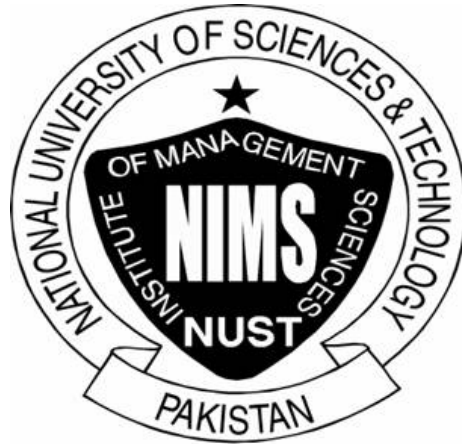


NUST Institute of Management Sciences



“Market Volatility At Karachi Stock Exchange”

Submitted To

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Executive Summary

Stock market volatility has always been of great concern to the investors in stock exchanges all over the world. In the past lot of research has been done on this. Researchers have tried to find out its causes, impact and remedies using various methodologies and tools. But still there is a lot to be done as the dynamics of volatility keeps on changing with the changing geopolitical and socio economic scenario.

Stock markets in Pakistan are still in the growing phase. Karachi Stock Exchange experienced high growth in the past few years under the policies of the current government. There were certain stages when the stock market crashed badly and investors lost billions of rupees. The stock market has been experiencing very volatile situations and the trend is still not over.

This thesis is aimed at carrying out a detailed study on the Karachi stock exchange's volatile situation. Effort is being made to figure out the various factors that cause inefficiencies in the functioning of the Karachi Stock Exchange. Then a link is established between these inefficiencies that result in market volatility. This has been tested with the help of some statistical tests which were carried out on the prominent KSE-100 Index companies that have a fair representation of the Index movements.

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Chapter No. 1

INTRODUCTION

1.1 Market Volatility

In financial terms, volatility is the degree to which the price of a security, commodity, or market rises or falls within a short-term period of time. Most importantly, the definition specifically mentions price increases and decreases. People are usually most concerned about volatility during periods when prices decrease or go through a “correction.” During an extreme bull market hardly anyone seems to care that the markets are exhibiting volatility.

Volatility is difficult to analyse because it means different things to different people. People are rarely precise when they talk about volatility. Also, there is a lot of misinformation about volatility. People speak of volatility without defining what they mean by the term. Most people use volatility and risk interchangeably. However, volatility has to do with variability while risk has to do with variability that is unpredictable or uncertain.

Different investors in different market sectors may have different characteristics with respect to risk. Because of this, different sectors may have different volatilities. Therefore, looking at the volatility of a market really means looking at the volatility of the indices of the securities within the market. For each individual security, its beta measures the security’s volatility relative to the market as a whole, but if beta stays the same, and the market’s risk increases, then the risk associated with a given security will increase.

Market volatility is an uncontrollable and unpredictable risk associated with investing. Though each individual stock has its own volatility pattern, certain stocks' prices fluctuate daily while others vary incrementally. The volatility of the market as a whole is usually not as dramatic as an individual stock. In addition, different market

sectors also have varying levels of volatility. There are several factors that play into market movements including politics, interest rates, and spending trends.

1.2 Significance of a Stock Market

Stock markets play a very vital role in building national economies. The stock markets provide a place where buyers and sellers meet and trade securities. The efficient markets encourage investments by the people that help different organizations to raise funds and grow their businesses. The secondary markets facilitate the trading of seasoned instruments thereby providing the investors an opportunity to create value for their investments. This function of a secondary market influences the performance of a primary market. The interlinked functioning of the primary and secondary markets makes it easy for the companies to generate funds for their businesses.

The companies do not get any direct financial benefits from the trading taking place in the secondary markets; however, the financial managers need to keep an eye on the company's stock price in the stock market. This gives the managers an idea about how the stock is being valued in the market by the investors and thus they can plan the funds they can raise by bringing new offerings in the primary markets.

So we can say that the markets play equally important roles for the investors who are looking for creating value for their money as well as the organisations who intend to raise funds in order to successfully accomplish their future plans to expand and grow their businesses. That is how an economic activity is generated in a country that is of great importance to the developing economies like Pakistan.

1.3 Role of Stock Markets in Pakistan

Pakistan has three stock exchanges in Karachi, Lahore and Islamabad out of which Karachi Stock Exchange is the major exchange in the country. In the recent past we have seen some steps taken by the present government to boost the economy. Keeping in view the role a stock exchange plays in an economy the government has tried to take measures to make our exchanges efficient and attractive for the investors. So far

our exchanges have been under the influence of institutions that can really control the performance of the stock market. To counter this, the government is working on demutualization of the stock exchanges.

In the last couple of years we have seen increased activity in the stock markets. The Karachi stock exchange has crossed the 10,000 points value that is an enormous increase. Still with little fluctuations the market is doing well by maintaining the index around this level. Mainly this increase has been contributed by the banking and oil & gas sector the main companies being OGDC, PTCL, PSO, POL and NBP.

1.4 Objective

The objective of this study is to analyse what impact does volatility has on the overall investment environment in the Karachi Stock Exchange. Pakistan stock markets are still under the influence of some powerful parties/institutions who can really define the course of the stock market. The efficiency in the market is also questionable which has an obvious impact on the overall functioning of the market and thus we see market being very volatile. All these things make investment in stock market very risky. So this study is aim at analysing the situation in detail which causes the market to be so volatile.

1.5 Hypothesis

The hypothesis to be tested is that the market lacks informational and operational efficiency that is consistent with the market volatility. The hypothesis will be tested by efficiency and volatility tests.

1.6 Scope

The study will be carried out by considering the activities in top 10 KSE-100 index companies by capitalization, which is a fair representation of the different sectors, during the months of May, June and July 2006.

1.7 Methodology

The work will be done by gathering the information from the stock exchanges, consulting different books and articles and Internet search. The data that will be used is going to be mostly secondary with little first hand information.

Chapter No. 2

ORGANISATION OF STOCK MARKETS

Well-functioning financial institutions encourage technological innovation by identifying and funding those entrepreneurs with the best chances of successfully implementing innovative products and production processes. It is a common saying, “Where enterprise leads finance follows.” According to this view, economic development creates demands for particular types of financial arrangements, and the financial system responds automatically to these demands. There is a belief that the development of financial markets and institutions is a critical part of the growth process. There is evidence that the level of financial development is a good predictor of future rates of economic growth, capital accumulation, and technological change. Financial market development crucially affects the speed and pattern of economic development.

2.1 Role of a Financial System

The costs of acquiring information and making transactions create incentives for the emergence of financial markets and institutions. Put differently, state-contingent claim framework with no information or transaction costs, there is no need for a financial system that expends resources researching projects, scrutinizing managers, or designing arrangements to ease risk management and facilitate transactions. Different types and combinations of information and transaction costs motivate distinct financial contracts, markets, and institutions.

A financial system is plays following important roles in the uplift of an economy.

- Facilitates the exchange of goods and services
- Mobilizes savings
- Allocates resources
- Monitors managers and exert corporate control
- Facilitates the trading, hedging, diversifying, and pooling of risk

2.2 Components of a Financial System

A financial system broadly has three main components as discussed below:

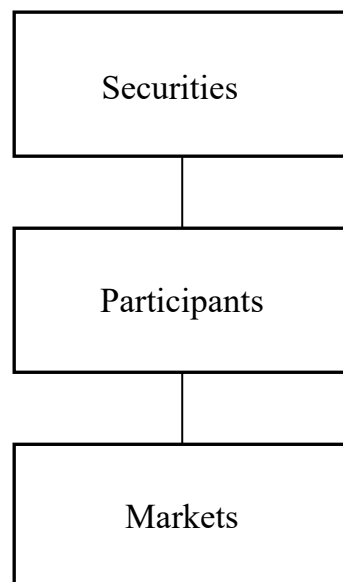


Fig 2.1: Components of a Financial System

1. Financial Instruments/Securities

One component of the financial system is the financial instruments or the securities. Every financial transaction creates a security which is simultaneously a financial asset (to the holder) and a financial liability (to the issuer). A security is a claim against real resources either in the form of an income stream or in the form of physical capital or assets. Securities can be classified on the basis of issuer; that will determine the risk of the particular security, currency, denomination, collateral/asset backing, term to maturity, pattern of income payments etc.

2. Participants

The participants are the people involved in the trading activities. Depending upon the role they have in the trades they can be further categorized as:

a) Market Makers

Market makers do not earn a commission from their activities. They simply buy and sell shares on their own account but make their money on the difference between the price they pay for buying shares and what they sell them for. This difference is called the 'spread'.

b) Financial Intermediaries/Stock Brokers

A stockbroker is referred to as the retail part of the market. Stockbrokers act on behalf of clients and buy and sell shares on their behalf and generally belong to firms who are members of the Stock Exchange.

They earn their money from charging a commission on each transaction. They might also advise clients on the shares that the client might be thinking of trading. Because there could obviously be a conflict of interest with stockbrokers advising clients of trades that might not be necessary to build the commission of the broker, their work is regulated. The rules are very tight and strictly observed and enforced. The process of buying and selling for the purpose of generating commission is called 'churning'. Some stockbrokers may act as 'execution only'. This means they merely buy and sell shares at low commission rates but do not offer any advice.

c) The End Users

The end user can be an individual or an institution trying to increase the value of his investment. The main aim is certainly to increase the worth of his investment. In an effort to do so they make trades by buying or selling stocks through intermediaries at some market place. That is the complete cycle runs and an activity is generated.

3. Markets

The third component of a financial system, are the markets in which securities are traded. An organized financial market is a place where or a system through which, securities are created and transferred. Financial markets can be classified according to the following types:

a) Call Vs Continuous Markets

In call markets, trading for individual stocks takes place at specified times. The intent is to gather all bids and ask for the stock and attempt to arrive at a single price where

the quantity demanded is as close as possible to the quantity supplied. Call markets are generally used during the early stages of development of an exchange when there are few stocks listed or a small number of active traders /investors. After determining all the available buy and sell orders, exchange officials attempt to arrive at a single price that will satisfy most of the orders, and all orders are transacted at this one price.

In a continuous market, trades occur at any time the market is open. Stocks in this continuous market are priced either by auction or by dealers. If it is a dealer market, dealers are willing to make a market in the stock, which means that they are willing to buy or sell for their own account at a specified bid and ask price. If it is an auction market, enough buyers and sellers are trading to allow the market to be continuous; that is, when you come to buy stock, there is another investor available and willing to sell stock.

b) Physical Vs. Over The Counter Market

Financial markets can either exist in physical form or securities can be traded in over-the-counter markets using a system of computers screens and telephones. The OTC market is not a formal organization with membership requirements or a specific list of stocks deemed eligible for trading. In theory any security can be traded on the OTC market as long as registered dealer is willing to make a market in the security (willing to buy and sell shares of the stock).

c) Money Vs. Capital Market

Markets can also be classified according to the time to maturity of the securities traded in them. A major distinction can be drawn between money markets and capital markets. *Money markets* deal in securities with less than one year to maturity, whereas *capital markets* deal in securities with more than one year to maturity.

d) Primary Vs. Secondary Market

The principal distinction is between primary markets where new securities are sold to acquire new capital. In this case the money obtained goes to the company issuing those securities where as secondary markets are those where outstanding securities are bought and sold.

2.3 Characteristics of a Good Market

There are many financial markets, but they are not all equal-some are active and liquid; others are relatively illiquid and inefficient in their operations. A good stock market generally has following characteristics:

a) Timely and Accurate Information

One enters a market to buy or sell a good or service quickly at a price justified by the prevailing supply and demand. To determine the appropriate price, participants must have timely and accurate information on the volume and prices of past transactions and on all currently outstanding bids and offers.

b) Liquidity

Another prime requirement is liquidity, the ability to buy or sell an asset quickly and at a known price-that is, a price not substantially different from the price for prior transactions, assuming no new information is available. An asset's likelihood of being sold quickly, sometimes referred to as its marketability, is a necessary, but not a sufficient, condition for liquidity. The expected price should also be fairly certain, based on the recent history of transaction prices and current bid-ask quotes.

A component of liquidity is **price continuity**, which means that prices do not change much from one transaction to the next unless substantial new information becomes available. A market with price continuity requires **depth**, which means that numerous potential buyers and sellers must be willing to trade at prices above and below the current market price. In summary, liquidity requires marketability and price continuity, which, in turn, require depth.

c) Transaction Cost/ Internal efficiency

Lower costs (as a percent of the value of the trade) make for a more efficient market. An individual comparing the cost of a transaction between markets would choose a market that charges 2 percent of the value of the trade compared with one that charges 4 percent. This attribute is also referred to as internal efficiency.

d) External/ Informational Efficiency

a buyer or seller would always want the prevailing market price to adequately reflect all the information available regarding supply and demand factors in the market. If such conditions change as a result of new information, the price should change accordingly. Therefore, the participants want prices to adjust quickly to new information regarding supply and demand, which means that prices reflect all available information about the asset.

2.4 Why Secondary Markets Are Important

Because the secondary market involves the trading of securities initially sold in the primary market, it provides liquidity to the individuals who acquired these securities. After acquiring securities in the primary market, investors want the ability to sell them again to acquire other securities. The primary market benefits greatly from the liquidity provided by the secondary market because investors would hesitate to acquire securities in the primary market if they thought they could not subsequently sell them in the secondary market. That is, without any active secondary market, potential issuers of stocks or bonds in the primary market would have to provide a much higher rate of return to compensate investors for the substantial liquidity risk.

Secondary markets are also important to those selling seasoned securities because the prevailing market price of the securities is determined by transactions in the secondary market. New issues of outstanding stocks or bonds to be sold in the primary market are based on prices and yields in the secondary market. Even forthcoming IPOs are priced based on the prices and values of comparable stocks or bonds in the public secondary market.

2.5 Trading Systems

The stock market in different parts of the world can differ in their trading systems. There are two major trading systems and an exchange can use one of these or a combination of both the systems. The two major trading systems are discussed below:

a) Pure Auction Market

In a pure auction market trading system interested buyers and sellers submit bid and ask prices for a given stock to a central location where the orders are matched by a broker who does not own the stock but who acts as a facilitating agent. Participants refer to this system as price driven because shares of stock are sold to the investor with the highest bid price and bought from the seller with the lowest offering price. The proponents of the auction system make an argument for a very centralized market that ideally will include all the buyers and sellers of the stock.

b) Dealer Market

The other major trading system is the dealer market where individual dealers provide liquidity for investors by buying and selling the shares of stock for themselves. Ideally, with this system there will be numerous dealers who will compete against each other to provide the highest bid prices when you are selling and lowest asking price when you are buying the stock.

The Karachi Stock Exchange is running on a pure auction market trading system in which the orders are matched by a broker and the prices are established by the supply and demand phenomenon and therefore, the trading is done on a price driven system.

2.6 Types of Orders

There are different types of orders entered by investors and the specialist as a dealer depending upon the requirements and their own understanding of carrying out the trade are discussed below:

a) Market Orders

The most frequent type of order is a market order, an order to buy or sell a stock at the best current price. An investor who enters a market sell order indicates a willingness to sell immediately at the highest bid available at the time the order reaches a specialist on the exchange or an OTC dealer. A market buy order indicates that the investor is willing to pay the lowest offering price available at the time the order

reaches the floor of the exchange or an OTC dealer. Market order provides immediate liquidity for someone willing to accept the prevailing market price.

b) Limit Orders

In a limit order the individual placing the order specifies the buy or sell price. The buyer or seller does not want to trade at the prevailing market price and set their own bid and ask prices. It is to be indicated how long the limit order will be outstanding. Alternative time specifications are basically boundless. A limit order can be instantaneous; **Fill or Kill**, meaning that the order is to be executed immediately or otherwise be cancelled. This order can be good for some part of a day, a full day or may be several days. It can also be open ended, or **Good Till Cancelled (GTC)**.

c) Short Sales

A short sale is the sale of stock that you do not own with the intent of purchasing it back later at a lower price. Most investors purchase stock expecting to drive their return from an increase in value. But those who believe that a stock is over priced, however, and want to take advantage of an expected decline in the price, can sell the stock short. In short selling the individual would borrow the stock from another investor through the broker, sell it in the market, and subsequently replace it at a price lower than the price at which he sold it. The investor who lent the stock has the proceeds of the sale as collateral.

Three technical points affect short sale. **First**, a short sale can be made only on an **Uptick Trade**, meaning the price of short sale must be higher than the last trade price. This is because the exchanges do not want traders to force a profit on a short sale by pushing the price down through continually selling short. **Second**, the short seller must pay ant dividends due to the investor who lent the stock. The purchaser of the short sale stock receives the dividend from the corporation, so the short seller must pay a similar dividend to the lender. **Finally**, short sellers must post the same margin as an investor who had acquired stock. This margin can be in any unrestricted securities owned by the short seller.

d) Special Orders

Apart from these general orders there are some special types of orders.

A **Stop Loss Order** is a conditional market order where by the investor directs the sale of a stock if it drops to a given price. Because of the possibility of market disruption caused by a large number of stop loss orders, exchanges may cancel all such orders on certain stocks and not allow brokers to accept further stop loss orders on those issues.

A related type of stop loss tactic for short sales is a **Stop Buy Order**. An investor who has sold stock short and wants to minimize any loss if the stock begins to increase in value would enter this conditional buy order at a price above that at which the investor sold the stock short.

2.7 Types of Accounts

There are two main types of accounts that an investor can keep with his/her broker:

a) Cash Account

This is the most common type of account which is similar to the standard bank account i.e. deposits must exceed with-drawls. Deposits in this case are the cash and revenues from sale of securities, whereas, with-drawls are in the form of cash and security purchases.

b) Margin Account

It is like a bank account with an overdraft limit. It allows investors to buy securities by paying some amount in cash and borrowing the rest through the broker. The securities are kept with the broker as collateral. The broker charges interest on this loan, at a rate that is related to current money market interest rates. Trading on margin is a means of leverage or gearing that magnifies the percentage gain or loss for a given change in security prices.

2.8 Market Regulations

These financial markets are governed by certain set of rules and regulations. The participants in these markets such as individuals, financial intermediaries, and market makers all are bound by certain code of conduct and ethics and they cannot go outside the umbrella of these regulations while performing their functions and roles. Each country has its own set of regulations, different from those of other countries, regulating these markets. Government in each country formulates its own set of regulations inline with the set of objectives and preferences it has for growth and investments. In Pakistan these markets are regulated by **Security and Exchange commission of Pakistan (SECP)**.

Some of the primary roles of governments in these markets are as follows:

- Providing for an efficient payment system
- Creating a currency with the objective of stable prices
- Providing a means for the central government to finance its activities
- Altering the taxation of income earned on specific types of financial claims as a tool to allocate savings
- Using direct and indirect lending by government chartered institutions, financial guarantees, and other means to allocate savings to investments deemed important.

In an effort to regularize the functioning of the stock markets government is taking significant measures. Recently the issue of demutualization of stock exchanges has grabbed lot of attention. This is not in the interest of influential parties who are now controlling the directions of stock market. So we can clearly see the impact of this on the market in the form of volatility. There are many other measures that are under consideration and the regulatory bodies are working on them.

Chapter No. 3

STOCK MARKETS In PAKISTAN

The Stock Exchange acts on two levels - one as a *primary market* and the other as a *secondary market*. As a primary market, the Stock Exchange will liaise with investment banks and businesses that are looking to raise capital by selling shares. This process involves the business being 'listed' on the Stock Exchange or 'floating'. In this case, the business will effectively get its capital through the initial sale of its shares.

Much of the Stock Exchange's work, however, is as a secondary market. People buying shares may wish to do so for a variety of reasons - to secure dividends or to see the price of the shares rise, for example. If people wish to sell shares then it would be very inconvenient for the business itself to take the shares back and then sell them on to someone else. Such a process would be extremely disruptive and not help planning.

The Stock Exchange, therefore, acts as a market that puts those wanting to sell shares in touch with those seeking to buy - effectively the Stock Exchange is a market for second hand shares

3.1 Role of an Exchange in the Economy

a) Raising Capital for Businesses

The Stock Exchange provides companies with the facility to raise capital for expansion through selling shares to the investing public.

b) Mobilizing Savings for Investment

When people draw their savings and invest in shares, it leads to a more rational allocation of resources because funds, which could have been consumed, or kept in idle deposits with banks, are mobilized and redirected to promote commerce and industry.

c) Redistribution of Wealth

By giving a wide spectrum of people a chance to buy shares and therefore become part-owners of profitable enterprises, the stock market helps to reduce large income inequalities because many people get a chance to share in the profits of business that were set up by other people.

d) Improving Corporate Governance

By having a wide and varied scope of owners, companies generally tend to improve on their management standards and efficiency in order to satisfy the demands of these shareholders. It is evident that generally, public companies tend to have better management records than private companies.

e) Creates Investment Opportunities for Small Investors

As opposed to other businesses that require huge capital outlay, investing in shares is open to both the large and small investors because a person buys the number of shares they can afford. Therefore the Stock Exchange provides an extra source of income to small savers.

f) Government Raises Capital for Development Projects

The Government and even local authorities like municipalities may decide to borrow money in order to finance huge infrastructure projects such as sewerage and water treatment works or housing estates by selling another category of shares known as Bonds. These bonds can be raised through the Stock Exchange whereby members of the public buy them. When the Government or Municipal Council gets this alternative source of funds, it no longer has the need to overtax the people in order to finance development.

g) Barometer of the Economy

At the Stock Exchange, share prices rise and fall depending, largely, on market forces. Share prices tend to rise or remain stable when companies and the economy in general show signs of stability. Therefore the movement of share prices can be an indicator of the general trend in the economy.

3.2 Karachi Stock Exchange

Karachi Stock Exchange is the biggest and most liquid exchange and has been declared as the “Best Performing Stock Market of the World for the year 2002”. As on June 30, 2006, 658 companies were listed with the market capitalization of Rs. 2,801.182 billion (US \$ 46.69) having listed capital of Rs. 495.968 billion (US \$ 8.27 billion). The KSE 100 Index closed at 9989.41 on June 30, 2006.

KSE has been well into the 4th year of being one of the Best Performing Markets of the world as declared by the international magazine “Business Week”. Similarly the US newspaper, USA Today, termed Karachi Stock Exchange as one of the best performing exchanges in the world.

Growth and Progress

Today KSE has emerged as the key institution of the capital formation in Pakistan with:-

- Listed companies 658, securities listed on the exchange 704: ordinary share 658, Preference shares 15 and debt securities (TFC's) 31.
- Listed capital Rs.495, 967.57 million (US\$ 8,226.13 million).
- Market capitalization Rs.2, 801,182.46 million (US\$ 46,686.37 million).
- Average daily turnover 348.53 million shares with average daily trade value Rs. 43,692.08 million (US\$ 728.20 million).
- Membership strength at 200.
- Corporate Members are 140 out of which 9 are public listed companies.
- Active Members are 163.
- Fully automated trading system with T+3 settlement cycle.
- Deliveries through central depository company.
- National Clearing and Settlement System in place.

KSE began with a 50 shares index. As the market grew a representative index was needed. On November 1, 1991 the KSE-100 was introduced and remains to this date the most generally accepted measure of the Exchange. The KSE-100 is a capital weighted index and consists of 100 companies representing about 88 percent of market capitalization of the Exchange.

Pakistan's main stock exchange has planned a new top-30 index reflecting the size of the constituents' free-floating share capital, rather than just total stock market value, in a bid to boost investor appeal. The new KSE-30 index was launched on 1st September. Officials said the new KSE-30 index, the first in Pakistan to be based on a free float, would be a better gauge for investors.

Table 3.1: Profile - Karachi Stock Exchange (Source: KSE)

	2002-03	2003-04	2004-05	2005-06
No. Of Listed Companies	702	668	659	658
Funds Mobilized (Rs. billion)	23.8	70.7	35.2	42.5
Listed Capital (Rs. billion)	300.9	374.1	422	495.96
Mkt. Capitalization (Rs. Billion)	755.8	1357.5	2117.8	2801.18

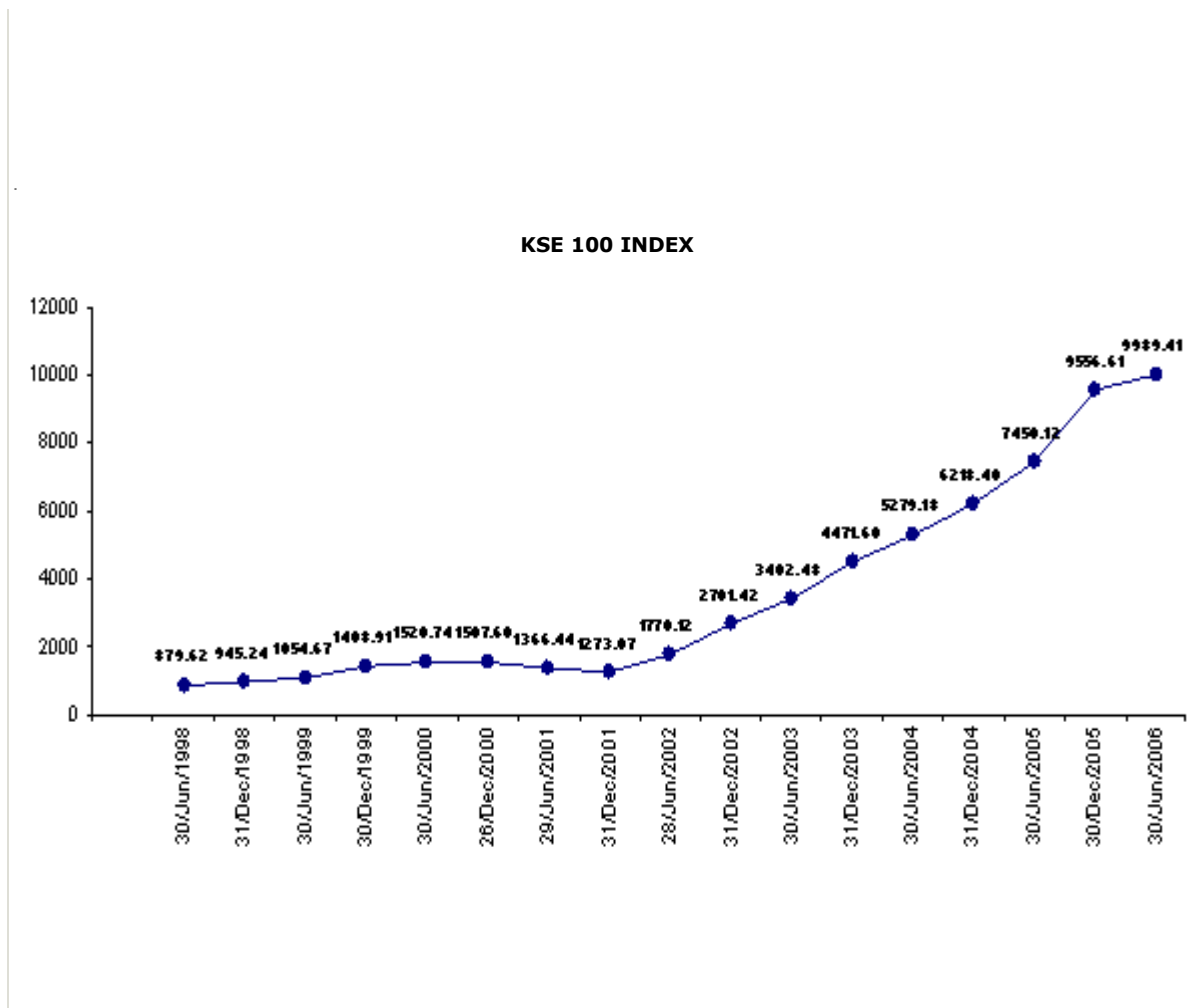


Fig: Performance of KSE-100 Index

The above graph shows the performance of KSE-100 index over the past decade. We can clearly see the gradual increase in the index value. The stock markets have been able to attract the investors and clearly the investor confidence is being reflected in the index performance. This has been made possible due to the continuous endeavours of the present government to encourage investment and build confidence of the people. Still government is required to do much in order to control the inefficiencies in the market. Many proposals are being studied and we will see some changes in the times to come.

3.3 Islamabad Stock Exchange

The Islamabad Stock Exchange (ISE) was incorporated as a guarantee limited Company on 25th October, 1989 in Islamabad Capital territory of Pakistan with the main object of setting up of a trading and settlement infrastructure, information system, skilled resources, accessibility and a fair and orderly market place that ranks with the best in the world. The purpose for establishment of the stock exchange in Islamabad was to cater to the needs of less developed areas of the northern part of Pakistan. The ISE has set the highest standards of operational efficiency and is committed to support a climate of confidence and optimism that encourages and promotes trading activity.

It also provides conducive environment to channelize the small investments of the residents of less developed areas. The ISE offers an easy access to both domestic as well as foreign investors and actively encourages the listing of eligible and profitable companies, both large and small to make it an exciting and diverse Exchange. The Exchange is playing a pivotal role for economic growth of the area thereby contributing towards the overall economic prosperity and welfare of the country.

At present there are 104 members out of which 39 are corporate bodies including commercial and investment banks, DFIs and brokerage houses. The other 65 Members are individual persons who are well educated, enterprising and progressive minded. The affairs of the Exchange are governed by the Board of Directors. The Board of Directors consists of ten directors, of which five are elected member directors and four are non-member directors nominated by the SECP while the managing director by virtue of his office is the tenth director of the Board. In order to protect the interest of the investing public, an Investors Protection fund has been established by the Exchange.

Since the inception of automated trading system (ISECTS), the trade volume has been multiplying day by day and the average daily turnover has now crossed the figure of 10 million shares. The automated system, which was indigenously developed, replaced the outcry system in 1997. Now all the listed securities are traded through

the ISECTS. The system of physical handling of shares and securities has been phased out and majority of the scrips are settled through Central Depository Company of Pakistan Limited. In comparison with major financial markets around the World, the functioning of capital market in Pakistan is still very much in its infancy and lacks advanced technology. In this context efforts are being made to bring ISE in line with the International system and methodology.

Table 3.2: Profile - Islamabad Stock Exchange (Source: ISE)

	2002-03	2003-04	2004-05	2005-06
No. Of Listed Companies	260	248	231	238
Funds Mobilized (Rs. billion)	11.5	14.5	18.8	21.6
Listed Capital (Rs. billion)	233	287.5	326.5	364.29
Mkt. Capitalization (Rs. Billion)	547	1082.9	1620.4	2357.27

3.4 Lahore Stock Exchange

Lahore Stock Exchange (Guarantee) Limited came into existence in October 1970, under the Securities and Exchange Ordinance, 1969, of the Government of Pakistan, in response to the needs of the Provincial metropolis of the Punjab. Only 83 members had its memberships and it was housed in a rented building in the crowded area of Bank Square in exotic city of Lahore. The number of members has increased from 83 to 150 over a period of 25 years. Inadequacy of space, crowded area and severe limitations of communications cramped its growth. Only a few of all the members

were active, and they too had to work through Karachi Stock Exchange, or be limited to do business in Bonus, Vouchers and Bonds.

It took the management all of two decades of uncertainties, apprehensions and planning to construct a suitable building for itself and venture out to its present location at 19-Khayaban-e-Aiwan-e-Iqbal, Lahore. Lahore Stock Exchange has taken shape of a significant institution of Pakistan. It owes a debt of gratitude to its past presidents and members of the Board who had contributed their time and energy to realize the dreams of the LSE members. The turnover of shares on the Lahore Stock Exchange (LSE) during July-March 2004-05 was 14.0 billion compared to 34.5 billion shares in the same period last year. Total paid up capital with the LSE increased from Rs 361.5 billion in June 2004 to Rs 387.6 billion in March 2005.

Table 3.3 Profile – Lahore Stock Exchange (Source: LSE)

	2002-03	2003-04	2004-05	2005-06
No. Of Listed Companies	561	534	524	548
Funds Mobilized (Rs. billion)	4.1	51.3	37.2	42.3
Listed Capital (Rs. billion)	280.1	361.5	387.6	441.13
Mkt. Capitalization (Rs. Billion)	751.2	1406.2	2088.2	2604.46

Chapter No. 4

MARKET EFFICIENCY And VOLATILITY

4.1 Market Efficiency

Market efficiency is a description of how prices in competitive markets respond to new information. When new information reaches a competitive market there is much turmoil as investors buy and sell securities in response to the news, causing prices to change. Once prices adjust all that is left of the information is worthless. No further study of old information will yield any more valuable intelligence. When money is put into the stock market, it is done with the aim of generating a return on the capital invested. Many investors try not only to make a profitable return but also to outperform or beat the market.

An efficient market is defined as a market where there are large number of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants. In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which the market expects to take place in the future. In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value.

The market efficiency can be divided into two broad categories. One is informational efficiency in which the concern is whether the market prices have incorporated all the available information or not. The other is the operational efficiency. In this case the focus is on how the market functions, the underlying concern being the cost of making transactions.

4.1.1 Informational Efficiency

The buyers and sellers in the stock market make transactions on the basis of the available information. From the participants' point of view the market will be efficient if all the relevant information is available to them and thus it will be reflected in the stock prices. So the informational efficient market is the one that can quickly adjust the stock prices to the new information.

There are **three** forms of the efficient market hypothesis relating to the extent of informational efficiency.

1. The Weak Form

The "Weak form" asserts that all past market prices and data are fully reflected in securities prices. In other words, technical analysis is of no use.

2. The Semi strong Form

The "Semi strong form" asserts that all publicly available information is fully reflected in securities prices. In other words, fundamental analysis is of no use.

3. The Strong Form

The "Strong form" asserts that all information is fully reflected in securities prices. In other words, even insider information is of no use.

4.1.2 Operational Efficiency

The buyers and sellers are always concerned about the efficiency in stock market operations. The efficiency in operations gives the people confidence to make large volume trades because they know that price is not going to be affected with this transaction unlike in an operationally inefficient market where transaction cost greatly affect the price of the trade.

The attributes of operational market efficiency include:

1. Availability of Price Information

Advances in information and communication technologies used in financial markets have substantially improved the availability of information concerning the prices at which financial claims trade. It is even possible for even individual investors to obtain

online real-time information on common stock prices listed on any exchange and many other markets. The rapid growth in the number on online price information services covering stocks, foreign currencies, and debt securities has significantly improved efficiency.

2. Transaction Costs

Buying and selling stocks on an efficient organized stock exchange does not involve a lot of transaction costs. Full-service and discount brokers will make the trade for a very small percentage of the total transaction. In addition, the market allows completing a transaction in very little time and the order can be executed in no time. The timeliness feature is another aspect of a liquid market.

3. Price Continuity

Price continuity means that there is a potential that the large transactions will not affect prices. If such a situation exists where it is possible to carry out large transactions without affecting prices, market is said to be *liquid*.

4.2 The Efficient Market Hypothesis

The Efficient Market Hypothesis (EMH), formulated by Eugene Fama in 1970 states that at any given time security prices fully reflect all available information. Most individuals that buy and sell securities do so under the assumption that the securities they are buying are worth more than the price that they are paying, while securities that they are selling are worth less than the selling price. But if markets are efficient and current prices fully reflect all information, then buying and selling securities in an attempt to outperform the market will effectively be a game of chance rather than skill. Thus, according to the EMH, no investor has an advantage in predicting a return on a stock price since no one has access to information not already available to everyone else.

4.2.1 Non-Predictability an effect of Efficiency

The nature of information is not necessarily limited to financial news and research only rather information about political situation, economic and social events in

addition to how investors perceive such information will be reflected in the stock price. According to EMH, as prices respond only to information available in the market and because all market participants are exposed to the same information, no one will have the ability to outperform anyone else.

In efficient markets, prices become not predictable but random, so no investment pattern can be recognized. A planned approach to investment, therefore, cannot be successful. This random movement of prices results in the failure of any investment strategy that aims to beat the market consistently. In fact, the EMH suggests that given the transaction costs involved in portfolio management, it would be more profitable for an investor to put his or her money into an index fund.

4.2.2 Arguments against EMH

In the real world of investment there are obvious arguments against the EMH. There are investors who have outperformed the market, whose investment strategy focuses on undervalued stocks, made millions and set an example for various followers. There are portfolio managers that have better track records than others, and there are investment houses with more renowned research analysis than others. Counter arguments to the EMH state that consistent patterns are present.

The various studies in the field of behavioural finance, which look into the effects of investor psychology on stock prices, also reveal that there are some predictable patterns in the stock market. Investors tend to buy undervalued stocks and sell overvalued stocks, and, in a market of many participants, the result can be anything but efficient. Because of the mass mentality of the trendy, short-term shareholder, investors pull in and out of the latest and hottest stocks. This result in stock prices being distorted and the market being inefficient. So prices no longer reflect all available information in the market and are manipulated by the profit seekers.

4.2.3 The EMH Response

The EMH does not dismiss the possibility of anomalies in the market that result in the generation of superior profits. In fact, market efficiency does not require prices to be

equal to fair value all of the time. Prices may be over- or undervalued only in random occurrences, so they eventually resort back to their mean value. As such, because the deviations from a stock's fair price are in themselves random, investment strategies that result in beating the market cannot be consistent phenomena.

Furthermore, the hypothesis argues that an investor who outperforms the market does so not out of skill but out of luck. EMH followers say this is due to the laws of probability: at any given time in a market with a large number of investors, there will simply be who that outperforms, those who under perform and those who maintain the average.

In order for a market to become efficient, investors must perceive that a market is inefficient and possible to beat. Ironically, investment strategies intended to take advantage of inefficiencies are actually the fuel that keeps a market efficient.

A market has to be large and liquid. Information has to be widely available in terms of accessibility and cost, and released to investors at more or less the same time. Transaction costs have to be cheaper than the expected profits of an investment strategy. Investors must also have enough funds to take advantage of inefficiency until, according to the EMH, it disappears again. Most importantly, an investor has to believe that she or he can outperform the market.

There is a great effect of market efficiency on the volatility of the market index. All those factors that have been discussed above are an ideal situation. The fact is that in the real world we have so many issues in our stock markets that result in the poor efficiency and we see its impact in the form of high volatility and huge movements in the index values. These various issues will be discussed in the proceeding sections.

4.3 Market Volatility

Market volatility is an uncontrollable and unpredictable risk associated with investing. Though each individual stock has its own volatility pattern, certain stocks' prices fluctuate daily while others vary incrementally. The volatility of the market as a

whole is usually not as dramatic as an individual stock. In addition, different market sectors also have varying levels of volatility. There are several factors that play into market movements including politics, interest rates, and spending trends. Understanding how these factors can potentially impact the market can help people reduce potential risk when making investment decisions.

People speak of volatility without defining what they mean by the term. In financial terms, volatility is:

The degree to which the price of a security, commodity, or market rises or falls within a short-term period.

There are several things to note about this definition. Most importantly, the definition specifically mentions price increases and decreases. People are usually most concerned about volatility during periods when prices decrease or go through a “correction.” During an extreme bull market, no one (with the possible exception of investors with short positions) seems to care that the markets are exhibiting volatility. Also, most people use volatility and risk interchangeably. However, volatility has to do with variability while risk has to do with variability that is unpredictable or uncertain.

Different investors in different market sectors may have different characteristics with respect to risk. Because of this, different sectors may have different volatilities. Therefore, looking at the volatility of a market really means looking at the volatility of the indices of the securities within the market. For each individual security, its beta measures the security’s volatility relative to the market as a whole, but if beta stays the same, and the market’s risk increases, then the risk associated with a given security will increase.

4.3.1 Causes of volatility

Professional traders who participate in a continuous stream of buying and selling manoeuvres often create a condition called 'arbitrage'. Arbitrage occurs when a security is bought and sold simultaneously at two different prices in two different markets. Because this activity causes stock prices fluctuate rapidly, what may have seemed like a good buy at first may turn into a disadvantage. Thus, arbitrage is one of

the forces behind market volatility. Another consequential factor is the dissemination of information available through the media. Public reports on corporate earnings estimates, management changes, product and service issues, along with political policies and regulations, compounded with rumours and speculation can influence the buying or selling of any stock.

So there are a number of things that cause volatility. Arbitrage causes volatility. Arbitrage is the simultaneous or almost simultaneous buying and selling of an asset to profit from price discrepancies. Arbitrage causes markets to adjust prices quickly. This has the effect of causing information to be more quickly assimilated into market prices. This is a curious result because arbitrage requires no more information than the existence of a price discrepancy.

Another obvious reason for market volatility is technology. This includes more timely information dissemination, improved technology to make trades and more kinds of financial instruments. The faster information is disseminated, the quicker markets can react to both negative and positive news. Improved trading technology makes it easier to take advantage of arbitrage opportunities, and the resulting price alignment arbitrage causes.

Finally, more kinds of financial instruments allow investors more opportunity to move their money to more kinds of investment positions when conditions change. Most people would say that new information in general causes volatility. News digests of the day's market performance almost always include a reason the market is up or down. Often, different writers give different reasons for market changes. Unfortunately, when analysing major market changes, it is often very difficult to associate specific market moves with specific news events. Some of the major factors effecting Karachi Stock exchange will be covered in the proceeding discussion.

4.3.2 Limits on volatility

Many people suggest that there should be limits on volatility. They suggest that trading should be suspended if markets change “too much” over a certain period of

time. Such limits on trading already exist on commodity markets. Most analysts are unsure whether this is a good or bad thing.

4.3.3 Volatility: Points versus Percentage

When talking about volatility, it is difficult to know whether to talk about volatility in terms of points or percentages. Percentage volatility reflects percentage changes in the value of the amount invested. It is therefore useful to talk about percentage changes to discuss the change in a given investor's wealth or in the change in wealth invested in the market, or in the economy as a whole. As a market's base level increases, the point volatility could increase while the percentage volatility could decrease. Economists, business professors, and market gurus often forget that people care more about dollars than percents.

4.3.4 Is volatility a bad thing?

The two primary complaints about volatility are that it delays IPO's and that it decreases value. The research done by people indicates that there is no statistical evidence that the number of IPO's decline during periods of increased volatility. Further, increases in volatility actually increase values of financial assets. This is because volatility increases the option value of waiting to invest. That is, during times of high volatility, there is value in being able to "time" ones investment.

4.4 Insider Trading and Market Manipulation

New research by Julan Du and Shang-Jin Wei finds that a significant cause of higher stock market volatility is insider trading – the buying and selling of shares by people who have information relevant for their prices that is not yet publicly available. The effect of insider trading on market volatility is, in theory, ambiguous. One influential view argues that by allowing relevant information to be reflected in the share price faster than otherwise, insider trading should increase the relative importance of fundamentals to 'noise'. This should lead to a reduction in market volatility, an improvement in the efficiency of stock markets.

In contrast, a competing view asserts that insider trading can raise market volatility in the long run and reduce economic efficiency. Access to inside information is most valuable when share prices either rise or fall dramatically because insiders can maximise their personal benefits by taking advantage of their knowledge of a share's fundamental value. As a consequence, insiders may be tempted to find ways to raise price volatility. For example, they may choose riskier projects or riskier technology than they normally would. Moreover, insiders may manipulate the timing and content of the information release in such a way as to increase the price volatility.

The researchers show that the positive correlation between insider trading and market volatility is likely to imply a causal relationship: an increase in insider trading leads to a rise in stock market volatility. Furthermore, insider trading leads to higher market volatility even after taking account of the impact on market volatility of:

- The volatility of economic fundamentals – for example, the volatility of the growth rate of real GDP;
- Uncertainty about macroeconomic policies, such as the volatility of the exchange rate and the rate of inflation and
- Market liquidity and maturity.

4.5 Free Float and Volatility

Free Float is the total number of shares publicly owned and available for trading. The float is calculated by subtracting restricted shares from outstanding shares. The term "float" refers to the regular shares that a company has issued to the public that are available for investors to transact. This figure is derived by taking company's outstanding shares and subtracting from it any restricted stock or the stock not available for trading like held by the government.

A company's float is an important number for investors because it indicates how many shares are actually available to be bought and sold by the general investing public. The company is not responsible for how shares within the float are traded by the

public - this is a function of the secondary market. Therefore, shares that are purchased sold or even shorted by investors do not affect the float because these actions do not represent a change in the number of shares available for trade: they simply represent a redistribution of shares.

It should also be noted that there is an inverse correlation between the size of a company's float and the volatility of the stock's price. This makes sense when you think about it: the greater the number of shares available for trade, the less volatility the stock will display because the harder it is for a smaller number of shares to move the price. The problem that we are facing at Karachi Stock Exchange is that the floating stocks of high weightage companies like OGDC and PTCL is very less which results in greater movement of index with very little change in the stock price.

In order to counter this problem the authorities planned to introduce new KSE-30 index. The new top-30 index will reflect the size of the constituents' free-floating share capital, rather than just total stock market value, in a bid to boost investor appeal. The Karachi Stock Exchange's (KSE) existing benchmark indexes are dominated by state-controlled firms, the vast bulk of whose stock sits un-traded in government hands.

According to the officials the new KSE-30 index, the first in Pakistan to be based on a free float, would be a better gauge for investors. The index will bring the exchange in line with international trading norms. The new index will be based on free float available, market capitalization, and trading performance. It will prevent undue influence of large but closely held companies on the market movement. Muslim Commercial Bank would top the index, with a weighting of 11.06 per cent, followed by the National Bank of Pakistan, with 7.85 per cent, and Pakistan Oilfields Ltd, with 7.65 per cent. Pakistan Petroleum Ltd, Oil and Gas Development Co Ltd, Pakistan Telecommunication Co Ltd, Fauji Fertilizer Co Ltd, Pakistan State Oil and Hub Power Co Ltd will be among the top 10 companies in the index.

A comparison of the outstanding stock and the floating stock for the selected companies of KSE-100 index is given below:

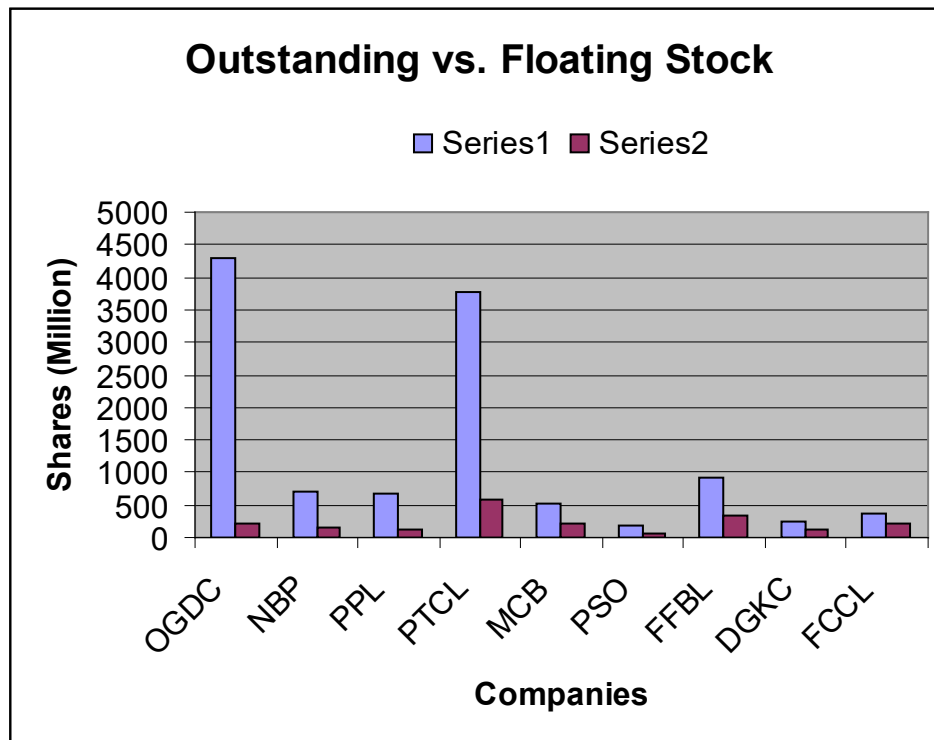


Fig 4.1: Comparison of Outstanding and Floating Stocks

4.6 Turnover and Market Volatility

Stock turnover is calculated by dividing the total number of shares traded over a period by the average number of shares outstanding for the period. The higher the share turnover, the more liquid the share of the company. The volume is the number of shares or contracts traded in a security or an entire market during a given period of time. It is simply the amount of shares that trade hands from sellers to buyers as a measure of activity. Turnover is calculated as price of a stock multiplied by the number of shares traded. It includes both the price and the number of shares traded i.e. the activity level in a stock. Both of these components of turnover are very important in assessing the market situation.

The share turnover and volume has a significant effect on the market volatility. Some researchers divide turnover into two components 'expected' and 'unexpected' to distinguish between the effects of 'noise trading' and 'information trading' on stock market volatility. Our stock market is not very stable and well established. It is still under the influence of speculative trading which gets reflected in the turnover of the stocks. Also there are few main players who can directly control the direction of the market movements. So all these speculations and inefficiencies are explicit in the turnover of the stocks. The turnover of the selected companies' stock is depicted in the following graph:

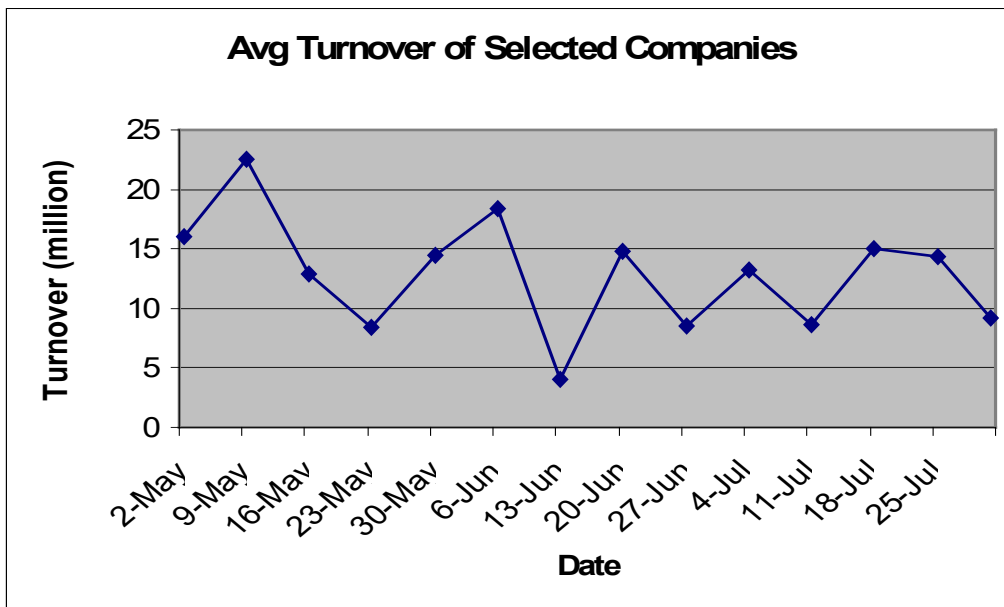


Fig 4.2 Avg Turnover of the Selected Companies

Chapter No. 5

MARKET EFFICIENCY AND VOLATILITY AT KSE-STATISTICAL MEASURES

The market efficiency and volatility at Karachi stock exchange as already discussed has been influenced by various factors. In this chapter we shall be undertaking some statistical tests to see whether our hypothesis stands correct or is otherwise. For this purpose we will be relying on the data of top 9 KSE-100 Index companies in capitalization which is a fair representation of the different sectors and carries sufficient weightage in the Index. The selected companies and their weightages in the Index is given in the following table:

Company	Capitalization (billion)	Weightage in KSE Index (%)
OGDC	541.916	19.32
NBP	164.08	6.41
PPL	158.66	5.66
PTCL	152.84	5.45
MCB	117.95	4.21
PSO	52.87	1.88
FFBL	25.03	0.92
DGKC	22.19	0.807
FCCL	7.69	0.275

Table 5.1: Weightages of Top KSE-100 Index Companies

5.1 Market Efficiency

Market efficiency is a description of how prices in competitive markets respond to new information. When new information reaches a competitive market there is much turmoil as investors buy and sell securities in response to the news, causing prices to change. Once prices adjust all that is left of the information is worthless. No further study of old information will yield any more valuable intelligence. When money is put into the stock market, it is done with the aim of generating a return on the capital invested. Many investors try not only to make a profitable return but also to outperform or beat the market.

An efficient market is defined as a market where there are large number of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants. In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which the market expects to take place in the future. In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value.

5.1.1 Testing Market Efficiency

The Efficient Market Hypothesis (EMH) formulated by Eugene Fama in 1970 states that at any given time security prices fully reflect all available information. There are three forms of the efficient market hypothesis relating to the extent of informational efficiency. We shall be testing Karachi Stock Exchange on the basis of '**Weak Form Efficiency**'.

The Weak Form asserts that all past market prices and data are fully reflected in securities prices which mean that technical analysis is of no use. So a weak form efficient market is a one in which past price information provides no useful valuation information about future prices. If the stock prices follow a trend that is not random then stock price changes are dependent, otherwise they are independent. Therefore,

weak-form tests involve the question of whether all information contained in the sequence of past prices is fully reflected in the current price.

In an Efficient market the changes in the stock prices should be independent. We shall be using a statistical test to see whether this scenario exists in Karachi Stock Exchange or not.

The Sign Test

The sign test is a statistical measure and is used to exhibit that the price in period $t+1$ is independent of the price in period t . The runs that will be formed are going to provide an evidence as to whether the market is weekly efficient or not. A *Run* is a combination of similar elements or signs (say '+' or '-'). Where share prices rise or fall consecutively, the positive (+) and negative (-) signs together make up a *run*. The presence of too much runs in a sequence support the randomness of data. The total number of signs every moment the share price falls or rises also helps to clarify the randomness or non-randomness of data.

Data

The average prices of the stocks for the selected top 9 KSE_100 index companies will be taken as data for the test. The prices are taken for three months that is May, June & July 2006.

Methodology

The price data for the selected companies over a period of three months was observed for persistent runs. For every negative change a “ - ” sign was assigned and for every positive change a “ + ” sign was assigned and if there was no change a “0” sign was assigned. Run tests were conducted separately for all the selected companies.

OGDC

DATE	Price	Run	Date	Price	Run	Date	Price	Run
2-May	161.3	-	1-Jun	135	-	3-Jul	129.95	-
3-May	164.95	+	2-Jun	138.55	+	4-Jul	133	+
4-May	164.25	+	5-Jun	138.4	-	5-Jul	132.75	+
5-May	160.6	-	6-Jun	142.2	+	6-Jul	132.1	+
8-May	161.35	+	7-Jun	135.1	+	7-Jul	130	+
9-May	154.6	-	8-Jun	128.35	-	10-Jul	123.65	-
10-May	157.25	0	9-Jun	130.6	+	11-Jul	125.1	-
11-May	157.25	+	12-Jun	127.9	+	12-Jul	131.35	-
12-May	157.2	+	13-Jun	121.55	+	13-Jul	135.25	-
15-May	152.6	+	14-Jun	115.5	-	14-Jul	135.6	+
16-May	145	-	15-Jun	121.25	-	17-Jul	133.6	-
17-May	151.2	+	16-Jun	124.95	-	18-Jul	137.5	+
18-May	143.65	-	19-Jun	131.15	-	19-Jul	137	+
19-May	147.45	+	20-Jun	137.7	-	20-Jul	136.75	-
22-May	147	-	21-Jun	138.1	-	21-Jul	137.45	-
23-May	148.65	-	22-Jun	139.55	+	24-Jul	138.4	-
24-May	154.5	+	23-Jun	132.6	+	25-Jul	141.45	+
25-May	151	+	26-Jun	126	+	26-Jul	140.85	-
26-May	143.7	+	27-Jun	119.7	-	27-Jul	142.4	+
29-May	136.55	+	28-Jun	125.65	-	28-Jul	140.9	-
30-May	135.35	+	29-Jun	131.9	-	31-Jul	143.7	+
31-May	128.6	-	30-Jun	136.75	+			

NBP

DATE	Price	Run	Date	Price	Run	Date	Price	Run
2-May	266.5	-	1-Jun	212	-	3-Jul	206	-
3-May	269	-	2-Jun	216	-	4-Jul	216.3	-
4-May	271.15	-	5-Jun	217.5	-	5-Jul	227.1	+
5-May	281.2	0	6-Jun	218.45	+	6-Jul	225.75	+
8-May	281.2	+	7-Jun	207.75	+	7-Jul	225.5	+
9-May	278	+	8-Jun	197.4	+	10-Jul	215.25	-
10-May	275	+	9-Jun	196.95	+	11-Jul	223	-
11-May	271.15	-	12-Jun	195	+	12-Jul	226.25	+
12-May	271.95	+	13-Jun	185.25	+	13-Jul	222.25	-
15-May	258.5	+	14-Jun	166.75	-	14-Jul	225.75	+
16-May	245.6	-	15-Jun	175.05	-	17-Jul	220	-
17-May	257.85	+	16-Jun	183.8	-	18-Jul	229.4	+
18-May	245	-	19-Jun	192.95	-	19-Jul	224.5	+
19-May	246.75	-	20-Jun	202.55	-	20-Jul	221.1	-
22-May	252.45	+	21-Jun	210.05	-	21-Jul	221.95	-
23-May	248.55	-	22-Jun	219.5	+	24-Jul	224.45	-
24-May	254.35	-	23-Jun	208.55	+	25-Jul	224.6	+
25-May	255.35	+	26-Jun	198.15	+	26-Jul	223.1	-
26-May	242.6	+	27-Jun	188.25	-	27-Jul	225.1	+
29-May	230.5	+	28-Jun	197.65	-	28-Jul	224	-
30-May	215	+	29-Jun	207.5	-	31-Jul	225.4	+
31-May	204.25	-	30-Jun	215.5	+			

MCB

DATE	Price	Run	Date	Price	Run	Date	Price	Run
2-May	245.5	-	1-Jun	207.9	-	3-Jul	204	-
3-May	248.1	+	2-Jun	211.9	+	4-Jul	213.45	-
4-May	247.6	-	5-Jun	209.45	-	5-Jul	224.1	+
5-May	253.4	-	6-Jun	214	+	6-Jul	224	+
8-May	256.25	+	7-Jun	204.5	+	7-Jul	218.5	+
9-May	252.9	+	8-Jun	194.3	+	10-Jul	207.6	-
10-May	250.1	-	9-Jun	189.1	+	11-Jul	217.5	-
11-May	251	+	12-Jun	185	+	12-Jul	219.35	+
12-May	250.1	+	13-Jun	175.75	+	13-Jul	215.15	-
15-May	239.75	+	14-Jun	158.2	-	14-Jul	216.55	+
16-May	227.9	-	15-Jun	166.1	-	17-Jul	214.2	-
17-May	239.25	+	16-Jun	174.4	-	18-Jul	220.5	+
18-May	227.6	-	19-Jun	183.1	-	19-Jul	216.9	-
19-May	235	-	20-Jun	192.25	-	20-Jul	220	+
22-May	243.5	+	21-Jun	201.85	-	21-Jul	218.7	-
23-May	239.5	-	22-Jun	211.9	+	24-Jul	225.8	+
24-May	241.7	-	23-Jun	201.35	+	25-Jul	225.2	+
25-May	243	+	26-Jun	191.3	+	26-Jul	222	-
26-May	230.85	+	27-Jun	181.75	-	27-Jul	223	+
29-May	219.35	+	28-Jun	190.8	-	28-Jul	221.3	-
30-May	208.4	+	29-Jun	200.3	-	31-Jul	222.75	+
31-May	198	-	30-Jun	210.3	+			

PPL

DATE	Price	Run	Date	Price	Run	Date	Price	Run
2-May	279.4	-	1-Jun	230	-	3-Jul	202.1	-
3-May	284.2	+	2-Jun	231.9	+	4-Jul	212.2	-
4-May	281	-	5-Jun	230.25	-	5-Jul	215.8	+
5-May	281.7	-	6-Jun	234.65	+	6-Jul	213.5	+
8-May	285.05	+	7-Jun	222.95	+	7-Jul	210.75	+
9-May	271.25	+	8-Jun	211.85	+	10-Jul	200.85	-
10-May	270	-	9-Jun	210	+	11-Jul	205.25	-
11-May	271.9	+	12-Jun	202.2	+	12-Jul	215.5	-
12-May	270.95	+	13-Jun	192.1	+	13-Jul	221.2	+
15-May	257.45	+	14-Jun	172.9	-	14-Jul	220.5	+
16-May	244.6	-	15-Jun	181.5	-	17-Jul	220	-
17-May	254.9	+	16-Jun	190.55	-	18-Jul	231	-
18-May	243	-	19-Jun	200.05	-	19-Jul	234.2	+
19-May	250	+	20-Jun	207	+	20-Jul	232.8	-
22-May	248.75	+	21-Jun	205.3	-	21-Jul	240.5	-
23-May	247.75	-	22-Jun	213.4	+	24-Jul	240.9	-
24-May	256.2	+	23-Jun	202.75	+	25-Jul	246.95	+
25-May	251.5	+	26-Jun	192.65	+	26-Jul	243.75	-
26-May	244.5	+	27-Jun	183.05	-	27-Jul	247	-
29-May	232.3	-	28-Jun	192.2	-	28-Jul	249.5	-
30-May	232.75	+	29-Jun	201.8	-	31-Jul	261.95	+
31-May	221.15	-	30-Jun	211.85	+			

PTCL

DATE	Price	Run	Date	Price	Run	Date	Price	Run
2-May	55.4	-	1-Jun	46.2	-	3-Jul	38.75	-
3-May	56.15	-	2-Jun	47	-	4-Jul	40	-
4-May	57.35	+	5-Jun	47.25	-	5-Jul	40.25	
5-May	56.75	-	6-Jun	48	+	6-Jul	40.5	+
8-May	58.4	+	7-Jun	47.5	+	7-Jul	39.8	+
9-May	57.45	-	8-Jun	45.15	-	10-Jul	37.85	-
10-May	58.4	+	9-Jun	47	+	11-Jul	39.25	-
11-May	57.5	+	12-Jun	46.6	+	12-Jul	41.2	-
12-May	57.4	+	13-Jun	41.45	+	13-Jul	41.3	-
15-May	54.55	+	14-Jun	37.35	-	14-Jul	41.4	+
16-May	51.85	-	15-Jun	39.2	-	17-Jul	40.25	-
17-May	52.8	+	16-Jun	41.15	-	18-Jul	42.25	-
18-May	50.5	-	19-Jun	43.05	+	19-Jul	42.5	+
19-May	51.25	+	20-Jun	42.7	+	20-Jul	42.35	-
22-May	51.15	+	21-Jun	42.35	+	21-Jul	43.4	-
23-May	51.05	-	22-Jun	42.15	+	24-Jul	43.8	-
24-May	51.25	+	23-Jun	40.6	+	25-Jul	43.5	+
25-May	50.5	+	26-Jun	38.6	+	26-Jul	42.45	+
26-May	48	+	27-Jun	36.7	-	27-Jul	42	+
29-May	45.6	+	28-Jun	38.5	-	28-Jul	41.7	+
30-May	44.8	+	29-Jun	40.4	-	31-Jul	41.65	-
31-May	44	-	30-Jun	40.6	+			

PSO

DATE	Price	Run	Date	Price	Run	Date	Price	Run
2-May	343	-	1-Jun	315.25	-	3-Jul	297	-
3-May	347.7	-	2-Jun	317	-	4-Jul	303	+
4-May	351	+	5-Jun	318.5	-	5-Jul	302.5	-
5-May	349.4	-	6-Jun	322	+	6-Jul	303	+
8-May	366.85	+	7-Jun	306.6	+	7-Jul	299	+
9-May	362.15	+	8-Jun	291.3	-	10-Jul	288.85	-
10-May	361.75	+	9-Jun	297	-	11-Jul	291.8	-
11-May	356.9	-	12-Jun	293.2	+	12-Jul	298.75	-
12-May	357	+	13-Jun	278.55	+	13-Jul	300.9	-
15-May	341.5	+	14-Jun	264.65	-	14-Jul	304.9	+
16-May	334	-	15-Jun	277.85	-	17-Jul	299.95	-
17-May	341.8	+	16-Jun	291.7	-	18-Jul	306	-
18-May	332.5	-	19-Jun	306.25	-	19-Jul	319	+
19-May	341	+	20-Jun	314	+	20-Jul	317.15	-
22-May	340	-	21-Jun	309.1	-	21-Jul	318.9	-
23-May	340.5	-	22-Jun	311.5	+	24-Jul	325	+
24-May	342.85	+	23-Jun	296	+	25-Jul	323	-
25-May	340.75	+	26-Jun	284	+	26-Jul	323.5	-
26-May	332	+	27-Jun	277	-	27-Jul	330.8	-
29-May	315.4	+	28-Jun	290.85	-	28-Jul	347.3	-
30-May	312.5	+	29-Jun	305.35	-	31-Jul	364.65	+
31-May	304	-	30-Jun	309	+			

DGKC

DATE	Price	Run	Date	Price	Run	Date	Price	Run
2-May	115.55	-	1-Jun	95	-	3-Jul	85.5	-
3-May	121.3	-	2-Jun	95.75	-	4-Jul	86.85	-
4-May	122	-	5-Jun	96.25	-	5-Jul	88	-
5-May	122.5	-	6-Jun	101.05	+	6-Jul	90.95	+
8-May	123	-	7-Jun	96	+	7-Jul	90	+
9-May	123.75	+	8-Jun	91.2	+	10-Jul	85.5	-
10-May	120.5	-	9-Jun	87.95	+	11-Jul	88.45	-
11-May	122.75	+	12-Jun	84.15	+	12-Jul	91.5	-
12-May	119.5	+	13-Jun	79.95	+	13-Jul	94	-
15-May	113.55	+	14-Jun	72	-	14-Jul	94.4	+
16-May	107.9	-	15-Jun	75.6	-	17-Jul	95.3	+
17-May	113.25	+	16-Jun	79.35	-	18-Jul	95.15	-
18-May	107.95	-	19-Jun	83.3	-	19-Jul	96.3	-
19-May	108	-	20-Jun	87.45	-	20-Jul	98.45	+
22-May	112.45	+	21-Jun	91.5	-	21-Jul	97.3	-
23-May	111	-	22-Jun	94.7	+	24-Jul	98.05	-
24-May	111.75	+	23-Jun	90	+	25-Jul	98.85	+
25-May	111.1	+	26-Jun	85.5	+	26-Jul	98.7	-
26-May	105.55	+	27-Jun	81.25	-	27-Jul	99.4	+
29-May	100.3	+	28-Jun	85.3	-	28-Jul	97.2	+
30-May	95.5	+	29-Jun	89.55	-	31-Jul	96.65	+
31-May	90.75	-	30-Jun	90	+			

FFBL

DATE	Price	Run	Date	Price	Run	Date	Price	Run
2-May	37.95	-	1-Jun	33.7	+	3-Jul	28.35	-
3-May	38.15	0	2-Jun	33.65	+	4-Jul	28.75	-
4-May	38.15	-	5-Jun	33.45	-	5-Jul	30.05	-
5-May	37.85	+	6-Jun	34.25	+	6-Jul	30.1	+
8-May	37.6	+	7-Jun	32.6	+	7-Jul	29.5	+
9-May	36.9	-	8-Jun	31	-	10-Jul	28.5	-
10-May	36.95	+	9-Jun	31.25	+	11-Jul	28.9	-
11-May	36.5	+	12-Jun	31.15	+	12-Jul	29.9	-
12-May	36.25	+	13-Jun	29.6	+	13-Jul	29.95	+
15-May	34.45	+	14-Jun	26.85	-	14-Jul	29.7	-
16-May	33.6	-	15-Jun	28.15	-	17-Jul	29.75	-
17-May	34.95	+	16-Jun	29.55	-	18-Jul	30.1	+
18-May	33.45	-	19-Jun	31	0	19-Jul	29.9	+
19-May	33.85	-	20-Jun	31	+	20-Jul	29.4	+
22-May	34.8	-	21-Jun	30.4	-	21-Jul	29	+
23-May	35.35	-	22-Jun	30.6	+	24-Jul	28.85	+
24-May	35.75	-	23-Jun	29.1	+	25-Jul	28.75	+
25-May	36.1	+	26-Jun	27.65	+	26-Jul	28.2	+
26-May	34.95	+	27-Jun	26.65	-	27-Jul	27.95	+
29-May	33.25	-	28-Jun	27.95	-	28-Jul	27.25	-
30-May	33.75	+	29-Jun	29.3	+	31-Jul	28.5	+
31-May	32.1	-	30-Jun	29.25	+			

FCCL

DATE	Price	Run	Date	Price	Run	Date	Price	Run
2-May	24.25	-	1-Jun	20.2	-	3-Jul	18.3	-
3-May	24.9	+	2-Jun	20.35	-	4-Jul	18.5	-
4-May	24.7	+	5-Jun	20.5	-	5-Jul	18.95	-
5-May	24.45	+	6-Jun	21.45	+	6-Jul	19.5	-
8-May	24.3	+	7-Jun	20.6	+	7-Jul	20.5	+
9-May	24.05	+	8-Jun	19.6	+	10-Jul	19.75	-
10-May	23.5	0	9-Jun	19.65	+	11-Jul	20.4	-
11-May	23.5	+	12-Jun	19	+	12-Jul	21.4	-
12-May	23	+	13-Jun	18	+	13-Jul	22.45	-
15-May	21.85	+	14-Jun	16.4	-	14-Jul	23.55	-
16-May	21.45	-	15-Jun	17.4	-	17-Jul	24	+
17-May	22.5	+	16-Jun	18.4	-	18-Jul	23.65	-
18-May	21.45	-	19-Jun	19.4	-	19-Jul	23.8	-
19-May	21.65	-	20-Jun	19.9	+	20-Jul	23.95	+
22-May	22.4	+	21-Jun	19.75	-	21-Jul	23.8	+
23-May	22.1	-	22-Jun	19.85	+	24-Jul	23.75	+
24-May	22.45	+	23-Jun	18.85	+	25-Jul	23.25	0
25-May	22.2	+	26-Jun	17.85	+	26-Jul	23.25	-
26-May	21.6	+	27-Jun	17.2	-	27-Jul	23.95	+
29-May	20.55	+	28-Jun	18.2	-	28-Jul	23.3	+
30-May	20.15	+	29-Jun	19.2	0	31-Jul	23.05	-
31-May	19.25	-	30-Jun	19.2	+			

Findings

If we carefully analyze the data we will come to know that there is hardly any evidence of persistent run pattern in any of the selected company. Although there have been a couple of instances where the prices formed a run of 4 to 5 observations but not more than that and even that formation of pattern is not consistent. So we say that the evidence does not support the independence of the prices which means that the stock market is not 'weakly efficient'.

5.2 Market Volatility

Market volatility is an uncontrollable and unpredictable risk associated with investing. Though each individual stock has its own volatility pattern, certain stocks' prices fluctuate daily while others vary incrementally. The volatility of the market as a whole is usually not as dramatic as an individual stock. In addition, different market sectors also have varying levels of volatility. There are several factors that play into market movements including politics, interest rates, and spending trends. Understanding how these factors can potentially impact the market can help people reduce potential risk when making investment decisions. In financial terms, volatility is the degree to which the price of a security, commodity, or market rises or falls within a short-term period.

There are a number of things that cause volatility. Arbitrage causes volatility. Arbitrage is the simultaneous or almost simultaneous buying and selling of an asset to profit from price discrepancies. Arbitrage causes markets to adjust prices quickly. This has the effect of causing information to be more quickly assimilated into market prices. This is a curious result because arbitrage requires no more information than the existence of a price discrepancy. Another obvious reason for market volatility is technology. This includes more timely information dissemination, improved technology to make trades and more kinds of financial instruments. The faster information is disseminated, the quicker markets can react to both negative and positive news. Improved trading technology makes it easier to take advantage of arbitrage opportunities, and the resulting price alignment arbitrage causes.

Finally, there can be many macro factors that have a very formidable influence the performance of the stock markets. The geopolitical situation of the world has its tremendous influence not just on Pakistani stock exchanges but stock exchanges all over the world. Especially the situation in Iraq and then the nuclear program in Iran have very devastating effects on the stock markets. At Karachi stock exchange the Oil and Gas sectors has a very significant weightage and any news regarding this energy resource can turn the market upside down.

5.2.1 Testing Market Volatility

One measure of volatility is standard deviation. It is defined as measure of the spread of a set of values from the mean value. The units of the standard deviation are the same as the units of the original data making the standard deviation a linear value. It is a measure of dispersion meaning it measures the deviations in the set of observations. As a means of measuring volatility, standard deviation measures the magnitude of price changes. The higher the value, the higher the magnitude will be and higher will be the market volatility. In our case we will be looking at the standard deviation of the average prices of the selected companies. The variations in the prices are directly linked with the market index since it is measuring factor of capitalization.

Data

The data for this test is going to be the average price of the selected companies' stocks over the period of three months that is May, June and July 2006.

Methodology

The methodology is that the standard deviation of the prices will be calculated from the mean value. Higher standard deviation value would mean more dispersed data that is going to imply high volatility.

Findings

The previous test has provided the evidence that the market is not that efficient and that there is a big factor of speculation and insider trading. If Standard Deviation is calculated for the selected companies, taking price data into consideration, the value comes out to be 14.80 that is quite high. The interpretation of such a high value of standard deviation will add to the conclusion already made that the market is inefficient. This higher value of standard deviation shows that any event results in high movements in prices of the stocks that make the market more volatile and speculative.

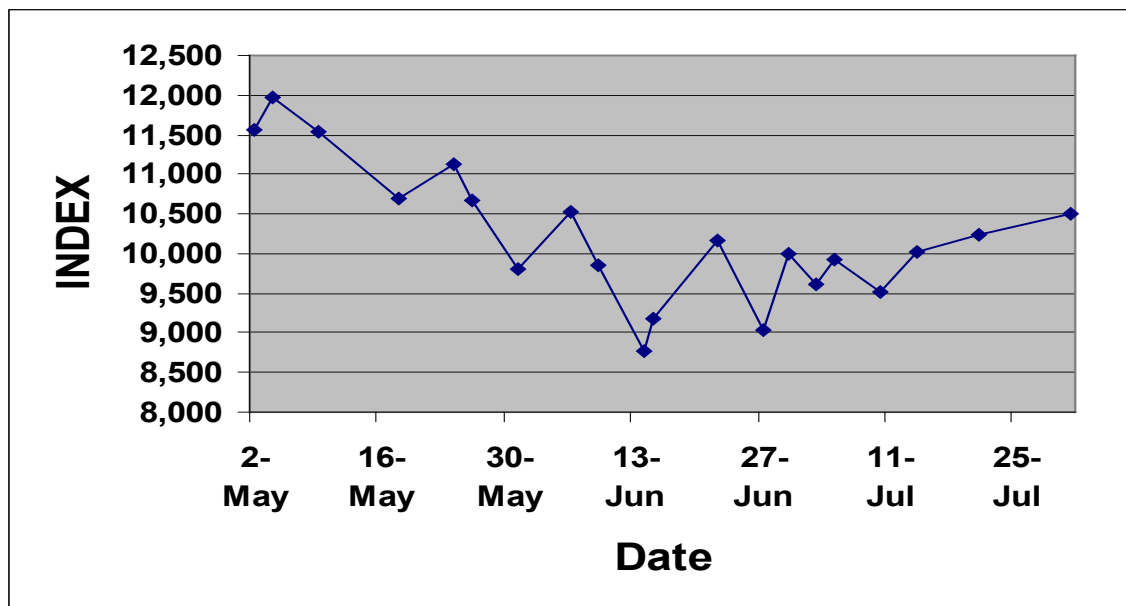
The table showing the standard deviation of the average prices of the selected companies is presented on the next page:

Date	Avg Price	Date	Avg Price	Date	Avg Price
2-May	169.87	1-Jun	143.92	3-Jul	134.44
3-May	172.72	2-Jun	145.79	4-Jul	139.12
4-May	173.02	5-Jun	145.73	5-Jul	142.17
5-May	174.21	6-Jun	148.45	6-Jul	142.16
8-May	177.11	7-Jun	141.51	7-Jul	140.39
9-May	173.45	8-Jun	134.46	10-Jul	134.20
10-May	172.61	9-Jun	134.39	11-Jul	137.74
11-May	172.05	12-Jun	131.58	12-Jul	141.69
12-May	171.48	13-Jun	124.69	13-Jul	142.49
15-May	163.80	14-Jun	114.51	14-Jul	143.59
16-May	156.88	15-Jun	120.23	17-Jul	141.89
17-May	163.17	16-Jun	125.98	18-Jul	146.17
18-May	156.12	19-Jun	132.25	19-Jul	147.12
19-May	159.44	20-Jun	137.17	20-Jul	146.88
22-May	161.39	21-Jun	138.71	21-Jul	147.89
23-May	160.49	22-Jun	142.57	24-Jul	149.89
24-May	163.42	23-Jun	135.53	25-Jul	150.62
25-May	162.39	26-Jun	129.08	26-Jul	149.53
26-May	155.97	27-Jun	123.51	27-Jul	151.29
29-May	148.20	28-Jun	129.68	28-Jul	152.49
30-May	144.24	29-Jun	136.14	31-Jul	156.48
31-May	138.01	30-Jun	140.27		
			Std Deviation		14.80

Table 5.2: Standard Deviation of Avg Price

KSE-100 INDEX Graph:

The following graph gives us an idea how the KSE-100 INDEX performed during the three months May, June & July 2006. The graph clearly shows how volatile the market had been for these months. The index reached the highest level of about 12000 and then dropped from there on. The index has been showing signs of great fluctuations during the period under analysis.



CONCLUSION

The hypothesis that was established in the beginning that the market efficiency is consistent with the volatility holds true. We have analysed various factors that are responsible for market volatility. These factors have in fact direct or indirect implications from the inefficiencies in the market. The statistical tests also validate the fact that the market lacks efficiency and is highly volatile. This is not very encouraging especially when we are looking for more and more investments for our economy to grow manifolds.

Some of the major reasons for the high volatility include lack of informational and operational efficiencies in the stock market. The issue of insider trading has also some role to play. Our market is to much an extent speculative. This is because of the fact that the investors lack awareness and also we do not have a very sound mechanism to control the functioning of the exchange. This has important implications for market regulators, particularly in emerging markets like ours. An adequate legal environment that aggressively cracks down on insider trading may help to create an efficient and transparent stock market with lower volatility. This will in turn promote the development of the capital market generally and raise the growth rate of the economy as a whole.

Under such conditions it is really very difficult for people to make investments and get return out of it. The risk involved is too high. We have seen in the past that the market remained under the control of some influential parties who could really decide upon the direction for the market to move. Many people lost their money because of this uncertainty and instability. The authorities are working on different proposals to regulate the functioning of the market. The issue of CVT is of great concern to the investors on which government needs to think. Recently they have launched new index with will counter the effects of much less floating stocks than the outstanding shares to control the huge movements of the index. So we can say that our market is gradually getting on the track to be a healthy financial institution of the country.

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APPENDIX

Market Volatility

Market volatility is an uncontrollable and unpredictable risk associated with investing. Though each individual stock has its own volatility pattern, certain stocks' prices fluctuate daily while others vary incrementally. The volatility of the market as a whole is usually not as dramatic as an individual stock. In addition, different market sectors also have varying levels of volatility. There are several factors that play into market movements including politics, interest rates, and spending trends. Understanding how these factors can potentially impact the market can help you reduce potential risk when making investment decisions.

Causes of Volatility

Professional traders who participate in a continuous stream of buying and selling maneuvers often create a condition called 'arbitrage'. Arbitrage occurs when a security is bought and sold simultaneously at two different prices in two different markets. Because this activity causes stock prices to fluctuate rapidly, what may have seemed like a good buy at first may turn into a disadvantage. Thus, arbitrage is one of the forces behind market volatility. Another consequential factor is the dissemination of information available through the media. Public reports on corporate earnings estimates, management changes, product and service issues, along with political policies and regulations, compounded with rumors and speculation can influence the buying or selling of any stock.

Measuring Stock Volatility

Standard Deviation

The most common and basic measure of volatility is called standard deviation, where volatility is measured in relation to a defined time frame. It takes into account the way a security has performed in the past, and estimates the probability as to whether it will perform in the same manner in the future. The most common way to calculate standard deviation is to determine the deviation from an average monthly return over a 36-month time period, and then annualize that number. As a general rule, the higher the standard deviation, the more volatile the security. However, standard deviation is not a 'relative

measure', and has no base reference point by which to compare. Thus, the logical way to use standard deviation is to compare one security's standard deviation to that of a similar security.

The Beta Coefficient

Beta is used to measure the volatility of a security in relation to that of the stock market as a whole. To determine the beta of any security, you need to know the security's monthly returns and the returns of a benchmark index. For stocks and mutual funds that hold stocks, the Standard & Poor's 500 Stock Index is the most frequently used index, and is assigned a beta coefficient of one (1.0). For bonds and bond mutual funds, the Lehman Brothers Aggregate Bond Index is the most prevalent benchmark, and is also assigned a beta coefficient of one also. Any security with a beta higher than one is more volatile than the relative market index, while any security with a beta less than one is less volatile than the index. Like standard deviation, beta is typically measured using data over a 36-month period. Beta is useful in providing a measurement of a security's past volatility relative a specific benchmark or index, but it's important to verify that the most relevant benchmark is used.

R-Squared

Whenever beta is used to measure volatility, you are likely to find an R-squared statistic as well. Where the beta coefficient to measure volatility, R-squared measures the reliability of the information used to determine beta. The lower the R-squared figure (on a scale of 1 — 100), the less reliable the information.

Volatility and Your Time Horizon

Negative market volatility tends to hit short-term investors the hardest because they are looking for more immediate, positive results. Because long-term investors have a longer time horizon, they are better able to 'ride out' down markets and stay invested for subsequent recovery and growth opportunities. Attempting to time the market (the proverbial 'buy low, sell high' approach) is extremely difficult and even professional traders are not always successful. If market volatility is one of your main investing

concerns, talk with a professional financial adviser for help creating a personal asset allocation profile that can help meet your financial goals, and provide protection against market volatility. You may never be able to insulate your portfolio 100%, but taking steps such as diversifying your portfolio through asset allocation will give you a better chance of deflecting some of the potential volatility that is inherent in investing.

The Efficient Market Hypothesis & The Random Walk Theory

An issue that is the subject of intense debate among academics and financial professionals is the Efficient Market Hypothesis (EMH). The Efficient Market Hypothesis states that at any given time, security prices fully reflect all available information. The implications of the efficient market hypothesis are truly profound. Most individuals that buy and sell securities (stocks in particular), do so under the assumption that the securities they are buying are worth more than the price that they are paying, while securities that they are selling are worth less than the selling price. But if markets are efficient and current prices fully reflect all information, then buying and selling securities in an attempt to outperform the market will effectively be a game of chance rather than skill.

The Efficient Market Hypothesis evolved in the 1960s from the Ph.D. dissertation of **Eugene Fama** (link courtesy of Ibbotson Associates). Fama persuasively made the argument that in an active market that includes many well-informed and intelligent investors, securities will be appropriately priced and reflect all available information. If a market is efficient, no information or analysis can be expected to result in outperformance of an appropriate benchmark. ¹

"An 'efficient' market is defined as a market where there are large numbers of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants. In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future. In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value."

Eugene F. Fama, "Random Walks in Stock Market Prices," *Financial Analysts Journal*, September/October 1965 (reprinted January-February 1995). One of Fama's recent papers (**Market Efficiency, Long-Term Returns, and Behavioral Finance** at the Social Science Research Network in Adobe Acrobat format) is one of the most popular investment downloads on the web.

The random walk theory asserts that price movements will not follow any patterns or trends and that past price movements cannot be used to predict future price movements. Much of the theory on these subjects can be traced to French mathematician Louis Bachelier whose Ph.D. dissertation titled "The Theory of Speculation" (1900) included some remarkably insights and commentary. Bachelier came to the conclusion that "*The mathematical expectation of the speculator is zero*" and he described this condition as a "fair game." Unfortunately, his insights were so far ahead of the times that they went largely unnoticed for over 50 years until his paper was rediscovered and eventually translated into English and published in 1964. (See Peter Bernstein's **Capital Ideas** for more on these topics.)

There are three forms of the efficient market hypothesis

1. The "**Weak**" form asserts that all past market prices and data are fully reflected in securities prices. In other words, technical analysis is of no use.
2. The "**Semistrong**" form asserts that all publicly available information is fully reflected in securities prices. In other words, fundamental analysis is of no use.
3. The "**Strong**" form asserts that all information is fully reflected in securities prices. In other words, even insider information is of no use.

Securities markets are flooded with thousands of intelligent, well-paid, and well-educated investors seeking under and over-valued securities to buy and sell. The more participants and the faster the dissemination of information, the more efficient a market should be.

The debate about efficient markets has resulted in hundreds and thousands of empirical studies attempting to determine whether specific markets are in fact "efficient" and if so to what degree. Many novice investors are surprised to learn that a tremendous amount of

evidence supports the efficient market hypothesis. Early tests of the EMH focused on technical analysis and it is chartists whose very existence seems most challenged by the EMH. And in fact, the vast majority of studies of technical theories have found the strategies to be completely useless in predicting securities prices. However, researchers have documented some **technical anomalies** that may offer some hope for technicians, although transactions costs may reduce or eliminate any advantage.

Researchers have also uncovered numerous other **stock market anomalies** that seem to contradict the efficient market hypothesis. The search for anomalies is effectively the search for systems or patterns that can be used to outperform passive and/or buy-and-hold strategies. Theoretically though, once an anomaly is discovered, investors attempting to profit by exploiting the inefficiency should result its disappearance. In fact, numerous anomalies that have been documented via back-testing have subsequently disappeared or proven to be impossible to exploit because of transactions costs.

The paradox of efficient markets is that if every investor believed a market was efficient, then the market would not be efficient because no one would analyze securities. In effect, efficient markets depend on market participants who believe the market is inefficient and trade securities in an attempt to outperform the market.

In reality, markets are neither perfectly efficient nor completely inefficient. All markets are efficient to a certain extent, some more so than others. Rather than being an issue of black or white, market efficiency is more a matter of shades of gray. In markets with substantial impairments of efficiency, more knowledgeable investors can strive to outperform less knowledgeable ones. Government bond markets for instance, are considered to be extremely efficient. Most researchers consider large capitalization stocks to also be very efficient, while small capitalization stocks and international stocks are considered by some to be less efficient. Real estate and venture capital, which don't have fluid and continuous markets, are considered to be less efficient because different participants may have varying amounts and quality of information.

The efficient market debate plays an important role in the decision between active and passive investing. Active managers argue that less efficient markets provide the opportunity for outperformance by skillful managers. However, it's important to realize that a majority of active managers in a given market will underperform the appropriate benchmark in the long run whether markets are or are not efficient. This is because active management is a zero-sum game in which the only way a participant can profit is for another less fortunate active participant to lose. However, when costs are added, even marginally successful active managers may underperform. (See "**The Arithmetic of Active Management**" from Nobel laureate William Sharpe for more on this subject.)

"I believe a third view of market efficiency, which holds that the securities market will not always be either quick or accurate in processing new information. On the other hand, it is not easy to transform the resulting opportunities to trade profitably against the market consensus into superior portfolio performance. Unless the active investor understands what really goes on in the trading game, he can easily convert even superior research information into the kind of performance that will drive his clients to the poorhouse . . . why aren't more active investors consistently successful? The answer lies in the cost of trading."

Jack Treynor, "What Does It Take to Win the Trading Game?" *Financial Analysts Journal*, January/February 1981

If markets are efficient, the serious question for investment professionals is what role can they play (and be compensated for). Those that accept the EMH generally reason that the primary role of a portfolio manager consists of analyzing and investing appropriately based on an investor's tax considerations and risk profile. Optimal portfolios will vary according to factors such as age, tax bracket, risk aversion, and employment. The role of the portfolio manager in an efficient market is to tailor a portfolio to those needs, rather than to beat the market.

While proponents of the EMH don't believe it's possible to beat the market, some believe that stocks can be divided into categories based on risk factors (and

corresponding higher or lower expected returns). For instance, some believe that small stocks are riskier and therefore are expected to have higher returns. Similarly some believe "value" stocks are riskier than "growth" stocks and therefore have higher expected returns.² See also Still on a random walk by Burton Malkiel in Bloomberg Personal Finance (July/August 98).

Faced with the inference that they cannot add value, many active managers argue that the markets are not efficient (otherwise their jobs can be viewed as nothing more than speculation). Similarly, the investment media is generally considered to be ambivalent toward the efficient market hypothesis because they make money supplying information to investors who believe that the information has value (beyond the time when it initially becomes public). If the information is rapidly reflected in prices, there is no reason for investors to seek (or purchase) information about securities and markets.

While many argue that outperformance by one or more participants in a market signifies an inefficient market, it's important to recognize that successful active managers should be evaluated in the context of all participants. It's difficult in many cases to determine whether outperformance can be attributed to skill as opposed to luck. For instance, with hundreds or even thousands of active managers, it's common and in fact expected (based on probability) that one or more will experience sustained and significant outperformance. However, the challenge is to identify an outperformer before the fact, rather than in hindsight. (See Coin-Flipping & Graham-and-Doddsville and A Stock Market Scam for more on these topics.)

Additionally, in many cases, strong performers in one period frequently turn around and underperform in subsequent periods. A substantial number of studies have found little or no correlation between strong performers from one period to the next. The lack of consistent performance persistence among active managers is further evidence in support of the EMH. (See Do Past Winners Repeat? and Cherry-Picking).

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Stock Market Volatility

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Western Banking Quarterly is a review of banking developments in the Twelfth Federal Reserve District, and includes FRBSF's Regional Banking Tables. It is normally published in the Economic Letter on the fourth Friday of January, April, July, and October.

In recent months, it has not been unusual to see the value of major stock indexes, such as the S&P 500, change by as much as 3% in a single day. Unfortunately for many investors, the general direction of those changes has been downward. For some researchers in financial economics, the interesting question is: what drives the volatility itself? The evidence they have uncovered over the last few decades sheds light on the efficiency of the stock market and points to some important implications for economic forecasters and investors. In particular, it suggests that the degree of stock market volatility can help forecasters predict the path of the economy's growth; furthermore, changes in the structure of volatility imply that investors now need to hold more stocks in their portfolios to achieve diversification. In this *Economic Letter* I survey the academic literature on the properties and causes of stock market volatility, focusing on the debate on whether the stock market varies excessively, how volatility changes over time, and some of the underlying components of volatility.

Excess stock market volatility and dividends

Stock market performance is usually measured by the percentage change in the stock price or index value, that is, the returns, over a set period of time. One commonly used measure of volatility is the standard deviation of returns, which measures the dispersion of returns from an average. Since the beginning of 1997, the standard deviation of daily returns is 1.3% for the S&P 500 Index, 2.2% for the NASDAQ, and 1.3% for the Dow Jones Industrial Average (see Figure 1).

If the stock market is efficient, then the volatility of stock returns should be related to the volatility of the variables that affect asset prices. One candidate variable is dividends. But research conducted in the early 1980s suggests that variation in dividends alone cannot fully account for the variation in prices (see LeRoy and Porter 1981 and Shiller 1981). Prices are much more variable than are the changes in future dividends that should be capitalized into prices. Asset prices apparently tend to make long-lived swings away from their fundamental values. This fact turned out to be equivalent to the finding that, at long horizons, stock returns displayed predictability. Thus, the literature on excess volatility broached the possibility that the stock market may not be efficient.

In the excess volatility literature, the researchers understood that the dividends that are capitalized in the stock price arrive in the future and need to be "discounted" back to the present using a discount rate. In the early research it was assumed that this discount rate was constant. However, discount rates depend on investors' preferences for risk, which could very well change over time. Therefore, stock market volatility may not be excessive if discount rates are variable enough. Thus, the real contribution of the excess volatility literature was to call attention to the fact that corporate dividends are simply too smooth a series to account for the high volatility in prices. Subsequent research necessarily focused away from the payout policy of firms and toward the characteristics of investors and of actual stock market trading.

Persistence of stock market volatility

Stock market volatility tends to be persistent; that is, periods of high volatility as well as low volatility tend to last for months. In particular, periods of high volatility tend to occur when stock prices are falling and during recessions. Stock market volatility also is positively related to volatility in economic variables, such as inflation, industrial production, and debt levels in the corporate sector (see Schwert 1989).

The persistence in volatility is not surprising: stock market volatility should depend on the overall health of the economy, and real economic variables themselves tend to display persistence. The persistence of stock market return volatility has two interesting implications. First, volatility is a proxy for investment risk. Persistence in volatility implies that the risk and return tradeoff changes in a predictable way over the business cycle. Second, the persistence in volatility can be used to predict future economic variables. For example, Campbell, et al. (2001) show that stock market volatility helps to predict GDP growth.

Components of stock market volatility

Researchers have sought to analyze the relative importance of economy-wide factors, industry-specific factors, and firm-specific factors on a stock's volatility. This approach borrows from modern asset pricing theory and its emphasis on so-called factor models, or models that assume a firm's stock return is governed by factors such as the overall market return, the return on a portfolio of firms sampled from the same industry, or even changes in economic factors such as inflation, changes in oil prices, or growth in industrial production. If returns have a factor structure, then the return volatility will depend on the volatilities of those factors. Campbell, et al. (2001) assume the factors are the overall market return, an industry return (e.g., financial, industrial, etc.), and an idiosyncratic noise term that captures firm-specific information. They document the important empirical fact that while volatility moves considerably over time, there is not a distinct trend upwards or downwards. More interestingly, however, since 1962, there has been a steady decline in stock market volatility attributed to the overall market factor; that is, the common volatility shared across returns on different stocks has diminished over that

period. The variation ascribed to firm-specific sources, by contrast, has risen. The implication for investors, then, is that they need to hold more stocks in their portfolios in order to achieve diversification.

Conclusion

Economists have long been interested in the patterns of stock market volatility. Their research on excess volatility relative to dividends found that volatility tends to ebb and flow; subsequent research found that periods of high volatility are persistent and occur during periods of stock market declines, and that the stock market volatility associated with systematic factors has been declining over time. These academic findings may offer little consolation to today's investor for whom volatility means portfolio losses, but the research has yielded important insights into how stock market information can help forecast economic variables, and how investors can construct portfolios that can minimize volatility.