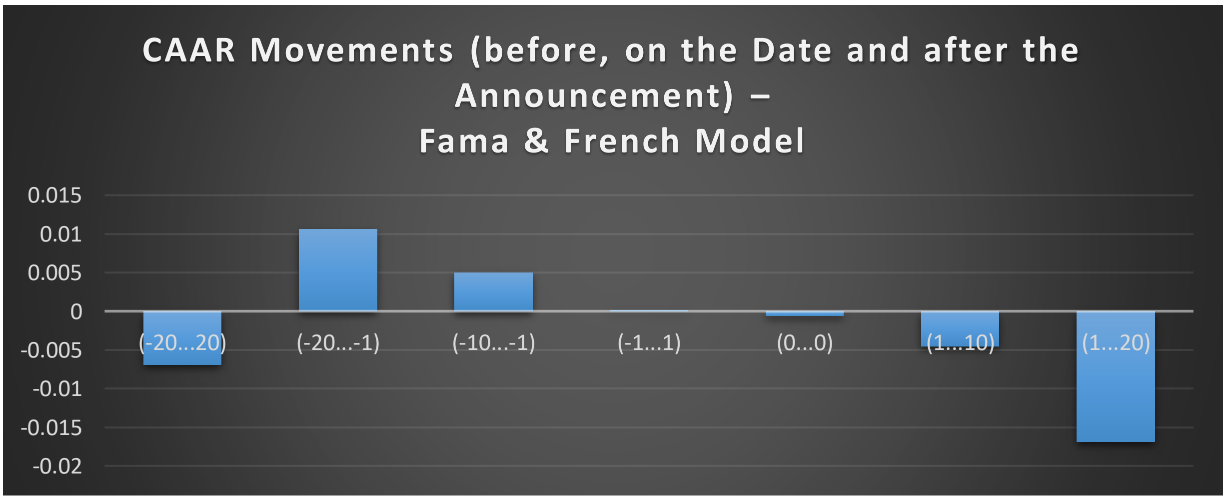




**Figure 3-7: CAAR Movements (before, on the Date and after the Announcement)**

| **Matrix of Overall Results (Karachi Stock Exchange)**<br>**Overall Empirical Tests** | **Results** | **Strong Form of Market Efficiency** | **Semi-strong Form of Market Efficiency** | **Weak Form of Market Efficiency** |
|---|---|---|---|---|
| Average Abnormal Returns | Presence of average abnormal returns before and after the announcement of event window (-20…+20). | Rejected | Rejected | Accepted |
| Absolute Average Abnormal Returns | Presence of average abnormal returns before and after the announcement of event window (-20…+20). | Rejected | Rejected | Accepted |
| Good News (Positive Abnormal Returns) | Positive abnormal returns around dividend announcement dates – within the event window (-20…+20). | Rejected | Rejected | Accepted |
| Bad News (Negative Abnormal Returns) | Negative abnormal returns around dividend announcement dates – within the event window (-20…+20). | Rejected | Rejected | Accepted |
| Cumulative Average Abnormal Returns (CAARs) | A rapid increase in CAAR before the event window (-1…+1) of the dividend announcement dates identifies inside information of announcements. | Rejected | Rejected | Accepted |
| t-Test Time Series (Fama-French three factor Model) | The event windows that show significant results are (-20…-1) and (1…20). However, the significant results show that the CAR is not equal to zero and reject the null hypothesis. | Rejected | Rejected | Accepted |
| t-Test Cross-Sectional (Fama-French three factor Model) | The following event windows show significant results: (-20…-1) and (1…20). These results are significant before and after the announcement. They show the presence of abnormal returns before and after the announcement. | Rejected | Rejected | Accepted |
| Patell z (Fama-French three factor Model) | Positive abnormal returns occur close to the event, and the test is statistically significant; the null hypotheses can be rejected and it can be concluded that the cumulative average abnormal return is statistically different from zero. | Rejected | Rejected | Accepted |
| Boehmer et al. (Fama-French three factor Model) | All the event windows are insignificant and the null hypothesis will be accepted; it is concluded that the average abnormal return is equal to zero at the time of event announcement. However, the presence of statistically significant results of average abnormal returns before the announcement and after the announcement reflect that the AAR is not equal to zero. Thus, the strong form and semi-strong form of efficiency are rejected. | Rejected | Rejected | Accepted |
| Corrado Rank (Fama-French three factor Model) | Event windows (-20…-1), (1….10) and (1…20). are significant, and the null hypothesis will be rejected; it is concluded that the average abnormal returns are not equal to zero at the time of the event announcement. However, the presence of statistically significant results of average abnormal returns before the announcement and after the announcement reflected AAR is not equal to zero. Thus, the strong form and semi-strong form of efficiency are rejected. | Rejected | Rejected | Accepted |
| Sign Test (Fama-French three factor Model) | All the event windows are statistically significant, and the null hypothesis will be rejected; it is concluded that the cumulative average abnormal return is statistically different from zero. | Rejected | Rejected | Accepted |

**Table 3-13: Matrix of Overall Results (Pakistan Stock Exchange), Overall Empirical Test**

### 3.17 Price Movements

It can be seen from Table 3-14 that the price movements contain the averages of all the market through our event window.

$$Price\ movement_{-20,+20} = \sum_{i=1}^{N} \frac{\left[\frac{AN_i}{Cumulative\ AN_i(-20,+20)}\right]}{N_{For\ t=1,\ldots T}} \qquad (3\text{-}27)$$

To be able to understand the price movements from the table, a sharp price movement can be observed in both models from the event window of -2 [2.413633 (market model), 0.04289 (CAPM model) and -0.07677 (Fama French model) ] to the pre-announcement day -1 [2.814163 (market model), 0.11026 (CAPM model) and -0.13614 (Fama and French model)]; however, the sharp increase in the price movement of 16.59% (market model), 162% (CAPM model) and 77% (Fama and French model) anticipated inside information of the dividend announcement before the announcement date. In addition, on the day of announcement '0', the price movement fell [2.59554 (market model) and 0.0262 (CAPM model)] and increased in Fama and French model (0.082087). It is important to note, however, that a sharp rise in the price movement can be observed just after the day of announcement +1.The sharp increase before and after the announcement determines abnormal returns around the event. It can be seen from the analysis that the market has the weak form of efficiency, because the price movements earlier than the announcement date were on the basis of the availability of past price data; alternatively, a weak form of inefficiency can be concluded due to insider information. Another interesting point reflected in Table 3-14 is that the highest negative and positive price movements observed within the event window of the market model (-20, +20) are on -20 (-

0.70087) and +4 (4.050319). We can say that the price movements reached two extreme points within the event window of (-20, +4). However, in the CAPM model, the highest positive price movement can be observed on the pre-announcement date -1 (0.1102) and the highest negative movement can be observed on the post-announcement date +20 (-0.1456). In other words, post-announcement price movements have a more positive trend than pre-announcement movements and maintain positive stability in the market model and the mixed trend observed in the CAPM model. In Fama and French model the highest negative value observed on +3 (-0.00105) and highest positive value observed on +20 (0.457279). Therefore, in view of the positive price movement after the event, the market can be confirmed as having the weak form of efficiency due to the price movement based on past information.

Table 3-14: Average Price Movements (Overall Market)

| Days | Average Price Movements (Market Model) | Average Price Movements (CAPM Model) | Average Price Movements (Fama & French Model) |
|---|---|---|---|
| -20 | -0.70087 | -0.02265997 | -0.10184 |
| -19 | -0.6305 | 0.087233394 | -0.04559 |
| -18 | -0.27771 | 0.059937588 | -0.09915 |
| -17 | -0.70346 | 0.03174256 | -0.25751 |
| -16 | -0.76626 | 0.131035431 | 0.030353 |
| -15 | -0.92866 | -0.074526778 | 0.052759 |
| -14 | -0.77558 | -0.031924234 | -0.13324 |
| -13 | -0.68359 | 0.062243148 | -0.10646 |
| -12 | -0.45087 | 0.095559621 | -0.13692 |
| -11 | -0.40834 | 0.058084985 | -0.00558 |
| -10 | -0.04705 | 0.018319416 | -0.06034 |
| -9 | 0.216604 | -0.005088263 | 0.14243 |
| -8 | 0.225952 | -0.036543932 | -0.00566 |
| -7 | 0.471578 | 0.091420129 | -0.12526 |
| -6 | 1.133281 | 0.073303627 | -0.16884 |
| -5 | 1.484516 | -0.020686654 | 0.037232 |
| -4 | 2.017129 | 0.024990662 | -0.10879 |
| -3 | 2.354104 | 0.04966212 | -0.22608 |
| -2 | 2.413633 | 0.042891023 | -0.07677 |
| -1 | 2.814163 | 0.110260907 | -0.13614 |
| 0 | 2.59554 | 0.026208069 | 0.082087 |
| 1 | 3.642407 | 0.094933571 | 0.045578 |
| 2 | 3.803593 | 0.010248711 | 0.279352 |
| 3 | 4.050319 | 0.020235285 | -0.00105 |
| 4 | 3.831837 | -0.079002407 | 0.233851 |
| 5 | 3.234245 | -0.003801845 | 0.00725 |
| 6 | 3.06 | -0.001390804 | 0.241722 |
| 7 | 2.898312 | 0.085154634 | 0.090814 |
| 8 | 2.970305 | 0.007840202 | -0.06979 |
| 9 | 3.081934 | 0.044288365 | -0.13405 |
| 10 | 2.776501 | 0.028897724 | -0.03996 |
| 11 | 2.218238 | -0.002346981 | 0.163052 |
| 12 | 2.500528 | 0.063802095 | -0.19413 |
| 13 | 2.419278 | 0.118391477 | 0.186611 |
| 14 | 1.81867 | -0.045596476 | 0.358405 |
| 15 | 1.530014 | 0.01661194 | 0.246195 |
| 16 | 1.55731 | -0.044510629 | 0.28539 |
| 17 | 1.572272 | 0.035642782 | 0.123816 |
| 18 | 1.524972 | -0.016496065 | 0.266141 |
| 19 | 1.617229 | 0.04131624 | -0.09715 |
| 20 | 0.006461 | -0.145678703 | 0.457279 |

Figure 3-8 shows precisely the average price movements in percentages of the pre-, on- and post-announcement days. Overall, the price movement as a percentage, pre-on-post announcement for the market, CAPM and Fama and French models.

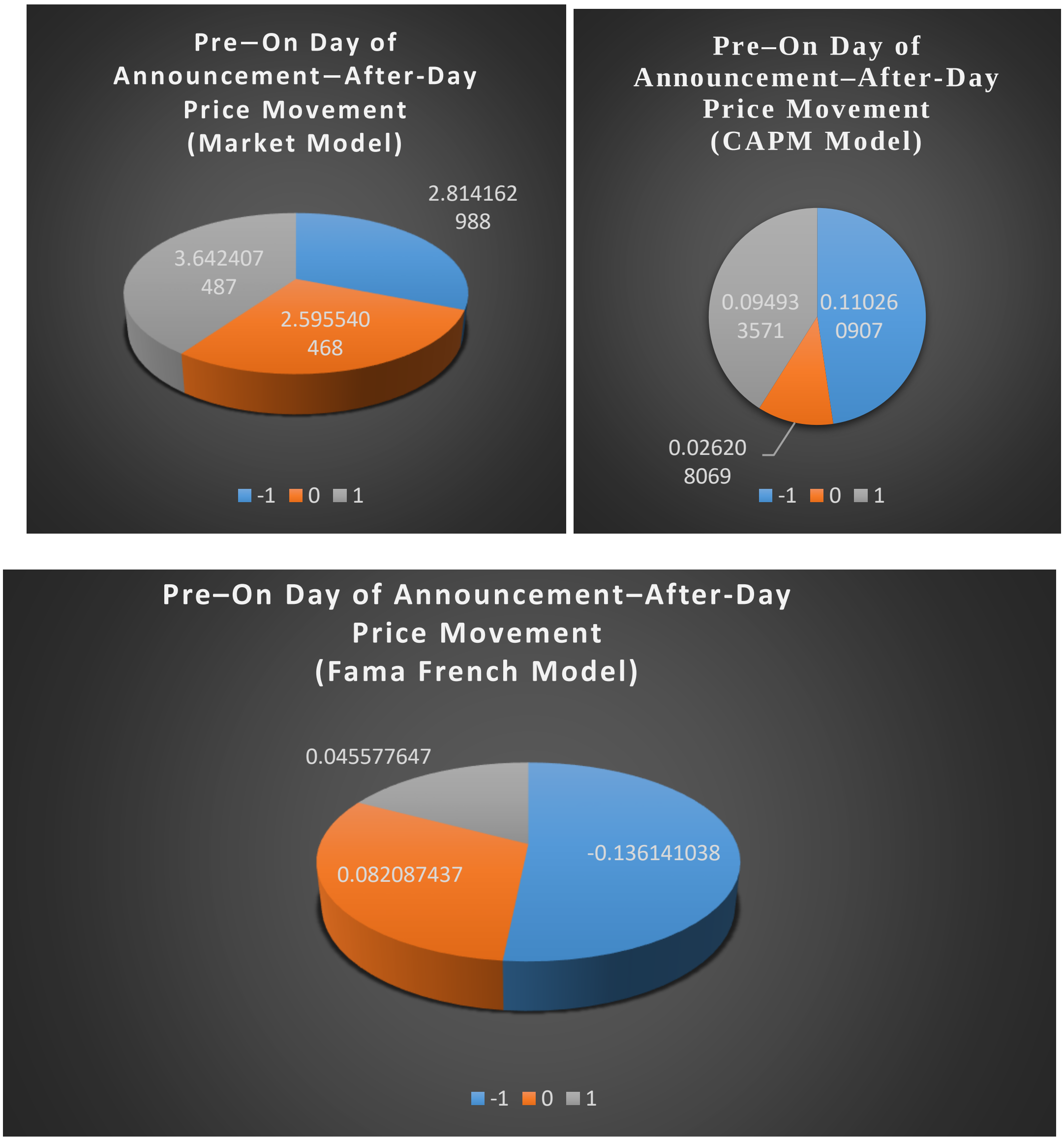


**Figure 3-8: Before, on and after the Announcement (Price Movements)**

## 3.18 Sector-Wise Price Movements

In Figure 3-9, price movements are observed sector wise. In the first chart, the majority of the price movements before the announcement date are stable except equity investment instruments, financial services and the industrial metal and mining and oil and gas sectors. The noticeable price movements in particular sectors, giving an indication of inside information before the announcement of dividends or prices, occur with the past available information of prices.

On the other hand, healthy price movements on the day of announcement can be observed in the financial services, household goods, leisure goods and oil and gas sectors. The significant movement in price in particular sectors indicates that the flow of information reacts to price movements during the time of the announcement.

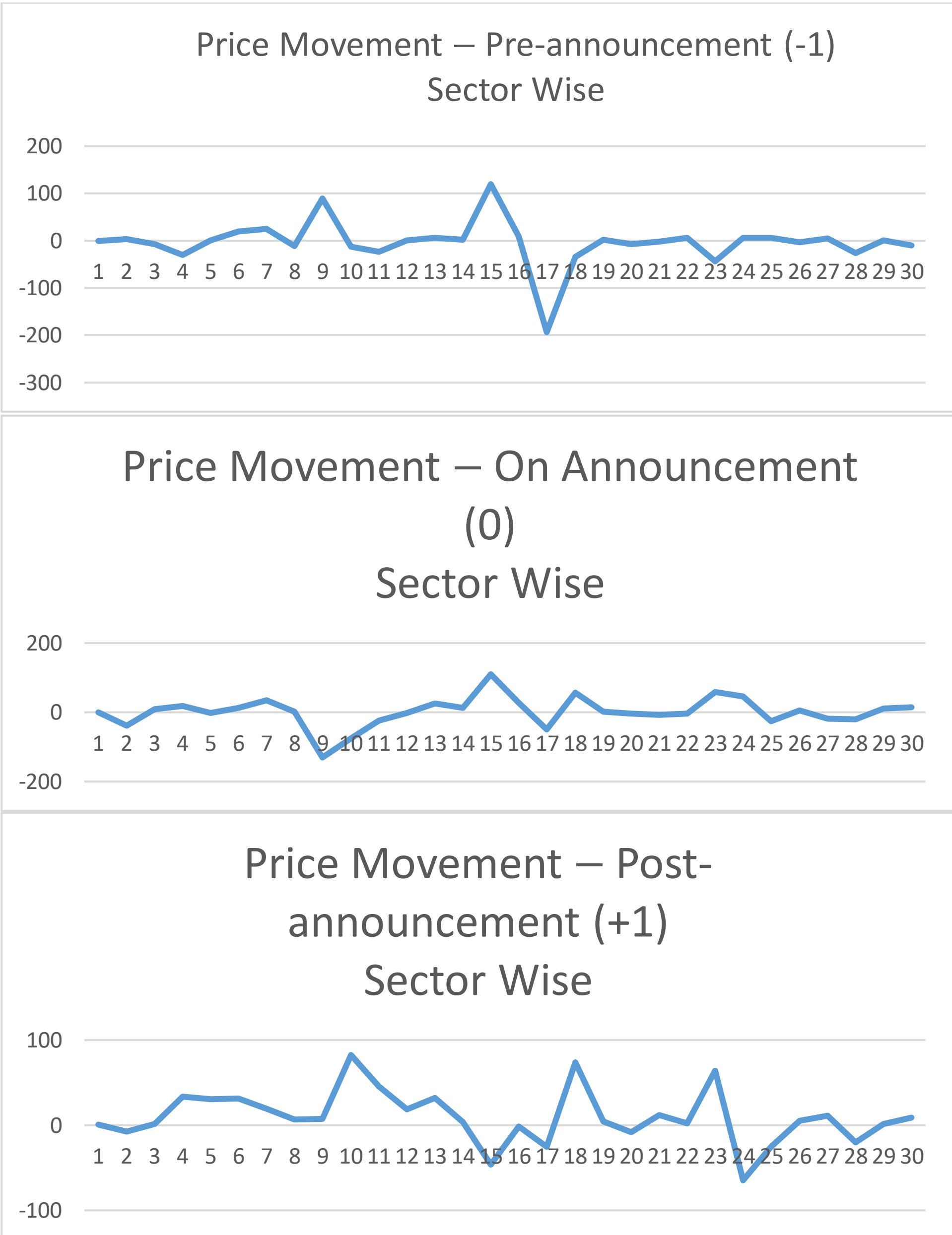



**Figure 3-9: Pre-announcement (-1), On Announcement (0) and Post-announcement (+1)**

Interestingly, the post-announcement day (+1) has a significant movement in price compared with the pre-announcement and on-announcement days. The overall healthy post-announcement price movement indicates that the majority of the investors are responsive to the announcement of dividends after the actual day of the announcement. In other words, the flow of information within the Pakistan Stock Exchange is not efficient, and the reaction of the market is slow on the day of announcement in comparison with one day after the announcement. The dividend announcements giving important information to investors and a flow of information before, on the day and after the announcement influence the abnormal returns (Pettit, 1972; Aharony & Swary, 1980; Lonie et al., 1996; McCluskey et al., 2007).

### 3.19 Efficiency Curve Analysis

The foregoing research implies that the market price is reflected as a signal of financial and economic activities. This efficiency curve is an attempt to address the issue of actual market movement in comparison with an efficient market. Examining the Table 3-15, we can see that the pre-announcement movement is uneven and mostly presents the movement of positive and negative trends. The available evidence seems to suggest that the post-announcement price movements are overreactions and show positive trends in the market model. However, the CAPM and Fama French models show an underreaction of market efficiency. The current research appears to validate the weak form of market efficiency, because the post-announcement movements show a similar trend in the graph based on past or historical information, that is, the dividend announcement on day 0.

**Table 3-15: Price Movements of the Market**

| Days | Actual Movement Market Model | Actual Movement CAPM Model | *Efficient Market |
|---|---|---|---|
| -20 | 0 | 0 | 0 |
| -19 | -0.6305 | -0.834595935 | 0 |
| -18 | -0.27771 | -1.409365878 | 0 |
| -17 | -0.70346 | -0.87762154 | 0 |
| -16 | -0.76626 | -1.558413514 | 0 |
| -15 | -0.92866 | -0.538167913 | 0 |
| -14 | -0.77558 | 1.017856377 | 0 |
| -13 | -0.68359 | -0.289569906 | 0 |
| -12 | -0.45087 | -1.511266591 | 0 |
| -11 | -0.40834 | -1.47138323 | 0 |
| -10 | -0.04705 | -0.731260266 | 0 |
| -9 | 0.216604 | -0.126564156 | 0 |
| -8 | 0.225952 | 0.398264272 | 0 |
| -7 | 0.471578 | -0.524176082 | 0 |
| -6 | 1.133281 | -1.577672752 | 0 |
| -5 | 1.484516 | -0.503023358 | 0 |
| -4 | 2.017129 | -0.041047289 | 0 |
| -3 | 2.354104 | -0.714546327 | 0 |
| -2 | 2.413633 | -0.886031184 | 0 |
| -1 | 2.814163 | -1.466461586 | 0 |
| 0 | 2.59554 | -1.306383451 | 1 |
| 1 | 3.642407 | -1.159638846 | 1 |
| 2 | 3.803593 | -1.006566052 | 1 |
| 3 | 4.050319 | -0.291704786 | 1 |
| 4 | 3.831837 | 0.562652615 | 1 |
| 5 | 3.234245 | 0.792144637 | 1 |
| 6 | 3.06 | 0.049693316 | 1 |
| 7 | 2.898312 | -0.801356682 | 1 |
| 8 | 2.970305 | -0.889886955 | 1 |
| 9 | 3.081934 | -0.498822404 | 1 |
| 10 | 2.776501 | -0.700523761 | 1 |
| 11 | 2.218238 | -0.254000492 | 1 |
| 12 | 2.500528 | -0.587923535 | 1 |
| 13 | 2.419278 | -1.745029176 | 1 |
| 14 | 1.81867 | -0.695091572 | 1 |
| 15 | 1.530014 | 0.277498239 | 1 |
| 16 | 1.55731 | 0.267105019 | 1 |
| 17 | 1.572272 | 0.085244078 | 1 |
| 18 | 1.524972 | -0.183035248 | 1 |
| 19 | 1.617229 | -0.23729197 | 1 |
| 20 | 1 | 1 | 1 |

*In efficient market 0 explains 0% price movement in stock market before announcement and 1 explains 100% price movement in stock market at the day and after the announcement.

On logical grounds there is no compelling reason to argue that the Figure 3-10 also shows the weak form of market efficiency after the announcement of the event.

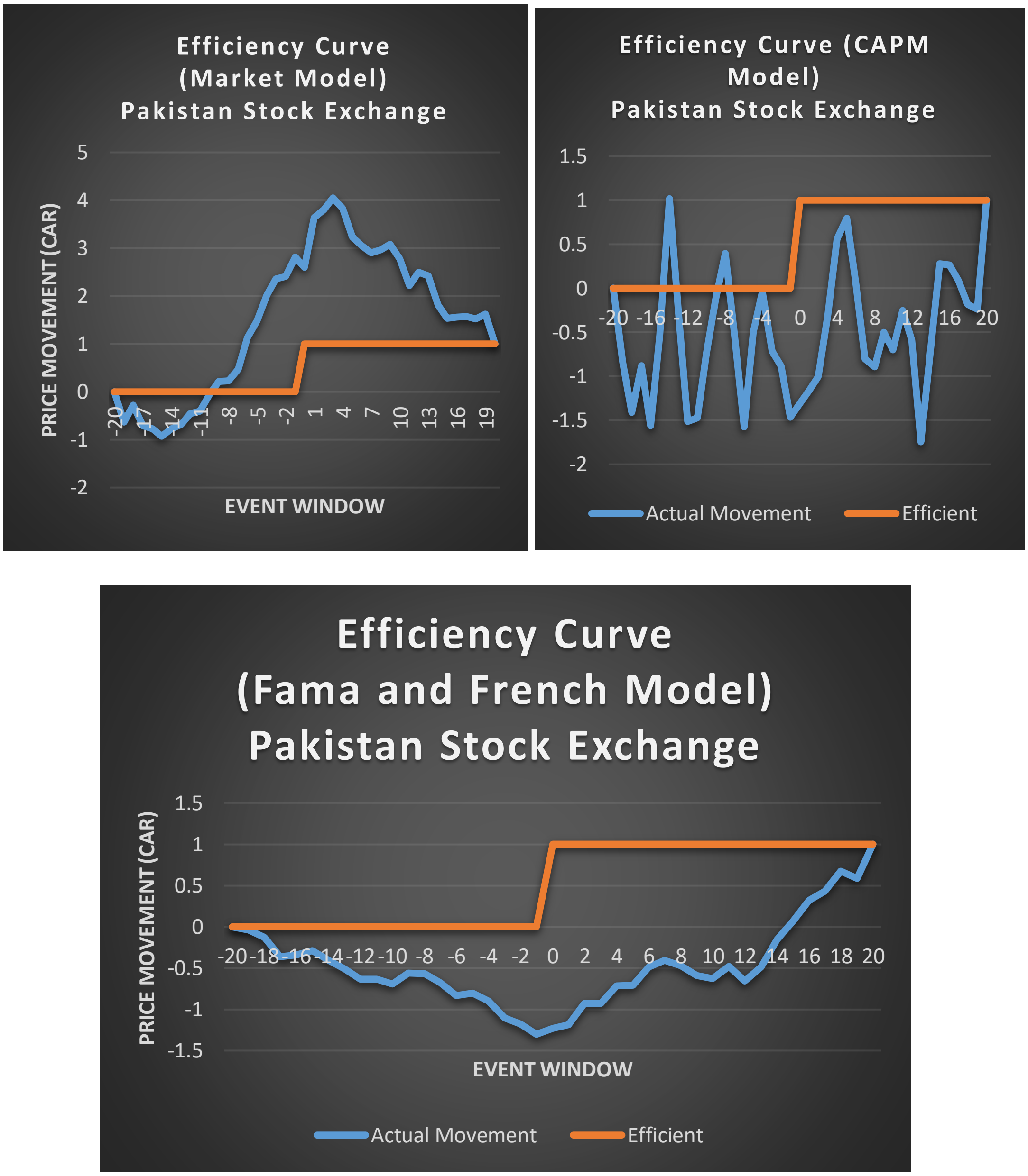



**Figure 3-10: Efficiency Curve**

## 3.20 Average Individual CARs (Overall Market)

In this analysis we calculate the individual CARs in each event window of the timeline. The market model shows negative CARs from (-20_-20) to (-20_-10). From another viewpoint the long-term event window shows negative CARs in the market model, and the remaining individual event windows become positive after (-20_-10). On the other side, the individual CARs of the CAPM model are all positive except (-20_-20). After analysisng the Fama and French average of individual CARs, all event windows are positive except (-20__16), (-20__17), (-20__18), (-20__19) and (-20__20).

**Table 3-16: Average Individual CARs**

| Date | Average of Individual CARs (Market Model) | Average of Individual CARs (CAPM Model) | Average of Individual CARs (FAMA and FRENCH Model) | Absolute Individual CARs (Market Model) | Absolute Individual CARs (CAPM Model) | Absolute Individual CARs (FAMA and FRENCH Model) |
|---|---|---|---|---|---|---|
| -20__-20 | -0.00453 | -0.00059957 | 0.0007 | 0.0045282 | 0.0005996 | 0.000705 |
| -20__-19 | -0.00407 | 0.001708582 | 0.00102 | 0.0040735 | 0.0017086 | 0.00102 |
| -20__-18 | -0.00179 | 0.003294502 | 0.00171 | 0.0017942 | 0.0032945 | 0.001706 |
| -20__-17 | -0.00454 | 0.004134395 | 0.00349 | 0.0045449 | 0.0041344 | 0.003487 |
| -20__-16 | -0.00495 | 0.00760153 | 0.00328 | 0.0049507 | 0.0076015 | 0.003278 |
| -20__-15 | -0.006 | 0.005629587 | 0.00291 | 0.0059999 | 0.0056296 | 0.002912 |
| -20__-14 | -0.00501 | 0.004784886 | 0.00383 | 0.0050109 | 0.0047849 | 0.003834 |
| -20__-13 | -0.00442 | 0.006431811 | 0.00457 | 0.0044165 | 0.0064318 | 0.004571 |
| -20__-12 | -0.00291 | 0.008960273 | 0.00552 | 0.002913 | 0.0089603 | 0.005518 |
| -20__-11 | -0.00264 | 0.010497174 | 0.00556 | 0.0026382 | 0.0104972 | 0.005557 |
| -20__-10 | -0.0003 | 0.010981897 | 0.00597 | 0.000304 | 0.0109819 | 0.005974 |
| -20__-9 | 0.001399 | 0.010847265 | 0.00499 | 0.0013994 | 0.0108473 | 0.004989 |
| -20__-8 | 0.00146 | 0.00988033 | 0.00503 | 0.0014598 | 0.0098803 | 0.005028 |
| -20__-7 | 0.003047 | 0.012299262 | 0.00589 | 0.0030468 | 0.0122993 | 0.005895 |
| -20__-6 | 0.007322 | 0.014238841 | 0.00706 | 0.0073219 | 0.0142388 | 0.007063 |
| -20__-5 | 0.009591 | 0.013691482 | 0.0068 | 0.0095912 | 0.0136915 | 0.006805 |
| -20__-4 | 0.013032 | 0.014352723 | 0.00756 | 0.0130323 | 0.0143527 | 0.007558 |
| -20__-3 | 0.015209 | 0.015666759 | 0.00912 | 0.0152094 | 0.0156668 | 0.009122 |
| -20__-2 | 0.015594 | 0.016801635 | 0.00965 | 0.015594 | 0.0168016 | 0.009653 |
| -20__-1 | 0.018182 | 0.019719086 | 0.01059 | 0.0181818 | 0.0197191 | 0.010595 |
| -20__0 | 0.016769 | 0.020412539 | 0.01003 | 0.0167693 | 0.0204125 | 0.010027 |
| -20__1 | 0.023533 | 0.022924435 | 0.00971 | 0.0235329 | 0.0229244 | 0.009711 |
| -20__2 | 0.024574 | 0.023195611 | 0.00778 | 0.0245743 | 0.0231956 | 0.007779 |
| -20__3 | 0.026168 | 0.023731027 | 0.00779 | 0.0261684 | 0.023731 | 0.007786 |
| -20__4 | 0.024757 | 0.021640661 | 0.00617 | 0.0247568 | 0.0216407 | 0.006168 |
| -20__5 | 0.020896 | 0.021540066 | 0.00612 | 0.0208958 | 0.0215401 | 0.006118 |
| -20__6 | 0.01977 | 0.021503226 | 0.00445 | 0.0197701 | 0.0215032 | 0.004446 |
| -20__7 | 0.018725 | 0.023756377 | 0.00382 | 0.0187254 | 0.0237564 | 0.003818 |

| | | | | | | |
|---|---|---|---|---|---|---|
| -20__8 | 0.019191 | 0.023963825 | 0.0043 | 0.0191906 | 0.0239638 | 0.0043 |
| -20__9 | 0.019912 | 0.025135674 | 0.00523 | 0.0199118 | 0.0251357 | 0.005228 |
| -20__10 | 0.017938 | 0.025900294 | 0.0055 | 0.0179385 | 0.0259003 | 0.005504 |
| -20__11 | 0.014332 | 0.025838184 | 0.00438 | 0.0143316 | 0.0258382 | 0.004376 |
| -20__12 | 0.016155 | 0.027526357 | 0.00572 | 0.0161554 | 0.0275264 | 0.005719 |
| -20__13 | 0.015631 | 0.030658939 | 0.00443 | 0.0156305 | 0.0306589 | 0.004428 |
| -20__14 | 0.01175 | 0.029452478 | 0.00195 | 0.0117501 | 0.0294525 | 0.001949 |
| -20__15 | 0.009885 | 0.029892022 | 0.00025 | 0.0098851 | 0.029892 | 0.000245 |
| -20__16 | 0.010061 | 0.028714291 | -0.00173 | 0.0100615 | 0.0287143 | 0.001729 |
| -20__17 | 0.010158 | 0.029657382 | -0.00259 | 0.0101582 | 0.0296574 | 0.002586 |
| -20__18 | 0.009853 | 0.029220904 | -0.00443 | 0.0098526 | 0.0292209 | 0.004427 |
| -20__19 | 0.010449 | 0.030314112 | -0.00375 | 0.0104486 | 0.0303141 | 0.003755 |
| -20__20 | 0.006461 | 0.026459523 | -0.00692 | 0.0064608 | 0.0264595 | 0.006918 |

## 3.21 Past Inefficiency: Analysis of the Cumulative Abnormal Returns (CARs) of the Pakistan Stock Exchange: A Comparison of Market Efficiency with Firm Size

In the view of economic growth, a company can progress through growth in its size. The consensus seems to be that, if someone were completely unconcerned about firm size, he or she would still agree with the importance of firm size in different sub-fields of economics. For example, firm size has been the centre of attention and has been considered to be a very significant variable in analysing financing decisions (Barclay & Smith, 1995 a and b), managerial compensation (Jensen & Murphy, 1990) and even the required rate of returns (Banz, 1981; Fama & French, 1992).

Different methods are used to measure the size of companies, and many parameters are used to determine company sizes. The main parameters considered are for example the total sales per year, total assets and stock exchange value through market capitalization.

From the perspective of market efficiency, a question of interest is whether the distribution of cumulative abnormal returns is random or perhaps associated with some characteristics of the firms concerned. The importance of the size effect drives researchers to examine the possible reasons, as its existence suggests that either the CAPM is not correctly specified or the market behaves inefficiently.

As mentioned earlier, various studies have investigated the presence of and actual reasons for the size effect. Nonetheless, a majority of these research studies were related to the US and other developed stock markets. Comparable studies on emerging stock markets, specifically the Pakistan Stock Exchange, are limited or new in origin. In contrast with other emerging markets, the Pakistani stock market is facing poor corporate governance, market and inside trading manipulation.

Investors mostly trade speculatively in the market, with a holding of a short period. The overall turnover of the stock market is suggestively very high, specifically Rs. 338.184 million (USD 3.160 million), indicating that investors are concerned more about the short-term advantage and overlook long-term investment objectives based on the prospects and growth of the firm. Considering all the facts, the Pakistan Stock Exchange is the largest and most liquid market among all emerging markets, announced as the best-performing stock market in the world in 2002. Such an exclusive investment atmosphere contributes to the examination of the stock return argument and its relationship with firm size and to the understanding of whether there is a firm size effect on the Pakistan Stock Exchange.

### 3.21.1 Earlier Studies based on Firm Size

The preceding discussion implies that the performance of stock market pricing is based on the size effect. Precisely, the importance of the size effect explicitly explains that small companies offer higher risk-adjusted returns than large companies. The size effect theory was first presented by Banz (1981) and Reinganum (1981). They established results on the firm size or market capitalization, considered as the market value of equity and its effect on the stock returns at optimum levels.

According to Basu (1977), low P/E stocks perform better than high P/E stocks. His results adopting a different sample period and other methods of portfolio formation techniques and established the result that a portfolio of small firms and low P/E ratios achieves the highest risk-adjusted returns. Several schools of thoughts have emerged and disagree with the argument that small stocks have higher returns than large stocks; rather, they have emphasized that it is not true for all markets and all periods of data (Dimson & Marsh, 1999; Al-Rojoub et al., 2005). Further research in this area may investigate the suggestion that few markets have a return premium correlated with large stocks and exhibit a reverse size effect (Lin & Wang, 2003).

According to Handa et al. (1989), the size of a firm is related to the return measurement intervals explained for beta calculations and represents the effect of the size of the firm being present when the beta is measured with the data set of annual returns. Other studies, including that by Fama and French (1995), have suggested that small firms face financial distress. The reward of higher returns is compensation for greater risk. To understand the concept from a different viewpoint, small firms' portfolios are less diversified than those of large firms, thus increasing the level of risk of small stocks, as stated by Schwert (2002).

The prior research by Hou and Moskowitz (2005) explained that the return premium gained by small stocks is partially a passive response of stocks to information. They also determined that small firms' returns are different from those of large firms.

According to Friend and Lang (1988), Standard and Poor's quality rankings of stocks explained the size of the effect for stocks over the period from 1962 to 1986. They concluded that stock returns are better explained by quality rankings than another measure, even counting beta.

Badrinath and Kini (1994) measured the size effect, price earnings and Tobin's Q of stock returns from 1967 to 1981. According to their results, the size effect exists after controlling for P/E and Tobin's Q. They concluded that the size effect has a strong association with the stock returns.

Fama and French (2006) studied the association between the value premiums, the stock returns and the size effects of the companies listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX) and National Association of Securities Dealers Automated Quotations (NASDAQ). They reached the conclusion that a higher-value premium exists in small stocks compared with large stocks. The value measure was determined through the book-to-market value of equity. They also found that the firm beta does not have any influence on the measurement of the expected stock returns.

Mills and Jordanov (2000) obtained their results by taking the London Stock Exchange as the measure of predictability of stock returns and firm size from 1982 to 1995. They recognized that small companies have noticeably greater access to returns than large firms. Moreover, they found that the firm beta explained limited risk related to the size of the firm effect.

Elfakhani and Wei (2003) measured the effects of firm size on the returns of Canadian stocks from 1970 to 1994. They concluded that small stocks earn higher returns but with the condition of high share price stocks.

There is evidence that the London Stock Exchange, six Asian markets and the US market have similar results. Chang et al. (1999) and Mills and Jordanov (2000) found that the firm size enclosed information about cross-autocorrelation of returns. Thus, the size of the firm may consolidate information that is appropriate for return measurement.

Dimson and Marsh (1999) found a significant size effect in the UK. They mentioned that the UK stock established a 6% premium for small firms from 1955 to 1987. This anomaly circulated in 1987 by the Hoare Govett Smaller Companies (HGSC) Index. Moreover, the authors found a small-capitalization discount of 6% in the following period (1989–1997).

Allen and Tan (1999) tested 131 funds from the period of 1989–1995 by adopting four distinct tests: contingency tables established on winners and losers, chi-squared independence examined on individual tables, the CAPM risk-adjusted returns test and the Spearman rank correlation coefficient (SRCC) results through the ordinary least square (OLS) regression method.

Their results contrasted the performance in a two-year period with the consecutive term of two years. They put forward the claim that 53.7% are winners in the successive period and 46.3% are losers. Another leading study by Rhodes (2000) followed the contingency table methodology. Moreover, Rhodes (2000) suggested that poorly performing funds are based on a small and insignificant component of the unit trust industry. Further, past performance cannot assessed efficiently by retail investors. Another study by Goetzmann and Ibbotson (1994) adopted contingency tables and used a sample of 728 mutual funds companies. They concluded that historical returns and relative rankings are suitable for forecasting future returns and are beneficial for rankings in the short term. Moreover, they obtained the result that greater variance is inclined to become successful repetitively (winners).

According to Kahn and Rudd (1994), persistence can be observed in fixed-income funds despite controlling for management fees and fund style. They followed the method of contingency tables and regression analysis using a sample of equity and fixed-income funds.

Malkiel (1995) examined twenty years of mutual funds in the period from 1971 to 1991. He followed the approach of contingency tables and buying mutual funds that had an exceptional performance history over the previous year. His conclusion was in line with Rhodes (2000) and established that performance persisted in the 1970s, but he did not find any indication of performance persistence in the 1980s. Therefore, he determined that security markets behaved efficiently.

Another study, conducted by Brown and Goetzmann (1995), investigated the period of 1976–1988 using a sophisticated method of contingency tables, a CAPM alpha measure and a three-factor alpha measure. They concluded with a clear indication of relative performance persistence, and previous information was considered as being useful for an investor to beat the market.

The main advantage of contingency tables is to identify the effectiveness of market efficiency if a factor varies, such as the size of the firm, liquidity, turnover and spread. Another useful point of contingency tables and chi-squared results is that, before making any recommendations or becoming involved in political advocacy, empirical evidence is required to authenticate the study's claims and contingency tables, and chi-squared results are the essential base for validation.

### 3.21.2 Data Arrangement for Firm Size Analysis

In this study 1625 dividend announcement events on the Pakistan Stock Exchange were collected over the period from 2005 to 2015. This distinction is further exemplified in studies using contingency tables, which are developed in the range of the largest 25% companies, 26% to 50% companies, 51% to 75% companies and 76% to 100% companies within the Pakistan Stock Exchange based on the criteria of market capitalization. Similar data are utilized for this analysis along with the market capitalization of a similar frequency collected from DataStream.

### 3.21.3 Data Analysis

All the dividend announcements of the firms are ranked according to the size of the firms, that is, market capitalization. The ranked categories are distributed across four equally weighted groups of the largest 25% of companies listed on the PSX, 26% to 50% size companies, 51% to 75% size companies and 76% to 100% size companies.

To examine the size effect, the sorting process is used first. The sorting method is used for the size from the largest (top) to the smallest (bottom) firms and then related to the cumulative average returns among these size groups. Fama and French (2008) discussed the merits of this approach regarding how the average returns fluctuate with specific characteristics, such as firm size.

Therefore, a means to address this is to check whether a certain measure of market inefficiency is distributed evenly across the characteristics of the companies under examination. A matrix is designed with the number of firms in each cell of the matrix. Moreover, each table is categorized with the different event windows; for example, the respective event windows are (-20 to -11), (-10 to -1), (+1 to +10), (+11 to +20), (-20 to +20) and (0 to 0).

### 3.21.4 Results

A contingency table is a useful means to indicate the relationship between two categorical variables. The chi-square statistic shows the firmness of this association. All else being equal, the greater the value of the chi-square statistic, the more robust the relationship. Contingency tables further enable this study to gauge the market efficiency through the CAR of the Pakistan Stock Exchange with the categorization of firm size based on market capitalization. Information is available in the form of contingency tables.

Table 3-17 and corresponding figure 3-12 showed that, the pre-announcement event windows, that is, (-20 to -11) and (-10 to -1), have a higher proportion of cumulative abnormal returns (CARs) in the top 25% companies of the Pakistan Stock Exchange. Further, the key aspect extracted from the pre-announcement results shows that the top companies based on market capitalization influence the inefficiency in the market before the announcement of dividends in comparison with small market capitalization holding companies. Along similar lines, it can be argued that the majority of CARs observed during the pre-announcement of the events are greater than 20%. In other words, the largest to smallest companies based on the market capitalization can influence the market by the inefficiency of greater than 20% CAR.

**Table 3-17: Proportion of CARs during (-20 to -11)**

| CAR (-20_-11)/CAR (-20_20) | Top 25% | 26 to 50% | 51 to 75% | 76 to 100% | Total | Proportion |
|---|---|---|---|---|---|---|
| **Market Model** | | | | | | |
| < 0% | 196 | 118 | 99 | 61 | 474 | 0.29241209 |
| Between 0% and 9% | 31 | 28 | 24 | 7 | 90 | 0.05552128 |
| Between 10% and 19% | 35 | 18 | 19 | 11 | 83 | 0.05120296 |
| > 20% | 488 | 235 | 150 | 101 | 974 | 0.60086366 |
| Total | **750** | **399** | **292** | **180** | **1621** | **1** |
| Chi-Squared Test | 0.003878 | | | | | |
| **(P Value < 5%)** | | | | | | |
| **CAR (-20_-11)/CAR (-20_20) CAPM Model** | **Top 25%** | **26 to 50%** | **51 to 75%** | **76 to 100%** | **Total** | **Proportion** |
| < 0% | 284 | 151 | 105 | 71 | 611 | 0.37692782 |
| Between 0% and 9% | 450 | 229 | 171 | 101 | 951 | 0.58667489 |
| Between 10% and 19% | 9 | 11 | 9 | 6 | 35 | 0.02159161 |
| > 20% | 7 | 8 | 7 | 2 | 24 | 0.01480568 |
| Total | **750** | **399** | **292** | **180** | **1621** | **1** |
| Chi-Squared Test (P value < 5%) | 0.354461 | | | | | |
| **CAR (-20_-11)/CAR (-20_20) Fama and French model** | **Top 25 %** | **26 to 50 %** | **51 to 75 %** | **76 to 100 %** | **Total** | **Proportion** |
| < 0% | 194 | 122 | 102 | 59 | 477 | 0.294262801 |
| between 0% to 9% | 490 | 233 | 147 | 102 | 972 | 0.599629858 |
| between 10% to 19% | 32 | 19 | 21 | 10 | 82 | 0.050586058 |
| >20% | 34 | 25 | 22 | 9 | 90 | 0.055521283 |
| Total | 750 | 399 | 292 | 180 | 1621 | 1 |
| Chi-squared test | 0.005448 | | | | | |
| (P value < 5%) | | | | | | |

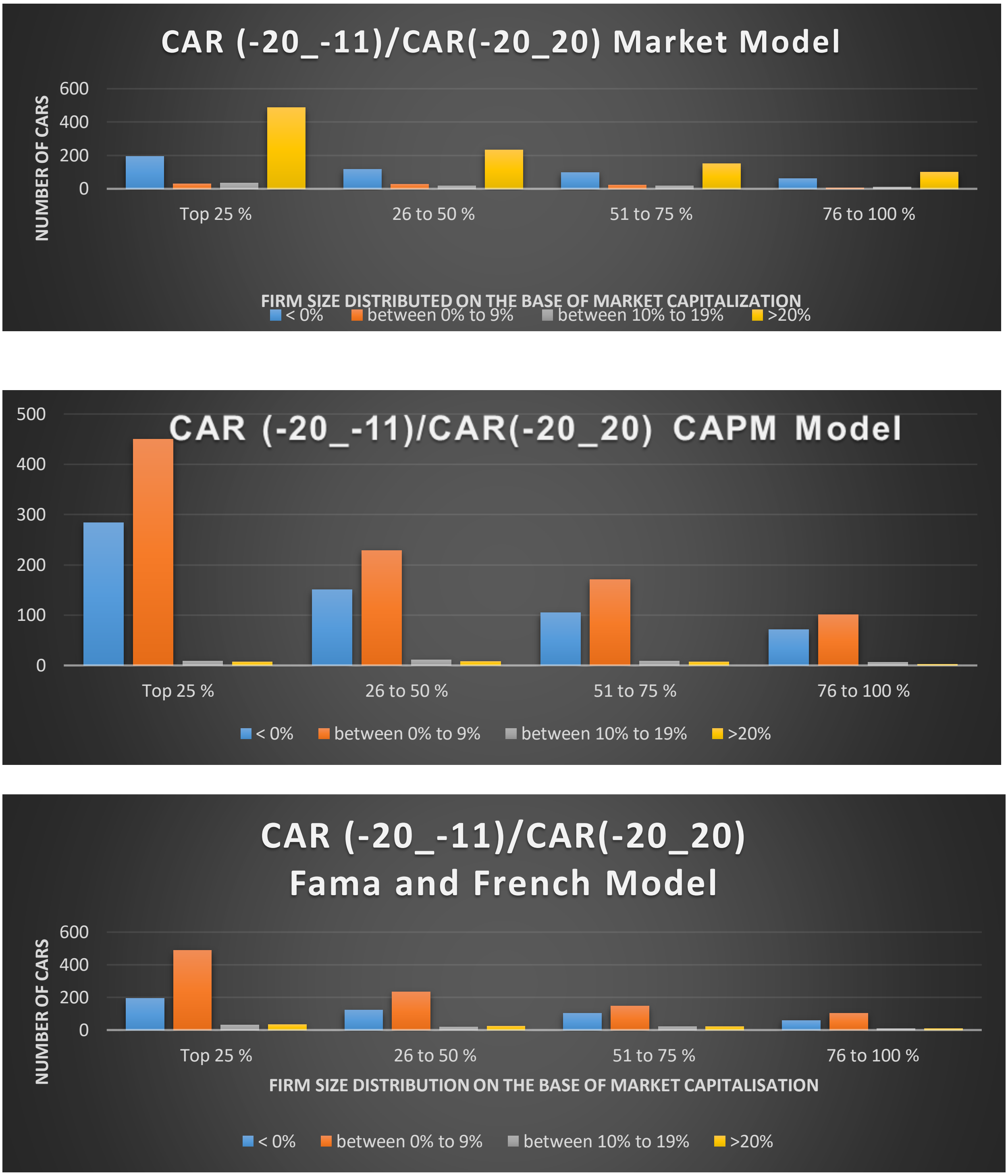



**Figure 3-11: Event Window (-20 to -11): Cumulative Abnormal Returns**

The preceding discussion also implies that the inefficiency of the market follows the even pattern from the top companies, which have a large influence based on the market capitalization from the second category of 51% to 75%, and 51% to 75%

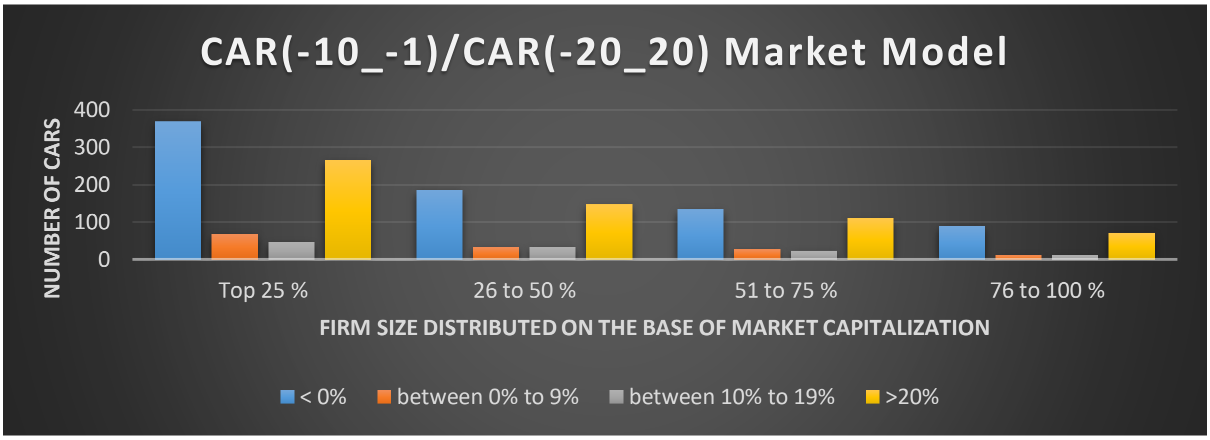
companies have a strong influence from 26% to 50% companies, respectively. Similarly, the largest companies based on market capitalization have a very large impact on market inefficiency because they hold 750 observations of cumulative abnormal returns in comparison with those in the 26% to 50% range.

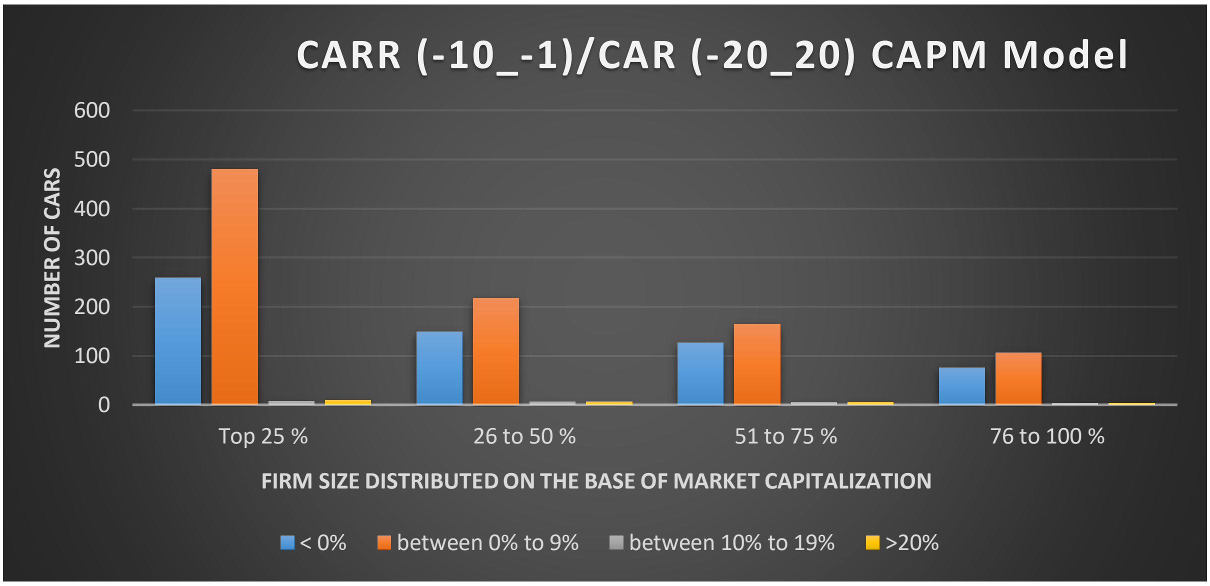
**Table 3-18: Proportion of CARs during (-10 to -1)**

| **CAR (-10_-1)/CAR (-20_20) Market Model** | **Top 25%** | **26 to 50%** | **51 to 75%** | **76 to 100%** | **Total** | **Proportion** |
|---|---|---|---|---|---|---|
| < 0% | 370 | 186 | 134 | 89 | 779 | 0.48056755 |
| Between 0% and 9% | 68 | 33 | 27 | 10 | 138 | 0.08513263 |
| Between 10% and 19% | 46 | 33 | 22 | 10 | 111 | 0.06847625 |
| > 20% | 266 | 147 | 109 | 71 | 593 | 0.36582357 |
| Total | **750** | **399** | **292** | **180** | 1621 | 1 |
| Chi-Squared (P Value < 5%) 0.719 | 0.719334 | | | | | |

| **CAR (-10_-1)/CAR (-20_20) CAPM Model** | **Top 25%** | **26 to 50%** | **51 to 75%** | **76 to 100%** | **Total** | **Proportion** |
|---|---|---|---|---|---|---|
| < 0% | 259 | 157 | 124 | 72 | 612 | 0.37754473 |
| Between 0% and 9% | 475 | 225 | 158 | 102 | 960 | 0.59222702 |
| Between 10% and 19% | 7 | 8 | 5 | 3 | 23 | 0.01418877 |
| > 20% | 9 | 9 | 5 | 3 | 26 | 0.01603948 |
| Total | **750** | **399** | **292** | **180** | **1621** | 1 |
| Chi-Squared Test (P Value < 5%) | 0.325 | | | | | |

| **CAR (-10_-1)/CAR (-20_20) Fama and French Model** | **Top 25 %** | **26 to 50 %** | **51 to 75 %** | **76 to 100 %** | **Total** | **Proportion** |
|---|---|---|---|---|---|---|
| < 0% | 323 | 144 | 116 | 64 | 647 | 0.399136336 |
| between 0% to 9% | 411 | 237 | 162 | 103 | 913 | 0.563232572 |
| between 10% to 19% | 10 | 7 | 8 | 6 | 31 | 0.019123998 |
| >20% | 6 | 11 | 6 | 7 | 30 | 0.018507094 |
| Total | **750** | **399** | **292** | **180** | **1621** | 1 |
| Chi-squared (P Value < 5%) | 0.018583 | | | | | |



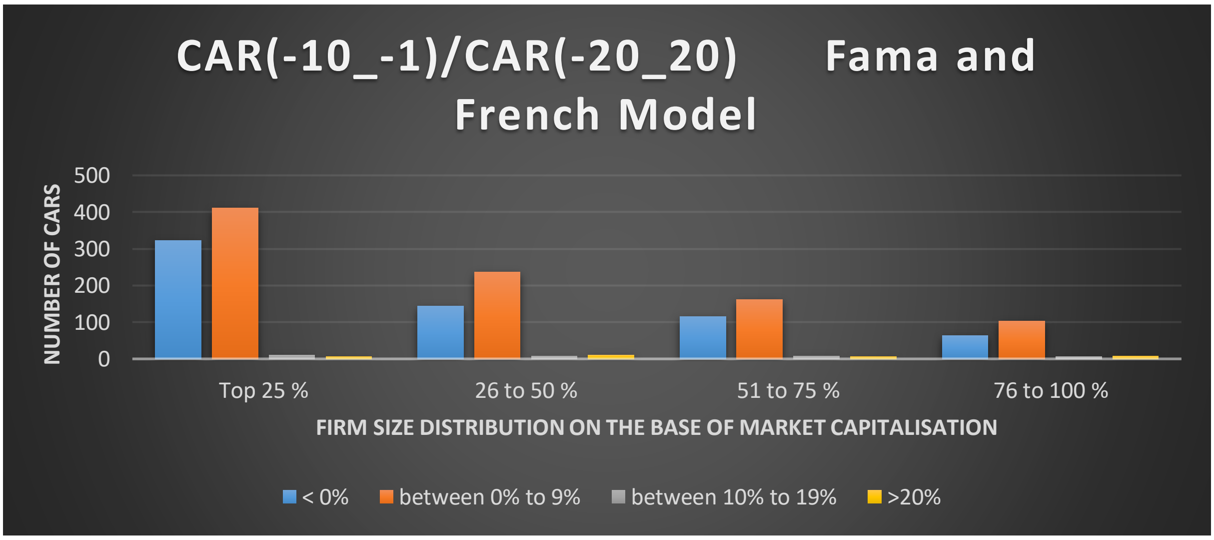




**Figure 3-12: Event Window (-10 to -1): Cumulative Abnormal Returns**

With the evidence currently available in Table 3-19, it seems fair to suggest that the majority of the cumulative abnormal returns are distributed between the categories of <0%, 0% to 9% and > 20%. These results provide confirmatory evidence that the cause of inefficiency in the market before the announcement of dividends is the largest companies in terms of firm size (market capitalization).

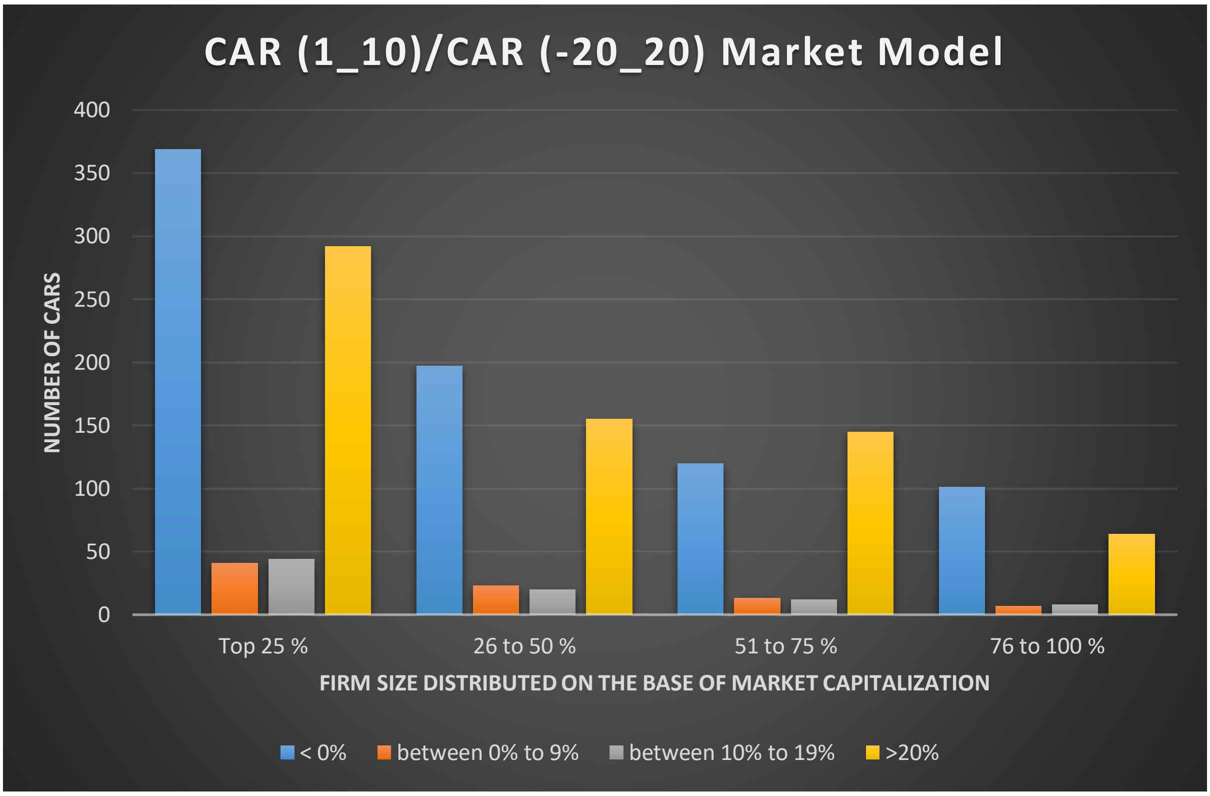
The results for the event windows after the announcement of dividends, that is, (+1 to +10) and (+11 to +20), show the pre-announcement trends. The majority of the inefficiency can be observed in the largest companies based on market capitalization.

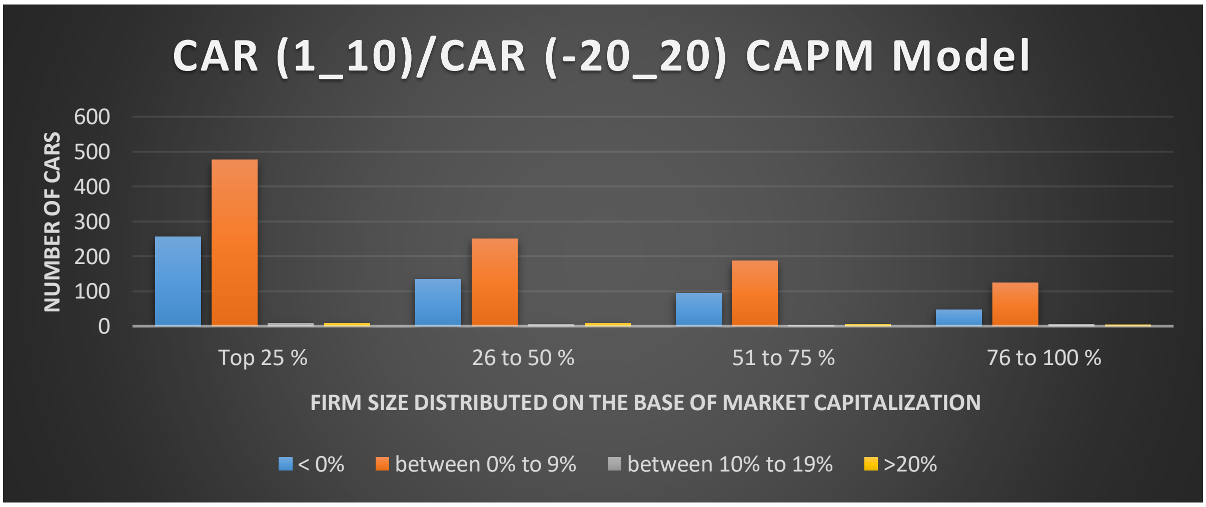
**Table 3-19: Proportion of CARs during (+1 to +10)**

| **CAR (1_10)/CAR (-20_20) Market Model** | **Top 25%** | **26 to 50%** | **51 to 75%** | **76 to 100%** | **Total** | **Proportion** |
|---|---|---|---|---|---|---|
| < 0% | 370 | 198 | 121 | 101 | 790 | 0.48735349 |
| Between 0% and 9% | 42 | 24 | 14 | 7 | 87 | 0.05367057 |
| Between 10% and 19% | 45 | 21 | 12 | 8 | 86 | 0.05305367 |
| > 20% | 293 | 156 | 145 | 64 | 658 | 0.40592227 |
| Total | **750** | **399** | **292** | **180** | 1621 | 1 |
| Chi-Squared | **0.066334** | | | | | |

| **CAR (1_10)/CAR (-20_20) CAPM Model** | **Top 25%** | **26 to 50%** | **51 to 75%** | **76 to 100%** | **Total** | **Proportion** |
|---|---|---|---|---|---|---|
| < 0% | 256 | 135 | 95 | 47 | 533 | 0.32880938 |
| Between 0% and 9% | 477 | 251 | 188 | 124 | 1040 | 0.64157927 |
| Between 10% and 19% | 8 | 5 | 3 | 5 | 21 | 0.01295497 |
| > 20% | 9 | 8 | 6 | 4 | 27 | 0.01665638 |
| Total | **750** | **399** | **292** | **180** | **1621** | 1 |
| Chi-Squared | **0.520087** | | | | | |

| **CAR (1_10)/CAR (-20_20) Fama and French Model** | **Top 25 %** | **26 to 50 %** | **51 to 75 %** | **76 to 100 %** | **Total** | **Proportion** |
|---|---|---|---|---|---|---|
| < 0% | 286 | 121 | 86 | 38 | 531 | 0.327575571 |
| between 0% to 9% | 432 | 264 | 189 | 111 | 996 | 0.614435534 |
| between 10% to 19% | 11 | 8 | 11 | 12 | 42 | 0.025909932 |
| >20% | 21 | 6 | 6 | 19 | 52 | 0.032078964 |
| Total | **750** | **399** | **292** | **180** | **1621** | 1 |
| Chi-squared (P Value < 5%) | 5.33E-12 | | | | | |


CAR (1_10)/CAR (-20_20) Market Model
NUMBER OF CARS
400
350
300
250
200
150
100
50
0
Top 25 %
26 to 50 %
51 to 75 %
76 to 100 %
FIRM SIZE DISTRIBUTED ON THE BASE OF MARKET CAPITALIZATION
< 0%
between 0% to 9%
between 10% to 19%
>20%


CAR (1_10)/CAR (-20_20) CAPM Model
NUMBER OF CARS
600
500
400
300
200
100
0
Top 25 %
26 to 50 %
51 to 75 %
76 to 100 %
FIRM SIZE DISTRIBUTED ON THE BASE OF MARKET CAPITALIZATION
< 0%
between 0% to 9%
between 10% to 19%
>20%

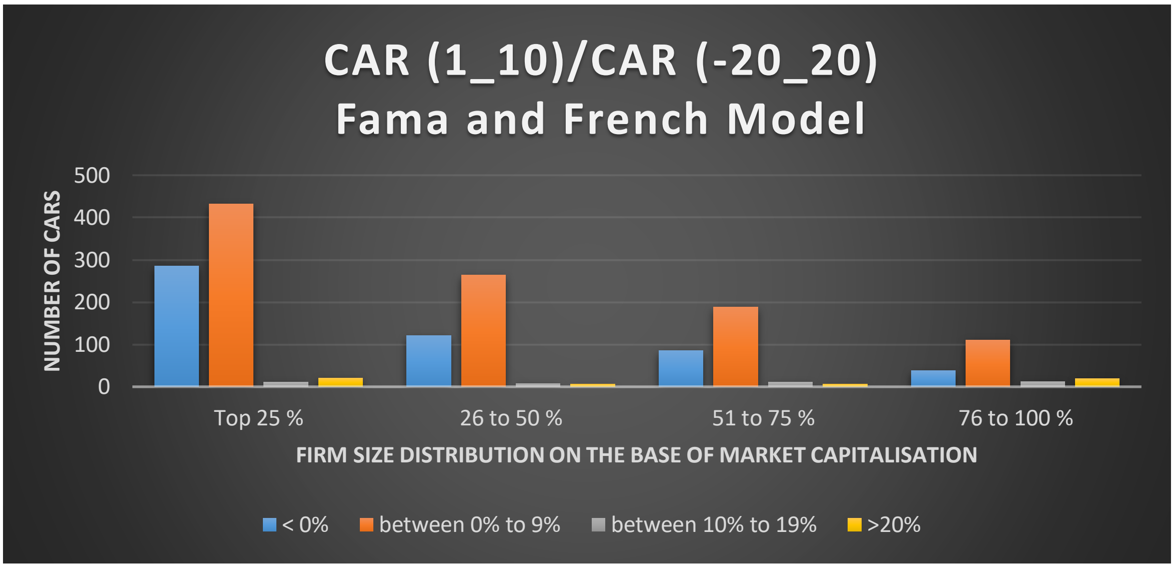



**Figure 3-13: Event Window (1 to 10): Cumulative Abnormal Returns**

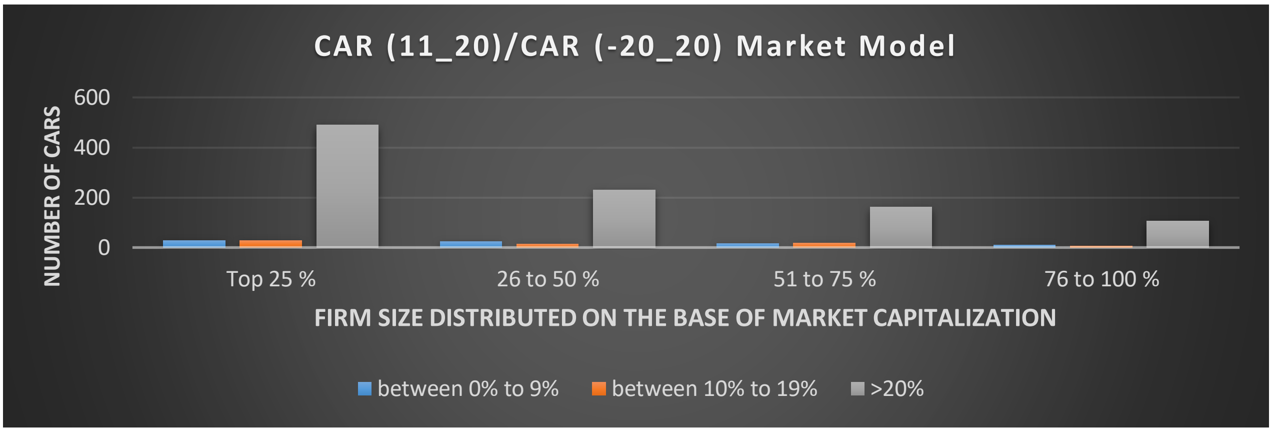
Moreover, based on Table 3-20, demonstrating post-announcement results which indicate that investors are able to earn abnormal returns due to the slow response in the market and explain the weak form of market efficiency. The majority of the CARs are placed in the proportion range of < 0% to 0%–9% in all the categories.

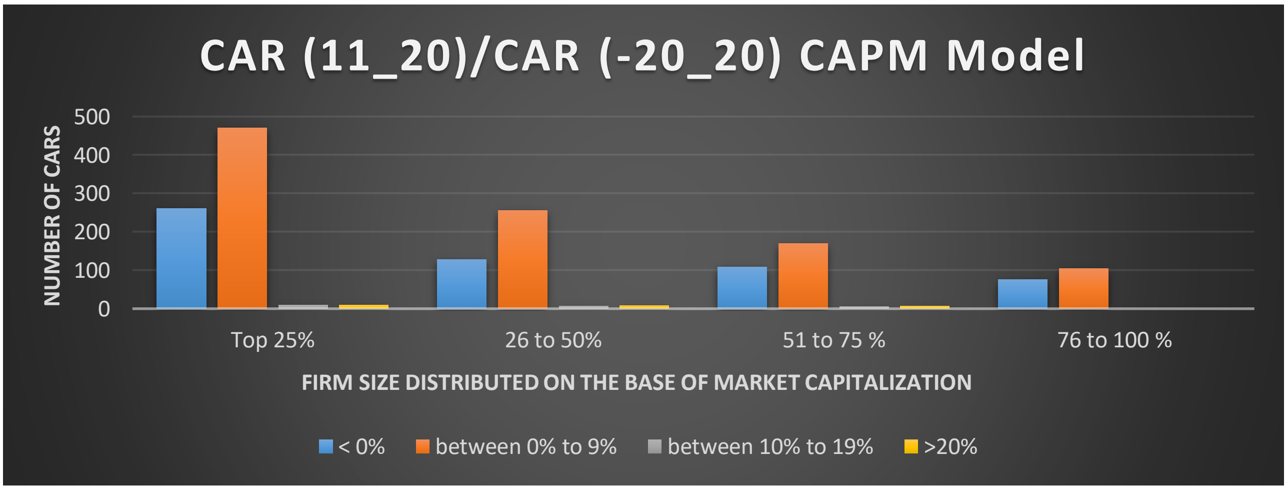
**Table 3-20: Proportion of CARs during (+11 to +20)**

| **CAR (11_20)/CAR (-20_20) Market Model** | **Top 25%** | **26 to 50%** | **51 to 75%** | **76 to 100%** | **Total** | **Proportion** |
|---|---|---|---|---|---|---|
| < 0 | 204 | 131 | 98 | 58 | 491 | 0.30289944 |
| Between 0% and 9% | 28 | 24 | 15 | 10 | 77 | 0.04750154 |
| Between 10% and 19% | 28 | 14 | 17 | 6 | 65 | 0.0400987 |
| > 20% | 490 | 230 | 162 | 106 | 988 | 0.60950031 |
| Total | **750** | **399** | **292** | **180** | 1621 | 1 |
| Chi-Squared (P Value < 5%) | 0.080233 | | | | | |

| **CAR (11_20)/CAR (-20_20) CAPM Model** | **Top 25%** | **26 to 50%** | **51 to 75%** | **76 to 100%** | **Total** | **Proportion** |
|---|---|---|---|---|---|---|
| < 0 | 261 | 128 | 109 | 76 | 574 | 0.35410241 |
| Between 0% and 9% | 471 | 256 | 170 | 104 | 1001 | 0.61752005 |
| Between 10% and 19% | 9 | 7 | 6 | 0 | 22 | 0.01357187 |
| > 20% | 9 | 8 | 7 | 0 | 24 | 0.01480568 |
| Total | 750 | 399 | 292 | 180 | 1621 | 1 |
| | | | | | | |
| Chi-Squared | 0.154042 | | | | | |

| CAR (11_20)/CAR (-20_20) Fam and French Model | Top 25% | 26 to 50% | 51 to 75 % | 76 to 100 % | Total | Proportion |
|---|---|---|---|---|---|---|
| < 0% | 276 | 155 | 99 | 52 | 582 | 0.359037631 |
| between 0% to 9% | 461 | 233 | 186 | 115 | 995 | 0.61381863 |
| between 10% to 19% | 6 | 4 | 3 | 4 | 17 | 0.010487353 |
| >20% | 7 | 7 | 4 | 9 | 27 | 0.016656385 |
| Total | 750 | 399 | 292 | 180 | 1621 | 1 |
| Chi-squared (P Value < 5%) | 0.007806 | | | | | |



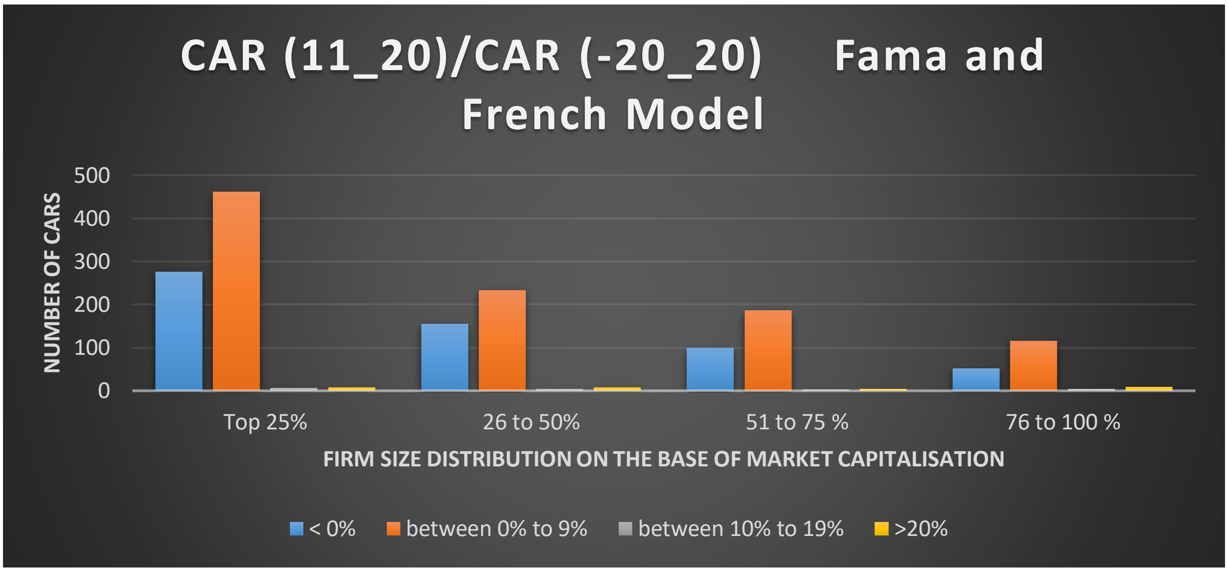



**Figure 3-14: Event Window (11 to 20): Cumulative Abnormal Returns**

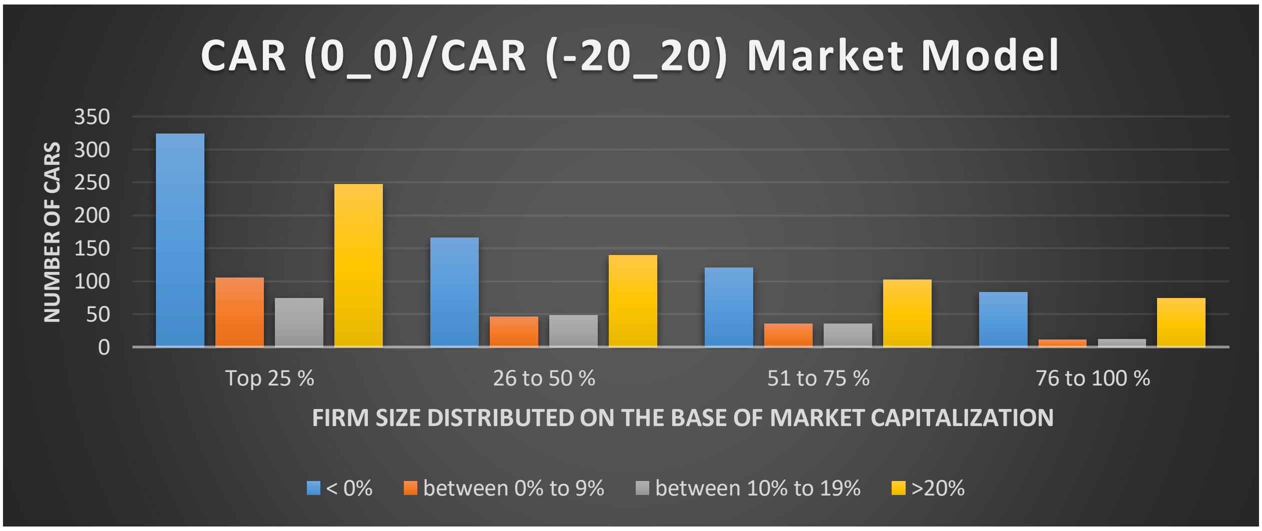
On the day of announcement from Table 3-21, (0 to 0), the largest companies based on market capitalization have a considerable influence in comparison with the pre- and post-announcement event windows. On logical grounds there is a compelling reason to argue that the market reacts on the day of dividend announcements and that the proportion of numbers is significantly larger during the day of the announcement. The influence of the news is also noticeable in the event window, that is, (0 to 0).

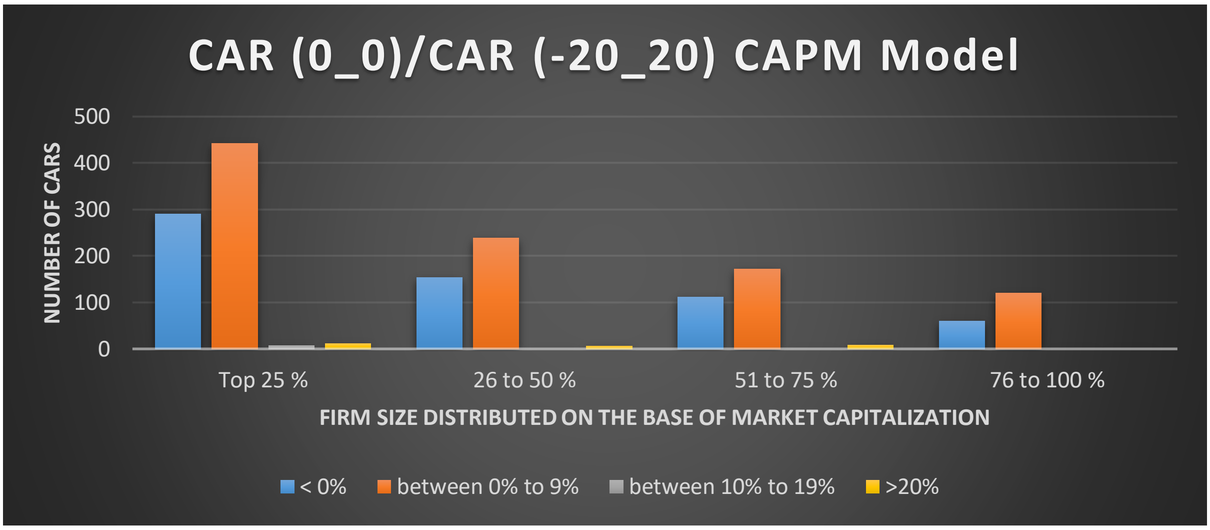
**Table 3-21: Proportion of CARs during (0 to +0)**

| **CAR (0_0)/CAR (-20_20) Market Model** | **Top 25%** | **26 to 50%** | **51 to 75%** | **76 to 100%** | **Total** | **Proportion** |
|---|---|---|---|---|---|---|
| < 0 | 324 | 166 | 120 | 83 | 693 | 0.42751388 |
| Between 0% and 9% | 105 | 46 | 35 | 11 | 197 | 0.12152992 |
| Between 10% and 19% | 74 | 48 | 35 | 12 | 169 | 0.10425663 |
| > 20% | 247 | 139 | 102 | 74 | 562 | 0.34669957 |
| Total | **750** | **399** | **292** | **180** | 1621 | 1 |
| Chi-Squared (P Value < 5%) | 0.075387 | | | | | |

| CAR (0_0)/CAR (-20_20) CAPM Model | Top 25% | 26 to 50% | 51 to 75% | 76 to 100% | Total | Proportion |
|---|---|---|---|---|---|---|
| < 0 | 290 | 154 | 112 | 60 | 616 | 0.38001234 |
| Between 0% and 9% | 442 | 239 | 172 | 120 | 973 | 0.60024676 |
| Between 10% and 19% | 7 | 0 | 0 | 0 | 7 | 0.00431832 |
| > 20% | 11 | 6 | 8 | 0 | 25 | 0.01542258 |
| Total | **750** | **399** | **292** | **180** | 1621 | 1 |
| Chi-Squared (P Value < 5%) | 0.045662 | | | | | |

| CAR (0_0)/CAR (-20_20) Fama and French Model | Top 25 % | 26 to 50 % | 51 to 75 % | 76 to 100 % | Total | Proportion |
|---|---|---|---|---|---|---|
| < 0% | 257 | 138 | 97 | 51 | 543 | 0.334978408 |
| between 0% to 9% | 472 | 247 | 185 | 123 | 1027 | 0.633559531 |
| between 10% to 19% | 8 | 6 | 3 | 4 | 21 | 0.012954966 |
| >20% | 13 | 8 | 7 | 2 | 30 | 0.018507094 |
| **Total** | **750** | **399** | **292** | **180** | **1621** | **1** |
| Chi-squared (P Value < 5%) | 0.791223 | | | | | |





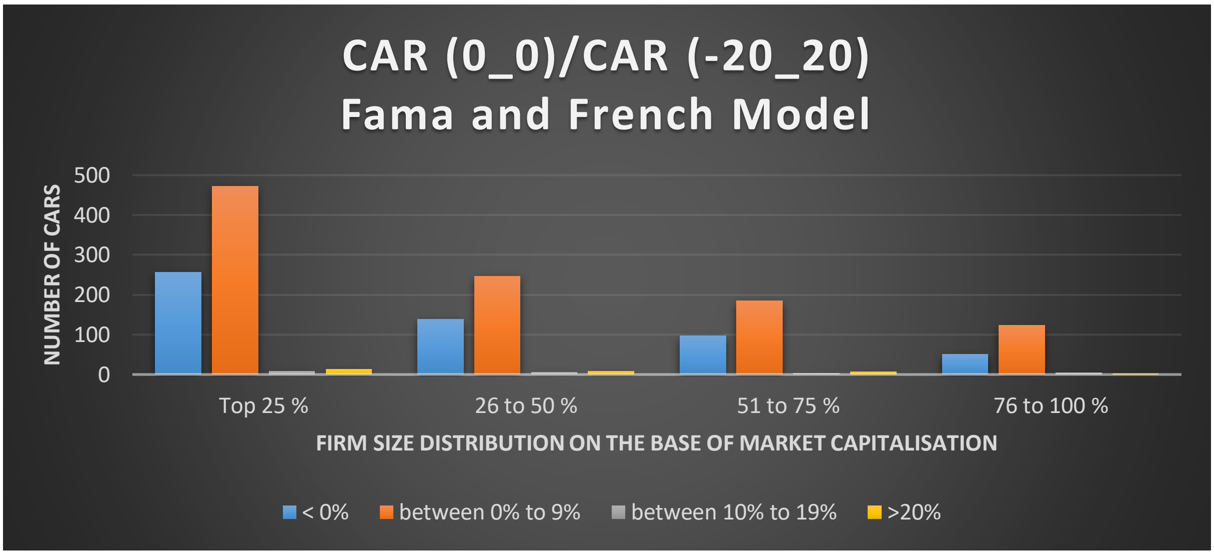




**Figure 3-15: Event Window (0 to 0): Cumulative Abnormal Returns**

### 3.21.5 Chi-Squared Test

The chi-squared test is very useful in terms of comparing categorical observed data with expected data and determining how well the data fit with the expected data. The chi-squared test is also called the goodness-of-fit test.

A chi-squared hypothesis is based on H0: no association; H1: association. The key analysis of pre-announcement event windows in the market model, that is (-20 to -11), is taken into consideration, and the results indicate that the event window of (-20 to -

11) is statistically significant, so the null hypothesis is rejected. In other words, the event window of (-20 to -11) has a strong association with the cumulative abnormal returns and the categories of companies. Further, in the CAPM model, none of the event windows are significant during the pre-announcement period, and it can be concluded that there is a strong association with the cumulative abnormal returns. On the other side, the post-announcement event window illustrates no significant statistical values. In comparison Fama and French has pre announcement significant event window CAR (-20_-11) and CAR (-10_-1) and having post announcement event window significant at (11_20).

The event window on the day of announcement (CAPM model), that is, (0 to 0), is statistically significant and helpful in understanding that the overall market reacted on the day of announcement when the information reached the public.  However, no evidence of significance found in Market and Fama and French models.

### 3.22 Cumulative Abnormal Returns (CARs)

The following table 3-22 shows the CAR of the event window from -20 to +20 of overall events from the Pakistan Stock Exchange. The cumulative abnormal return (CAR) is simply a summation of a firm's abnormal returns over a specified period before and after an event, for instance three days evenly surrounding the event, that is, -1, +1. In that case the calculation of the CAR is basically the summation of a firm's abnormal returns on the day prior to the event, the event day and the day after the event.

**Table 3-22: Averages of the Cumulative Abnormal Returns Event Categories over the Total Cumulative Abnormal Returns**

| <u>Market Model</u> | **Overall Market Averages** |
|---|---|
| **Pre-Announcement** | |
| CAR (-20_-11)/CAR (-20_20) | 0.180798218 |
| CAR (-10_-1)/CAR (-20_20) | 0.203670284 |
| | |
| **Day of Announcement** | |
| CAR (0_0)/CAR (-20_20) | -0.105321888 |
| | |
| **Post-Announcement** | |
| CAR (1_10)/CAR (-20_20) | -0.444561746 |
| CAR (11_20)/CAR (-20_20) | 1.165415133 |

| <u>CAPM Model</u> | **Overall Market Averages** |
|---|---|
| **Pre-Announcement** | |
| CAR (-20_-11)/CAR (-20_20) | 0.3967 |
| CAR (-10_-1)/CAR (-20_20) | 0.3485 |
| | |
| **Day of Announcement** | |
| CAR (0_0)/CAR (-20_20) | 0.0262 |
| | |
| **Post-Announcement** | |
| CAR (1_10)/CAR (-20_20) | 0.2074 |
| CAR (11_20)/CAR (-20_20) | 0.0211 |

| <u>Fam and French Three Factor Model</u> | **Overall Market Averages** |
|---|---|
| **Pre-Announcement** | |
| CAR (-20_-1)/CAR (-20_20) | -0.04207 |
| CAR (-10_-1)/CAR (-20_20) | -0.29495 |
| | |
| **Day of Announcement** | |
| CAR (0_0)/CAR (-20_20) | 0.158484 |
| | |
| **Post-Announcement** | |
| CAR (1_10)/CAR (-20_20) | 0.600638 |
| CAR (1_20)/CAR (-20_20) | 0.883581 |

The averages of each firm's cumulative abnormal returns category over the total cumulative abnormal returns window (CAR -20_20), specified as the number of trading days within the event window, are named the cumulative abnormal return (CAR) (which includes several days within the event window), respectively.

### 3.23 Summary of the Results

This study attempts to address the association between the firm size effect and the cumulative average returns on the Pakistan Stock Exchange. A set of four categories is created based on size, that is, market capitalization, for the period from 2005 to 2014. With the evidence currently available, it seems fair to suggest that the firm size has a noticeable effect on large firms and large cap firms perform better, moreover, our results are aligned with those of Banz (1981) and Reinganum (1981), who evidently considered that the market capitalization has an impact on the large firms and abnormal returns in comparison with small size firms. Further, the evidence supports the idea that large firms have superior cumulative abnormal returns to small firms. These results provide confirmatory evidence in line with the literature proposition that the firm size effect exists on the Pakistan Stock Exchange. Moreover, the results are associated with those of Hou and Moskowitz (2005), who identified large firms as having higher abnormal returns than small companies.

Now a summary of the ground covered in this study is presented, showing that the alternative hypothesis of cumulative abnormal returns holds true for the Pakistan Stock Exchange. The results provide confirmatory evidence of the size effect on cumulative abnormal returns, opposing the analysis by Fama and French (1995), in which small firms face more risk and produce more returns. The indication of the size effect in the Pakistani stock market suggests doubts regarding the efficiency level of the market. The presence of abnormal returns through the identification of an investment portfolio constructed on the basis of firm size indicates that the Pakistan Stock Exchange is not efficient on the basis of publicly available information;

specifically, the firm size strategy can be practised to take advantage of higher abnormal returns.

### 3.24 Conclusion

The focus of this study is on examining the market efficiency of the Pakistan Stock Exchange in terms of the capital market reaction to the announcement of dividends. The established empirical evidence leads to several conclusions. First of all, dividend announcements strongly support the capital market reaction, as a substantial market reaction in terms of abnormal returns is found surrounding the dividend announcements. The results suggest that the market contains more or less equal percentages of good news and bad news, but the identification of the good news and bad news depends on the dividend pay-outs and on a comparison with previous dividend pay-outs, which is beyond the scope of this study.

Secondly, regarding the market reaction to the announcement of dividends, the evidence implies that announcements play a major role in signalling effects and support the signalling theory as explained graphically through CARs in all models. Moreover, dividend announcement signals indicate the overall prospect of the firm within the market.

Thirdly, the Pakistan Stock Exchange continues to react on average positively after the day of the public announcement of dividends. This means that the market reaction is slow, calling into question the efficiency of the market, and it reveals weakness within the flow of the information system.

In the final analysis, the empirical evidence from the study is that the Pakistan Stock Exchange has not achieved full efficiency. For this reason the market is characterized as having the weak form of efficiency. Accordingly, it is also reasonable to investigate the time needed to absorb the dividend announcement information along with abnormal returns surrounded on announcement days. The cumulative abnormal returns after the announcement of dividends follow upward and downward trends within 20 days, showing a late reaction to the newly available public information.

The efficiency curve is another illustration to establish the conclusion that the Pakistan Stock Exchange has a weak form of market efficiency after the announcement because of the underreaction observed after the announcement date.

The firm size analysis also indicates the weak form of market efficiency, because it is mainly based on the top 25% of companies. The percentage change in cumulative abnormal returns in the top 25% companies is larger than that of small companies. Therefore, large size firms are less efficient.

**Chapter 4: Implementation of New Price Impact Ratios: Evidence from the Pakistan Stock Exchange**

# 4 Introduction

The present study attempts to examine the prominent liquidity measures namely, the price impact ratio, RtoV, and the ratio recently developed by Florackis et al. (2011), known as RtoTR. To gain a better understanding of the concept of these ratios, it is necessary to understand the characteristics of liquidity: an asset which has low execution fees, if it sells immediately after its initial purchase (Amihud & Mendelson, 1986:p.224).

There is evidence that liquidity has an association with direct costs while operating a transaction containing the asset. According to Amihud and Mendelson (1991), the liquidity of an asset could be examined through its price while trading in comparison with the price of the same asset without trade.

To put it another way, the liquidity of an asset is identified through the ability to trade with three major characteristics: the trading cost, price impact, and trading swiftness. The underlying argument based on the concept of the contemporary theory of finance is that financial markets are free of resistances and efficient. Having said that, only the risk and return classically identify stockholders' investment decisions (Kaniel et al., 2012). However, the theory of microstructure is established on market frictions (Cohen, Maier & Schwartz, 1986). Stoll (2000) classified these frictions into two groups: real frictions, which are a shortfall in the market, absorb real resources and affect overall investors in an identical manner. On the other hand, informational friction redistributes wealth among investors. Hence, liquidity becomes a supplementary feature of investors' decision-making criteria.

It is necessary to understand illiquid assets, which are difficult to trade as a result of the high cost of trading attached to them. Moreover, an immediate decline in the liquidity position of the market can develop financial distress; therefore, controllers need to be observant and pay adequate attention to the liquidity of the market, being ready to take actions to maintain the minimum liquidity requirements. Investors need liquid markets to handle/diversify their risks and meet the requirement of their own funding (Verousis and ap Gwilym, 2014). Liquidity is considered as a multidimensional concept that includes the dynamics of the market from its width, depth, immediacy and resiliency. The bases of illiquidity are mainly developed from the trading costs, asymmetric information, inventory risk, search frictions and ownership structure of a firm. The following section presents the characterstics of liquidity.

This study has used Amihud (2002) (R/V) and Florackis et al. (2011) (R/TR) ratios instead of bid-asked spreads. The advantages of using two price impact ratios are appealing because it is easy to compute for long time periods given the wide availability of returns and trading volume data. In addition, it is intuitively attractive because the average daily price response associated with a dollar of trading volume renders it a good proxy for the theoretically founded Kyle's price impact coefficient and advantage of long run financial stability (Hasbrouck, 2005; Goyenko et al., 2009). On the other side Brennan and Subrahmanyam (1996) explained that the bid–ask spread can be considered as a noisy portion of liquidity. They further reported that a high volume of large trades can be noticed outside the spread and a high volume of small trades can be observed within the spread. The bid–ask spread is comparatively suitable and important to engage, but when data collected on daily frequency then it is probably incomprehensible and non-informative due to noise and is typically considered for day-end transactions (see, e.g., Florackis et al., 2011). Similarly, Acharya and Pedersen (2005) showed that illiquidity could be identified through larger bid–ask spreads but mentioned that this measure of illiquidity is unable to offer any information on depth of the market and incapable of reporting the impact of the price due to a particular trade.

### 4.1 Characteristics of Liquidity in Financial Assets

Liquidity is commonly considered to be an analytical characteristic of financial assets and to play a significant role in the operations of financial markets. Several schools of thought have emerged and explained the definition of liquidity as the capability to buy and sell assets effortlessly, and this attribute allows buyer and sellers to trade within the financial markets either by injecting money or by taking out their positions swiftly without exerting a large impact on prices (O'Hara, 2004).

Prior research has considered liquidity in terms of measures, including tightness, depth and resiliency. Kyle (1985) claimed that tightness means the extent to which the transaction prices deviate from the mid-market prices, and, it is calculated using the bid–ask spread. Moreover, depth explains the size of an order flow, which is essential to adjust to a given amount of prices. Resiliency considers the swiftness of prices returning from irregular and uninformative shocks.

Another key point that also comprises the price impact is the flow of order and trading volume-based sizes. Different proxies have been recommended by various empirical studies to measure liquidity. Demsetz (1968) encouraged a debate on the bid–ask spread as the liquidity measure and was the first to suggest that the spread can be considered as the approximate cost.

## 4.2 Why Liquidity is important for stock markets?

The foregoing discussion implies that liquidity is a major feature of the financial markets. Liquidity allows investors to encounter unforeseen financial requirements without experiencing major losses. Moreover, from the viewpoint of institutions, illiquidity is a factor in abnormal returns on assets, limited trade volume and higher risks (Instefjord, 1999). It is also worth considering that liquidity is a vital factor in measuring a firm’s cost of capital. It perhaps affects investors’ portfolio decision making, because it is connected with transaction costs, and lower transaction costs imply higher liquidity, and, vice versa.

Along similar lines, Amihud and Mendelson (1986) claimed that illiquidity can have contrary effects on the asset value. According to Brennan and Subrahmanyam (1996), measures of trade are size dependent, and the fixed costs of transactions that represent the component of illiquidity on asset returns indicate a vital link between the empirical measures of adverse selection and asset returns.

Datar, Naik and Radcliffe (1998) suggested the turnover rate as a proxy for an asset to be used for measuring liquidity, indicating the usefulness of liquidity in describing the cross-sectional variation in stock returns. Another significant factor, highlighted by

Wurgler (2000), is that price information is readily available in larger markets, and perhaps liquidity and low transaction costs lead to more efficient arbitrage. This permits market participants and fund managers to differentiate between favourable and unfavourable investments.

Evidently liquidity could be one of the important points of policy apprehension for regulators. For instance, the sudden vanishing of liquidity from particular markets can pose a serious threat to their stability, as similar cases have been recorded as examples in history, such as the financial crises in Asia and Russia in 1997–1998 (BIS, 1999).

## 4.3 Causes of Liquidity Costs

It is essential to note, however, that the present market microstructure on liquidity differentiates three determinants that affect the market liquidity costs (see, e.g., Stoll, 1989, 2000; Amihud et al., 2005). It is important to understand these factors that influence the market liquidity, as described below.

### 4.3.1 Order Handling/Processing Cost

According to Demsetz (1968), Tinic (1972) and Roll (1984), the order/processing cost directly illustrates the payment required for the intermediation process of transacting an order.

### 4.3.2 Adverse Selection

Evidence in support on adverse selection can be found in the studies by Stoll (1978b), Amihud and Mendelson (1980) and Ho and Stoll (1981). The market maker purchases an asset from an investor with the expectation of being close to the existing position by selling the same asset to another investor in the future. During the interim period, the purchaser of an asset has to face the risk of adverse price movements. In this way he or she must be rewarded for taking a particular risk. In addition to implementing the reward through the use of the spread is the measurement of risk, which affects the size of the spread.

The adverse selection cost reflects the concept of asymmetric information. Moreover, it is the main tool for the liquidity cost and determines the spread compensation for losses experienced by trading with informed investors. The underlying concept was developed by Copeland and Galai (1983), who established the argument that, due to the adverse selection problem, uninformed market traders will increase the spreads, resulting in low market liquidity. Consequently, market makers will benefit from trading uninformed liquidity traders; however, they will incur losses from the privately informed participants (Bagehot, 1974). The private information consists of either confidential information based on the fundamentals of the assets or information regarding the order flow. The essential theoretical structure of adverse selection is prominent in the literature by Kyle (1985) and Glosten and Harris (1988). Further empirical evidence of adverse selection can be found in the studies by Stoll (1989) and George et al. (1991) in the financial markets.

Significantly, the identification of the source of liquidity costs is important for exchanges, regulators, traders, market makers and so on to establish standards. For instance, quality disclosure decreases the impact of private information, and these will help to improve the market liquidity.

### 4.4 Measures of Market Liquidity

To provide an illustration and the characteristics of liquidity, a complete view of liquidity measurement appears to be nearly impossible. Therefore, distinctive measures have been used as proxies for the liquidity of a market, which shows that there is no definite agreement regarding which one is the most suitable measure. One major limitation in the decision to adopt a market liquidity measure is data availability. In developed markets financial data are reported with a high frequency, which allows liquidity measurement to be constructed on the actual orders, trades and quotes existing recently in developed markets. However, in underdeveloped markets the availability of data is limited, and it is necessary to use low-frequency data to examine the market liquidity. The following part of this section will further highlight the current market liquidity measures and build the groundwork for introducing the market liquidity measure that will be used for this empirical study. This section will introduce the liquidity measures that act as a proxy for market liquidity, give the impression of the liquidity of an asset and allow a liquidity ranking of assets.

#### 4.4.1 Indirect Measure

The indirect measure of liquidity are based on the traded volume, turnover rate and proportion of zero-trading days.

##### 4.4.1.1 Traded Volume

It is worthwhile considering the traded volume, which is a simple liquidity measure. Traded volume examines the number of transactions between the market participants of a single asset or the overall market for a particular period of time (e.g. a day, a week, a month or a year) (Gabrielsen et al., 2011). Therefore, the volume is an appropriate proxy for the measurement of market activity and the presence of investors in the market. We can analyse the relationship by aggregating the product of the price of transaction $P_x$ with quantity $n_x$ for the entire transactions in a particular period.

$$V = \sum_x P_x . n_x \qquad (4\text{-}1)$$

According to Blume et al. (1994), the traded volume generates results that cannot be obtained from different statistics. By contrast, some studies have illustrated the traded volume as an inadequate liquidity proxy because of the double-counting problem. For example, business in the seller’s component could also be measured as activity on the buyer’s book.

Studies that have supported the use of the volume as a proxy for liquidity include those by Campbell et al. (1993) and Brennan, Chordia and Subrahmanyam (1998). Having said that, O’Hara (2015) explored the impact of technological changes on the high-frequency market microstructure and found that the methods of high-frequency trading change the approaches of investors and the overall trading volume of market.

#### 4.4.1.2 Turnover Rate

Datar et al. (1998) recommended the turnover rate as a substitute proxy for liquidity. Traded volumes are hard to compare across stock markets, as they do not consider shareholder bases or outstanding shares in the market. On the other hand, the turnover rate is developed by involving the traded volume, denoted by V, and the outstanding volume of financial asset, represented by MV.

$$T_n = \frac{V}{MV} \tag{4-2}$$

Amihud and Mandelson (1986b) indicated that the turnover ratio has a negative relationship with the transaction cost of market stocks. Moreover, they emphasized that liquidity is correlated with trading frequency. Therefore, precisely to investigate the turnover ratio, it is desirable to use the ratio for examining the liquidity. Earlier research studies that have employed turnover ratio as a liquidity proxy include the work of : Datar et al. (1998), Chordia et al. (2001) and Becker-Blease and Paul (2006).

Moreover, Becker-Blease and Paul (2006) explained turnover as shares traded on a monthly basis divided by outstanding shares. In calculating the liquidity proxy, they removed the event month and the two months around the event. For instance, considering the event month as M, they started by examining the pre-liquidity as M minus two months, and the calculation of post-liquidity was considered as M plus two months.

#### 4.4.1.3 Proportion of Zero-Trading Days

In the view of Lesmond et al. (1999), liquidity can be examined using the frequency of trading days with zero returns. Moreover, they identified a direct relationship between the cost of liquidity and the number of days with zero returns. They observed that a higher liquidity cost plays an important role in view of price movements. The proportion of zero-trading days can be examined as follows:

$$Zero = \frac{\#\, of\ days\ with\ zero\ returns}{\#\, of\ trading\ days\ in\ a\ month} \tag{4-3}$$

The main feature of this measure is the requirement for much fewer data on time series returns, and it is an appropriate liquidity proxy when very complex and high-frequency data are missing, especially from emerging markets.

Some researchers (for example; Dick-Nielsen et al., 2012 and Gagnon and Karolyi 2010) have examined the proportion of zero-trading days, evaluating only zero-return days with a positive trading volume.

$$Zero = \frac{\#\ of\ positive\ volume\ days\ with\ zero\ returns}{\#\ of\ trading\ days\ in\ a\ month} \qquad (4\text{-}4)$$

## 4.4.2 Direct Measure of liquidity

### 4.4.2.1 Bid–Ask Spread (Quoted)

The bid–ask spread is an important direct element for measuring the trading cost in addition to the other cost measurements, such as brokerage fees, transaction taxes and processing fees. The bid–ask spread is mostly a useful measure in dealer markets, for example the NASDAQ, to evaluate transaction costs.

To understand the bid–ask market more clearly, consider the following example: a bid price is the maximum available price for dealers at which they are ready to buy a stock, or, on the other hand, at which a market investor desires to sell a stock; moreover, a key aspect is to understand that a market ask price is the lowest price at which the dealer is ready to sell the stock. It accentuates the realization that the dealer circulates both bid and ask orders, and the spread between bid and ask numbers can be interpreted as the charge fee for the liquidity service presented by the dealer.

A deeper understanding of the process of the bid–ask spread is the difference between the highest bid price and the lowest ask price of a stock. Moreover, small orders consider the quoted spread as a good explanation for the execution cost for trade. On the other hand, large trade orders might not indicate the cost. The bid–ask spread (quoted) is a good estimate used by Amihud and Mendelson (1986) and Azevedo et al. (2014) to measure stocks' liquidity. Moreover, they concluded that liquidity reduces the required return on securities. According to Amihud et al. (2010), illiquid stocks achieve higher returns.

In comparison, Fialkowski (1994) indicated that the quoted spread is a bad proxy for real business transaction costs. Other studies have also suggested that the closing price bid–ask spreads are probably manipulated and influenced by market makers (see, e.g., Florackis et al., 2011).

#### 4.4.2.2 Bid–Ask Spread (Effective)

The definition of the bid–ask spread (effective) is twice the change between the actual execution price and the quoted market price. For example, the quoted price at the time of the order is £5.00 for the buyer and £5.20 for the seller. Let us suppose that the particular order is executed at £5.15. Therefore, the effective spread of the transaction is 2 (5.15 – 5.10) = £ 0.10.

The bid–ask spread (effective) was advanced for measuring the cost of both the price change and the market impact. The price change develops when market dealers aim to make orders at a better available price than quoted earlier, whereas the market impact arises when the bid–ask spread enlarges because of the size of the order.

Many prominent researchers have concentrated on the bid–ask spread (effective) as an important tool for liquidity measurement, such as Lee (1993) and Heflin and Shaw (2000). Chalmers and Kadlec (1998) also examined the liquidity measure using the amortized effective spread. They concluded that liquidity has a positive impact on stock returns.

### 4.5 Amihud's (2002) Price Impact Ratio (RtoV)

One of the important measures of liquidity was presented by Amihud (2002) and is called the liquidity ratio. This ratio operates as an alternative to the price impact. Amihud (2002) demonstrated the liquidity ratio as the average of the ratio of daily absolute returns divided by the daily volume in dollars. Amihud's (2002) RtoV ratio of the price impact is as follows:

$$R\ to\ V_{it} = \frac{1}{D_{it}} \sum_{d=1}^{D_{it}} \frac{|R_{itd}|}{V_{itd}} \qquad (4\text{-}5)$$

where $D_{it}$ is considered as the number of days for trading, $R_{itd}$ as the return of stock *i* on day t and $V_{itd}$ as the daily volume in dollar terms (in millions). Moreover, the day-t impact represents the price of the volume traded in the respective ratio. The measure of liquidity in the equation presents the average of the daily price's influence on a specified sample period of the data set. The ratio RtoV itself shows the relationship between the trade volume (in dollars) and the price impact.

The mentioned ratio RtoV is similar to the Aminvest ratio of liquidity. This ratio is very commonly used by professional analysts and investors (Khan & Baker, 1993). The difference between the Amihud (2002) ratio and the Aminvest ratio is that Aminvest ratio is the inverse of Amihud's (2002) RtoV ratio, given by the sum of the daily volume data divided by the sum of the absolute return developed by Amihud et al. (1997).

It is important to understand that the liquidity measure developed by Amihud (2002) is widely used in the finance literature. During the period of 2009–2013, over a hundred papers published in the *Journal of Finance, Journal of Financial Economics* and the *Review of Financial Studies*, adopted Amihud's (2002) liquidity proxy for their empirical analysis (Gabrielsen et al., 2011). This certainly indicates the popuality of this ratio in the finance community around the world.

There are two advantages of the RtoV ratio for liquidity. The first advantage is its simplicity in terms of structure, which develops the daily absolute value of returns to volume to measure the price impact. Moreover, Florackis et al. (2011) identified the advantages of the RtoV ratio and emphasized that it is straightforward to determine for long periods and the volume and return data are widely accessible in comparison with high-frequency microstructure data, which are challenging to acquire for long periods.

In other words, the ratio precisely calculates the effect of the trade volume in dollar units on a stock's return. Acharya and Pedersen (2005) claimed that the RtoV ratio has an influence on the trade volume effect on stock price movements and therefore gives the result of transaction costs.

Examining the ratio further, it is a very helpful and appropriate measure in relation to transaction costs in comparison with the bid–ask spread (see, e.g., Florackis et al., 2011).

The second advantage of the RtoV ratio is its active association with the expected stock returns (see, e.g., Amihud, 2002; Chordia et al., 2009). A positive return premium of the RtoV ratio is generally known as a liquidity premium that benefits and rewards price movement or transaction costs. The RtoV ratio recommends that the bigger the impact of returns, the less liquid a stock.

The RtoV ratio has many different benefits and advantages in contrast to other measures, such as the bid–ask spread, which determine the important feature of liquidity, that is, the transaction cost. Prior research has suggested that the RtoV ratio has an intuitive meaning. For example, Cochrane (2005a) mentioned that RtoV has a significant advantage, called the 'price discovery' factor, due to trading activity that is influenced by information or potential prospects based on future stock price movements. Along similar lines Kyle (1985) introduced the concept of lambda, and the RtoV ratio is a robust empirical measure for this theoretical concept. As presented in equation 4-6, it is characterized as the regression of absolute returns to volume over a defined duration.

$$\lambda = \frac{|P_{it}|}{Volume_{it}} \quad (4\text{-}6)$$

Hence, $P_t$ represents the absolute change in the price of stock $i$ at time $t$ and $Volume_{it}$ is generally assessed as the turnover value of shares traded in the market. By considering this proxy, the most liquid stock reflects a small price movement for an existing level of trade volume.

## 4.6 Florackis et al.'s (2011) Price Impact Ratio (RtoTR)

A recent interesting test of liquidity measurement was developed by Chris Florackis, Andros Gregoriou and Alexandros Kostakis. Florackis et al. (2011) recommended a new and slightly different price impact ratio as a substitute for the generally used proxy of Amihud's (2002) RtoV ratio. They mentioned the shortcomings of Amihud's (2002) ratio. According to Florackis et al. (2011), there seems to be no compelling reason to argue that the RtoV ratio is suitable to compare stocks with diverse market capitalization and holds a substantial size bias. For example, small market capitalization stocks probably have a lower trade volume (in monetary terms) than large market capitalization stocks even when the two stocks result in a similar turnover ratio. To put it another way, the results established on RtoV ratio for small market capitalized stocks can possibly be defined as 'illiquid' based on their size effect (Florackis et al., 2011). Moreover, considering the cross-sectional analysis, RtoV outcomes based on the size bias of the trade volume represented in monetary value have a positive correlation with the market capitalization.

In earlier research by Cochrane (2005b), the author claimed that the RtoV ratio is likely to be much higher for a firms with small market capitalization stocks, establishing the result that small firms stocks are considered to be less liquid than firms with large market capitalization stocks. Moreover, Cochrane (2005a) distinctly mentioned this bias, also advocating a cautious approach to researchers while using the RtoV ratio to make conclusions mentioning the size premium because of illiquidity.

Datar et al. (1998) described the trading frequency as becoming a main concern, and, they reported that it is supposed to have a serious effect on asset pricing because of its substantial cross-sectional as well as time series differences. According to Amihud and Mandelson (1986b), liquidity has a correlation with the trading frequency. Moreover, Datar et al. (1998) and Nguyen et al. (2007a) stated a negative correlation and claimed that stocks with a higher turnover ratio are observed to have superior trading speed and are considered as highly liquid stocks, reflecting lower expected returns in contrast to stocks having a low turnover ratio.

Florackis et al. (2011) highlighted the concerns regarding the RtoV ratio, which overlooks the trading frequency matter of liquidity. Generally, the RtoV ratio assumes identical trading frequency across all stocks; therefore, the liquidity premium should not be affected. The RtoV measure is used as a proxy to determine the transaction cost; on the other hand, it is difficult to understand in relation to the trading frequency at which this cost is achieved.

A large volume of orders for illiquid stocks results in a large short-term stock price impact because of adverse selection and the costs of holding inventory, which comparatively ‘bounce back’; however, the subsequent day would absorb the shock of a large order (Amihud & Mendelson, 1980; O’Hara, 2003).

Florackis et al. (2011) recommended a substitute and appropriate price impact ratio known as RtoTR, essentially using the trade volume (in dollars) of stock with its turnover ratio in the denominator. The RtoTR ratio can be explained as follows:

$$R\ to\ TR_{it} = \frac{1}{D_{it}} \sum_{D=1}^{D_{it}} \left(\frac{|R_{itd}|}{TR_{itd}}\right) \quad (4\text{-}7)$$

As $R\ to\ TR_{it}$ is the return on stock i on day t, $TR_{itd}$ represents the turnover ratio and $D_{it}$ is considered as the number of days collected for stock i for the time period of t.

Florackis et al. (2011) argue that the RtoTR ratio is appropriate to support the concern about the price impact from the size effect. They claimed that the turnover ratio is adopted to measure the price impact ratio and assists in controlling not only for the significance of the trading cost, but also for the trading frequency within the asset pricing. According to Brown et al. (2009), the turnover ratio does not acquire built-in size-related trends. As mentioned by Florackis et al. (2011), the performance of the trading frequency can be measured adequately and approximately through the turnover ratio and is recommended by the fundamental theoretical outcome of Amihud and Mendelson (1986). They showed that, for a risk-neutral trader with trading intensity represented as $\mu$, the required return on security $i$ is as follows:

$$E\,(r)^i = r^f + u\,\frac{C^i}{P^i} \tag{4-8}$$

$C^i$ represents the liquidity cost and $P^i$ indicates the price of asset $i$. The main theoretical premises presented in the earlier discussion argue that higher transaction costs require higher expected returns if all other things remain constant. On the other hand, higher expected returns increase the asset's trading frequency. Therefore, the effect of the trading frequency must be considered overall instead of examining its impact in isolation.

During the last two decades, trading activities have been enhanced because of institutional participants taking a bigger share in stock markets. According to Bogle (2005) and French (2008), institutional investors play an important role in terms of short-term holding horizons. Therefore, the RtoTR ratio is considered as a complete and more understandable price impact ratio that reflects the influence of the trading frequency on the required premium and stocks, establishing substantial cross-sectional variability in their turnover ratios.

Florackis et al. (2011) also claimed that the RtoTR ratio represents a substitute for the amortized spread of Chalmers and Kadlec (1998), who also investigated the merged effect of trading frequency and transaction costs. Moreover, Chalmers and Kadlec (1998) presented proof in support of the combined effect, and they concluded that amortized spreads are more strongly priced than unamortized spreads. Specifically, their results support the suggestion that stocks with similar spreads show massively different turnover ratios; therefore, the spread is not only an informative measure for liquidity.

Florackis et al. (2011) explained that the main drawback of Chalmers and Kadlec's (1998) proxy is that the data are based on bid–ask prices. Therefore, it is affected by the influence of market makers to manipulate the standards of data and obviousaly there are challenges in collecting information quoted on a daily basis.

## 4.7 Literature Review

This section discusses the literature on developing markets, with a particular emphasis on Asian markets, followed by research carried out in the USA and European markets. Finally, the literature review discusses the two methodologies developed by Amihud (2002) and Florackis et al. (2011), which will be used later in the research on the Pakistani stock market.

Empirical studies in relation to the liquidity proxies used by Amihud (2002) and Florackis et al. (2011) for Asian markets are still limited and primarily dedicated to the Chinese and Japanese markets. Particularly, to the best of the author's knowledge, there is very limited empirical evidence within South Asian markets using the proxies developed by Amihud (2002) and Florackis et al. (2011). Moreover, no empirical evidence is available for the Florackis et al. (2011) measure in relation to the Pakistan Stock Exchange. The first three chapters provides justifications for choosing the Pakistan Stock Exchange as a research context for this type of investigation.

Liu (2000) examined the variations in the Nikkei 500 on stock prices and trade volumes, adopting 92 companies. However, he did not find any evidence of liquidity effects. Another significant study conducted by Harris and Gurel (1986) used the volume ratio approach to examine the variations in volume. In particular, the study showed that, in the short run, the trade volume significantly increases for the S&P 500 stocks. Moreover, Liu (2006) examined the price and trade volume effects related to the Nikkei 225, adopting the same methodology to identify the variations in the volume effects. The results indicated that the Nikkei 225 changes indicate more price and volume fluctuations in the short term, illustrating the imperfect substitute hypothesis (ISH) and having a limited volume effect.

Chordia, Roll and Subrahmanyam (2000) and Hasbrouck and Seppi (2001) backed the presence of systematic risk of liquidity that is based on time-varying persistence but cannot be diversifiable. Their work mainly focused on the time variation of market-wide liquidity in asset pricing. The presence of commonality around the liquid assets market-wide shows that the covariance among individual assets indicates a positive relationship among asset illiquidity and market illiquidity. This implies that investors are rewarded for holding an illiquid asset at the time of an illiquid market. According to Chordia et al. (2001), inventory risk defines the co-movement of particular asset liquidity. As the owner of the securities is willing to sell his/her assets, he/she has to wait for the buyers in the market to close his/her position; moreover, holding the asset exposes him/her to price changes in the market.

Pastor and Stambaugh (2003) recommended the ‘liquidity beta’, which shows the cross-sectional differential sensitivity to the advancement of market-wide collective liquidity, and the sensitivities are associated with cross-sectional differences in the expected stock returns.

Especially the securities that are more volatile with the innovations of present market liquidity are expected to face more liquidity risk and demand higher expected returns; the securities that have less volatility to the liquidity risk demand lower expected returns for stockholders.

Acharya and Pedersen (2005) contributed an integrated theoretical model that sheds light on the way in which liquidity risk affects stock returns. They suggested three ways: the commonality of liquidity, which is based on the study by Chordia, Roll and Subrahmanyam (2000); co-variance between the asset liquidity and the market return is priced based on Pastor and Stambaugh (2003); moreover, along with liquidity risk, the liquidity level needs a risk premium, which is mentioned in various studies, such as those by Amihud and Mendelson (1986), Brennan, Chordia and Subrahmanyam (1998), Chordia, Subrahmanyam and Anshuman (2001) and so on.

Huberman and Halka (2001) indicated that the systematic part of the liquidity is detrmined by four measures, namely: the bid–ask spread, proportional spread (spread/price), depth (averaged number of shares traded at the bid–ask price) and dollar intensity (number of shares traded times transaction price). The results show a positive relationship between the liquidity proxies and their unexpected innovations. Specifically, the variables that identify the risk of inventory and the asymmetric information, such as positive and negative market returns, volatility of market returns, interest rate and expected and unexpected trading volume, are examined in the regressions. Having said that, none of these variables can identify the changes in liquidity.

Cheung and Roca (2013) described the influence of returns, risk and liquidity of stocks, particularly in Asia Pacific markets. They examined the trade volumes and bid–ask spreads to determine the liquidity.

Furthermore, the liquidity risk premium has been examined through liquidity features using long–short methods in empirical research (e.g. Sadka, 2003; Liu, 2006; Florakis, Gregoriou & Kostakis, 2011). Sadka (2003) decomposes the price variable into the sections of the transitory variable effect$\bar{\lambda}$, fixed effect $\psi$ and fixed variable effect $\lambda$. He composed the factors of liquidity by categorizing stocks into portfolios on the grounds of $\bar{\lambda}$ and $\psi$ and having a long position in an illiquid portfolio and a short position in a liquid one. The return procedure of zero-cost profit returns represents the liquidity factor. The Fama–French estimation shows a fall in the regression, and more or fewer liquidity factors join in the regression.

Liu (2006) recommended a substitute liquidity measure, $LM_x$, which represents the standardized turnover-adjusted number of zero daily volumes over the prior x months (x = 1, 6, 12). The results of the CAPM and Fama–French models were unsuccessful in describing this latest liquidity measure, and Pastor and Stambaugh (2003) also recommended considering the overall market liquidity risk as the stated variable, which motivated Liu (2006) to research the liquidity-augmented two-factor model. The returns are significant between the beta with the highest liquidity portfolio and the beta with the lowest liquidity portfolio. This shows that the liquidity risk is priced in returns, and investors need a larger reward for stocks facing greater market liquidity risk. This argument is aligned with Pastor and Stambaugh (2003) and Florakis, Gregoriou and Kostakis (2011).

Several schools of thought have emerged that consider the total volatility of liquidity also to be very interesting. According to Pereira and Zhang (2010), the negative association between stock returns and volatility of liquidity can be illustrated using the utility-maximizing investment strategy of rational risk-averse investors, where liquidity represents the process of the stochastic price impact. The risk-averse investor is willing to maximize wealth utility in situations of liquidity and faces substantial losses during the states of low liquidity. Hence, stockholders trade in large volumes during periods of high liquidity in comparison with periods of low liquidity. A high-liquidity volatile market contributes better trading opportunities to manage the trades properly, which result in a reduction in the expected returns as well as given liquidity premia. Using Granger causality tests, Pereira and Zhang (2010) suggested that a higher price impact Granger results in a lower trading volume and turnover.

Chordia, Subrahmanyam and Anshuman (2001) followed the methodology of Brennan, Chordia and Subrahmanyam (1998) to examine the characteristics through a regression on stocks by applying cross-sectional asset returns. They determined that the level of liquidity is significantly priced in asset returns. Moreover, they studied the effect of the liquidity impact on expected returns and found negative slopes in trading activities. The presence of a negative estimation of slopes showed lower returns on assets due to variations in liquidity. They conducted robustness checks to confirm the significant effects after adjusting the level of trading activities, book-to-market, price level, size and momentum effect. The existence of a negative relation is contradictory to the perception regarding the requirement of higher returns from investors in compensation for holding the liquidity risk, as recommended by Hasbrouk (2006).

Barinov (2011) found that the relationship between the volatility of turnover and the assets return is negative, owing to the assets' idiosyncratic risk, which has a positive relationship with turnover variability and aggregate return volatility. Thus, the volatility of turnover is just a measure to determine the aggregate volatility risk, which as a result forecasts the asset returns in the negative trend (e.g. Campbell, 1993; Chen, 2002; Ang, Hodrick, Xing & Zhang, 2006).

In addition, Barinov (2011) studied the impact of liquidity volatility on predicted asset returns through other liquidity methods. He found that asset returns and the liquidity volatility relationship resulted was significant only when the liquidity was determined through the turnover rate. Moreover, Blaua and Whitby (2015) claimed that liquidity fluctuations affect predicted returns positively when liquidity is determined through bid–ask spreads. They also supported the assertion that variability in liquidity is a vital part of illiquidity resulting from the empirical results of asset pricing.

Liquidity is another important aspect for measuring momentum. It is observed by determining whether the volatility of market liquidity controls the levels of market liquidity in relation to affecting and forecasting the momentum profits.

Momentum was discovered by Jegadeesh (1990) with respect to forecasting the asset returns, represented by a month's forward continuous performance of asset's returns. The later study by Jegadeesh and Titman (1993) examined the momentum effect of future months and found that assets that have a healthy performance in the last few months would remain as leaders, while assets that have lower expected returns show weak performance in the upcoming months.

The reaction to the signals of new information will only continue for a specific period of time; hence, stock prices will eventually show positive serial correlation. With respect to finding the short-term winners, one more significant sign from their research is that the momentum effect is more influential for losers than for winners. This is because of investors' asymmetric response to good or bad news.

Another key point to remember regarding portfolio performance on the basis of short-term continuation is that the evidence shows that assets, after a period of many years, illustrate the opposite pattern, that is, negative serial correlation of portfolio returns, which defines long-term losers achieving a good performance against long-term winners. For example, DeBondt and Thaler (1990) and Poterba and Summers (1988) examined assets' long-term reversals and described them by mean return reversals and market overreaction. Especially, the interest rate, which reverts to the mean over time, creates reversals of asset returns or develops consistent mean reversions with efficient operational workings of markets. Moreover, some other investigations, for instance DeBondt and Thaler (1985), have supported the arguments of long-term overreaction.

As this chapter mainly focuses on the aspect of liquidity, the emphasis is therefore on the literature that is related to the study of liquidity and momentum. Grinblatt and Moskowitz (1999) and Grundy and Martin (2001) illustrated that trading strategies comprise high turnover, which should be measured in empirical research studies;

ultimately, the transaction costs and taxes play an important role during trading, which could perhaps decrease the profits from momentum strategies. Lee and Swaminathan (2000) established the argument that the effect of momentum is stronger among high-turnover assets; moreover, not only the magnitude, but also the momentum is predictable in the persistence pattern of price through earlier trading volumes.

Glaser and Weber (2003) presented a study on the German market showing that the stocks with a high turnover ratio build greater profits, which are determined through past winners. This paper examined the liquidity and momentum profit and motivated the idea that momentum profits are specifically associated with and affected by asset liquidity.

The momentum anomaly examination conducted by Sadka (2003) explained that half of the momentum anomaly is described by the liquidity risk premium and the remaining anomaly is explained by the illiquidity of stocks. Precisely, the estimated *alphas* decline significantly by approximately one half, after adding the liquidity factors to the regression models. Moreover, the beta of liquidity winners is greater than the beta of losers. In other words, winners are more sensitive than losers to market-wide liquidity disturbance. Therefore, momentum persistence is partly described by the liquidity premium. The consideration of the illiquidity situation is based on different trading strategies and demonstrates the likelihood of restrictions to arbitrage.

The most recent literature review based on market-wide liquidity was conducted by Chordia, Subrahmanyam and Tong (2014) and linked the momentum anomaly to market liquidity. The study established the perception that more arbitrage trading opportunities decrease the asset's anomaly, which comprises the momentum payoff in a liquid market, particularly after the 2001 decimalization, when the trading cost decreased tremendously.

Avramov, Cheng and Hameed (2015) provided empirical support for the suggestion that the results of momentum portfolios rely significantly on market illiquidity. They studied the influence of market illiquidity on momentum profit, observing decreased momentum profit after taking into consideration an illiquid market and greater momentum returns after taking into consideration a liquid market. This is the opposite claim to that of Chordia, Subrahmanyam and Tong (2014). In addition, Avramov, Cheng and Hameed (2015) provided evidence that their study is aligned and consistent with the overconfidence–illiquidity relation, provisional in the absence of overconfident investors resulting in return continuation, while using market illiquidity as a proxy. Basically, in an illiquid market, the decreasing momentum payoff is based on two aspects, specifically illiquidity in the market and investors' overconfidence.

Another key aspect of liquidity development that exists in periods of economic crisis and prolongs the market uncertainty are two related phenomena, namely: flight-to-quality and flight-to-liquidity. This is emphasized through an examination of empirical investment behaviour that illustrates that, when a high degree of uncertainty prevails in the financial markets, investors shift their investments to less risky (flight-to-quality) and more liquid (flight-to-liquidity) opportunities. One of the fundamental reasons why these two phenomena are joined is because risky assets are considered to be less liquid (Ericsson & Renault, 2006).

Earlier empirical studies based on the effect of the default of an asset by the consequences of credit quality due to market liquidity specified that there is an inverse relationship between liquidity costs and credit quality. These studies mainly emphasized bond and Credit Default Swap (CDS) markets. Based on the underlying concept, Ericsson and Renault (2006) developed a model to establish the effect of market liquidity risk on corporate bond yield spreads. The important qualitative outcomes from their model showed that the levels of liquidity spreads have a positive relationship with the credit risk/default probability. Chen et al. (2007a) investigated liquidity costs, adopting three different measures of liquidity to conduct an examination of more than 4000 non-callable corporate bonds from 1995 to 2003, and, they find a reduction in liquidity with increasing credit quality measured by bond ratings. Similarly, Dunbar (2008) showed that the average bid–ask spread rises as the credit ratings start declining. In contrast, Beber et al. (2009) identified a negative relationship between credit quality and market liquidity in the bond market of the euro-area government.

Vayanos (2004) investigated theoretically whether traders select more liquid securities in a period of a highly volatile market, which is shown by higher liquidity premiums. He provided justification that an increase in liquidity preferences is due to an increase in investors' risk aversion. Longstaff (2004) studied the flight-to-liquidity premium in US Treasury bond prices by matching the prices of Treasury bonds with the Resolution Funding Corporation, having only the difference of liquidity. He found that investors move towards liquid treasury bonds when uncertainty prevails in the market, which leads to the flight-to-liquidity premium.

Similarly, Beber et al. (2009) found that, in a period of financial crisis, market participants follow the liquidity in the bond market. This conclusion is also aligned with Næs et al. (2011), who used data from Norway to explain that, in times of market distress, some traders depart from the stock market, which is considered to be riskier; on the other hand, many other investors shift their equity portfolio to less volatile and liquid stocks.

In view of insider trading, noticeable research has been dedicated to developing and imposing legal restrictions on insider traders. Moreover, researchers who support insider trading restrictions have specifically justified through hypotheses that insider trading generates the problem of adverse selection, which results in market illiquidity.

Previous empirical studies based on market liquidity have dealt with the factors of cross-sectional variation in liquidity among stocks, for example, Benston (1974), Stoll (1978a), Harris and Glosten (1988), Stoll (1989) and George et al. (1991). The results observed by these researchers show that informational effects indicate a fluctuation in the market liquidity. On the other hand, further invistigations are required to evaluate better the effect of adverse selection on stock market liquidity. In addition, insider trading appears to be the main case of information-based movement in the present financial markets.

First of all consider the research involving insider trading finding no effect on the liquidity of the stock market: Cornell and Sirri (1992) and Chakravarty and McConnell (1997) studied two major outstanding cases of prohibited insider trading activities. Cornell and Sirri (1992) highlighted unlawful insider activities identified around the acquisition of Campbell Taggart by Anheuser-Busch in 1982 by collecting ex post court records. They concluded that their spread measurements did not increase at the time of illegal insider trading and the liquidity of the market did not decrease.

Other empirical studies have supported the idea that market liquidity is improved by insider trading. For example, the initial public offering (IPO) lockup expiration established an important feature in corporate finance for examining the effect of information regarding trading events on the market liquidity. On the expiration day of the lockup, it became legally permissible for insider trading to sell stocks for the first time since the IPO. Therefore, Cao et al. (2004) and Krishnamurti and Thong (2008) focused on similar topics for their studies. Cao et al. (2004) investigated an intraday trade sample consisting of 1497 lockup IPO expiration dates. They found a small effect on effective spreads on insider sales. In contrast, the lockup expirations in which insiders reveal their sales showed a decline in spreads, specifically 23% of the average spread in the sample.

Krishnamurti and Thong (2008) examined 399 technology stocks with IPO lockup expiration from the NASDAQ, considering the period from 1998 to 2000. They concluded that liquidity within the market improves soon after the lockup expiration period. Likewise, Cao et al. (2004) investigated firms in which insiders actually mentioned their post-lockup sales after 10 days, and the bid–ask spreads deteriorated relative to other firms. The main feature of their findings was based an enormous deterioration in the adverse selection factor of the spread. Both studies indicated a positive association between insider trading and market liquidity, exclusively emphasizing insider sales in the framework of lockup expiration. Bettis et al. (2000) examined corporate policies and procedures, for example blackout periods, to control insider trading in the company's own shares. They determined that blackout periods effectively push down both inside buyers and sellers; moreover, the bid–ask spread falls by approximately 2 basis points. Therefore, they concluded that the market liquidity is reduced in periods when insider trading is allowed.

The emerging markets literature appears to suggest that government and founding family members within the company possibly interfere in the stock market. Bhanot and Kadapkkam (2006) examined the interference of the government by purchasing stocks from the Hang Seng Index in August 1998 to block speculators. They observed 24% abnormal returns during the time of government interference. Moreover, abnormal returns were not converse between the eight weeks, contradicting the argument that returns are due to temporary liquidity effects. Their investigation of daily abnormal returns during the interference acknowledged that abnormal returns are associated with overall interference activity. Their conclusion is aligned with information effects.

Likewise, Chan et al. (2004) analysed the Hong Kong Government's interventions in the stock market of Hong Kong during 1998, when it collected an estimated HK$3 billion (US$0.4 billion) shares from the stock market of the Hang Seng Index (HSI) in an attempt to drive currency speculators out of the Hong Kong financial market. The government's assurance that it would not liquidate the shares for a certain period of time resulted in considerable deterioration of the public free float of shares in the stock market of Hong Kong. Chan et al. (2004) revealed that the level of free float in the market had an impact on the liquidity of the market. Moreover, they found no significant, positive association in the price effect and the government's holdings or a fall in the free float.

Tavakoli et al. (2012) investigated the USA dataset for the informational content of insider trades and its implications for market participants. They found that insider behaviours have positive anticipated power for expected returns. They supported the argument that the senior management has forecasting power for expected returns. Particularly director behaviours have forecasting power for all sizes of firms, whereas only officers have forecasting power for small firms. They also discovered that informational signals originating from *'buys'* are more powerful than informational signal originating from '*sells*'. They further emphasized that the trading activities of directors and officers have substantial effects on the trading performance of other groups of insiders.

Kaul et al. (2000) analysed the likely association between the public float and the stock liquidity. They examined the Toronto Stock Exchange (TSE) 300 Index, finding an impact of the redefinition of the public float of 31 stocks on 15 November 1996, and concluded that an increase occurred in the free float and index weights of the stocks. The main point basically of the TSE 300 Index following the redefinition of the public float was that the index weights were steady, making the index tracking simple. Further, Kaul et al. (2000) found an impermanent abnormal rise in the trade volumes that was aligned with index rebalancing.

Lam et al. (2011) recently investigated the behaviour of liquidity and observed that stocks' free float influences the level of liquidity and that price influence reactions are noticeable in the US market. Their results supported the acceptance of the free float methodology, which is useful in dropping the price biases that developed from the demand and inconsistent supply for low-float stocks. Many bid–ask spread variables can be used as liquidity measures that detect the cost of trading. Rezaei and Tahernia (2013) examined the association between free-float shares and liquidity in the share market for the Tehran Stock Exchange. They observed a strong association between the free-float shares and the number of buyers, the number of transactions and the turnover ratio of shares.

There is a positive relationship between a higher number of shares outstanding and higher market capitalization. Stoll (2000) mentioned a negative relationship between transaction costs and market capitalization. The fundamental reason for this association is liquidity provision. For example, the greater the market capitalization, the greater the expected presence of liquidity. Likewise, a positive relationship is present between free-float shares and the existence of liquidity.

The following sections explains the methodology employed in this part of my research.

## 4.8 Data and Methodology

### 4.8.1 Data Sample

The preliminary sample of common stocks was collected from the companies listed on the Pakistan Stock Exchange during the period starting from January 2005 and ending at December 2014. The present study covers an analysis based on presently listed and departed stocks of 332 companies (financial and non-financial firms) on Pakistan stock exchange; for example, companies that were delisted in the sample period are also included in our analysis which also include overall 32 sectors from Pakistan stock exchange. Therefore, the data are free from survivorship bias (see, e.g., Florackis et al., 2011). In the data set, different screening measures are instituted to reduce the impact of outliers, for example, I eliminated firms for which it is not possible to collect stock prices for at least 24 months consecutively, which is necessary to determine the beta values. Moreover, each share is collected from the Thomson Reuters DataStream and the dataset is compared with the official data source of the Pakistan Stock Exchange to access daily data on a broad set of variables, namely: the trading volume (the number of shares traded for a stock on a particular day), turnover (the ratio of the trading volume to the number of shares outstanding), market value (the share price multiplied by the number of outstanding ordinary shares) and the price-to-book value ratio (the share price divided by the book value per share).

The following is a list of the variables collected from Datastream:

**Table 4-1: List of Variables**

| S.no. | Variable(s) |
|---|---|
| 1 | Stock prices |
| 2 | Volume |
| 3 | Number of outstanding shares |
| 4 | Equity |
| 5 | Turnover; calculated as (trading volume / number of shares outstanding) |
| 6 | Market value; calculated as (share price * number of ordinary shares outstanding) |
| 7 | Price-to-book value ratio (share price / book value per share) |

## 4.9 Research Methodology

This chapter basically applies two alternative price impact ratios, namely the price impact ratio developed by Amihud (2002), the RtoV ratio, which is measured on the basis of the average ratio of the absolute daily return to the equivalent GBP trading volume, and the second new price impact ratio, which was proposed by Florackis et al. (2011), the RtoTR ratio, which aims to determine the monthly average ratio of the absolute daily returns to the equivalent turnover rate.

For the examination of the asset-pricing models, it is necessary to develop the factors based on size, value and momentum. Considering the size factor, all the listed firms are categorized according to their market capitalization in month t-1. The top 30% stocks are considered the ‘big size’ portfolio, and the bottom 30% are considered as the ‘small size’ portfolio. The difference between the big and the small portfolios is considered as the size factor of the (Small Medium Big)t return in month t. In addition, for the momentum factor, all the listed stocks are ranked in month t-1 based on their returns from month t - 13 to month t - 2. The first 30% (value-weighted) of the overall stocks are considered as ‘winners’, and the last 30% are indicated to be ‘losers’. The difference between the monthly returns in month t is reflected as the momentum factor return (MOMt). In addition, this chapter uses the Pakistan Stock Index and government treasury rates in Pakistan as a proxy for the risk-free rate.

### 4.9.1 Asset-Pricing Models

In the primary stage, Jensen’s alpha is analysed using asset pricing models i.e. CAPM, Fama French three factor and Carhart four factor. The equation of CAPM as follows:

$$r_{it} - r_{ft} = \alpha_i + \beta_{i,MKT} MKT_t + \varepsilon_{it} \qquad (4\text{-}9)$$

$r_{it} = return\ of\ portfolio\ i\ in\ month\ t$

$r_{ft} = risk - free\ rate\ for\ month\ t$

$MKT_t = excess\ market\ portfolio\ return\ (r_{mt} - r_{ft})\ in\ month\ t$

### 4.9.2 Risk-Adjusted Performance of Securities

It is known that Jensen’s alpha is needed to examine the risk-adjusted performance of a security or portfolio in association with the expected market return (constructed using the capital asset-pricing model) given the portfolio or investment beta and the average market return. The greater the value of alpha, the more a portfolio has earned above the forecasted level.

To investigate the performance of an asset manager correctly, a stockholder must not only appreciate the complete return of the portfolio but also consider the risk of that portfolio to observe whether the investment's return provides a reward for the risk taken.

Whenever an investment is made in the shares of a company listed on a stock market, there is a risk that the actual return on the investment will be different from the expected return. Investors take the risk of an investment into account when deciding on the return that they wish to receive for making the investment. The CAPM is a method of calculating the return required on an investment based on an assessment of its risk (Smart & Graham, 2012). The following section further explains the different types of risks.

#### 4.9.2.1 Systematic and Unsystematic Risk

Melicher and Norton (2011) observed that the risk of a portfolio is less than the average of the risks of the individual investments. Through the diversification of investments in a portfolio, an investor can reduce the overall level of risk faced. The full diversification of a portfolio cannot eliminate the risk entirely, and there is a limitation to the overall level of risk reduction. The risk that cannot be eliminated by portfolio diversification is called 'undiversifiable risk' or 'systematic risk', since it is connected with the financial system. The risk that can be eliminated by portfolio diversification is called 'diversifiable risk', 'unsystematic risk' or 'specific risk', since it is associated with individual companies and the shares that they have issued. The sum of the systematic risk and unsystematic risk is called the total risk.

#### 4.9.2.2 Capital Asset-Pricing Model

According to Das (1993), the CAPM expects investors to hold fully diversified portfolios. This means that investors are understood by the CAPM to want a return on an investment based on its systematic risk alone rather than on its total risk. The measure of risk in the CAPM, which is called ‘beta’, is therefore a measure of systematic risk. The minimum level of return required by investors occurs when the actual return is similar to the expected return, so, there is no risk at all of the return on the investment being different from the expected return. This minimum level of return is called the ‘risk-free rate of return’.

#### 4.9.2.3 Risk-Free Rate of Return

According to Copeland et al. (2000), in the realistic world, there is no such thing as a risk-free asset. Short-term government debt is a fairly safe investment, however, in practice, it can be used as an acceptable alternative to risk-free assets.

For the uniformity of the data, the yield on Pakistani Treasury bills is considered as an alternative to the risk-free rate of return while applying the CAPM to shares that are traded on the Pakistani capital market and in the same way US treasury bills are used for US capital markets.

The CAPM is applied within a particular financial system, and the risk-free rate of return (the yield on short-term government debt) will be modified depending on which country’s capital market is being measured. The risk-free rate of return is also not fixed, but, it will alter with changing economic circumstances.

#### 4.9.2.4 Equity Risk Premium

According to Armitage (2005), research has determined an appropriate value for (E(rm) - Rf), which is the difference between the average return on the capital market and the risk-free rate of return. This is called the equity risk premium, since it explains the extra return required for investing in a risky asset i.e equity (shares on the capital market as a whole) rather than investing in risk-free assets. In the short term, share prices can decrease as well as increase; therefore, the average return on a capital market can be negative as well as positive. To level out the short-term changes in the equity risk premium, a time-smoothed moving average analysis can be used over longer periods of time, often several decades. In the UK, when applying the CAPM to shares that are traded on the UK capital market, an equity risk premium of between 3.5% and 5% is considered to be reasonable at the current time.

#### 4.9.2.5 Beta

According to Watson and Head (2006), beta is defined as the slope of a line that measures the relation between the returns on a stock and the returns on the overall market. More technically, it is normally computed with regression analysis as the covariance between the returns on a security and the returns on the market divided by the variance in the overall market returns. The reason why beta measures risk is that any difference in the returns on a stock that are not related to movement in the overall market can in theory be eliminated or diversified away by holding a portfolio of many different investments. As in many statistical analyses, the idea behind estimating beta is that there is supposed to be a true underlying relationship that can be discovered through the evaluation of historical data. In the case of beta, one assumes that there is a true relationship between the rate of return on a stock and the rate of return on the market, and statistical analysis is used to try to find this true relationship from historical data.

In practice the estimation of beta involves the evaluation of historical stock price data for companies that are publicly traded and the selection of companies that appropriately reflect the risk of the investment being analysed. This means that, in determining the cost of capital for a specific investment, one should try to find companies that have comparable risks to the particular investment in question. In many cases there are very few publicly listed companies that have portfolios of assets similar to the investment in question. For example, for an airline company studying the risks of investing in an A-380 airbus jet, there are no airline companies that only own that type of plane and there are surely no companies that operate on exactly the same routes as the planned investment. One must instead use industry betas for a set of airline companies and perhaps adjust them for leverage (it is common to use betas for a group of similar companies then remove the effect of leverage from each beta and average all of the asset betas.) The real risk of the investment in a particular investment, however, is likely to be different from the portfolios of planes of the comparison companies.

If the true beta is 1.0, then the covariance between the individual security and the market is the same as the variance in market returns, and the security is defined as having the same risk as the overall market even if the volatility of the stock is much higher or lower than the volatility of the overall market. When beta is above 1.0, the return on the stock moves by more than the market and the CAPM implies that the cost of capital for the stock is higher than the expected market return (Rf + Rm). When the true beta is below 1.0, the cost of capital for the stock is lower than the market return. The derivation of the relationship between the beta and the cost of capital comes from the fact that risk is defined as the standard deviation of the returns on a firm's stock.

#### 4.9.2.6 Capital Asset-Pricing Model Assumptions

According to Watson and Head (2006), the CAPM is usually opposed as being impractical because of the assumptions on which it is based, so it is significant to be aware of these assumptions and the causes of the criticism. The assumptions are as follows.

##### 4.9.2.6.1 Investors hold diversified portfolios

This assumption means that shareholders will only require a return for the systematic risk of their portfolios, since unsystematic risk has been eliminated and can be ignored (Megginson, 1996).

##### 4.9.2.6.2 Single-period transaction horizon

A uniform holding period is assumed by the CAPM to make the returns on different securities comparable. A return over six months, for example, cannot be compared with a return over twelve months. A holding period of one year is usually used (Megginson, 1996).

##### 4.9.2.6.3 Investors can borrow and lend at the risk-free rate of return

This is initially assumed in portfolio theory, from which the CAPM model originated, and provides a minimum level of return required by investors. The risk-free rate of return corresponds to the intersection of the security market line (SML) and the yaxis. The SML is a graphical representation of the CAPM formula (Megginson, 1996).

#### 4.9.2.6.4 Perfect capital market

The assumption is that all securities are valued correctly and their returns will be plotted onto the SML. A perfect capital market needs the following: no taxes or transaction costs; perfect information that is freely available to all investors, who, as a result, have the same expectations; investors who are all risk averse, rational and desire to maximize their own utility; and a large number of buyers and sellers in the market (Megginson, 1996).

Despite the assumptions made by the CAPM, in the real world capital markets are clearly not perfect. Even though it can be asserted that well-developed stock markets do, in practice, exhibit a high degree of efficiency, there is the possibility for stock market securities to be priced incorrectly, and, as a result for their returns not to plot onto the SML.

With the assumption of a single-period transaction, as in the real world investors hold securities for much longer than one year, returns on securities are usually extracted on an annual basis.

All investors desire to hold a portfolio that follows the stock market as a whole. Although it is not likely that they will own the market portfolio themselves, it is fairly simple and economical for investors to diversify away specific or unsystematic risk and to build portfolios that ‘track’ the stock market.

A more important problem is that, in the actual world, it is not possible for investors to borrow at the risk-free rate (for which the yield on short-dated government debt is taken as a proxy). The reason for this is that the risk connected with individual investors is much higher than that connected with the government. This inability to borrow at the risk-free rate means that the slope of the SML is shallower in practice than in theory.

Overall it seems rational to conclude that, while the assumptions of the CAPM represent an idealized rather than a real-world view, there is a strong possibility in reality of a linear relationship existing between the required return and the systematic risk.

### 4.10 Fama–French Three-Factor Model

The second asset-pricing model that this study uses to compute the Fama and French alpha, that is, the intercept from Fama and French's (1993) three-factor model, can be highlighted as follows:

$$r_{it} - r_{ft} = \alpha_i + B_{i,MKT} MKT_t + B_{i,SMB} SMB_t + B_{i,HML} HML_t + \varepsilon_{it} \qquad \text{(4-10)}$$

$SMB_t and\ HML_t\ known\ as\ size\ and\ value\ risk\ factors, respectively$

$\beta_{i,SMB} and\ B_{i,HML} = factor\ loadings\ (other\ than\ market\ \beta)$. This loading is characterized as the time series regression slope(s).

$\alpha_{it}\ and\ \varepsilon_{it} = intercept\ of\ regression\ equation\ and\ error\ term, repectively.$

### 4.10.1 Portfolio Construction

Adopting the Fama and French (1993, 1996) measures, all the stocks listed on the Pakistan Stock Exchange (PSX) are ranked based on the size (market price times number of shares outstanding) in January of individual year $'t'$ from 2005 to 2014. The median of the Pakistan Stock Exchange size is then used to divide those data into two precise portfolios: stocks with a market value less than the median are recognized as small, while stocks with a market value greater than the median value are recognized as big.

### 4.10.2 SMB and HML Portfolios

To examine the three-factor model by processing the multiple regression for the Pakistan Stock Exchange, SMB (small minus big) and HML (high minus low) portfolios are developed using the same portfolio method as Fama and French (1993 and 1996) as below: six portfolios are created (i.e. S/L, S/M, S/H, B/L, B/M and B/H) on the basis of the market size and book-to-market value as the intersection of the two market capitalizations each year and three groups are developed on the basis of the book-to-market ratio as follows: by the year end t, the stocks are divided into two categories (small or big, S or B) established according to whether their market size value is below or above the size of the median of stocks. After that the stocks are arranged in ascending order in three categories (low, medium or high; L, M or H) based on divisions for the lowest 30%, middle 40% and highest 30% of the values of the book-to-market ratio. Moreover, in each year t, the book-to-market ratios for every stock are calculated using the year t - 1 December book value and market equity value. By the completion of each year t, six portfolios are generated as the intersections of the two market sizes and three book-to-market ratios (i.e. S/L, S/M, S/H, B/L, B/M and B/H).

Fama and French (1993) used value-weighted returns for six market size and book-to-market portfolios; they accepted and illustrated in Fama and French (1996) that equally weighted returns have superior performance to value-weighted returns in describing the returns by the three-factor model. Lakonishkok, Shliefer and Vishny (1994) and Munesh and Segal (2001) also recommended the use of equally weighted portfolios to examine the association between risk and stock factors.

SMB is examined for every month as the change between the simple average of the returns on the three small portfolios (S/L, S/M and S/H) and similarly the average returns on the three big portfolios (B/L, B/M and B/H). Moreover, it is confirmed that SMB can be considered as the difference between small-stock and big-stock portfolios with identical book-to-market ratios. Therefore, the change between small and big is free of the effect of the book to market concentrating on the diverse return trends of small and big stocks (Fama & French, 1993).

On the other hand, HML is examined for every month as the difference between the average of the returns on the two high book-to-market portfolios (S/H and B/H) and the average of the returns on the two low book-to-market portfolios (S/L and B/L). Therefore, the change between the high and the low book-to-market ratio is free of the effect of market size concentrating on the diverse return trends of high and low book-to-market stocks (Fama & French, 1993).

**Table 4-2: Development of Six Portfolios**

| | |
|---|---|
| S/L | Represents the group of portfolios that have a small size and low book-to-market value |
| S/M | Represents the group of portfolios that have a small size and medium book-to-market value |
| S/H | Represents the group of portfolios that have a small size and high book-to-market value |
| B/L | Represents the group of portfolios that have a big size and low book-to-market value |
| B/M | Represents the group of portfolios that have a big size and medium book-to-market value |
| B/H | Represents the group of portfolios that have a big size and high book-to-market value |

### 4.10.3 Equations Used to Calculate SMB and HML

The calculation of SMB is based on the following equation:

$$SMB = \frac{1}{3}(Small\ Low + Small\ Medium + Small\ High) - \frac{1}{3}(Big\ Low + Big\ Medium + Big\ High) \quad (4\text{-}11)$$

The calculation of HML is built on the following equation:

$$HML = \frac{1}{2}(Small\ High + Big\ High) - \frac{1}{2}(Small\ Low + Big\ Low) \quad (4\text{-}12)$$

### 4.10.4 Equations Used to Calculate $R_{it} - R_{ft}$

The stock returns are calculated on the base of the following equation:

$$R_{it} = ln(\frac{P_i - P_{i-1}}{P_{i-1}}) \quad (4\text{-}13)$$

The risk-free rate of return is subtracted from the average return of an individual portfolio:

$$R_{it}\ X\ 100 - R_{ft}\ X\ 100 \qquad (4\text{-}14)$$

### 4.10.5 Equations Used to Calculate Market Returns

The market return is calculated on the basis of the following equation:

$$R_{mt} = ln(\frac{P_i - P_{i-1}}{P_{i-1}}) \qquad (4\text{-}15)$$

The risk-free rate of return is subtracted from the market return:

$$R_{mt}\ X\ 100 - R_{ft}\ X\ 100 \qquad (4\text{-}16)$$

## 4.11 Carhart Four-Factor Model

Carhart (1997) included the momentum factor in the Fama–French three-factor model, which is also prominently called the MOM factor (monthly momentum). In other words, the Carhart four-factor model is an extension of the Fama–French three-factor model. The concept of momentum in a stock can be explained as the inclination of the stock price to increase if it is moving upward and to decrease if it is moving downward. Carhart (1997) determined the MOM by subtracting the equally weighted average of the least performing stocks from the equally weighted average of the maximum performing stocks, lagged by one month. For instance, stocks have performing momentum if the last 12 months' average of returns is positive. The momentum approach is prominent and widely used in financial markets; for example, financial experts include the 52-week high/low price in their buy/sell proposals.

In Carhart's (1997) four-factor model, the first three-factor model is explained in the same way as the Fama–French three-factor model, that is, Rm-Rf, SMB and HML. The only alteration is the inclusion of the fourth factor, namely MOM, which actually includes winners minus losers, and this factor is referred to as the momentum factor. The highest 30% (value weighted) of these stocks are representing as 'winners', and the lowest 30% are known as 'losers'. The difference in their monthly returns in month t is considered as the momentum factor of return$[MOM_t]$.

$$r_{it} - r_{ft} = \alpha_i + B_{i,MKT} MKT_t + B_{i,SMB} SMB_t + B_{i,HML} HML_t + \beta_{i,MOM} MOM_t + \varepsilon_{it} \qquad (4\text{-}17)$$

All the other dependent variables have already been explained; the new momentum factor is represented as follows:

$MOM_t = return\ of\ the\ momentum\ factor$

$\beta_{i,MOM} = beta\ value\ of the\ independent\ variable\ MOM_t$

### 4.12 Heteroscedasticity

The standard concern regarding cross-sectional pooled data sets is heteroscedasticity. It is commonly recognized that the data of financial time series are conditionally heteroscedastic, meaning that estimators are consistent but inefficient. Moreover, this study implements (OLS) estimators to discover heteroscedasticity-robust estimators of the variances (Kaufman, 2013). The presence of heteroscedastic errors would not modify the 'central position' of unbiasedness of the OLS line.

A common test built on OLS is appropriate to find the presence of conditional heteroscedasticity. This study conducts the White (1980) test with the null hypothesis: $H_0$ : no heteroscedasticity and the alternative hypothesis $H_A$: there is heteroscedasticity.

Importantly, to examine the test, it is necessary to estimate the coefficients adopting the OLS and retain squared residuals through the regression of all squared residuals on all the variables to calculate $R^2$. $H_0$ will be rejected when $R^2$ is too large (see Greene, 2012).

The heteroscedasticity has been detached in the regression model by retaining the OLS estimators but substituting the old variance with White's (1980) stable and consistent estimators proposed by Kaufman (2013). This is a very prominent practice; moreover, it does not require any assumptions on the structure of the variance.

The OLS estimators and standard errors are estimated using the following equation:

$$Var\,(\hat{\beta}) = (X'X)^{-1}(X'^{\Sigma X})(X'X)^{-1} \qquad (4\text{-}18)$$

Likewise, standard errors established using the mentioned method are described as robust standard errors or White–Huber standard errors. The method is empirically consistent and has the benefit of not making any assumptions on the construction of heteroscedasticity.

## 4.13 Serial Correlation

Fama and Macbeth (1973) proposed that there is a possibility of correlation of error terms using pooled regression and a likely breach of the OLS assumptions. It is very common to apply the linear generalized method of moments (GMM) regression in general as well as to OLS regressions. It is suitable for time series and equally cross-section time series regressions (Roodman, 2009; Florackis et al., 2011).

## 4.14 Results and Findings

### 4.14.1 Return-to-Volume (RtoV) Price Impact Ratio Descriptive Analysis

The performance and attributes of 10 (decile) portfolios are developed in support of the return-to-volume (RtoV) price impact ratio. The following results in Table 4-3 identify the main characteristics of the portfolios developed, following the method of Amihud (2002), to calculate the return-to-volume (RtoV) price impact ratio. These stocks are categorized in month t - 1 in ascending order based on the results of the RtoV ratios. Further, on the basis of these ratios, they are constructed into 10 portfolios. Portfolio 1 is the portfolio comprising the stocks with the lowest RtoV ratios, and portfolio 10 is the portfolio comprising the stocks with the highest RtoV ratios. Moreover, the excess returns of all the portfolios in month t are determined through post ranking of the returns. In addition, portfolio 10–portfolio 1 is considered as the spread between portfolio 10 and portfolio 1. The study adopts the rebalance approach, and the portfolios are rebalanced monthly. The EW returns represent the annualized average monthly returns of the equally weighted portfolios. The VW returns in Table 1 represent the annualized average monthly returns of the value-weighted portfolios. MV is considered as the average market value of stocks in each portfolio (in PKR million), and the calculation of MV is based on the share price multiplied by the number of ordinary shares outstanding. The ratio of price-to-book is calculated as the average ratio of the share price divided by the book value per share for the stocks in each portfolio. The CAPM beta is considered as the average stock beta in each portfolio determined through a 24-month rolling window. Finally the t test is calculated on the basis of the null hypothesis

$H_o =$

$no\ difference\ in\ means\ between\ Portfolio\ 10's\ and\ Portfolio\ 1's\ features.$

**Table 4-3: Performance and Characteristics of the Decile Portfolios Constructed on the Basis of the Return-to-Volume (RtoV)**

| Performance and Characteristics of the DeciBe Portfolios Constructed on the Basis of the Return-to-Volume (RtoV) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Portfolios | Mean | EW Returns | VW Returns | RtoV Ratio | MV | Price-to-Book | CAPM Beta |
| 1 | Mean | -9.230 | 1.485 | 0.149 | 46408 | 2.407 | 1.053 |
| 2 | Mean | -11.344 | -3.140 | 0.004 | 19923 | 3.189 | 1.227 |
| 3 | Mean | -4.227 | 2.983 | 0.032 | 7656 | 1.402 | 0.963 |
| 4 | Mean | 5.336 | 6.849 | 0.401 | 4285 | 1.494 | 0.768 |
| 5 | Mean | 9.586 | 8.335 | 0.811 | 2612 | 1.291 | 0.593 |
| 6 | Mean | 7.743 | 8.746 | 1.532 | 1753 | 1.002 | 0.541 |
| 7 | Mean | 21.021 | 9.186 | 1.267 | 1627 | 1.287 | 0.487 |
| 8 | Mean | 16.735 | 9.313 | 1.969 | 1529 | 1.921 | 0.426 |
| 9 | Mean | 20.669 | 10.021 | 3.158 | 1602 | 2.164 | 0.403 |
| 10 | Mean | 22.504 | 9.805 | 8.791 | 5799 | 2.664 | 0.322 |
| Total | Mean | 7.772 | 6.331 | 1.683 | 9400 | 1.880 | 0.681 |
| P10 - P1 | | 31.734 | 8.320 | 8.642 | -40609 | 0.257 | -0.731 |
| t-Test | | 5.881 | 11.676 | 16.029 | -34.645 | -23.673 | 0.712 |

The above table shows the descriptive analysis of 10 portfolios based on the RtoV ratio. The findings presented in the table are interesting. The difference between P10 and P1 (P10 - P1) is significantly positive except for the MV and CAPM beta. In other words, the portfolios with the highest RtoV ratios achieve considerably higher mean returns than the lowest RtoV ratio portfolio, but the opposite case applies to the MV and CAPM beta. Moreover, analysing the portfolios from 1 to 10, the average portfolio returns are increasing in all our descriptive analyses. This clearly indicates that the highest trading volume stocks do not always generate higher mean returns (for example; P1, P2 etc.). Similarly, mean returns are lower for low RtoV stocks, that is, P1, and the trend increases gradually upward towards P10, which has the highest RtoV stocks. This trend occurs in EW returns as well as VW returns. The difference is observed as 31.734% p.a. (t = 5.881) for equally weighted stocks and 8.320% p.a. (t = 11.676) for value-weighted returns.

Another significant point to be considered in relation to the market value (MV) from Table 4-3, during all the periods under observation, is that the average market capitalization of stocks in each portfolio declines almost monotonically from portfolio 1 to portfolio 10. This particular trend endorses the argument that RtoV has a highly negative correlation with market capitalization. These results are aligned with those of Florackis et al. (2011), who also argued whether the spread noticed in Table 4-3 can be analysed as a size or illiquidity premium. Moreover, in Table 4-3 the remaining outcomes explain that portfolios established on low RtoV ratios tend to show higher average price-to-book value ratios than stocks established with high RtoV values. Lastly, the average beta of stocks, considered using a 24-month rolling window, is one or close to one when the RtoV ratio is lower, and, when the RtoV ratio is higher, the beta becomes much less than one. This shows that portfolios are more volatile moving from portfolio 1 and less volatile when reaching portfolio 10.

### 4.14.2 Return-to-Turnover (RtoTR) Price Impact Ratio Descriptive Analysis

Table 2 shows the performance and attributes of the 10 (decile) portfolios developed to investigatw the return-to-turnover (RtoTR) price impact ratio. The following results in Table 4-4 identify the main characteristics of the portfolios developed following the method of Florackis et al. (2011), in calculating the return-to-turnover (RtoTR) price impact ratios. All the portfolio stocks are listed on the Pakistan Stock Exchange during the period from January 2005 to December 2014. These stocks are categorized in month t - 1 in ascending order based on the RtoTR ratios. On the basis of these ratios, they are formed into 10 portfolios. Portfolio 1 is the portfolio comprising the stocks with the lowest RtoTR ratios, and portfolio 10 is the portfolio comprising the stocks with the highest RtoTR ratios. Moreover, the excess returns of all the portfolios in month t are determined through post ranking of the returns. In addition, portfolio 1 – portfolio 10 is considered as the spread between portfolio 1 and portfolio 10. The rebalance approach is used, so the portfolios are rebalanced monthly. The EW returns represent the annualized average monthly returns of the equally weighted portfolios. The VW returns represent the annualized average monthly returns of the value-weighted portfolios. MV is considered as the average market value of the stocks in each portfolio (in PKR million); the calculation of the MV is based on the share price multiplied by the number of ordinary shares outstanding. The ratio of price-to-book is calculated as the average ratio of the share price divided by the book value per share for the stocks in each portfolio. The CAPM beta is considered as the average stock beta in each portfolio determined through a 24-month rolling window. Finally, the t test is calculated on the basis of the null hypothesis

$$H_o = no\ difference\ in\ means\ between\ portfolio\ 10's\ and\ portfolio\ 1's\ features$$

**Table 4-4: Performance and Characteristics of the Decile Portfolios Constructed on the Basis of the Return-to-Turnover Ratio**

| Performance and Characteristics of the Decile Portfolios Constructed on the Basis of the Return-to-Turnover Ratio (RtoTR) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Portfolios | Mean | EW Returns | VW Returns | RtoTR Ratio | MV | Price-to-Book | CAPM Beta |
| 1 | Mean | -9.620 | 1.111 | 2.224 | 25374 | 2.705 | 1.081 |
| 2 | Mean | -6.659 | 0.681 | 0.557 | 20389 | 2.812 | 1.089 |
| 3 | Mean | 1.455 | 3.636 | 2.101 | 10986 | 1.520 | 0.858 |
| 4 | Mean | 6.533 | 6.047 | 7.275 | 8103 | 1.332 | 0.712 |
| 5 | Mean | 11.115 | 7.606 | 20.805 | 8496 | 1.909 | 0.595 |
| 6 | Mean | 10.289 | 8.069 | 21.495 | 4535 | 1.863 | 0.535 |
| 7 | Mean | 11.592 | 8.377 | 40.594 | 2762 | 1.482 | 0.528 |
| 8 | Mean | 15.787 | 9.062 | 45.123 | 2535 | 1.174 | 0.505 |
| 9 | Mean | 18.747 | 9.284 | 65.669 | 2738 | 1.432 | 0.435 |
| 10 | Mean | 18.306 | 9.746 | 212.055 | 8985 | 2.579 | 0.423 |
| Total | Mean | 7.697 | 6.344 | 40.237 | 9518 | 1.881 | 0.679 |
| P1-P10 | | -27.926 | -8.635 | -209.831 | 16389 | 0.126 | 0.657 |
| t-Test | | 5.537 | 11.674 | 11.823 | -15.270 | -0.333 | -30.331 |

Table 4-4 demonstrates the features of the overall 10 portfolios developed on the basis of the RtoTR price impact ratio. However, Table 4-4's results differ from Florackis et al. (2011) and Amihud's (2002) arguments. Specifically, the portfolio 1 and portfolio 2 have the lowest average returns (for both equally and value-weighted portfolios) in contrast to P10 and also increase monotonically. These results contradict the results of Florackis et al. (2011). Moreover, the spread of P1 - P10 in the equally weighted portfolios is -27.926% p.a. (t = 5.537) and -8.635% p.a. (t = 11.674) calculated for the value-weighted portfolios. These outcomes are not consistent with the opinion that the trading frequency effect controls the transaction cost effect, because the low RtoTR portfolios have lower average returns in comparison with high RtoTR values. Moreover, these findings indicate that the Pakistan Stock Exchange is not particularly aligned by the new price impact ratio designed by Florackis et al. (2011).

Another important point to consider from Table 4-4 is that the average market capitalization of the stocks in each of these portfolios reflects the same trends as Table 4-1. MV reflects the almost monotonic pattern across 10 portfolios (portfolio 10 has higher market value than many of the others), indicating that the RtoTR spread does reflect the size premium. This particular trend endorses the argument that RtoTR develop a highly negative correlation with market capitalization. Further, Table 4-4 illustrates that the stocks in P1, P2 and P10 reflect the highest average price-to-book values in comparison with the other portfolios, and the average price-to-book values do not follow a monotonic pattern. Lastly, the average beta of the stocks, considered using a 24-month rolling window, is one or close to one when the RtoTR ratio is lower, and, when the RtoTR ratio is high, the beta is very far from being less than one. This shows that the portfolios are more volatile moving from portfolio 1 and less volatile when reaching portfolio 10.

### 4.15 Regression Analysis (Return to Volume Ratio)

#### 4.15.1 Return-to-Volume Price Impact Ratio

The portfolios from P1 to P10 are arranged on the basis of the return-to-volume (RtoV) price impact ratio. Rmmf represents the excess return of the market, that is, $(R_{mt} - R_{ft})$. R-squared represent goodness of fit of model. The CAPM model is used in the following table to examine the relationship of all the portfolios with the excess return of the market.

### 4.15.2 CAPM Model

**Table 4-5: Regression Analysis of the Return-to-Volume Price Impact Ratio through the CAPM Model**

| VARIABLES | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Rmmf | 0.646*** | 0.939*** | 0.807*** | 0.746*** | 0.623*** | 0.488*** | 0.615*** | 0.552*** | 0.476*** | 0.367*** |
| | (0.0489) | (0.0649) | (0.0610) | (0.0576) | (0.0570) | (0.0625) | (0.0676) | (0.0759) | (0.0788) | (0.104) |
| Constant | 0.00484 | -0.00246 | 0.00303 | 0.00777* | 0.0135*** | 0.0113** | 0.00489 | 0.0117** | 0.0149** | 0.0170** |
| | (0.00378) | (0.00507) | (0.00475) | (0.00448) | (0.00442) | (0.00483) | (0.00522) | (0.00586) | (0.00609) | (0.00801) |
| Observations | 119 | 116 | 117 | 117 | 118 | 119 | 119 | 119 | 119 | 119 |
| R-squared | 0.599 | 0.647 | 0.604 | 0.594 | 0.507 | 0.342 | 0.415 | 0.311 | 0.237 | 0.097 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

The above table shows how much of the variability of all the portfolio returns moving from P1 to P10 is explained by the excess market returns. The beta coefficients on the excess market return for P1 to P10 are statistically significant, explaining that beta is very precisely determined and has a very small standard error, which means that the beta of all the portfolios equal to 1 can be rejected statistically. Moreover, it is possible to indicate that all the portfolios are defensive portfolios, because, as the market rises, the respective portfolio does not rise much, and similarly, when the market falls, the portfolio does not fall much. Another key point is that defensive portfolios provide little hedge against market conditions.

The R-squared determines the goodness-of-fit measure for the regression analysis. Precisely it explains how much variability in the dependent variables is described by the independent variable. The R-squared is between 0 and 1. If the R-squared is 0, it means that the independent variable has no explanatory power for the dependent variable. On the other side, if the R-squared is 1, it means that all the data points are perfectly lined up with the regression line.

Analysing the R-squared results shows that the fraction of variability of excess returns explained by the movements in the market is above 50% from P1 to P5 and below 50% from P6 to P10. Moving from P1 to P10, the trend of the R-squared is decreasing and demonstrates that the model is strongly fitted when the RtoV price impact ratio is lower in comparison with a higher RtoV ratio.

### 4.15.3 Fama–French Three-Factor Regression Analysis

The portfolios from P1 to P10 are arranged on the basis of the market capitalizations of the intersecting size and book-to-market and size and momentum portfolios. Rmmf represents the excess return of the market, that is, $(R_{mt} - R_{ft})$. R-squared represent (goodness of fit of model). The Fama–French three-factor model is used in the following table to examine the relationship of all the portfolios with the excess return of the market, SMB (small minus big) and HML (high minus low).

**Table 4-6: Regression Analysis of the Return-to-Volume Price Impact Ratio through the Fama–French Three-Factor Model**

| VARIABLES | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 |
|---|---|---|---|---|---|---|---|---|---|---|
| rmmf | 0.542*** | 0.785*** | 0.790*** | 0.843*** | 0.816*** | 0.771*** | 0.977*** | 0.914*** | 1.036*** | 0.851*** |
| | (0.0722) | (0.0932) | (0.0916) | (0.0841) | (0.0805) | (0.0855) | (0.0853) | (0.101) | (0.0942) | (0.141) |
| SMB | -0.147 | 0.0844 | 0.0575 | 0.374*** | 0.521*** | 0.619*** | 0.951*** | 0.874*** | 0.965*** | 1.053*** |
| | (0.123) | (0.158) | (0.155) | (0.143) | (0.136) | (0.145) | (0.145) | (0.172) | (0.160) | (0.239) |
| HML | 0.148* | 0.370*** | 0.0655 | -0.0147 | -0.145 | -0.289*** | -0.287*** | -0.327*** | -0.706*** | -0.498*** |
| | (0.0885) | (0.115) | (0.113) | (0.103) | (0.0989) | (0.105) | (0.105) | (0.124) | (0.116) | (0.173) |
| Constant | 0.00895* | 0.00973 | 0.00531 | 0.00855 | 0.0106** | 0.00427 | -0.000954 | 0.00433 | -0.00397 | 0.00495 |
| | (0.00464) | (0.00610) | (0.00596) | (0.00547) | (0.00520) | (0.00550) | (0.00549) | (0.00652) | (0.00606) | (0.00906) |
| Observations | 119 | 116 | 117 | 117 | 118 | 119 | 119 | 119 | 119 | 119 |
| R-squared | 0.612 | 0.680 | 0.606 | 0.617 | 0.566 | 0.453 | 0.585 | 0.453 | 0.515 | 0.258 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

The explanatory variables in the Fama–French three-factor model consist of the market risk premium, SMB and HML in the regression analysis calculated on a monthly basis. In the above table, the average of the explanatory variables is presented. It is important to notice the negative HML observed in the portfolios moving from P4 to P10. It indicates that, on average during the period, stocks with a high BE/ME ratio tend to show a lower return than stocks with a low BE/ME ratio. The results of HML from P4 to P10 contradict Fama and French's theory, which states that value stocks with a higher BE/ME ratio should outperform growth stocks in comparison with stocks with a lower BE/ME ratio.

A further point to notice is that the positive values for the explanatory variables explain that small companies and companies with a higher BE/ME ratio earn a higher average return in comparison with large companies and companies with a lower BE/ME ratio.

### 4.15.4 Carhart Four-Factor Regression Analysis

All the variables in this model are as already explained. Only the new variable MOM, called momentum, used in the Carhart four-factor model is included in the regression analysis. The portfolios from P1 to P10 are arranged on the basis of the market capitalization of the intersecting size and book-to-market and size and momentum portfolios. The results indicate that the statistically significant positive portfolios are P5 ($p < 0.01$), P8 ($p < 0.05$) and P10 ($p < 0.1$). The positive momentum values explain that, for this specific time period of the portfolios, the winners of the last portfolio are the winners of this period as well. However, the negative coefficient of P2 indicates that the winners of the last period are not the winners of the current period in the portfolio.

**Table 4-7: Regression Analysis of the Return to Volume Price Impact Ratio through the Carhart Four-Factor Model**

| VARIABLES | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 |
|---|---|---|---|---|---|---|---|---|---|---|
| rmmf | 0.502*** | 0.929*** | 0.880*** | 0.934*** | 0.912*** | 0.845*** | 1.122*** | 1.016*** | 1.176*** | 0.905*** |
| | (0.084) | (0.098) | (0.098) | (0.090) | (0.079) | (0.094) | (0.087) | (0.112) | (0.105) | (0.166) |
| SMB | -0.122 | 0.301* | 0.220 | 0.416*** | 0.648*** | 0.700*** | 1.134*** | 0.949*** | 1.140*** | 1.174*** |
| | (0.138) | (0.160) | (0.161) | (0.147) | (0.129) | (0.155) | (0.142) | (0.182) | (0.172) | (0.271) |
| HML | 0.151 | 0.242* | 0.0536 | 0.0248 | -0.0778 | -0.281** | -0.296** | -0.240 | -0.733*** | -0.342 |
| | (0.112) | (0.131) | (0.131) | (0.120) | (0.105) | (0.126) | (0.116) | (0.149) | (0.140) | (0.221) |
| MOM | 0.0291 | -0.0527 | 0.150 | 0.199 | 0.326*** | 0.149 | 0.155 | 0.348** | 0.116 | 0.450* |
| | (0.120) | (0.140) | (0.141) | (0.129) | (0.113) | (0.135) | (0.124) | (0.159) | (0.150) | (0.237) |
| Constant | 0.0102* | 0.00958 | 0.00919 | 0.0133** | 0.0161*** | 0.00594 | 0.00272 | 0.00710 | -0.000369 | 0.0131 |
| | (0.005) | (0.006) | (0.006) | (0.005) | (0.005) | (0.006) | (0.005) | (0.007) | (0.006) | (0.010) |
| Observations | 98 | 95 | 96 | 96 | 97 | 98 | 98 | 98 | 98 | 98 |
| R-squared | 0.557 | 0.725 | 0.639 | 0.679 | 0.679 | 0.503 | 0.687 | 0.531 | 0.585 | 0.302 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

The remaining variables, for instance rmmf, show that all the portfolios are statistically significant moving from P1 to P10. The SMB is interpreted as managers describing the excess returns of the portfolio through SMB, which indicates whether to choose small firms and rely on the small-firm effect having a lower market capitalization within the market and the ability to earn abnormal returns. The portfolios from P4 to P10 ($p < 0.01$) are statistically significant, as well as P2 ($p < 0.1$).

Finally a negative HML is observed in the portfolios moving from P1 to P10. This indicates that, on average during the period, stocks with a high BE/ME ratio tend to show a lower return than stocks with a high BE/ME ratio.

## 4.16 Alphas of Value-Weighted Portfolios Sorted by the Return-to-Volume (RtoV) Price Impact Ratio

The following Table 4-8 indicates the alpha of the value-weighted portfolios arranged on the basis of the return-to-volume (RtoV) price impact ratio. The following table illustrates the abnormal performance of the 10 value-weighted portfolios. All the stocks are listed on the Pakistan Stock Exchange in the period from 2005 to 2014 and are organized in ascending order based on the RtoV ratio in 10 portfolios. Among the 10 portfolios, P1 comprises the stocks with a lower RtoV ratio and P10 contains those with a higher RtoV price impact ratio. The spread between the portfolios is represented as (P10 – P1). The CAPM alpha is determined as the annualized alpha estimate resulting from the capital asset-pricing model (CAPM). In addition, the Fama–French alpha is calculated as the annualized alpha estimate resulting from the Fama–French three-factor model. Moreover, the final model is based on the Carhart four-factor model and the Carhart annualized alpha estimate is derived from the Carhart four-factor model. T-values are reported under each model alpha. Finally, the last column of the table represents the chi-square statistics obtained through the Wald test contributing to the null hypothesis $H_0$ = the alphas of the 10 portfolios are jointly equal to zero.

**Table 4-8: Alphas of the Value-Weighted Portfolios Sorted by the Return-to-Volume (RtoV) Price Impact**

| Alphas of Value-Weighted Portfolios Sorted by the Return-to-Volume (RtoV) Price Impact Ratio | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Results | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 | P10-P1 | Wald |
| CAPM_alpha (%) | 0.095 | -0.916 | -0.436 | -0.192 | 0.103 | -0.042 | -0.101 | 0.026 | 0.6918 | 1.226 | 1.130 | 26.457 |
| T-value | 0.244 | -1.477 | -0.918 | -0.401 | 0.213 | -0.081 | -0.162 | 0.045 | 0.850 | 1.531 | 1.287 | 0.003 |
| Fama_French_alpha(%) | 0.587 | 0.058 | -0.396 | -0.418 | -0.455 | -0.856 | -1.673 | -1.167 | -0.962 | -0.070 | -0.658 | 15.407 |
| T_value | 1.217 | 0.077 | -0.663 | -0.702 | -0.802 | -1.482 | -2.570*** | -1.800* | -1.057 | -0.069 | -1.286 | 0.117 |
| Carhart_alpha (%) | 0.659 | 0.173 | 0.067 | 0.157 | 0.049 | -0.806 | -1.215 | -0.691 | -0.908 | 0.069 | -0.590 | 10.192 |
| T_value | 1.172 | 0.198 | 0.102 | 0.243 | 0.081 | -1.280 | -1.688* | -0.955 | -0.836 | 0.056 | -1.115 | 0.423 |

*The corresponding alpha coefficient is statistically significant at the 10% level
**The corresponding alpha coefficient is statistically significant at the 5% level
***The corresponding alpha coefficient is statistically significant at the 1% level

The table identifies the alphas of the 10 portfolios created on the basis of the RtoV price impact ratio. The CAPM alpha is interpreted as the positive RtoV premium. Examining the above table, P1 has the smallest Jensen alpha (i.e. 0.0959 p.a.) in comparison with P10, which shows the highest (0.012266 p.a.). Moreover, the CAPM alpha results are aligned with Florackis et al. (2011), and they mentioned in their analysis that the results are not very healthy. Furthermore, the CAPM alphas shown as the risk-adjusted performance have a positive spread of 1.1307% p.a. (t = 1.287).

The spread of Fama–French (P10 - P1) is -0.00658, which indicates that all the returns of the portfolios cannot beat the market benchmark return because of the negative alpha. Similarly, the Carhart alpha shows a negative spread of P10 - P1 (-0.0059), indicating that on average the spread of the return approximately less than 0.59% from market returns. Fama–French and Carhart are not statistically significant either.

Finally, the Wald test is conducted to investigate the joint significance of the subcategories of coefficients. These variables are insignificant individually based on the results of the t-tests having very high p values. Therefore, the Wald test is adopted to test the joint significance of the estimated alphas of all 10 portfolios. None of the portfolios have a significant p-value. This means that the portfolios developed on the basis of the RtoV ratio do not produce abnormal returns and could be used in asset-pricing models.

## 4.17 Regression Analysis (Return to Turnover Ratio)

### 4.17.1 Return-to-Turnover (RtoTR) Price Impact Ratio

The following tables are constructed with exactly the same time period as the earlier tables. The only difference in the following tables is the ratio, which is constructed on the basis of the value-weighted portfolios arranged by the return-to-turnover rate (RtoTR) price impact ratio. Moreover, all the other details are the same as already mentioned in the earlier models constructed on the basis of RtoV. Three models are used in the regression analysis, the same as those used by Florackis et al. (2011), namely the CAPM, Fama–French three-factor model and Carhart four-factor model. Rmmf represents the excess return of the market, that is, $(R_{mt} - R_{ft})$. R-squared represent (goodness of fit of model). The Fama–French three-factor model is used in the following table to examine the relationship of all the portfolios with the excess return of the market, SMB (small minus big) and HML (high minus low). The new variable MOM, called momentum, is used in the Carhart four-factor model included in the regression analysis.

## 4.17.2 CAPM Model

**Table 4-9: Regression Analysis of the Return-to-Turnover Price Impact Ratio through the CAPM Model**

| VARIABLES | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 |
|---|---|---|---|---|---|---|---|---|---|---|
| rmmf | 0.523*** | 0.834*** | 0.807*** | 0.707*** | 0.576*** | 0.505*** | 0.737*** | 0.539*** | 0.619*** | 0.659*** |
| | (0.048) | (0.060) | (0.077) | (0.082) | (0.065) | (0.051) | (0.071) | (0.056) | (0.078) | (0.082) |
| Constant | 0.013*** | 0.006 | 0.005 | 0.012** | 0.010** | 0.007 | 0.011** | 0.010** | -0.005 | 0.007 |
| | (0.004) | (0.004) | (0.005) | (0.005) | (0.004) | (0.004) | (0.004) | (0.005) | (0.006) | (0.006) |
| Observations | 126 | 121 | 95 | 107 | 120 | 119 | 109 | 120 | 130 | 118 |
| R-squared | 0.488 | 0.615 | 0.540 | 0.413 | 0.393 | 0.452 | 0.498 | 0.434 | 0.329 | 0.357 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

### 4.17.3 Fama–French Three-Factor Model

**Table 4-10: Regression Analysis of the Return-to-Turnover Price Impact Ratio through the Fama–French Three-Factor Model**

| VARIABLES | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 |
|---|---|---|---|---|---|---|---|---|---|---|
| rmmf | 0.447*** | 0.669*** | 0.987*** | 1.034*** | 0.754*** | 0.679*** | 1.146*** | 0.829*** | 1.111*** | 0.677*** |
| | (0.073) | (0.094) | (0.105) | (0.108) | (0.095) | (0.073) | (0.097) | (0.070) | (0.098) | (0.130) |
| SMB | -0.154 | 0.0276 | 0.431*** | 0.746*** | 0.478*** | 0.636*** | 0.740*** | 1.095*** | 0.921*** | 0.516** |
| | (0.128) | (0.155) | (0.147) | (0.172) | (0.177) | (0.123) | (0.152) | (0.140) | (0.161) | (0.214) |
| HML | 0.0810 | 0.423*** | -0.0562 | -0.280** | -0.124 | -0.0679 | -0.463*** | -0.178* | -0.498*** | 0.231 |
| | (0.086) | (0.143) | (0.095) | (0.120) | (0.125) | (0.091) | (0.113) | (0.100) | (0.111) | (0.192) |
| Constant | 0.0151*** | 0.0186*** | 0.00458 | 0.00390 | 0.00635 | 0.00675 | -0.00102 | 0.0110** | -0.0127** | 0.0158* |
| | (0.005) | (0.006) | (0.005) | (0.006) | (0.005) | (0.004) | (0.005) | (0.005) | (0.006) | (0.008) |
| Observations | 126 | 121 | 95 | 107 | 120 | 119 | 109 | 120 | 130 | 118 |
| R-squared | 0.497 | 0.643 | 0.581 | 0.509 | 0.432 | 0.556 | 0.613 | 0.641 | 0.536 | 0.411 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

### 4.17.4 Carhart Four-Factor Model

**Table 4-11: Regression Analysis of the Return-to-Turnover Price Impact Ratio through the Carhart Four-Factor Model**

| VARIABLES | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 |
|---|---|---|---|---|---|---|---|---|---|---|
| rmmf | 0.407*** | 0.802*** | 1.295*** | 1.210*** | 1.067*** | 0.736*** | 1.134*** | 0.931*** | 1.223*** | 0.839*** |
| | (0.079) | (0.107) | (0.117) | (0.134) | (0.118) | (0.073) | (0.106) | (0.074) | (0.105) | (0.157) |
| SMB | -0.142 | 0.185 | 0.719*** | 0.932*** | 0.873*** | 0.687*** | 0.792*** | 1.314*** | 0.968*** | 0.678*** |
| | (0.136) | (0.167) | (0.144) | (0.183) | (0.200) | (0.123) | (0.153) | (0.153) | (0.164) | (0.254) |
| HML | 0.223** | 0.268 | -0.229** | -0.305** | -0.311** | -0.0858 | -0.381*** | -0.233* | -0.481*** | 0.388 |
| | (0.105) | (0.178) | (0.099) | (0.138) | (0.151) | (0.105) | (0.133) | (0.121) | (0.126) | (0.240) |
| MOM | 0.296** | 0.116 | -0.294** | 0.0464 | -0.0841 | 0.0688 | 0.261** | -0.00435 | 0.258* | 0.586*** |
| | (0.120) | (0.170) | (0.123) | (0.142) | (0.170) | (0.117) | (0.101) | (0.142) | (0.152) | (0.216) |
| Constant | 0.0184*** | 0.0179** | 0.00734 | 0.00780 | 0.00562 | 0.00607 | 0.000434 | 0.0133** | -0.00674 | 0.0185* |
| | (0.005) | (0.007) | (0.005) | (0.006) | (0.006) | (0.005) | (0.006) | (0.006) | (0.006) | (0.010) |
| Observations | 107 | 94 | 79 | 88 | 94 | 101 | 93 | 98 | 111 | 92 |
| R-squared | 0.494 | 0.664 | 0.683 | 0.540 | 0.518 | 0.624 | 0.686 | 0.703 | 0.595 | 0.491 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

The results of the CAPM model based on the value-weighted RtoTR ratio show similar results to the value-weighted RtoV ratio. An analysis of the CAPM model table shows how much of the variability of all the portfolios' returns moving from P1 to P10 is explained by the excess market returns. The beta coefficients on the excess market returns for portfolios P1 to P10 are statistically significant. This also gives a similar representation of defensive stocks to the results predicted for the RtoV ratio.

While analysing the Fama–French three-factor model, the HML values show negative returns moving from P3 to P9. Negative values of HML are representative of a high BE/ME ratio having lower returns in comparison with a lower BE/ME ratio. Moreover, the portfolios are arranged on the basis of the RtoTR price impact ratio. Higher trading frequency has a lower RtoTR ratio (moving from a lower ratio in P1 to a higher ratio in P10). The analysis indicates that HML becomes negative when the trading frequencies are gradually lower and have a higher RtoTR ratio.

Moreover, analysing the Carhart four-factor model, portfolios P1, P7, P9 and P10 are positively significant, indicating that the winners of the last-period portfolios are the winners of this period's portfolios. However, portfolios P3, P5 and P8 are negatively significant, explaining that the winners of the last period are not the same as the winners in this period.

## 4.18 Alphas of Value-Weighted Portfolios Sorted by the Return-to-Turnover Rate (RtoTR) Price Impact Ratio

The following tables indicate the alpha of the value-weighted portfolios arranged on the basis of the return-to-turnover (RtoTR) price impact ratio. The following table presents the abnormal performance of the 10 value-weighted portfolios. All the stocks are listed on the Pakistan Stock Exchange in the period from 2005 to 2014 and are organized in ascending order based on the RtoTR ratio in the 10 portfolios. Among the 10 portfolios, P1 comprises the stocks with a lower RtoTR ratio and P10 portfolio contains the higher RtoTR price impact ratio. The spread between the portfolios is represented as (P10 – P1). The CAPM alpha is determined as the annualized alpha estimate resulting from the capital asset-pricing model (CAPM). In addition, the Fama–French alpha is calculated as the annualized alpha estimate resulting from the Fama–French three-factor model. Moreover, the final model is based on the Carhart four-factor model, and the Carhart annualized alpha estimate is derived from the Carhart four-factor model. T-values are reported under each of the model alphas. Finally, the last column of the table represents the chi-square statistics obtained through the Wald test confirming to the null hypothesis $H_0$ = the alphas of the 10 portfolios are jointly equal to zero.

| Alphas of the Value-Weighted Portfolios Sorted by the Return-to-Turnover Rate (RtoTR) Price Impact Ratio | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 | P1-P10 | Wald |
| CAPM_alpha (%) | 0.411 | -0.526 | -0.613 | -0.210 | 0.025 | 0.110 | -0.240 | 0.076 | 0.285 | 0.806 | -0.395 | 0.012 |
| T-value | 0.954 | -0.997 | -1.195 | -0.374 | 0.049 | 0.215 | -0.369 | 0.124 | 0.364 | 1.009 | -0.055 | 0.092 |
| Fama_French_alpha(%) | 0.009 | -0.001 | -0.005 | -0.002 | -0.008 | -0.007 | -0.020 | -0.009 | -0.0003 | -0.007 | 0.016 | -0.005 |
| T_value | 1.700* | -0.317 | -0.824 | -0.392 | -1.350 | -1.217 | -2.976*** | -1.578 | -0.032 | -0.695 | 2.395*** | -2.219 |
| Carhart_alpha (%) | 0.010 | -0.001 | -0.0003 | -0.004 | -0.002 | -0.005 | -0.018 | -0.012 | -0.0009 | -0.003 | 0.013 | -0.003 |
| T_value | 1.440 | -0.289 | -0.049 | -0.635 | -0.399 | -0.789 | -2.444*** | -1.845* | -0.080 | -0.273 | 1.714* | -1.675 |

**Table 4-12: Alphas of the Value-Weighted Portfolios Sorted by the Return-to-Turnover Rate (RtoTR) Price Impact Ratio**

*The corresponding alpha coefficient is statistically significant at the 10% level
**The corresponding alpha coefficient is statistically significant at the 5% level
***The corresponding alpha coefficient is statistically significant at the 1% level

In the above analysis, portfolio P1 gives the highest yields of the estimated alpha taking into consideration all three asset-pricing models. Analysing from P1 to P10, the alpha estimates noticeably decline. P7 becomes the lowest Fama–French alpha estimate (-0.02017), and the second and third lowest alpha estimates are the P7 and P8 Carhart alpha (-0.01842, -0.01227), respectively. Moreover, the premium, that is, P1 to P10, is significantly positive for the Fama–French specification of 1.66% p.a. (t = 2.395) and the Carhart model of 1.346% (1.7144). The premium is the indication that overall the 10 portfolios have a positive spread and perform above the benchmark by 1.66% p.a. according to the Fama–French model and 1.346% above according to the Carhart model. Another way to present these results is to endorse in risk-adjusted terms that the remarkable performance of stocks is evident in stocks with low RtoTR values compared to stocks with high RtoTR values. The Wald test for the Fama–French and Carhart alphas intensely rejects the null hypothesis of joint zero alpha estimates. This means that portfolios developed on the basis of the RtoTR ratio produce abnormal returns and cannot be accounted by generally used asset-pricing models. The key findings also include that turnover ratio of Florakis et al. (2011) showing importance of liquidity risk whearas he Amihud (2002) price impact ratio does not find liquidity risk. Moreover, Carhart (1997) four factor model which includes the momentum is also picking up some liquidity risk.

## 4.19 Robustness Test – Alphas of Equally Weighted Portfolios Sorted by the Return-to-Turnover Rate (RtoTR) Price Impact Ratio (Robustness of the Results)

The following results are generated to check the robustness of the results based on the equally weighted portfolios arranged by the RtoTR ratio. According to Fama and French (1993), using value-weighted returns and further endorsed by Fama and French (1996), equally weighted returns have superior performance in relation to value-weighted returns in explaining the returns by the three-factor model. Lakonishkok, Shliefer and Vishny (1994) and Munesh and Segal (2001) also suggested the use of equally weighted portfolios.

The following table presents the alpha of the equally weighted portfolios arranged on the basis of the return-to-turnover (RtoTR) price impact ratio. The table illustrates the abnormal performance of the 10 equally weighted portfolios. All the stocks are listed on the Pakistan Stock Exchange in the period from 2005 to 2014 and are organized in ascending order based on the RtoTR ratio in the 10 portfolios. Among the 10 portfolios, P1 comprises the stocks with a lower RtoTR ratio, and P10 contains those with a higher RtoTR price impact ratio. The spread between the portfolios is represented as (P10 – P1). The CAPM alpha is determined as the annualized alpha estimate resulting from the capital asset-pricing model (CAPM). In addition, the Fama–French alpha is calculated as the annualized alpha estimate resulting from the Fama–French three-factor model. Moreover, the final model is based on the Carhart four-factor model, and the Carhart annualized alpha estimate is derived from the Carhart four-factor model. T-values are reported under each of the model alphas. Finally, the last column of the table represents the chi-square statistics through the Wald test confirming to the null hypothesis $H_0$ = the alphas of the 10 portfolios are jointly equal to zero.

### 4.19.1 CAPM Model

**Table 4-13: Regression Analysis of the Return-to-Turnover Price Impact Ratio through the CAPM Model (Equally Weighted Portfolios)**

| VARIABLES | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 |
|---|---|---|---|---|---|---|---|---|---|---|
| rmmf | 0.646*** | 0.939*** | 0.807*** | 0.746*** | 0.623*** | 0.488*** | 0.615*** | 0.552*** | 0.476*** | 0.367*** |
| | (0.048) | (0.064) | (0.061) | (0.057) | (0.057) | (0.062) | (0.067) | (0.075) | (0.078) | (0.104) |
| Constant | 0.00484 | -0.00246 | 0.00303 | 0.00777* | 0.0135*** | 0.0113** | 0.00489 | 0.0117** | 0.0149** | 0.0170** |
| | (0.003) | (0.005) | (0.004) | (0.004) | (0.004) | (0.004) | (0.005) | (0.005) | (0.006) | (0.008) |
| Observations | 119 | 116 | 117 | 117 | 118 | 119 | 119 | 119 | 119 | 119 |
| R-squared | 0.599 | 0.647 | 0.604 | 0.594 | 0.507 | 0.342 | 0.415 | 0.311 | 0.237 | 0.097 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

### 4.19.2 Fama–French Three-Factor Model

**Table 4-14: Regression Analysis of the Return-to-Turnover Price Impact Ratio through the Fama–French Three-Factor Model (Equally Weighted Portfolios)**

| VARIABLES | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 |
|---|---|---|---|---|---|---|---|---|---|---|
| rmmf | 0.542*** | 0.785*** | 0.790*** | 0.843*** | 0.816*** | 0.771*** | 0.977*** | 0.914*** | 1.036*** | 0.851*** |
| | (0.072) | (0.093) | (0.091) | (0.084) | (0.080) | (0.085) | (0.085) | (0.101) | (0.094) | (0.141) |
| SMB | -0.147 | 0.0844 | 0.0575 | 0.374*** | 0.521*** | 0.619*** | 0.951*** | 0.874*** | 0.965*** | 1.053*** |
| | (0.123) | (0.158) | (0.155) | (0.143) | (0.136) | (0.145) | (0.145) | (0.172) | (0.160) | (0.239) |
| HML | 0.148* | 0.370*** | 0.0655 | -0.0147 | -0.145 | -0.289*** | -0.287*** | -0.327*** | -0.706*** | -0.498*** |
| | (0.088) | (0.115) | (0.113) | (0.103) | (0.098) | (0.105) | (0.105) | (0.124) | (0.116) | (0.173) |
| Constant | 0.00895* | 0.009 | 0.005 | 0.008 | 0.010** | 0.004 | -0.0009 | 0.004 | -0.003 | 0.004 |
| | (0.004) | (0.006) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.006) | (0.006) | (0.009) |
| Observations | 119 | 116 | 117 | 117 | 118 | 119 | 119 | 119 | 119 | 119 |
| R-squared | 0.612 | 0.680 | 0.606 | 0.617 | 0.566 | 0.453 | 0.585 | 0.453 | 0.515 | 0.258 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

### 4.19.3 Carhart Four-Factor Model

**Table 4-15: Regression Analysis of the Return-to-Turnover Price Impact Ratio through the Carhart Four-Factor Model (Equally Weighted Portfolios)**

| VARIABLES | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 |
|---|---|---|---|---|---|---|---|---|---|---|
| rmmf | 0.502*** | 0.929*** | 0.880*** | 0.934*** | 0.912*** | 0.845*** | 1.122*** | 1.016*** | 1.176*** | 0.905*** |
| | (0.084) | (0.098) | (0.098) | (0.090) | (0.079) | (0.094) | (0.087) | (0.112) | (0.105) | (0.166) |
| SMB | -0.122 | 0.301* | 0.220 | 0.416*** | 0.648*** | 0.700*** | 1.134*** | 0.949*** | 1.140*** | 1.174*** |
| | (0.138) | (0.160) | (0.161) | (0.147) | (0.129) | (0.155) | (0.142) | (0.182) | (0.172) | (0.271) |
| HML | 0.151 | 0.242* | 0.0536 | 0.024 | -0.077 | -0.281** | -0.296** | -0.240 | -0.733*** | -0.342 |
| | (0.112) | (0.131) | (0.131) | (0.120) | (0.105) | (0.126) | (0.116) | (0.149) | (0.140) | (0.221) |
| MOM | 0.029 | -0.052 | 0.150 | 0.199 | 0.326*** | 0.149 | 0.155 | 0.348** | 0.116 | 0.450* |
| | (0.120) | (0.140) | (0.141) | (0.129) | (0.113) | (0.135) | (0.124) | (0.159) | (0.150) | (0.237) |
| Constant | 0.010* | 0.0095 | 0.0091 | 0.013** | 0.016*** | 0.0059 | 0.002 | 0.007 | -0.0003 | 0.013 |
| | (0.005) | (0.006) | (0.006) | (0.005) | (0.005) | (0.006) | (0.005) | (0.007) | (0.006) | (0.010) |
| Observations | 98 | 95 | 96 | 96 | 97 | 98 | 98 | 98 | 98 | 98 |
| R-squared | 0.557 | 0.725 | 0.639 | 0.679 | 0.679 | 0.503 | 0.687 | 0.531 | 0.585 | 0.302 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

All of the results described earlier are robust to computing the portfolio returns using equal weights. Further, in the following table, the reported figures are alphas of the equally weighted portfolios arranged by RtoTR.

**Table 4-16: Alphas of the Equally Weighted Portfolios Sorted by the Return-to-Turnover (RtoTR) Price Impact Ratio**

| Alphas of Equally Weighted Portfolios Sorted by the Return-to-Turnover (RtoTR) Price Impact Ratio | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 | P1-P10 | Wald |
| CAPM_alpha (%) | 0.095 | -0.916 | -0.436 | -0.192 | 0.103 | -0.042 | -0.101 | 0.0264 | 0.6918 | 1.2266 | -1.131 | 26.457 |
| T-value | 0.244 | -1.477 | -0.918 | -0.401 | 0.213 | -0.081 | -0.162 | 0.045 | 0.850 | 1.531 | -1.287 | 0.003 |
| Fama_French_alpha (%) | 0.5879 | 0.0587 | -0.396 | -0.418 | -0.455 | -0.856 | -1.673 | -1.167 | -0.962 | -0.070 | 0.658 | 15.407 |
| T_value | 1.217 | 0.077 | -0.663 | -0.702 | -0.802 | -1.482 | -2.570*** | -1.800* | -1.057 | -0.452 | 1.670* | 0.117 |
| Carhart_alpha (%) | 0.659 | 0.173 | 0.067 | 0.157 | 0.049 | -0.806 | -1.215 | -0.691 | -0.908 | 0.069 | 0.590 | 10.192 |
| T_value | 1.172 | 0.198 | 0.102 | 0.243 | 0.081 | -1.280 | -1.688* | -0.955 | -0.836 | 0.056 | 1.980** | 0.423 |

*The corresponding alpha coefficient is statistically significant at the 10% level
**The corresponding alpha coefficient is statistically significant at the 5% level
***The corresponding alpha coefficient is statistically significant at the 1% level

For the consideration of the robustness of the earlier alpha value-weighted results based on RtoTR, the above table is calculated to measure the risk-adjusted performance of the equally weighted portfolios developed on the grounds of the RtoTR ratio. The premium (P1 - P10) is significantly positive for the Fama–French specification of 0.665% p.a. (t = 1.2861) and the Carhart model of 0.590% (t = 1.1159). It shows the similar conclusion that the premium is the indication that the overall portfolios have a positive spread and perform above the benchmark of about 0.665% p.a. market returns based on the Fama–French model and 0.590% based on the Carhart model.

## 4.20 Conclusion

This chapter is based on the comparison of Amihud's (2002) return-to-volume ratio (RtoV) and a new price impact ratio, return to turnover (RtoTR), recommended by Florackis et al. (2011), using evidence collected from the Pakistan Stock Exchange. The major contribution of this chapter is the provision of evidence about the examination of both the price impact ratios in an emerging market, namely the Pakistani stock market. In the Pakistani stock market, to the best of the author's knowledge, there is no empirical evidence that precisely examines the liquidity price impact ratios of Amihud (2002) and Florackis et al. (2011). This chapter is influenced by the paper of Florackis et al. (2011), and its results are aligned with it.

The criticism pointed out by Florackis et al. (2011) of Amihud's RtoV ratio is that, based on the trading volume of stocks in monetary terms, it has a strong correlation with the market value and eventually creates a size bias. Florackis et al.'s (2011) RtoTR ratio is free from this bias and has the advantage of examining the cross-sectional variability in trading frequency.

Amihud and Mendelson (1986a) explained the expected return of the asset calculated on the basis of the trading cost and trading frequency of the respective transaction. Technological advancement and other factors in stock markets create the image that a large volume of trading transactions is associated with a lower cost. Therefore, Florackis et al.'s (2011) RtoTR ratio clearly takes into the account cross-sectional variation in stocks' turnover ratios. Moreover, this study uses the Pakistan Stock Exchange data over the period from January 2005 to December 2014, and the results are strongly aligned with those of Florackis et al. (2011), as stocks with low RtoTR values indicate higher returns in comparison with high RtoTR ratio values. In addition, Amihud's (2002) RtoV ratio has diverse positive and negative return values surrounded by all the portfolios. Moreover, the results endorse the argument of Florackis et al. (2011) that the trading frequency and trading cost are both important factors in measuring the returns in alignment with the similar argument of Amihud and Mendelson (1986a). The results also evidence that Amihud's (2002) RtoV ratio develops a highly negative correlation with market capitalization, which indicates that small stocks are essentially illiquid.

Finally, the results are confirmed to be robust through equally weighted portfolios arranged by RtoTR and produce similar results using equal weights.

**Chapter 5: Market Efficiency and Anomalies: Evidence from the Pakistan Stock Exchange**

# 5 Introduction

Along with the development of the efficient market hypothesis (EMH) (Fama, 1965), there are contrary arguments that anomalies exist; they not only identify the existence of anomalies but also challenge the concept of market efficiency. Prior studies in favour of this point, found by Basu, (1975), involved using the P/E (price–earnings ratio) to study the market efficiency of the NYSE during the period from April 1957 to March 1971 and provided the result that the information that exists in the P/E ratio was not entirely present in the security prices as proposed by the efficient market hypothesis. Ball (1978) also explained his findings that post-announcement earnings comprised higher returns. Therefore, the specific anomaly is considered as post-announcement earnings drift. Banz (1981) emphasized the association between the return and the total market value of the NYSE and found that small firms give a higher returns than large firms. Certainly, earnings and size anomalies are also some influences on the market efficiency hypothesis. There are many studies opposing Fama's (1970) efficient market hypothesis, and certainly, in an inefficient stock market, investors would be capable of generating abnormal returns. In other words, it could be argued that returns are not equally balanced with risk in inefficient markets.

Currently, the significance of seasonality in the stock market is an interesting area of research. This effect is also recognized as the calendar effect; seasonality comprises various effects that are associated with time, and it is measured as the main trends of anomalies with market efficiency. Considering the entire stock market, anomalies associated with seasonality are supposed to be an interesting puzzle for academic scholars, since stock market anomalies are incoherent with the principles of asset-pricing performance. Many empirical studies have explored abnormal returns, mispriced opportunities and volatility (Bollerslev and Ghysels, 1996); Franses & Paap, 2000; Doshi, 2011). However, limited evidence has been found for seasonality effects in South Asian markets and Chinese markets (Mookerjee & Yu, 1999; Luo, Gan, Hu & Kao, 2009).

Therefore, the main contribution of this empirical chapter is to recognize the seasonality effect on the Pakistan Stock Exchange, which has totally different institutional dynamics from developed stock markets, while considering the calendar effects through the prominent ARCH and GARCH models.

This chapter is different from the previous literature on the following ways. Firstly, the current research analyses three different and important seasonality effects, for instance, weekdays and the weekend effect, the monthly and turn of the year effect and the holiday effect. To the best of the author's knowledge, the chapter examines all the three major characteristics of seasonality and therefore presents a more complete understanding of anomalies in the Pakistan Stock Exchange over the period from January 2005 to December 2015. The comprehensive discussion and evaluation of different anomalies from the market will provide a clear understanding for investors to take their decisions based on information on different anomalies. Secondly, the stocks used only PSX 100 listed companies based on market cap of the Pakistan Stock Exchange. This analysis will present combined and comprehensive information and effects of seasonality on the overall market in Pakistan. Thirdly, this chapter applies the methodology of the generalized autoregressive conditional heteroscedasticity (GARCH) model, which examines volatility movements and therefore increases the accuracy of the investigation.

Lastly, this research contains data from two different regimes in Pakistan, namely, those of a chief executive of army personnel selected through a referendum (Army regime) and democratic regimes selected through public votes (Democratic Government), enabling the study to determine how the Pakistani financial market responded to seasonality effects under the different regimes. Further, two parallel calendars used in the country i.e. Gregorian calender and Islamic calendar indicating interesting analysis. Pakistan is one of the few countries in world where two different calendars are parallel. Another, interesting anomaly introduced into this empirical chapter known as 'budget' anomaly. It is quite interesting to examine the budget anomaly and its impact on stock returns.

The daily returns from listed companies are used from January 2005 to December 2015, and the analysis of the results evidences the presence of significant weekday, monthly and holiday effects on the Pakistan Stock Exchange. Specifically, if analysed in more detail, the day-of-the-week effect shows a trend of seasonality effects on: Friday, Monday and Tuesday within a week. On the other hand, the month-of-the-year anomaly occurs in August. With respect to seasonality effects on holidays, the results indicate no particular holiday effect to be significant.

## 5.1 Definitions

### 5.1.1 Market Efficiency Anomalies

Market efficiency anomalies indicate inconsistency with the concept of the efficient market hypothesis, for example seasonality/calendar effects, the book-to-market ratio, the price-to-earnings ratio, the post-announcement earnings drift and the firm size effect.

### 5.1.2 Seasonality Effects

Seasonality effects are also called calendar effects. The presence of seasonality effects in stock returns is closely associated with the weak form of market efficiency. Seasonality effects in stock market returns are considered as persistent existence, which indicates that the market participants have different required rates of returns on risky assets subject to the calendar in which the monthly investment takes place.

### 5.1.3 Definition of Day-of-the-Week Effect

The day-of-the-week effect anomaly exists in the stock market primarily on Friday and Monday trading days. Normally, the pattern of stock prices rises on Fridays and falls on Mondays. Moreover, considerable supporting evidence has been observed in different markets based on the other days of the week as well.

For example, the day-of-the-week effect has been observed in the stock indices on many stock markets, visible in the stock options or derivative markets, stock index futures market (Yadav & Pope, 1992) and bonds and T-bills (Gibbons & Hess, 1981). It has been found in the bond market that the longer the maturity of the bond, the lower the Monday's returns. Roll (1984) also emphasized the presence of the day-of-the-week effect. In addition, the day-of-the-week effect is present in foreign exchange rates.

### 5.1.4 Definition of Month-of-the-Year Effect (January Effect)

The month-of-the-year effect is defined by the presence of the trends in stock returns during a specific month of the year; the most common and evident effect of seasonality is the January effect. Commonly, the January effect is related to higher average stock returns observed in the month of January in contrast to the other months of the year.

The possible argument of the January effect is that investors take out the bad stocks in December for tax reasons and the resulting substantial increase in sales in January causes higher returns. In the context of Pakistan, the tax year starts from 1st July of current year and ends at 30th June of next year. Additionally, window dressing at the year end is very common. This means that portfolio managers take out the non-performing stocks from the portfolio at the year end to avoid giving any bad impression in the annual reports. Moreover, similar stocks are repurchased at the start of the year, and in this way the January effect can be observed.

### 5.1.5 Definition of Holiday Effect

The pre-holiday effect is a prominent anomaly in stock markets. Generally, stocks increase their prices on the last trading day prior to the start of a holiday. Studies have shown evidence that the market return during pre-holiday periods is often 10 times higher than the average returns in comparison with normal trading days (Agrawal and Tandon, 1994). Moreover, the argument arises that a phenomenal portion of the equity premium is focused on these many days. This anomaly has been evident in many developed countries, so its authenticity seems to be very robust. Another argument exists for pre-holiday days in the equity market sometimes feature minimum liquidity and negative returns (Chong, 2005), as investors do not participate in the stock market or reduce their investments. The expectation of positive equity market activities is subsequently based on a normal tendency, as investors are psychologically more optimistic. Therefore, it is a very easy strategy developed to exploit the market with inefficiency.

Another supporting argument could be that the presence of high returns before holidays is like weekends, with the occurrence of steadily higher returns before the closure of trading transactions; however, this cannot be correct, because higher returns are observed the day before a holiday starts in contrast to the returns on the last day of the week. Therefore, the holiday effect could be explained by the behaviour of investors, because holidays produce feelings of happiness and pleasure, convincing investors of high purchasing power, and as a result higher returns are observed before the holiday.

## 5.2 Other Anomalies

### 5.2.1 Price-to-Earnings Ratios

One of the financial measures is defined as the price-to-earnings ratio; it is typically calculated as one share divided by the profit of the firm produced from one share. It is considered to be a very easy measure to calculate. Moreover, Basu (1975) documented that portfolios with low P/E ratio stocks can achieve tremendously in comparison with high P/E portfolios. Many studies have argued that portfolios with a low P/E ratio develop abnormal returns, because the capital market equilibrium model does not properly define the returns with adjusted risk. However, if the P/E ratio is used to compute the anomaly effect, the CAPM beta is applied as the tool to adjust the risk, and afterwards the abnormal returns can be related by applying the CAPM as the yardstick.

### 5.2.2 Book-to-Market Ratios

Fama and French indicated that the book-to-market ratio is based on the firm's stock to the market value of the stock. Fama and French distributed firms into 10 portfolios based on their book-to-market ratios and analysed the monthly returns of the 10 respective portfolios. The results indicated that the portfolio with the highest book-to-market ratio had the leading average returns. The study evidenced that the book-to-market value is not exclusively dependent on the beta. The stocks with a higher book-to-market ratio are comparatively underpriced, and the investor can apply this ratio to follow the abnormal returns.

Further the firm size effect was built on the risk mismeasurement developed by Chan and Chen (1988). They emphasized that the size effect examined by Banz (1981), because of the application of beta in the investigation, is measured imprecisely, which permits the firm size to act as a proxy for the true beta. On the other hand, Jegadeesh (1992) advocated the use of test portfolios, which developed small cross-sectional correlation between beta and size proxy. Fama and French (1992) also applied test portfolios arranged on the basis of size and beta. They obtained the result that the size effect is not explained by beta.

### 5.2.3 Small Firms in January Effect

The small-firm effect is explained as firms with small market capitalization performing better than big firms in terms of stock returns. Moreover, small firms are considered to be relatively riskier; therefore, investors demand extra returns for bearing more risk. The small-firm effect also holds for many other reasons. For example, many growing business opportunities exist for small firms in contrast to big companies.

## 5.3 Literature Review

The day-of-the-week effect is primarily associated with stock market trends originating on Fridays and Mondays, specifically on trading days. Generally the pattern of stock returns rises on Fridays and declines on Mondays. It is important to note, however, the anomalies of the day-of-the-week effect; a considerable amount of evidence explaining the day-of-the-week effect can be found on different days of the week as well, that is, except Fridays and

Mondays. Moreover, it has been observed that the day-of-the-week effect is an important seasonality effect of equity markets, because the return and volatility on weekdays are not similar.

The most studied day is Monday, as examined by Jaffe and Westerfield (1985) for developed countries, for example the US, the UK and Canada. Generally Monday's average returns are significantly lower than those of the remaining days of the week. On the other side, the Friday effect describes the maximum returns. Empirical results were produced on the day-of-the-week effect in the US market by Gibbons and Hess (1981) in their study from 1962 to 1978. They found evidence that Monday returns are lower than those of the rest of the weekdays; similarly Friday returns are higher than those of the rest of the weekdays.

In consideration of the seasonality effect, it is exciting to find evidence of negative returns on Tuesday from Condoyanni, O'Hanlon and Ward (1987) and Dubois and Louvet (1996) in the stock markets of Japan, Australia, Singapore, France and Turkey. Agrawal and Tandon (1994) examined 18 countries and found positive returns on Fridays and Wednesdays in selected countries and, on the other hand, negative returns on Mondays and Tuesdays.

In addition, more prominent evidence was found by Balaban, Bayar and Kan (2001) on 19 developed stock markets, which consisted of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Italy, Japan, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the UK and the USA. The results of this particular research are very useful, as they cover all the main stock markets of the world. They indicate that 14 countries produced negative returns on Mondays. Furthermore, negative returns on Tuesdays were found in Austria, Germany and the Netherlands; however, Japan showed positive returns on Tuesdays.

A further analysis found positive returns on Wednesdays for Hong Kong, Japan and New Zealand. Moreover, New Zealand showed positive returns on Thursdays along with Japan. New Zealand was considered as the only country having a positive effect on Fridays in comparison with Germany, which showed a negative effect on Fridays.

Similarly, Ho (1990) investigated 10 Asian Pacific countries and included the USA and the UK markets in the observations. The results indicated that 5 countries achieved similar results to the US market, that is, negative returns on Mondays. Moreover, Australia, Japan, Malaysia, Thailand and the Philippines produced negative returns on Tuesdays; on the other hand, the UK, New Zealand and Taiwan were pointed out as experiencing a positive Tuesday effect. However, Poshakwale and Murinde (2001) discovered no considerable weekday effect in Warsaw and Budapest; likewise, Liam and Chen’s (2004) study identified negative returns on Mondays in the period 1992–1997.

Considering China, Wong, Hui and Chan (1992) and Mookerjee and Yu (1999) provided evidence for the presence of the day-of-the-week effect. Luo, Gan, Hu and Kao (2009) examined the day-of-the-week effect as well as the monthly effect by taking the daily stock prices of the Shenzhen and the Shanghai Stock Exchange to examine the volatility. Moreover, the stocks were examined as A and B shares in the Chinese market. The A shares indicated the local/domestic investors, and the B shares represented the foreign-currency investors. They used data from 1992–2005 and followed the generalized autoregressive conditional heteroscedasticity (GARCH) model to examine the week of the returns.

The contradictory research produced by Connolly (1989) investigated US indices from the period 1963 to 1983, finding that the weekend effect was negligible and perhaps was not exists until the mid-1970s; therefore, he was completely in favour of the market efficiency hypothesis. Jaffe, Westerfield and Ma (1989) examined the US, UK, Japan, Canada and Australia indices and recognized a negative or low effect on Mondays. As mentioned early studies found a consistent weekend effect and day of the week effect, with positive returns on Fridays and negative returns on Mondays. However, more recent studies indicates the results moving to other days, reversing or vanishing (See for instance; Hudson et al. 2002; Blau et al. 2009; Christophe et al. 2009; Aggarwal et al. 2003; and Jones and Ligon, 2009).

**January Effect:**

However, no particular evidence has been found on the reasons behind the January effect. The very early study by Wachtel (1942) suggested five different likely reasons for the January effect: 1) tax loss selling; 2) the uncommon demand for cash surrounding Christmas; 3) a pre-Christmas holiday effect; 4) the expectation of good business deals in the spring; and lastly 5) positive behaviour and emotions about the upcoming New Year.

The January effect is described by the presence of stock return trends within the particular month of the year, which is significant; however, empirical studies have produced strong evidence for the January effect. Similarly, the argument constructed is that the January effect is associated with higher returns in comparison with the rest of the months of the year. Ariel (1987) evidenced the month-of-the-year effect in the US equity market at the start of the year and the end of the calendar year.

Rozeff and Kinney (1976) and Lakonishok and Smidt (1984) also determined that the January effect in the US is larger and regular in contrast with the rest of the months of the year. Having measured the January effect, it is important to understand the particular reasons for the existence of monthly anomalies, and evidence has shown that the January effect is closely associated with the tax-loss-selling proposition, the window-dressing hypothesis, insider trading and the risk–return association.

In view of all this evidence, the most prominent support has been found for the tax-loss-selling hypothesis. Moreover, tax-sensitive traders change their investment characteristics significantly in the month of January. The US evidence usually presented the tax-loss-selling hypothesis (see, for example, Reinganum, 1983; Roll, 1983; Schultz, 1985; Jones et al., 1991; Poterba & Weisbenner, 2001; Starks, Yong & Zheng, 2006). On the other hand, the window-dressing hypothesis was endorsed by Haugen and Lakonishok (1987), Lakonishok et al. (1991) and Ng and Wang (2004). This defines the anomaly when portfolio managers sell non-performing stocks before publishing their holdings in portfolios. The main reason behind this action is to influence traders by showing good results and to buy the stocks back after the publication of the results. Along with the evidence of the tax-loss-selling hypothesis, it is important to view another feature of the January effect, which suggests that unexpected returns in the month of January are due to the arrival of new information based on earnings announcements, which are generally organized and published at the end of the year. Therefore, it is also a prominent factor to increase the stock returns.

The year end anomaly is an information hypothesis, explained by Rozeff and Kinney (1976). Keim (1983) and Barry and Brown (1984) suggested that the January effect is the reason for the unfitted modelling of risk: the market is unable to consider the rising uncertainty in

January because of the impending announcement of essential information for firms with a December financial year end.

An associated study by Kim (2006) developed an earnings information uncertainty risk element that describes the January effect in the US market. Ogden (1990) recommended the liquidity hypothesis and suggested that the January effect anomaly appears from the rising demand for equities because of the liquid cash addition from year end salaries, increments, bonuses and dividend payments. Moreover, the optimistic expectation hypothesis recommended by Ciccone (2011) argues that the turn of the year is a psychological factor and provides new optimism that increases the stock price in January. Moreover, Anderson et al. (2007) discovered a behaviour-associated description through laboratory examinations.

The earlier studies based on the seasonality effects outside the US market, particularly as robustness checks for the tax-loss-selling hypothesis and for the January effect, indicated the presence of the January effect. On the other hand, these studies also concluded that tax loss selling may be part of the January effect. For example, Brown et al. (1982) discovered that Australian stocks from 1958 to 1981 showed higher returns in the months of July (considering tax loss selling as the fiscal year ends in June), December, January and August. One of the prominent research studies was constructed by Gultekin and Gultekin (1983) for 17 countries and determined that January stock returns were remarkably higher than those of the rest of the months, except in Australia, where the evidence did not support the tax-loss-selling hypothesis.

According to Berges et al. (1984), however, the January effect exists in the Canadian equity market, particularly before and after the implementation of the capital gains tax in 1973. This result was obtained by taking 30 years of data from the 1950s onwards. Moreover, Tinic et al. (1987) found no seasonality effect in stocks traded by foreign traders and Canadians who were exposed to taxation earlier than 1973, showing that tax loss selling is unable to explain the January effect completely. Van den Bergh and Wessels (1985) found the January effect in the Dutch stock market from 1966 to 1982, even though capital gains were not taxed. Individual investors in Japan are not subject to capital gains tax, and firms' fiscal year differs among firms, but Kato and Schallheim (1985) concluded that the January and June effects existed in the Japanese stock market from 1952 to 1980. The respective research also supported the substitute liquidity and information hypothesis.

Considering the UK evidence, Reinganum and Shapiro (1987) used monthly data from 1955 to 1980 and concluded the existence of the tax-loss-selling hypothesis. They pointed out the January as well as the April effect after the implementation of capital gains taxes in April 1965; however, they did not find seasonality in the before-tax period. Afterwards Clare et al. (1995) also demonstrated high returns in December and low returns in September in the UK stock market from 1955 to 1990. Taking advantage of cross-sectional data, research has shown that the January effect exists in the UK (Dimson & Marsh, 2001) and Australia (Brown et al., 1982) and is considered as a market-wide occurrence in comparison with the US; the anomaly in these particular countries is not dependent on the firm size.

Branch's (1977) results indicated that higher returns in January are effective for the stocks, which were different from the market returns of the other months. Still, the biggest consensus has been developed on the argument that tax loss evidence remains the valid reason for the January effect, and Roll (1983) investigated whether small firms in the US equity market were affected by the tax-loss-selling hypothesis in contrast to big firms.

Brown *et al.* (1983) found that the monthly stock return effect exists in two months, namely January and July, due to the tax year beginning in July in Australia. Moreover, Reinganum and Shapiro (1987) analysed the London Stock Exchange and indicated that the tax-loss-selling hypothesis applies to both January and April, because individual traders consider April as the tax year end.

A contrary view was given by Ho (1990) on emerging markets regarding the existence of the January effect in 7 out of 10 Asian Pacific markets. Fountas and Segredakis (2002) examined monthly seasonality effects for 18 emerging markets and confirmed a significant January effect in Chile, Greece and Turkey, considerably higher returns in Colombia and Malaysia and lower returns in Greece. Darrat et al. (2011) recently considered the monthly seasonality in 34 stock markets, including the US and the UK. Moreover, they applied a more recent sample to their data from 1988 to 2010 but were unable to find the January effect in the sample with the exception of 3 countries (Denmark, Ireland and Jordan). In addition, the majority of the stock markets disclose considerably higher returns in April and December and lower returns in June, August and September.

Likewise, Rogalski and Tinic (1986) examined the January effect by matching firm sizes and developed the argument that small firms have significantly greater risk at the beginning of the year in contrast to the rest of the year. Consequently, traders should obtain a greater reward in terms of returns by taking risks at the beginning of the year. Further investigations by Choudhry (2001) and Mehdian and Perry (2002) into the monthly effects in developed equity markets showed no healthy supporting argument established on the January effect, particularly in the post-war period.

In the context of emerging markets, Ayadi and Chatterjee (1998) supported the existence of the monthly effect for emerging markets. Likewise, Andrew and Sheikh (2000) constructed an argument in support of monthly effects in emerging markets.

**Holiday Effects:**

The final anomaly in this chapter is the holiday effect, which was first developed by Fields (1934). Lakonishok and Smidt (1988) provided results based on 30 to 50% of the complete returns discovered by holidays effects in the period before 1987. Later Brockman and Michayluk (1998) and Vergin and McGinnis (1999) described the holiday effect as depending on the investors' behaviour. Many traders are influenced to engage in high levels of trading before the beginning of the holidays, which is termed 'holiday euphoria'. On the other hand, the concept of the holiday effect is inconsistent according to Agrawal and Tandon (1994), who investigated 17 national markets and documented the existence of pre-holiday periods in 65% of the representative market. The important point to reflect is that the holiday effect could be economic and behavioural (Thaler, 1999).

Several studies have confirmed seasonal trends with reasonable illustrations. While Bouman and Jacobsen (2002) explained the anomaly as a puzzle, their results were aligned with the summer holiday hypothesis. In their earlier work, they recommended a specific model that associated holidays with changes in risk aversion and the risk allocation capability of the market. Specifically, traders may choose to liquidate their stockholdings or transfer a portion of their risky portfolio assets to safer assets before, during or after taking summer holidays because of cash requirements or to avoid having to pay attention to the equity market during their summer holidays. Therefore, with the general one-period model, Bouman and Jacobsen indicated that stock prices have a positive association with the number of investors and a negative relationship with the average degree of market risk aversion.

Visaltanachoti's (2009) results showed that, in the US market, there is no noticeable seasonal pattern in liquidity measured by the flow of orders in relation to the price changes using Pastor and Stambaugh's (2003) model, which indicates that the Halloween effect is not caused by holiday-persuaded variations.

Similarly, Hong and Yu (2009) explained that vacations mainly decrease trading events and reduce stock returns. They identified considerably lower equity market turnovers and returns, specifically during the summer season (July to September for Northern Hemisphere countries and January to March for Southern Hemisphere countries).

Supporting evidence with regard to the holiday effect has been established by Chan, Karolyi and Stulz (1992), Wilson and Jones (1993), Mills and Coutts (1995), Arsad and Coutts (1997), Mookerjee and Yu (1999), Coutts, Kaplanidis and Roberts (2000) and Abeysekera (2001).

**Literature on the Pakistan Stock Exchange:**

With regard to the Pakistan Stock Exchange (formerly known as the Karachi Stock Exchange), there is limited but very diverse literature. For instance, Husain (1998) concluded no evidence of the weekday effect from an examination of the Pakistani equity market by studying the period from 1 January 1989 to 30 December 1993. Based on the study by Nishat and Mustafa (2002), there is no evidence of a significant day-of-the-week effect on stock returns and on conditional variance from an examination of data from 14 December 1991 to

31 December 2001 on the KSE 100 Index. Moreover, earlier research has examined the month of May in the Pakistani market and found lower returns in contrast to other months of the Gregorian calendar (Zafar et al., 2010; Rafique & Shah, 2012); on the other hand, the returns for the months of the Islamic year, that is, Shawwal and Zil Qa'ad, showed returns that differed from the rest of the Islamic calendar (Mustafa, 2008).

It is important to highlight that much less research has been conducted to examine the calendar anomalies in the Islamic calendar for the equity market of Pakistan in comparison with investigating the stock returns' recurring pattern based on the Gregorian calendar (Halari et al., 2013).

The Islamic calendar effect was first exemined by Husain (1998) to investigate the patterns of stocks on the Pakistani equities market. He investigated the daily stock prices and daily index values on the Karachi Stock Exchange for the period from 1989 to 1993. This study concluded that the share returns deteriorated in the holy month of Ramadan, but this decline was not significant. Similarly, a very recent study was conducted by Mustafa (2008). He examined daily share price data of the Karachi Stock Exchange, considering the period from 1998 to 2004. His results indicated that there was no evidence of the holy-month-of-Ramadan effect on the Karachi stock market; however, the study identified the presence of significantly positive average returns in the months of Shawwal and Zil Qa'ad, therefore concluding that monthly anomalies are present in the Karachi stock market, which may cause seasonality effects.

Husain (1998) and Mustafa (2008) found no evidence of recurring stock returns of the Pakistani equities market established on the Islamic calendar. Similar results were obtained in an examination of the Pakistani stock market that studied monthly calendar anomalies developed on the Gregorian calendar. Mahmood (2007) also examined the monthly seasonality on the Karachi Stock Exchange. He investigated monthly share price data for the period from 1996 to 2000 to examine the seasonality effect on the Pakistani stock market using the Gregorian calendar. His results showed that the mean returns in the overall months were not significantly different from each other; therefore, he concluded that no seasonality effect is present in the months on the Karachi Stock Exchange. Earlier research by Ali and Akbar (2009) highlighted the monthly effect in the returns of the Karachi Stock Exchange 100 Index for the period from 1991 to 2006 utilizing the Gregorian calendar. Their conclusion supported the results of Mahmood (2007), as their findings explained that no seasonality effect exists on a monthly basis on the Karachi Stock Exchange.

In comparison with different studies, Zafar et al. (2010) investigated a monthly calendar anomaly on the Karachi Stock Exchange using the regression analysis methodology with data collected from 1991 to 2007. The outcome of the regression analysis indicated that the coefficient for May was negative and significant, showing that the May effect exists on the Karachi stock market. Therefore, the authors strongly believed that monthly anomalies are present in the market using the Gregorian calendar. In the recent research conducted by Rafique and Shah (2012), they examined KSE data to evaluate the presence of calendar anomalies, utilizing the daily share price data of the KSE 100 Index. The preliminary descriptive statistics showed that May, June and August were the months with negative mean returns. This analysis supported the conclusion presented by Zafar et al. (2010) in which they found a negative mean return for May. Moreover, Rafique and Shah (2012) disclosed that the highest average mean return exists in the month of January while the lowest mean return was reported in the month of May. The conclusion of their study supported the results of Zafar et al. (2010), which explained the monthly seasonality effects present on the Karachi Stock Exchange.

## 5.4 Research Gap

By comprehensively analysing the literature, it is discovered that many remarkable research studies indicated seasonality effects in the early 1970s and 1980s. Moreover, through searching the Pakistan Stock Exchange literature, it is revealed that many studies have shown evidence of the day-of-the-week effect and the monthly effect. However, to the best of the author's knowledge, no research has been produced based on the holiday effect in Pakistan. Moreover, many studies have been based on one effect of seasonality, but this study aims to produce results based on multiple seasonality factors, for example the day-of-the-week effect, monthly effect and holiday effect, in one paper. It will provide considerable help for investors to take an appropriate decision when investing in the Pakistani stock market. Generally, the research explored in the arena of market efficiency has engaged typical efficiency tests, for example the runs test, correlation test and filter test, to examine the market efficiency. However, the current research paper is different and tries to discover efficiency through the behavioural approach of the market participants to the existence of special events, days and months. Therefore, the current research fills the gap and focuses on the key stock market predictabilities to recognize the volatility pattern of stock market returns surrounding holidays as well as examining the weekdays and months.

## 5.5 Hypotheses of the Research

The paper is developed on the basis of the following hypotheses:

- The first hypothesis is that the returns of stocks are the same on all weekdays. The hypothesis is defined as follows:

$$H_o : \propto_1 = \propto_2 = \propto_3 = \propto_4 = \propto_5$$

$$H_1\text{: Atleast one of the } \propto_i \text{ is different from the others.}$$

- The second hypothesis is that the returns of stocks are the same in all the months of the year. The hypothesis is defined as follows:

$$H_o: \propto_1 = \propto_2 = \propto_3 = \propto_4 = \propto_5 = \propto_6 = \propto_7 = \propto_8 = \propto_9 = \propto_{10} = \propto_{11} = \propto_{12}$$

$$H_1\text{: At least one of the } \propto_i \text{ is different from the others.}$$

- The third hypothesis is that the returns of stocks surrounding all holidays (pre and post) of the year are the same as the remaining days of the year. The hypothesis is defined as follows:

$$H_o: \propto_{pre} = \propto_{pre\ pre} = \propto_{post} = \propto_{post\ post} = \propto_{pre} = \propto_1$$

$$H_1\text{: At least one of the } \propto_i \text{ is different from the others.}$$

## 5.6 Research Methodology

This study explores the existence of stock market consistencies by examining the weekday effect, monthly effect and holiday effect. The data are mainly based on the daily returns of the Pakistan Stock Exchange 100 Index for the time period from 1 January 2005 to December 2015, which includes 2,899 observations collected from DataStream. The stock returns are examined through the following equation:

$$r_t = (ln\, P_t / P_{t-1}) * 100 \qquad (5\text{-}1)$$

$r_t$ represents the return period of time $t$

$P_t$ represents the daily closing price of stock on the Pakistani stock market

$P_{t-1}$ represents the closing price of the previous day

$ln$ represents the natural logarithm.

The main feature of this study is the examination of the seasonality effects, specifically the day-of-the-week effect, month-of-the-year effect and holiday effect, using the model established by Engle (1982). The model is used to calculate the variance of returns successively after the adjustment in the squared lagged values of the error terms from the previous period.

## 5.7 ARCH Model Description

Engle (1982) introduced the ARCH model to determine the volatility of the inflation in the macroeconomic variables of the United Kingdom. The ARCH model is particularly effective in finding the difference between the unconditional and the conditional variance of the stochastic process. Most analysts prefer the ARCH model to assess the volatility of the stock market. It is effective in predicting the effect of the previous day's news on the volatility of today's return. The ARCH model can measure the heteroscedasticity in the data over time and model this explicitly in terms of defining a model for conditional variance.

The model known as ARCH (q) is a remarkable achievement and was awarded the Nobel prize.

$$H_t = V_c + \sum_{j=1}^{q} V_j \, \epsilon^2 \, t - j \qquad (5\text{-}2)$$

## 5.8 GARCH Model Description

The GARCH model is an extension of the ARCH (m) model. Bollerslev (1986) developed a new general class of ARCH models, named generalized autoregressive conditional heteroscedastic (GARCH) models, which allows for both a long memory and a more flexible lag structure. It explains the linear relationship between past conditional variance and p lagged conditional variance. ARCH models explain the conditional variance that is linearly associated with the past variances only. The GARCH model is also capable of measuring the time-varying volatility of time series returns. It is also easy to understand, and the GARCH (1, 1) model is simple and predicts the forecast of the volatility in a better manner. The GARCH model can add the previous conditional variances to the formulation as well. In addition, it emphasizes the most recent estimates of the continuously compounded return square (u2) and variance rate (σ2).

Moreover, the generalized version of the ARCH model was recommended by Engle's student Bollerslev (1986) and adjusts the conditional variance into lag values of $Ht^2$ and $\epsilon t^2$. It is widely recognized as GARCH (p,q) modelling.

$$H_t = V_c + \sum_{j=1}^{q} V_{ja}\, \epsilon^2\, t - j + \sum_{j=1}^{p} V_{jb}\, h^2\, t - j \qquad (5\text{-}3)$$

## 5.9 Creation of the Models

### 5.9.1 Day-of-the-Week Anomaly

In the following stage, the author analyses the seasonality effect based on the day of the week. In this analysis the days of the week are selected as dummy variables for investigating the Day of the week effect, for instance $D_{mt}, D_{tut}, D_{wt}\ and\ D_{tht}$ for Monday, Tuesday, Wednesday and Thursday, respectively. The dummy variable here indicates the significance of unity for a specified day and the significance of zero for all the remaining days of the week. Nevertheless, to examine the weekend effect, the dummy variable of Friday is erased, because it has been considered as the benchmark day of the week. The reason for omitting the dummy variable of Friday is to avoid the multicollinearity problem. The explanation of the model developed for analysing the weekday effect is as follows:

$$R_t = \alpha_1 + \alpha_2 D_{mt} + \alpha_3 D_{tut} + \alpha_4 D_{wt} + \alpha_5 D_{tht} + \epsilon_t \qquad (5\text{-}4)$$

The intercept $\alpha_1$ indicates Friday's mean returns, and the rest of the dummies show the returns on Mondays to Thursdays.

### 5.9.2 Month-of-the-Year Anomaly

Likewise, the month of the year is investigated through dummy variables, focusing on the month of January, because it is important to examine the 'tax-loss-selling hypothesis' due to most companies in Pakistan having their year end in December.

Hence, the dummy variable of the specified month is a unitary value; otherwise, it is reflected as zero. Subsequently, the January effect is recognized using the same technique as before for the day-of-the-week effect, and it is necessary to omit it from the return model for the reason of it being the benchmark month. There is a valid point to consider in that the existence of the seasonality effect is documented if one dummy variable becomes statistically significant (Pandey, 2002).

$$R_t = \alpha_1 + \alpha_2 D_{feb} + \alpha_3 D_{mar} + \alpha_4 D_{apr} + \alpha_5 D_{may} + \alpha_6 D_{jun} + \alpha_7 D_{jul} + \alpha_8 D_{aug} + \alpha_9 D_{sept} + \alpha_{10} D_{oct} + \alpha_{11} D_{nov} + \alpha_{12} D_{dec} + \epsilon_t \qquad (5\text{-}5)$$

$\alpha_1$ indicates the mean return of January, which is considered as the benchmark month. On the other hand, $\alpha_2$ $to$ $\alpha_{12}$ indicate the remaining months of the year.

### 5.9.3 Holiday Effect Anomaly

To analyse the holiday effect in Pakistan, the returns around major holidays in Pakistan are examined, namely Eid Milad un-Nabi, Kashmir Day, Pakistan Day, Labour Day, Eid-ul-Fitr, Independence Day, Eid-ul-Azha and Quiad Azam Muhammad Ali Jinnah Birthday/Christmas. The holiday calendar is extracted from the official website of the Government of Pakistan. The detailed dates of the holidays are provided in the Appendix. This research examines the pre- and post-holiday effect independently for the period from 2005 to 2015. The following model is used to identify the holiday effect of the stock returns.

$$R_t = \alpha_1 + \alpha_2 D_{pre} + \alpha_3 D_{post} + \epsilon_t \qquad (5\text{-}6)$$

In the above model, $D_{pre}$ represents the return on the day before the holiday and similarly $D_{post}$ is the return on the following trading day after the holiday.

## 5.10 Empirical Results

### 5.10.1 Descriptive Statistics: Day-of-the-Week Effect

Table 5-1 presents the descriptive examination of the returns for the days within a week. It reports the mean, maximum, minimum, standard deviation, skewness, kurtosis and standard error (SE mean).

**Table 5-1: Descriptive Statistics: Day-of-the-Week Effect**

| Day of the Week | N | Mean | Max. | Min. | Std Dev. | Skewness | Kurtosis | SE (Mean) |
|---|---|---|---|---|---|---|---|---|
| Monday | 584 | -0.00239 | 0.0455 | -0.0572 | 0.0132 | -0.888 | 5.314 | 0.000544 |
| Tuesday | 577 | -0.000286 | 0.0646 | -0.0538 | 0.0107 | -0.403 | 9.193 | 0.000445 |
| Wednesday | 588 | 0.000889 | 0.0467 | -0.0588 | 0.0107 | -0.991 | 7.652 | 0.000443 |
| Thursday | 582 | 0.000655 | 0.0418 | -0.0442 | 0.00996 | -0.871 | 6.150 | 0.000413 |
| Friday | 568 | 0.00201 | 0.0354 | -0.0482 | 0.00921 | -0.915 | 8.120 | 0.000387 |
| Total | 2899 | 0.000167 | 0.0646 | -0.0588 | 0.0109 | -0.913 | 7.279 | 0.000203 |

The table presents the descriptive measures of each day of the week. It indicates positive mean returns during Wednesday (0.000889), Thursday (0.000655) and Friday (0.00201). However, negative mean returns are observed on Monday (-.00239) and Tuesday (-.000286). It is also important to note here that the highest positive mean returns are observed on the last day of the week, Friday (.00201), and the highest negative mean returns occur on Tuesday (-0.000286). This clearly indicates that the pattern of mean returns increases on Friday in line with the evidence presented by Gibbons and Hess (1981) and Agrawal and Tandon (1994). Moreover, negative mean returns on Tuesday were supported by Condoyanni, O'Hanlon and Ward (1987) and Dubois and Louvet (1996) in the following stock markets for Japan, Australia, Singapore, France and Turkey. Another observation from the table indicates that the weekend (Friday) has positive mean returns and Monday has negative mean returns, identifying that the pattern of the bid-and-ask spread is lower and the presence of high liquidity on Friday's in comparison with Monday's stock returns, which have a large spread and increased selling pressure in the market.

The kurtosis values are higher during all the weekdays, representing sharp peaks and showing the existence of extreme mean return values. It is also noted from the table that all the skewness values are negative. Therefore, the table demonstrates that the returns are not symmetric towards the mean by considering any day of the week. Monday evidences the highest standard deviation (0.0132) and the highest volatility in relation to the other days of the week. On the other hand, Friday reports the lowest standard deviation (0.00921).

### 5.10.2 Descriptive Statistics: Returns for the Month-of-the-Year Effect

Table 5-2 shows the descriptive examination of the returns for the month-of-the-year effect. It reports the mean, maximum, minimum, standard deviation, skewness, kurtosis and standard error (SE mean). The months from 1 to 12 are considered as January to December.

**Table 5-2: Descriptive Statistics of the Returns for the Month-of-the-Year Effect**

| Month | N | Mean | Max. | Min. | Std Dev. | Skewness | Kurtosis | SE (Mean) |
|---|---|---|---|---|---|---|---|---|
| Jan | 249 | 0.0284 | 0.148 | -0.218 | 0.0887 | -1.374 | 5.309 | 0.00562 |
| Feb | 219 | -0.0169 | 0.0727 | -0.102 | 0.0548 | 0.213 | 2.062 | 0.00370 |
| Mar | 232 | -0.0102 | 0.0934 | -0.157 | 0.0818 | -0.620 | 2.379 | 0.00537 |
| Apr | 241 | 0.0244 | 0.0837 | -0.0838 | 0.0441 | -0.813 | 3.662 | 0.00284 |
| May | 253 | -0.0196 | 0.119 | -0.183 | 0.0962 | -0.211 | 1.925 | 0.00605 |
| Jun | 258 | 0.00305 | 0.0840 | -0.0685 | 0.0451 | 0.573 | 2.317 | 0.00281 |
| Jul | 255 | 0.0206 | 0.115 | -0.186 | 0.0815 | -1.216 | 4.133 | 0.00510 |
| Aug | 244 | -0.0452 | 0.0803 | -0.220 | 0.0757 | -0.536 | 3.155 | 0.00485 |
| Sep | 242 | 0.0261 | 0.114 | -0.0736 | 0.0538 | 0.0934 | 2.252 | 0.00346 |
| Oct | 238 | 0.000202 | 0.0798 | -0.0583 | 0.0421 | 0.223 | 1.855 | 0.00273 |
| Nov | 225 | 0.0270 | 0.122 | -0.0445 | 0.0605 | 0.268 | 1.502 | 0.00403 |
| Dec | 243 | 0.00926 | 0.157 | -0.418 | 0.131 | -2.205 | 8.191 | 0.00840 |
| Total | 2899 | 0.00401 | 0.157 | -0.418 | 0.0790 | -1.290 | 7.356 | 0.00147 |

Table 5-2 examines the descriptive statistics of each month of the year considered in this study.

It shows positive mean returns in January (0.0284), April (0.0244), June (0.00305), July (0.0206), September (0.0261), October (0.000202), November (0.0271) and December (0.00926). On the other hand, negative mean returns are observed in four months, namely February (-0.0169), March (-0.0102), May (-0.0196) and August (-0.0452). From the results produced in Table 5-2, a positive mean return of turn-of-the-year effect can be found in the month of July; instead, the highest positive half year turn effect is probably visible in the month of January (0.0284) in comparison with the other months. As we know, most of the companies in Pakistan have their year end in June. However, most of the companies announce their half year unexpected earnings during the month of January. The highest mean returns are visible due to the arrival of new information. This argument was also supported by Rozeff and Kinney (1976), Keim (1983) and Barry and Brown (1984). The highest negative mean returns are observed in the month of May (-0.0196). Our results are aligned with the studies conducted on the Pakistan Stock Exchange by Zafar et al. (2010) and Rafique and Shah (2012), in which May demonstrated higher negative returns.

December shows the highest volatility (0.131) in comparison with the other returns and indicates that the mean returns have high movements at the end of the year due to the expectation of results in the next month. On the other hand, the lowest volatility is observed in the month of October (0.0421). The majority of the kurtosis values are higher than 3, for instance those for the months of January (5.309), April (3.662), July (4.133), August (3.155) and December (8.191), which all explain the high peaks surrounding the mean returns. Moreover, positive skewness is observed in the months of February (0.213), June (0.573), September (0.0934), October (0.223) and November (0.268), and all the other months report negative skewness values. Nevertheless, none of the months indicate skewness of normal distribution.

### 5.10.3 Descriptive Statistics: Returns around Holidays

Table 5-3 presents the descriptive examination of the returns around holidays. It reports the mean, maximum, minimum, standard deviation, skewness, kurtosis and standard error (SE mean). The holidays considered in our analysis are pre-Milad, post-Milad, pre-Kashmir Day, post-Kashmir Day, pre-Pakistan Day, post-Pakistan Day, pre-Independence Day, post-

Independence Day, pre-Labour, post-Labour, pre-Quaid/Christmas and post-Quaid/Christmas.

**Table 5-3: Descriptive Statistics of the Returns around Holidays**

| Holidays | Mean | Max. | Min. | Std Dev. | Skewness | Kurtosis | SE (Mean) |
|---|---|---|---|---|---|---|---|
| Pre-Milad | 0.005462 | 0.011318 | 0.001966 | 0.004086 | 0.85748 | 2.13003 | 0.002043 |
| Post-Milad | 0.004488 | 0.011432 | -0.00282 | 0.006234 | 0.134056 | 1.387725 | 0.002788 |
| Pre-Kashmir | 0.002903 | 0.015288 | -0.00828 | 0.008871 | 0.353698 | 1.824968 | 0.003353 |
| Post-Kashmir | 0.004541 | 0.010561 | 0.00083 | 0.003521 | 0.620006 | 1.928758 | 0.001245 |
| Pre-Pak. Day | -0.00431 | 0.004294 | -0.03441 | 0.013614 | -1.83662 | 4.710368 | 0.005146 |
| Post-Pak. Day | -0.00241 | 0.031074 | -0.03958 | 0.021893 | -0.24751 | 2.717292 | 0.008275 |
| Pre-Indep. Day | 0.00084 | 0.012848 | -0.01425 | 0.010434 | -0.45195 | 1.804437 | 0.003689 |
| Post-Indep. Day | 0.004791 | 0.021215 | -0.00407 | 0.009071 | 0.885287 | 2.375238 | 0.003207 |
| Pre-Labour | -0.00326 | 0.013184 | -0.01591 | 0.009384 | 0.436918 | 2.241317 | 0.003318 |
| Post-Labour | -0.00258 | 0.01378 | -0.02872 | 0.013289 | -0.85923 | 2.94663 | 0.004698 |
| Pre-Quaid/Christmas | -0.00307 | 0.005334 | -0.03319 | 0.013682 | -1.81851 | 4.628585 | 0.005171 |
| Post-Quaid/Christmas | -0.00331 | 0.010733 | -0.02282 | 0.010176 | -0.69019 | 2.891812 | 0.003598 |
| Pre-Fit. | 0.00530 | 0.030110 | 0.00090 | 0.008710 | 0.517312 | 3.762621 | 0.003878 |
| Post-Fit. | 0.002812 | 0.012471 | -0.04321 | 0.011782 | -0.13641 | 1.813757 | 0.004766 |
| Pre-Adh. | 0.001803 | 0.020221 | -0.01262 | 0.012762 | 0.112163 | 1.852646 | 0.003861 |
| Post-Adh. | 0.000721 | 0.012621 | -0.01482 | 0.011266 | -0.21451 | 1.721647 | 0.003217 |

This study’s final illustration of the descriptive analysis shows positive mean returns of many pre- and post-holiday periods, for instance pre-Milad (0.005462), post-Milad (0.004488), pre-

Kashmir (0.002903), post-Kashmir (0.004541), pre-Independence (0.00084) and post-Independence (0.004791). In other words, we can say that four holidays (pre and post) have positive mean returns in the Pakistani equity market in comparison with the remaining holidays' mean returns. The highest positive mean returns are observed in pre-Milad (0.005462) and after that post-Pakistan Independence Day (0.004791). Possibly the highest positive mean returns are based on the behavioural aspects of the investors, because both events bring positive feelings; for instance, pre-Milad is Prophet Muhammad birthday and Muslims are more spiritually attached, and the second event is the Independence Day of Pakistan and is celebrated with high spirit across the entire nation. Therefore, the results can be aligned with the theory given in the early study by Wachtel (1942), in which emotions are attached to the returns of stocks.

Negative mean returns are observed pre-Pakistan Day (-0.00431), post-Pakistan Day (-0.00241), pre-Labour Day (-0.00326), post-Labour Day (-0.00258), pre-Quaid/Christmas Day (-0.00307) and post-Quaid/Christmas Day (-0.00331). It is very interesting to note that the standard deviation is high in all the observations for which the mean returns are negative in comparison with a lower standard deviation for mean returns that are positive. Moreover, the highest volatility in returns is observed post-Pakistan Day (0.021893) and the lowest volatility is observed post-Kashmir Day (0.003521).

Positive skewness is observed pre-Milad (0.85748), post-Milad (0.134056), pre-Kashmir (0.353698), post-Kashmir (0.620006), post-Independence Day (0.885287) and pre-Labour Day (0.436918). On the other hand, negative skewness is observed for the following holidays: pre-Pakistan Day (-1.83662), post-Pakistan Day (-0.24751), pre-Independence Day (-0.45195), post-Labour Day (-0.85923), pre-Quaid/Christmas (-1.81851) and post-

Quaid/Christmas (-0.69019). Nevertheless, none of the months indicate skewness of normal distribution.

### 5.11 Empirical Results: Day-of-the-Week Effect

Table 5-4 contains the empirical results for the GARCH regression for the day-of-the-week effect along with the weekend effect. The study has used Z-test to compare sample and population means to know if there's a significant difference between them. Z-tests always use normal distribution and also ideally applied if the standard deviation is known. Z-tests are often applied if the certain conditions are met; otherwise, other statistical tests like T-tests are applied in substitute. Z-tests are often applied in large samples (n > 30). When T-test is used in large samples, the t-test becomes very similar to the Z-test. There are fluctuations that may occur in T-tests sample variances that do not exist in Z-tests. Because of this, there are differences in both test results and appropriate to use Z test in this study.

Moreover, the following table considers variables such as Monday, Tuesday, Wednesday, Thursday and Constant (Friday)[14].

[14] For further work, day of the week (DOW) effect could be run with the 5 dummies instead of 4 dummies plus a constant.

**Table 5-4: Empirical Results: Day-of-the-Week Effect (Mean Equation)**

| Variables | Coef. | Std Err. | z | P>\|z\| | 95% Conf. | Interval |
|---|---|---|---|---|---|---|
| Monday | -0.00331 | 0.000443 | -7.470 | 0.000** | -0.00418 | -0.00244 |
| Tuesday | -0.00145 | 0.000475 | -3.050 | 0.0020** | -0.00238 | -0.000515 |
| Wednesday | -0.000663 | 0.000450 | -1.470 | 0.141 | -0.00155 | 0.000220 |
| Thursday | -0.000513 | 0.000413 | -1.240 | 0.214 | -0.00132 | 0.000297 |
| Cons. | 0.00217 | 0.000314 | 6.920 | 0.000** | 0.00156 | 0.00279 |
| **Variance Equation** | | | | | | |
| ARCH L1. | 0.359 | 0.0258 | 13.91 | 0.000** | 0.308 | 0.409 |
| GARCH L1. | 0.580 | 0.0381 | 15.23 | 0.000** | 0.505 | 0.654 |
| Cons. | 2.29e-06 | 2.56e-06 | 0.900 | 0.370 | -2.72e-06 | 7.30e-06 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

Table 5-4 represents the results of equation 2 to examine the weekend effect of the Pakistan Stock Exchange. It shows that the equity market has the presence of the highly significant weekend effect or the Friday effect with probability of 0.000. Moreover, the market also indicate highly significant Monday (0.000) and Tuesday (0.00200) effect.

The Z statistics indicate the negative values on all the days of the week except Friday; for example, Monday (-7.470), Tuesday (-3.050), Wednesday (-1.470), Thursday (-1.240) and the Constant (Friday) show a positive value (6.920). The negative values indicated in the Z statistics explain the low level of returns on each day of the week except Friday in the relationship of mean returns. However, the positive value of returns on Friday indicates a high level of returns on Friday in comparison with the mean return. It is a clear indication that Friday has the highest return of the mean returns among the days of the week and shows the presence of the weekend anomaly on the Pakistan Stock Exchange.

The ARCH and GARCH probabilities show zero P values, explaining that the previous day's return $(H_{t-1})$ information can influence today's return $(H_t)$. Therefore, it can be concluded that the returns on each day influence the other days as well. Moreover, it is visible from Table 5-4 that the GARCH coefficient value is higher (0.580), which depicts persistency in the returns value, and, on the other hand, the smaller ARCH value (0.359) shows less sensitivity to information. It could also be suggested that the Pakistan Stock Exchange has the inefficient weak form of market efficiency, because the performance of the price is not random and usually develops on predicted error values of the previous day. Considering that the total summation of ARCH and GARCH is 0.939, which is less than one, this puts forward an interesting argument that volatility decreases on Friday by 0.061. There is also a valid opinion that volatility in the returns on different days of the week is affected by own and inside shocks and surprises constructed on the basis of news or the flow of information.

## 5.12 Empirical Results: Monthly Effect

Table 5-5 contains the empirical results for the monthly effect or turn-of-the-year effect.

**Table 5-5: Empirical Results: Monthly Effect**

| **Mean Equation** | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | **Coef.** | **Std Err.** | **z** | **P>\|z\|** | **95% Conf.** | **Interval** |
| Jan | 0.0279 | 0.0197 | 1.410 | 0.157 | -0.0108 | 0.0666 |
| Feb | -0.0167 | 0.0317 | -0.530 | 0.597 | -0.0788 | 0.0453 |
| Mar | -0.00836 | 0.0216 | -0.390 | 0.700 | -0.0508 | 0.0341 |
| Apr | 0.0228 | 0.0384 | 0.590 | 0.554 | -0.0526 | 0.0981 |
| May | -0.0193 | 0.0177 | -1.090 | 0.275 | -0.0540 | 0.0153 |
| Jun | 0.00310 | 0.0376 | 0.0800 | 0.934 | -0.0706 | 0.0768 |
| Jul | 0.0209 | 0.0218 | 0.960 | 0.338 | -0.0218 | 0.0635 |
| Aug | -0.0442 | 0.0221 | -2 | 0.0460** | -0.0875 | -0.000872 |
| Sep | 0.0259 | 0.0314 | 0.830 | 0.408 | -0.0355 | 0.0874 |
| Oct | -0.000240 | 0.0400 | -0.0100 | 0.995 | -0.0786 | 0.0781 |
| Nov | 0.0272 | 0.0281 | 0.970 | 0.332 | -0.0278 | 0.0822 |
| Dec | 0.000781 | 0.0178 | 0.0400 | 0.965 | -0.0342 | 0.0357 |
| **Variance Equation** | | | | | | |
| ARCH L1 | 2.91e-08 | 0.0210 | 11.02 | 0.000** | 0.310 | 0.421 |
| GARCH L1. | 2.91e-08 | 0.0312 | 15.10 | 0.000** | 0.530 | 0.556 |
| Cons. | 0.00584 | 0.000530 | 2.566 | 0 | 0.00480 | 0.00688 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

Table 5-5 presents the results of equation 3, which examines the monthly effects of returns in the period from January 2005 to December 2015. The outcome indicates that August – m8 (0.0460) has significant results and reveals the seasonality effect, indicating the monthly anomaly in the month of August. It is important to mention that Pakistan has tax effect month ends on June 30th. Moroever, every year the Governmnet of Pakistan announced the annual budget of country during the month of June for next fiscal year and subsequently provisional assemblies announced their budget afterwards. The proper implementation started from the month of July and August. Therefore, significant results of August month anomaly has important consideration for turn of the year effect.

Considering the Z statistics, positive returns are observed in the following months: January (1.410), April (0.590), June (0.08000), July (0.960), September (0.8300), November (0.332) and December (0.965). There is also, however, a further point to be considered in that the highest returns are observed in the month of January, which indicates that the January returns are higher than the mean returns. Moreover, the analysis could be considered as showing the half-of-the-year effect, as the highest returns are observed after the half year end. This is because of the half yearly announcement of unexpected earnings and profits during the month of January from majority of firms in Pakistan. Therefore, we can confirm that the highest returns, that is, above the mean returns, occur in the month of January, because they are an indication of new information arriving in the market. Similarly, an important point to consider is that positive returns are observed after each quarter month except October (m10). It is also an indication that companies release their quarterly earnings information after the quarter ends and the next month soon after the quarter has positive Z values and shows the impact of the news on the returns. Further, the last two months in the analysis, that is, November and December, report positive returns, which are also an indication of investors' behaviour towards understanding the higher returns in January. Based on the ten-month performance or the results of the three quarters already announced in the market, all investors have a clear understanding of the market returns. Therefore, higher January returns are expected by the half-of-year earnings announcements.

Negative Z values are observed in the following months: February (-0.530), March (-0.390), May (-1.090), August (-2) and October (-0.0100). The negative Z values indicate low returns in comparison with the mean returns and are an indication of bewildered investment strategies. The coefficient represents the mean returns in each month, and the highest positive mean return is observed in January (0.0279) and the lowest in October (-0.000240).

The ARCH and GARCH models from table 5-5 are also analysed. The coefficient value of GARCH is higher, which indicates significance in the returns' value, and comparatively the ARCH value is smaller and indicates low volatility of information. The probability values of ARCH and GARCH are reported as zero, suggesting that the last month's return information could affect the current month's returns. Therefore, it could be explained that the Pakistan Stock Exchange is inefficient regarding the weak form of market efficiency, because the movement in price is not considered as random and is generally based on the forecasted error values of the last month.

Moreover, adding the ARCH and GARCH probabilities' values, which are reported as being less than one, it can be observed that volatility decreases with the turn-of-the-year effect, that is, August.

### 5.13 Empirical Results: Holiday Effect

Table 5-6 presents the empirical results for the holiday effect. Moreover, the holidays considered in the analysis are pre-Milad, post-Milad, pre-Kashmir Day, post-Kashmir Day, pre-Pakistan Day, post-Pakistan Day, pre-Independence Day, post-Independence Day, pre-Labour, post-Labour, pre-Quaid/Christmas, post-Quaid/Christmas, pre-Eid Fitr, post-Eid Fitr, pre-Eid Adha and post-Eid Adha. It is important to note that Pakistan holiday's calendar includes Islamic holidays as well. However, the country follows Gregorian calendar as main business activities and used Islamic calendar for religious holidays. Therefore, it is quite interesting to examine the mix and match of two calendar effects within Pakistan.

**Table 5-6: Empirical Results: Holiday Effect**

| **Mean Equation** | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | **Coef.** | **Std Err.** | **z** | **P>\|z\|** | **95% Conf.** | **Interval** |
| Pre-Milad | 0.00384 | 0.0157 | 0.240 | 0.807 | -0.0270 | 0.0347 |
| Post-Milad | 0.00348 | 0.0109 | 0.320 | 0.750 | -0.0179 | 0.0249 |
| Pre-Kashmir | 0.00346 | 0.00214 | 1.610 | 0.106 | -0.000739 | 0.00766 |
| Post-Kashmir | 0.00313 | 0.0135 | 0.230 | 0.817 | -0.0234 | 0.0296 |
| Pre-Pak. | -0.000843 | 0.00842 | -0.100 | 0.920 | -0.0173 | 0.0157 |
| Post-Pak. | -0.00161 | 0.00207 | -0.780 | 0.437 | -0.00566 | 0.00244 |
| Pre-Indep. | 0.000557 | 0.00418 | 0.130 | 0.894 | -0.00764 | 0.00875 |
| Post-Indep. | 0.00266 | 0.00437 | 0.610 | 0.542 | -0.00590 | 0.0112 |
| Pre-Lab. | -0.00464 | 0.00503 | -0.920 | 0.357 | -0.0145 | 0.00522 |
| Post-Lab. | -0.00182 | 0.00301 | -0.600 | 0.547 | -0.00772 | 0.00409 |
| Pre-Qui. | 0.00133 | 0.0116 | 0.120 | 0.908 | -0.0213 | 0.0240 |
| Post-Qui. | -0.00355 | 0.00410 | -0.870 | 0.386 | -0.0116 | 0.00448 |
| Pre-Fit. | 0.00467 | 0.00618 | 0.760 | 0.449 | -0.00744 | 0.0168 |
| Post-Fit. | 0.00666 | 0.00970 | 0.690 | 0.493 | -0.0124 | 0.0257 |
| Pre-Adh. | 0.00210 | 0.00799 | 0.260 | 0.793 | -0.0136 | 0.0177 |
| Post-Adh. | -0.00238 | 0.00211 | -1.130 | 0.259 | -0.00651 | 0.00175 |
| Cons. | 0.00117 | 0.000162 | 7.210 | 0 | 0.000852 | 0.00149 |
| **Variance Equation** | | | | | | |
| ARCH L1. | 0.395 | 0.0270 | 14.66 | 0.000** | 0.342 | 0.448 |
| GARCH L1. | 0.518 | 0.0360 | 14.42 | 0.000** | 0.448 | 0.589 |
| Cons. | 5.84e-06 | 2.44e-06 | 2.390 | 0.0170 | 1.05e-06 | 1.06e-05 |

*The corresponding *P* value is statistically significant at the 10% level
**The corresponding *P* value is statistically significant at the 5% level
***The corresponding *P* value is statistically significant at the 1% level

The above Table 5-6 describes the results of equation 4 by examining the impact of the holiday effect on the Pakistani stock market. This study considers the majority of pre- and post-holiday periods, and Pakistan has many calendar and religious holidays. Moreover, these holidays are considered as the most awaited holidays for market investors. Therefore, these holidays are significant in evaluating anomalies within the market.

It is important to note, however, that the Pakistani stock market does not show any particular trend of returns. None of the reported results show a significant probability value. There is a perception in Pakistan about investors' participation in trading activities surrounding the Eid holiday, but the reported outcomes are different. Therefore, it is very unlikely to be able to predict any seasonality effect from the respective holiday effect on the Pakistani stock market.

However, the positive Z values, for example pre-Milad (0.240), post-Milad (0.320), pre-Kashmir (1.610), post-Kashmir (0.230), pre-Independence (0.130), post-Independence (0.610), pre Quaid/Christmas (0.120), pre-Eid Fitr (0.760), post-Eid Fitr (0.690) and pre-Eid Adha (0.260), indicate positive mean returns in most of the pre- and post-holiday periods. The highest positive values are observed pre-Eid Fitr (0.760) and post-Eid Fitr (0.690), supporting the argument that the returns surrounding the Eid Fitr holiday are higher than the mean returns of the remaining holidays. The negative Z values consist of pre-Pakistan Day (-0.100), post-Pakistan Day (-0.780), pre-Labour Day (-0.920), post-Labour Day (-0.600), post-Quaid/Christmas Day (-0.870) and post-Eid Adha (-1.130), and the lowest Z value is observed pre-Labour Day (-0.920). Therefore, all the negative Z values indicate lower returns for specific pre- and post-holiday days in comparison with the mean returns.

From Table 5-6 it is possible to investigate whether pre-holiday returns are higher than post-holiday returns. This analysis further indicates that investors could gain more returns before the holidays begin because of the emotions, behaviour or happiness attached to the returns for the investors.

Moreover, it is possible to analyse the probabilities of the ARCH and GARCH models reporting significant values, indicating that the all previous days return information has an effect on this holiday’s returns. Therefore, it is clearly explained that the Pakistan Stock Exchange has the inefficient weak form of market efficiency due to the volatility in the stock prices during the pre- and post-holiday days not being random and usually relying on the predicted error values of the previous holidays.

## 5.14 Conclusion

To finish the examination, it can be concluded that there is a day-of-the-week effect, which includes the weekend effect as well as the month-of-the-year effect and the holiday effect in the Pakistani stock market. The results indicate that the Pakistani stock market experiences the weekend effect, as shown by significantly higher returns on Fridays. Moreover, it is noticeable from the analysis that Monday and Tuesday have significant values constituting evidence of the seasonality effect. Based on this analysis, the Pakistani stock market has three consecutive trading days of the anomaly effect. Therefore, investors within the market may build their trend of strategies based on the anomaly noticed in the market. Thus, it is concluded that the day-of-the-week effect in the Pakistani stock market shows the weak form of an inefficient market. In addition, the ARCH and GARCH (1, 1) models indicate that the previous day's return information has an effect on today's return volatility.

In consideration of the seasonality effect, it exists in the month of August and has a significant result. Based on the Z statistics, the highest mean returns are observed in the month of January. The higher positive returns in January may be an indication of the announcement of unexpected earnings and profits after the half year end result announcments. Another important point to consider is that, after the ending of each quarter, the next month has an impact on positive mean returns, except October (m10), which indicates the arrival of earnings news in the Pakistani stock market from companies after each quarter has ended. Based on the Z statistics, the turn-of-the-year effect is experienced by the Pakistan Stock Exchange. Therefore, it could be aligned with the argument of the tax-loss-selling hypothesis. Moreover, November and December achieve positive returns, which reflect the investors' behaviour towards the consideration of higher returns in the month of January, because the market participants already have information on the actual returns of three quarters and match the performance of companies in the last quarter of the year, reflected in the form of higher returns in the month of January. The ARCH and GARCH models reflect significant results and specify that the information on the previous month's return affects the current month's returns.

In the Pakistani stock market, there is no specific pattern of returns for the holiday effect. From the stated outcomes, none of the results show any significant probability values. Examining the Z statistics, the highest positive mean values for pre-Eid Fitr and post-Eid Fitr indicate that investors could gain more returns before and after the Eid Fitr holidays because of the emotions, behaviour or happiness attached to the returns for the investors. It is important to determine whether the ARCH and GARCH models for the holiday effect appear to be significant.

The Pakistani stock market is reflected as not being weak form efficient market, because the seasonality effect appears on three consecutive days of the week and the weekend effect exists in the market. The month-of-the-year effect is obvious in August instead of July, and the holiday effect is not considered to be significant during pre- and post-holiday periods. Each of these notable outcomes represents a vital influence on our understanding of the seasonality effect within the Pakistani stock market and is helpful not only for individual market participants but also for institutional investors.

**Chapter 6: Conclusion**

# 6 Summary

The present Government of Pakistan is implementing vision 2025 which was introduced a couple of years ago. The main aim of the vision is to put Pakistan on the fast track towards economic growth with the absolute objective of transforming the Pakistani economy into one of the top ten economies in the world by 2047. By the end of 2025, it predicts that Pakistan will be among the major twenty-five economies of the world and considered as an upper-middle-income country. The current factual economic indicators show that Pakistan is a middle-income country, but in contrast the social factors fall into the group of least-developed countries. Pakistan today is facing various challenges relating to economy, security and governance. Many nations have faced related problems and challenges in history and magnificently transformed them into lucrative opportunities through balanced economic planning, sound governance and stable policy implementation.

Consequently, it is mandatory for an emerging country like Pakistan to transform its economy to accomplish the goals set for Vision 2025. The economic transformation programme of the Government comprises the stimulation of Pakistan’s equity market. The Security Exchange Commission of Pakistan (SECP) plays an important role in transforming the main stock market, the Pakistan Stock Exchange, and enabling the market to follow the principles of efficient markets in which the flow of information must be transparent, as well as improving the liquidity within the market whereby buyers and sellers deal swiftly without any insider information.

The empirical studies based on market efficiency in chapter three of the thesis provide useful guidelines for all investors, policy developers and market research analysts. The emphasis is on market efficiency in consideration of the capital market's response to the announcement of dividends. The empirical chapter contributes to the literature from the viewpoint of informational market efficiency. In particular, it defines the short- and long-run market efficiency across the Pakistan Stock Exchange in the period from January 2005 to December 2014. It employs the event study methodology, which calculates abnormal returns and associates them with market efficiency. In this chapter the conventional cumulative average abnormal returns method is used over different event windows to capture abnormal returns (market efficiency) in the short and long run. The main methods used in this chapter are based on parametric and non-parametric tests, such as the CAAR test, t-test, Patell Z test, Boehmer et al. test and Corrado rank and sign test.

The results provide strong support for dividend announcements towards the market reaction. Moreover, significant abnormal returns are observed around dividend announcements. The overall market indicates an almost equal percentage of good or bad news based on abnormal returns and expected returns. The results also support signalling theory, because dividend announcements project the outlook of the firm within the market. The results also indicate the slow response of the market to new information towards the market, as positive returns are observed after the announcement of dividends, creating doubts about the efficiency of the market and highlighting the weakness towards the flow of information. Therefore, the market is considered as having the weak form of market efficiency. Moreover, the efficiency curve is another important foundation on which to develop the conclusion that the Pakistan Stock Exchange is a weak form efficient market because of the slow response observed after the announcement of dividends in the CAPM model. Finally, the weak form of market efficiency is also based on the firm size analysis; the percentage change of cumulative abnormal returns in the top 25% companies is higher than that of small companies.

In the fourth chapter, the study of the Pakistan Stock Exchange is extended by introducing liquidity measures, and, this partical aspect of this research is influenced by the work of Florackis et al. (2011). The latest modified liquidity measure presented by Florackis et al. (2011), RtoTR, and the earlier prominent liquidity measure developed by Amihud (2002), RtoV, are implemented on the Pakistani stock market for the first time. It is also helpful to compare the two proxies and address the issues highlighted by Florackis et al. (2011) on any emerging market like Pakistan.

The results of the Pakistani stock market are more aligned with Florackis et al. (2011). They reflect that low RtoTR values indicate higher returns in comparison with high RtoTR ratio values, supporting the arguments of Florackis et al. (2011). Furthermore, the results support the assertion that the trading frequency and trading cost are both significant factors in examining the returns, and similar arguments are also presented by Florackis et al. (2011) and Amihud and Mendelson (1986a). The RtoV ratio produces a negative correlation with the market capitalization in this study's results, which shows that small stocks are basically illiquid, and similar results were presented by Florackis et al. (2011).

In chapter five the empirical analysis identified the presence of anomalies in the Pakistani stock market. The analyses are based on the day-of-the-week effect, which includes the weekend effect as well as the month-of-the-year effect and the holiday effect in the Pakistani stock market. The significance of the studies is the examination of the market anomalies using a similar data set and implementing the ARCH and GARCH models.

The results show that the Pakistani stock market has the weekend anomaly. Furthermore, Monday and Tuesday have significant values and reflect the day of the week effect. In other words, it can be concluded that the Pakistani stock market contains three sequential trading days of anomalies. Therefore, it is a signal for market participants to develop trading strategies based on the seasonality effect existing in the market and the day-of-the-week effect indicates the weak form of an inefficient market.

The seasonality effect exists in the month of August regarding the month-of-the-year effect on the Pakistani stock market. Moroever, every year the Governmnet of Pakistan announced the annual budget of country during the month of June for next fiscal year and subsequently provisional assemblies announced their budget afterwars. The proper implementation started from the month of July and August. However, based on the Z statistics, January represents the highest mean returns in relation to the overall mean returns. The highest mean returns show the appearance of new information in the market during the month of January. Similarly, the next month of each quarter end shows positive returns except for October, indicating the arrival of new information.

The holiday effect does not seem apparent in the Pakistani stock market. No significant value is observed on the holiday effect. However, the Z statistics show the highest return for pre-Eid Fitr and post-Eid Fitr, explaining that the Eid Fitr holiday involves emotions, behaviour or happiness attached to the returns for the investors.

Moreover, the ARCH and GARCH models of all three analyses show significant results, which indicate that the previous day/monthhas a significant effect on the returns of the current month/current holiday.

## 6.1 Economic Significance

The vision of Pakistan-2025 is to transform the Pakistani economy to become compatible and build the trust of all investors. Part of the transformation programme is to revitalize the Pakistani stock market and increase the transparency and trading volumes within the market. Pakistan has a favourable position in the emerging market bloc, due to surge in Chinese investments in the form of the China–Pakistan Economic Corridor (CPEC), which shows signs of optimism for investors and the opening of the window of the Asian Tiger, which would pull a wider horizon of investors all around the world into the equity market.

Furthermore, Pakistan's stock market has created history, showing exciting returns to global investors and members of the business community, who are wondering and asking questions regarding the flow of money into Pakistan despite its many challenges. Certainly, stable economic growth is replicating Pakistan's political atmosphere in Karachi, Baluchistan and the Federally Administered Tribal Areas (FATA). The main reason behind Pakistan's growing economy is based on the China-funded loans and investments generated in the shade of the CPEC.

## 6.2 Market Efficiency Recommendations for the Pakistan Stock Exchange

It is important for the authority to take some steps to enhance the liquidity within the market, increasing the buying and selling volume in a transparent manner. Further, it is necessary to limit family ownership and welcome new industries for listing to the Pakistan Stock Exchange.

Proper regulations should be put in place to enhance the equity base of companies, which will ultimately increase the corporate debt market. Moreover, for common investors all companies should disclose correct, accurate and understandable financial reports. There is a need to improve the market norms by keeping checks on insider trading by directors and senior executives of companies, and they should be bound to disclose their sales and purchases.

## 6.3 Implication, Limitations and Future Research

This research will implies towards existing shareholders and stakeholders to build investing strategies based on reecent performance of the Pakistan Stock Exchange has been outstanding, and it has become a top performer in all the Asian markets, generating 46% growth in 2016. Moreover, better market efficiency and liquidity would make the market more attractive. Therefore, the current study helps to take the market towards the next level that is, becoming a developed market by 2025, by enabling a transparent flow of information to all investors and increasing the size of the market by building confidence among local and global investors.

The current growth in the stock market is also a perfect example of the potential within the market, and it is important to find the true prices of assets through the demand and supply of the market. As a result it will definitely encourage more investment, transparency and growth in the Pakistani economy.

This thesis emphasizes market efficiency through event studies. The empirical chapter three only covers dividend announcements. The inclusion of different events in the study will allow further investigation of the efficiency level of the market. The inclusion of other announcement such as EPS, profitability or some qualitative information such as change of

CEO etc would be interesting to examine the market efficiency. Moreover, the study explains firm size distributed across market capitalization. However, there is a further opinion on research on firms divided into traded volumes, which will analyse the influence of market efficiency on firms based on highly liquid firms.

The examination of liquidity measures in chapter four, related to Florackis et al.'s (2011) RtoTR and Amihud's (2002) RtoV, would be benefit from implementation of the same comparison ratios in more than one emerging market for robustness. This poses the question of whether RtoTR or RtoV may better capture liquidity when applied to more than one emerging market. Further research is encouraged to address the ratio with some economic indicators, such as RtoGDP and R/interest rate etc.

An analysis of the seasonality effect in relation to the day-of-the-week, month-of-the-year and holiday effects is conducted in chapter five. Further advanced modelling of TGARCH and EGARCH could be implemented for a better analysis. This study caters for very few Islamic holidays in the analysis. It would be beneficial for further studies to implement the same model on the pure Islamic calendar and specifically to cater for the holidays based on the Islamic calendar. Finally, the seasonality effects could be used in religious, cultural and seasonal calendars as well, to capture people's behaviours and emotions are linked to the returns of the markets.

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# 8 Appendices

| Holiday date | Holidy name |
|---|---|
| 04-Jan-15 | Eid Milad un-Nabi |
| 05-Feb-15 | Kashmir Day |
| 23-Mar-15 | Pakistan Day |
| 01-May-15 | Labor Day |
| 18-20 Jul-15 | Eid-ul-Fitr |
| 14-Aug-15 | Independence Day |
| 24-27 Sept-15 | Eid-ul-Azha |
| 25-Dec-15 | Quaid Birthday/Christmas holiday |
| | |
| | 2014 |
| | |
| 14-Jan-14 | Eid Milad un-Nabi |
| 05-Feb-14 | Kashmir Day |
| 23-Mar-14 | Pakistan Day |
| 01/05/2014 | Labor Day |
| 29Jul- 1st Aug-14 | Eid-ul-Fitr |
| 14/08/2014 | Independence Day |
| 6Oct-8Oct -14 | Eid-ul-Azha |
| 25-Dec-14 | Quaid Birthday/Christmas holiday |
| | |
| | 2013 |
| | |
| 24-Jan-13 | Eid Milad un-Nabi |
| 05-Feb-13 | Kashmir Day |
| 23-Mar-13 | Pakistan Day |
| 01-May-13 | Labor Day |
| 8 Aug - 11 Aug - 2013 | Eid-ul-Fitr |
| 14-Aug-13 | Independence Day |
| 15-16 Oct - 2013 | Eid-ul-Azha |
| 25-Dec-13 | Quaid Birthday/Christmas holiday |
| | |
| | 2012 |
| | |
| 05-Feb-12 | Eid Milad un-Nabi |
| 05-Feb-12 | Kashmir Day |
| 23-Mar-12 | Pakistan Day |
| 01-May-12 | Labor Day |
| 19-22- Aug-2012 | Eid-ul-Fitr |
| 14-Aug-12 | Independence Day |
| 26-27-Oct -2012 | Eid-ul-Azha |

| | |
|---|---|
| 25-Dec-12 | Quaid Birthday/Christmas holiday |
| | |
| | 2011 |
| | |
| 17-Feb-11 | Eid Milad un-Nabi |
| 05-Feb-11 | Kashmir Day |
| 23-Mar-11 | Pakistan Day |
| 01-May-11 | Labor Day |
| 31 Aug - 3 Sept -2011 | Eid-ul-Fitr |
| 14-Aug-11 | Independence Day |
| 7-8 Nove 2011 | Eid-ul-Azha |
| 25-Dec-11 | Quaid Birthday/Christmas holiday |
| | |
| | 2010 |
| | |
| 01-Mar-10 | Eid Milad un-Nabi |
| 05-Feb-10 | Kashmir Day |
| 23-Mar-10 | Pakistan Day |
| 01-May-10 | Labor Day |
| 10-13 Sept 2010 | Eid-ul-Fitr |
| 14-Aug-10 | Independence Day |
| 17-18 Nov 2010 | Eid-ul-Azha |
| 25-Dec-10 | Quaid Birthday/Christmas holiday |
| | |
| | 2009 |
| | |
| 09-Mar-09 | Eid Milad un-Nabi |
| 05-Feb-09 | Kashmir Day |
| 23-Mar-09 | Pakistan Day |
| 01-May-09 | Labor Day |
| 21-24 Sept 2009 | Eid-ul-Fitr |
| 14-Aug-09 | Independence Day |
| 28-29 Nov 2009 | Eid-ul-Azha |
| 25-Dec-09 | Quaid Birthday/Christmas holiday |
| | |
| | 2008 |
| | |
| 21-Mar-08 | Eid Milad un-Nabi |
| 05-Feb-08 | Kashmir Day |
| 23-Mar-08 | Pakistan Day |
| 01-May-08 | Labor Day |
| 2-5 Oct 2008 | Eid-ul-Fitr |
| 14-Aug-08 | Independence Day |
| 9-10 Dec 2008 | Eid-ul-Azha |

| | |
|---|---|
| 25-Dec-08 | Quaid Birthday/Christmas holiday |
| | |
| | 2007 |
| | |
| | |
| 31-Mar-07 | Eid Milad un-Nabi |
| 05-Feb-07 | Kashmir Day |
| 23-Mar-07 | Pakistan Day |
| 01-May-07 | Labor Day |
| 13-16 Oct 2007 | Eid-ul-Fitr |
| 14-Aug-07 | Independence Day |
| 01-Jan-07 | Eid-ul-Azha (Second day of Eid, First day of Eid on 31-Dec-2006) |
| 25-Dec-07 | Quaid Birthday/Christmas holiday |
| | |
| | |
| | 2006 |
| | |
| 11-Apr-06 | Eid Milad un-Nabi |
| 05-Feb-06 | Kashmir Day |
| 23-Mar-06 | Pakistan Day |
| 01-May-06 | Labor Day |
| 24-27- Oct 2006 | Eid-ul-Fitr |
| 14-Aug-06 | Independence Day |
| 10-11 Jan-2006 & 31-Dec-2006 | Eid-ul-Azha (First day of Eid on 31-Dec-2006 and second day of Eid observed 1-Jan-2007) |
| 25-Dec-06 | Quaid Birthday/Christmas holiday |
| | |
| | |
| | 2005 |
| | |
| 22-Apr-05 | Eid Milad un-Nabi |
| 05-Feb-15 | Kashmir Day |
| 23-Mar-05 | Pakistan Day |
| 01-May-05 | Labor Day |
| 04-07 November 05 | Eid-ul-Fitr |
| 14-Aug-05 | Independence Day |
| 21-22 Jan 2005 | Eid-ul-Azha |
| 25-Dec-05 | Quaid Birthday/Christmas holiday |
| | |