

Relationship between Movement of Stock Prices and Bond Prices: A Case Study of Karachi Stock Exchange

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Abstract

A potential investor may have different options for utilizing its excess ideal money but he will avail that option where he can have maximum satisfaction in terms of profitability and security. However, the higher level of uncertainty de-motivates an investor to employ his funds in a risky venture, especially during the period of economic instability. As a result, one must evaluate the factors which act as a key determinant in the market to boost up investors' confidence. KSE has been termed as high risk high premium market by researchers, so the higher persistence of volatility discourages an investor to rely on uncertain market. Instead he would be more willing in fixed income securities or may opt for diversification of its portfolio. For this purpose correlation analysis will be a helpful technique as it supports in asset allocation, portfolio selection and risk management. It identifies the degree of dependency of one portfolio on another and helps in deciding the correct proportion of allocation of funds on various assets. The two major forms of investment, stock and bonds do follow a particular pattern in the market and by analyzing their trend one can opt for a proper mix which will avert the risk associated with them. As per correlation analysis carried out on monthly data of KSE 100 and KSE all index from Nov 2003 to May 2009, it has been concluded that share indices have a positive correlation with GDP, interest rate and money supply and a negative correlation with bond prices and T-bill rates. The regression analysis of the model presented the higher value of R square of 96%, which represents the significance of the model.

Keywords: portfolio selection, correlation analysis, volatility.

1. Introduction

1.1 Background of Study

Finance is the key of every business and companies must generate funds for their long-term sustainability in the market. Nowadays financial markets are the key provider of funds for investments in profitable avenues by mobilizing savings from large pool of small savers to productive users of investment. Money market and capital markets are the components of financial market, where short-term needs are provided by the money markets in the form of T-bills and certificate of deposits and long-term needs are satisfied by the capital market in form of equity finance which can be raised through public or private offerings of shares and by the debt instruments in form of bonds and TFC.

Karachi Stock Exchange is the premier institution in the country to support the capital needs of the prospective investors in Pakistan. Since its inception in 1947 with a paid up capital of 37 million, it has shown tremendous growth. Today, it is owned by 200 members with a market capitalization of US \$26.48 billion and 652 listed companies shares are floating at its 1850 trading terminals. Electronic trading system has replaced the open outcry system and 4 different indices are available namely, KSE 100, KSE 30, KSE all share index and KMI index. Table 1 will give some details of KSE from 2004-2009.

Table 1 Profile of Karachi Stock Exchange

	2004-05	2005-06	2006-07	2007-08	2008-09 (Jul-Mar)
Number of Listed Companies	659	658	658	652	652
New Companies Listed	15	14	16	7	8
Fund Mobilized (Rs billion)	54	41.4	49.7	62.9	42.3
Listed Capital (Rs billion)	438.5	496	631.1	706.4	770.7
Turnover of Shares (billion)	88.3	79.5	54	63.3	17.1
Average Daily Turnover of Shares (million)	351.9	348.5	262.5	238.2	80.2
Aggregate Market Capitalization (Rs billion)	2068.2	2801.2	4019.4	3777.7	2057.1

Source: Economic Survey of Pakistan 2008-09, p. 91

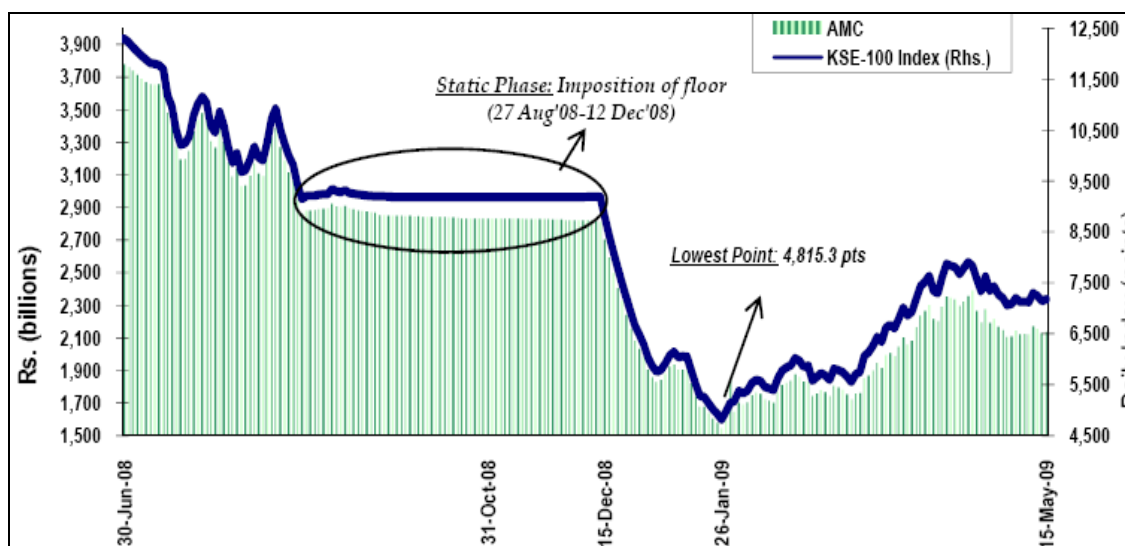
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1990 has been considered as a boom period in the history of KSE due to the reforms introduced in form of improved operational efficiency, financial liberalization, promotion of privatization culture and political stability in the economy. Later in 2002, an incredible growth in KSE 100 index and market capitalization was witnessed. Annual growth of 136% was reported over 2002-2007. The year 2008 also proved to be the promising year regardless of sub-prime crisis in the globe and by mid April 2008 KSE 100 index gained 11.6% and reached the highest level of 15676 on April 18, 2008 with a gain of 1747 pts. Later in 2008, due to worsening conditions of law and order prevailing in the country, it has fallen by 62%.

Near 2009, due to timely signing of SBA with IMF and by the commitment pledges of Friends of Pakistan, it has shown a positive sign of 22.5%. However, in May KSE-100 index suffered a gigantic loss of 41.6% and closed at 7177.6 pts and the magnitude of loss in USD was higher up to 52%. As a result, different measures have been announced by SECP to revive the situation like changing the upper and lower circuit breakers to 10 % and 1% respectively from 5% on both sides, short sale was banned in future to reduce the width of exit way to 1/5 of the existing. Blank selling for deliverable future was prohibited for Oct 2008. SBP allows banks to invest up to 30% in shares, government offered 30 billion guarantee to foreign investors in put option, etc. The figure 2 will give the position of KSE from July 2008- May 2009.

Figure 1: KSE snapshot, July-May 2008-09



Source: Economic survey of Pakistan 2008-09, p. 89.

Debt market in Pakistan is very small in size and it offers different instruments like: government securities, national saving schemes, corporate bonds, Ijara Sukuk bonds.

We need viable bond market to mobilize saving for long-term investment needs. Pakistan Investment bonds facilitate long-term government borrowings. During year 2007 and 2008, SBP raised 87.9 billion and 73.6 billion respectively from the auction of PIB's. In year 2009 and years papers have been added and rate of coupons have been revised. From July 2009-April 2009, 44.5 billion had been extracted from the auction of PIB's. Table 2 will give an overview of PIB's.

Table 2: Overview of Pakistan Investment Bonds

Tenor	2006-07 (Rs. billion)	Percentage Share	2007-08 (Rs. billion)	Percentage Share	2008-09 (Rs. billion)	Percentage Share
3-Years	10.88	12.38%	5.17	7.03%	7.24	14.81%
5-Years	10.17	11.58%	10.78	14.65%	5.85	11.97%
7-Years	0.00	0.00%	0.00	0.00%	5.53	11.31%
10-Years	30.21	34.38%	23.87	32.44%	22.66	46.36%
15-Years	9.25	10.53%	8.61	11.70%	1.30	2.66%
20-Years	11.25	12.80%	9.05	12.30%	1.70	3.48%
30-Years	16.10	18.32%	16.10	21.88%	4.60	9.41%
Total	87.86	100%	73.58	100%	48.88	100%

Source: Economic Survey of Pakistan 2008-09, p. 95.

Ijara Sukuk is another component of Debt Market in Pakistan, which provides diversified portfolios to investors based on the principles of Islamic Financial Industry. In 2009, 27.85 billion has been raised through auction of 3 year Sukuk bonds.

NSS are the long-term government papers, which provide high yield and easy redemption facility to investors before its maturity. As of March 2009, it contributes 35% of total domestic debt. Nowadays, it is the most attractive means of investment due to the increased in interest rates.

1.2. Problem Statement

Macro economic issues and instability in the political setup creates anxiety among investors and even foreign interest in equity market is declining. Due to high uncertainty in the market, investor wants to diversify their portfolios, so they can minimize the risk and maximize the returns. Now the need arises that one must evaluate the factors which govern the stock exchange in Pakistan and risk and return of market must be properly gauged in presence of other possible means of investment. Secondly one must analyze the degree of correlation which may exist between the movements of stock prices and bond prices in Pakistan.

Different researches have identified variables which may affect the stock prices. As quoted by Oseni (2009) that Al Tamini (2007) has identified some of the variables and these may include earning per share, gross domestic product, interest rates, foreign exchange rate. Higher the earnings or more the dividend a firm may declare, more people would be interested in investing their money in shares. More stable the economy would be, the more would be the growth opportunities, and hence investors may benefit from capital gains. More the interest rate, less people would be interested in shares as they may receive maximum return from banks, from government securities and bonds which are less risky in comparison to stock market.

Bond prices are also affected by different variables like: changes in economic conditions, changes in credit conditions, market psychology, budget deficit, changes in rate of inflation, changes in monetary policies i.e. interest rates, taxes, demand/supply, risk and returns (Chapman, 2002).

1.3. Objectives of the Study

Objective of the study would be:

- To identify the possible means of investments available in a market
- To identify the factors, which influence an investment decision regarding shares in Pakistan
- To know the degree of association between movements in share prices and bond prices.

1.4. Benefits of the Study

This research would be helpful for investor in identifying the investment trends prevailing in the market and will identify the key determinants of market. The findings may help investors in their decision making and they may secure their money in the most profitable and least risky option.

1.5. Hypotheses

As per the essentials of financial management, we assume that the changes in stock prices may inversely affect the bond prices as when people may receive more return on bonds, they would not be willing to invest their funds in an uncertain market. The following hypotheses are generated for the research:

1. Increase in interest rates offered by banks on deposits may discourage investments in shares, as they are more secured and offers certain rates to their investors, thus creating negative impact on share price.
Our Null Hypothesis would be: $H_0 = b_2 = 0$
And alternate hypothesis would be: $H_1 = b_2 < 0$
2. More stable the economy, the more would be value of a share
Our Null Hypothesis would be: $H_0 = b_4 = 0$
And alternate hypothesis would be: $H_1 = b_4 > 0$
3. Higher the value of bonds less would be the investment in shares.
Our Null Hypothesis would be: $H_0 = b_1 = 0$
And alternate hypothesis would be: $H_1 = b_1 < 0$
4. Higher the rates offered by t-bills the less would be the value of shares.
Our Null Hypothesis would be: $H_0 = b_3 = 0$
And alternate hypothesis would be: $H_1 = b_3 < 0$
5. Greater the uncertain credit conditions the less investment would be made in shares and bonds.
Our Null Hypothesis would be: $H_0 = b_5 = 0$
And alternate hypothesis would be: $H_1 = b_5 > 0$

1.6. Model specification

On the basis of above hypotheses the following model will be tested.

$$S_p = b_0 + b_1P_b + b_2R + b_3T_b + b_4Gdp + b_5MS$$

Where S_p is the Share price

P_b is the price of bond

R is the rate of interest offered by banks

T_b is the return on t-bills

Gdp is the proxy for Economic growth

MS is the money supply which is a proxy for credit conditions.

The expected signs for b_1, b_2, b_3 are negative whereas rest is positive.

1.7. Limitations

Due to time and data constraints only effect of above variables on share prices are evaluated.

1.8. Research Methodology

This research is based on empirical analysis of data from Karachi Stock Exchange and currently 4 indices are available namely KSE 100, KSE 30, KSE all index, KMI 30. The research is carried out only on KSE all index and KSE 100 index. The above hypotheses are tested on monthly data of Karachi Stock Exchange of Pakistan for a period of 5 years from Nov 2003 to May 2009. The study is to be based on quantitative information collected from secondary source of data primarily from the website of Karachi Stock Exchange, and from the publications of the State Bank of Pakistan. For share prices monthly indices of KSE 100 And

KSE all share index were taken, Bond prices figures are taken from the statistical bulletin of State bank of Pakistan, for monthly GDP the close proxy of Industrial production index was used, for interest rate weighted average deposit rates on fresh deposits are used, for t- bill rates weighted average yields are used and for money supply M2 figures are used. The statistical analysis is carried out by using the software of E-views. Different tools of testing are applied, like correlation and regression analysis, Augmented Dickey Fuller test, Ganger Causality test. Graphical analysis would be based on line graphs and histogram of all the variables.

2. Stock and Bond Market: General Perspective

2.1 Concept

Stock is an instrument of equity market which provides ownership to the investor and offers dividend as a percentage of profit, if ownership is retained otherwise investor can benefit from capital gains as prices are daily quoted in the market. It is the most risky form of investment as market is highly volatile and no fixed returns are guaranteed, even in case of liquidation of company shareholders are the last to receive their claims from the company, provided funds are available. Bonds are the instruments of debt market which offers fixed return to the investors and are least risky. In case of liquidation they are the first one to receive claims from the company.

2.2 Factors affecting movement in Stock prices and Bond prices

Stock prices are driven by various factors and many researches have been carried out to determine these elements playing major role in the market. Nishat and Irfan (2003) have carried out a research on how dividend policy affects stock price volatility after controlling for firm size, earning volatility, leverage and asset growth. Researcher identifies that dividend yield and payout ratios have significant but negative impact on share prices. His results have proven that size and leverage create positive and significant impact on stock prices, as highly leverage firms are more risky and the rate of change in prices would be greater whereas earning volatility has a negative and significant relation with stock prices during pre-reform period (1980-90).

In another research carried out by Nishat and Irfan (2002), key fundamental factors were identified which affect the stock prices in long run in Karachi Stock Exchange (KSE), especially after the introduction of reforms which brought more openness and competition in the market. As per the model presented by the researcher, six fundamental variables were identified namely dividend yield, payout ratio, leverage, growth, size of the firm and the earning volatility. They hypothesized that only leverage and earning volatility has a positive impact whereas the rest of the variables have negative relationship with stock prices. The results reflect that earning volatility is the most insignificant factor in KSE and even the asset growth also proves to be insignificant whereas the other four factors are not substantially significant.

The highest impact is of payout ratios, which is 16% whereas size exerts lowest but positive impact on share price. The results were consistent with emerging and developing economies where speculative forces and other macro environmental factors play more dominant role other than in developed economies where market is mainly influenced by fundamental factors. The explanatory power of these variables even varies in pre-reform (1981-90) and post reform (1991-2000) periods. In pre-reform period two fifth of the variation is explained by payout ratios, size and dividend yield and even the correct sign of the size variable is observed whereas in post reform only one third of the variation is explained by these variables leading to the conclusion that market is highly influenced by other factors, which need to be accounted.

The researcher, Al – Tamimi, Hussein (2007), examines the effect of interest rate, money supply, EPS, DPS, oil prices, GDP, consumer price index on stock prices by using the method of least square in UAE financial market. Researcher identifies that oil prices and GDP have a strong correlation, therefore he drops oil prices from his regression model. He explained this behavior by supporting data from 1990 to 2005, where on average oil prices alone constitutes 33% share in GDP. His findings also identify strong correlation between EPS and DPS and thus he drops DPS from the model as EPS is the source of generating DPS and secondly all the companies may not pay dividend. Researcher concluded EPS as the most influencing factor which stimulates high prices for the stocks in the UAE market and companies must focus on improving EPS in order to stimulate investment in stock market.

Hussain and Mahmood (1999) evaluates the casual relationship between money supply and stock prices in Pakistan by using two measures of money supply M1 and M2 and six stock price indices (general and five

sectoral indices based on cotton and textile, chemicals and pharmaceuticals, fuel n energy, transportation and communication and banks and financial institutions) for the period June 1991 to June 1999. The results prove a long run relationship between money supply and stock prices. However the error correction model does not hold a long run relation between M1 and stock prices but it do verifies one way causation from M2 to stock prices, thus giving an analysis that information about monetary assets will be helpful in determining the future prices of stock.

Mehar (2000) evaluates the effect of change in macro economic variables on market capitalization and concludes that market capitalization is caused by change in funds invested in equity and by the availability of liquidity in the market by the help of Ganger causality test. Researcher uses different exogenous variables mainly budget deficit, foreign exchange reserves, bank credits to public and private sectors, equities, external borrowing, use of cash balances, time deposits and money supply to explain the model presented by him. Results confirm that monetary and fiscal policies do affect market capitalization and equity elasticity was less than 0.55 and liquidity elasticity was greater than 1.25.

Hussain and Mahmood (2001) evaluates the long-term casual relation between stock prices and macro variables like consumption expenditure, investment spending and economic activity in Pakistan from a period 1959-1999 and observes only unidirectional causality from macro variables to stock prices. Correlation especially improves during the reform period as reforms termed positive for the development of stock market in Pakistan. However, the researcher concludes that stock market is not fully developed in generating strong influence on macro-variables and it lags economic activity. Hussain (2006) re-examine the casual relationship between stock price and real sector variables on the basis of annual data from 1959-2005. It was reconfirmed that Pakistan's stock market is not developed enough to create a strong influence on real sector of the economy. It means reforms like economic liberalization, openness to international investors, relaxation of foreign exchange policies, privatization, etc. are still not sufficient enough to derive the prices of real sector variables.

Mustafa and Nishat (2008) evaluates the relationship between average stock trading volume and serial correlation of daily stock returns from 1991 to 2001 and identifies that stock returns are highly affected by change in fundamentals, aggregate expected returns and by changes in effective risk aversion of investors, especially during pre-nuclear test period from 1991 to 1998. However, during post nuclear period from May14 1998 to 2001, the results were insignificant. The researcher concludes that non-informational factors like structural changes in stock market, construction of stock price index based on market capitalization has a significant effect on price and trading activity and it helps in gaining confidence of the potential investors in Pakistan who requires some sort of security especially when the economy is facing political instability as well as law and order situation.

Various factors affect the prices of bond. Kluza and Slawinski (2002), evaluates the factors affecting polish bond market and confirms the relation between bond prices and expected interest rate. Changes in Polish bond prices may also have an influence on international bond prices and over the years liquidity in a market has been improved. Analysis also concludes that fluctuation of market sentiments; exchange rate volatility and budget deficits have a strong impact on bond prices in polish market.

2.3. Correlation between the Movement of Stock Prices and Bond Prices

Valcx (2001) has examined the factors which move US and European stock and bond markets and identifies that stock price volatility is mainly due to future return news i.e. about its dividend rate and dividend growth and also inflation news plays a significant role in both US and European stock market. In bond market, bond returns plays a significant role in US whereas in EU, bond markets rely on innovations in future bond factors. Li (2002) explained the correlation phenomena between stock and bond returns on the basis of macroeconomic factors and identifies that major trend in stock and bond co-movement is due to uncertainty about expected inflation. Additionally interest rate and unexpected inflation also affects the co-movement but to a lesser extent. Researcher examines the effect in all G7 countries from a period 1958-2001 and observes upward trend in stock-bond correlation until the mid 1990s.

Fang (2004) investigates the volatility between equity and bond markets of Japan and U.S by using the BEKK method and identifies that within domestic market volatility transmission is unidirectional from stock market to bond market. Lee et al (2006) analyses co-movements between bond and equity prices for different economic sectors and explores the possible determinants of equity bond co-movements and

identifies that correlation decreases from 50% in beginning to 40% in 2002 and later it was zero in mid 2005. Substantial jumps have been witnessed and they largely follow the pattern of flight to quality and no significant persistence has been observed in post 2000 period. These jumps are less likely to be associated with market volatility. Long run serial dependency was noticed in post 2001 and the characteristics of early 1960's period can be used as a clue for predicting financial market position in post 2001. Chiang and Li analyses the correlation between the U.S stock and bond markets over the period 1996 to 2008 and concluded that on average the correlation between stock and bond returns is negative and time varying and depends on few macro variables like it is positively related to real income growth and the level of funds rate.

3 Capital Markets in Pakistan

3.1 State of Equity Market

Hussain and Qasim (1997) reviewed the role of Pakistan's equity market in 50 years since its inception, in strengthening the economy. Pakistan's equity market has shown great momentum in 1960 but later due to nationalization in 1970's it lose people's confidence. Later the privatization policy help in redeveloping the market and significant progress has been made in listing and market capitalization. It was ranked 3rd in 1991 among the emerging markets, however, due to political instability and other factors , its performance was highly affected and 1995 was termed as a disaster year, as political unrest and strikes disrupted its normal functioning and it collapsed by 28% in local index and 31% in international index.

Iqbal (2008) reviews the effect of liberalization and incorporation of corporate code of governance on stock market of Pakistan and compares it with other developed and emerging markets. As per the analysis of the researcher, the impact of liberalization was not positive on stock prices and economy due to non integration of market and high political instability and budget deficits. Pakistan has a very low correlation with developed markets whereas relatively larger correlation is observed with regional markets. On comparative basis, it was found that financial depth of Pakistan's equity market is lower than Indian and East Asian countries but higher than Latin America and African countries. Market size is small due to financial illiteracy and most of the people invest in land, real estate, in bank and gold reserves, even at corporate level cheap loans are available which are usually never repaid.

Trading volume has been increased due to high GDP rates, low interest rates, stable political conditions and injection of liquidity in foreign remittances by overseas Pakistanis. Return and risk on stocks are high but in comparison to other emerging markets, the difference is not too much. KSE is highly dominated by oil and gas exploration sector and stock market concentration is high in comparison to US market but developed economies have better price earning ratios. The market value on assets have shown upward trend due to increase in share prices and the incorporation of new code of governance have ensured fair trading and better allocation of resources in the market.

3.2 Status of Bond Market

Along with the stock, bond also holds a dominating share in a market and corporate bond market will be helpful in managing funds for long-term projects, provides competition to the banking sector which holds lion's share in corporate finance, improves allocation of capital, enhances financial stability in the economy, provides funds for investment in riskier assets where banks are reluctant to do so and is much cheaper than equity finance. Pakistan's corporate bond market is at infant stage with just one per cent share in GDP. Hameed (2006) identifies the factors which hinders the growth of corporate bond market in Pakistan like crowding out by government borrowing, administrative barriers and lack of liquidity. Researcher also presented some valuable recommendations for developing strong corporate bond market like government should regularly announce the auction of PIB's, should also borrow at market rates and reduce borrowing through national saving schemes (NSS) as it crowds out the private sector and affects the market rate for long-term funds and the rate for NSS should also be reduced.

Khalid (2007) investigates the status of domestic bond market in Pakistan and observed very slow growth in South Asian region. Researcher identifies that lack of market information and uncertain macro economic conditions decreases investor's interest in the bond market. The high level of fiscal deficits and internal and external debts has worsened the condition. Researcher proposes that regular supply of PIB's should be encouraged and proper policies should be developed for auction schedule, market pricing mechanism and yield curve.

3.3 Stock Market Volatility vs. Bonds

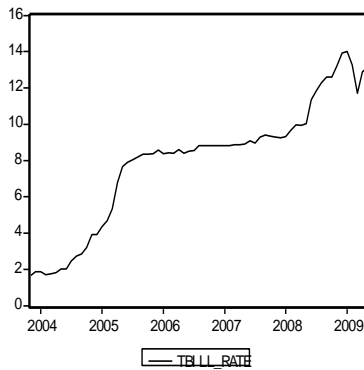
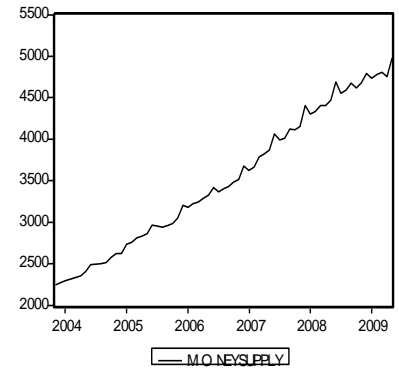
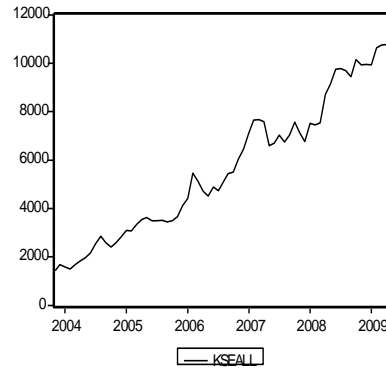
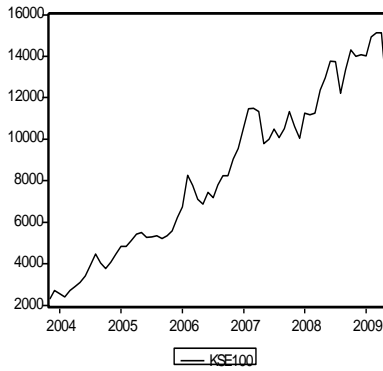
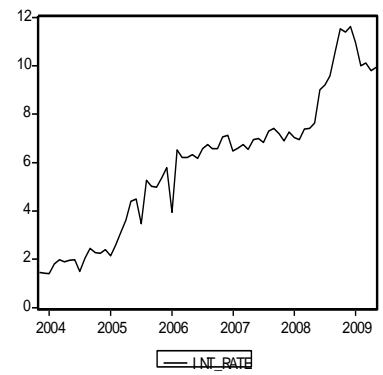
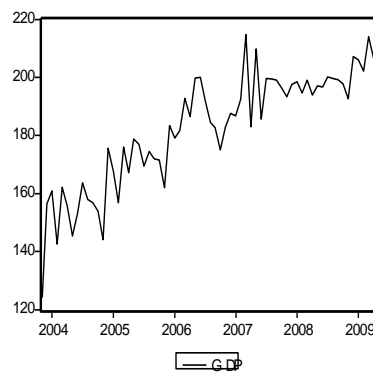
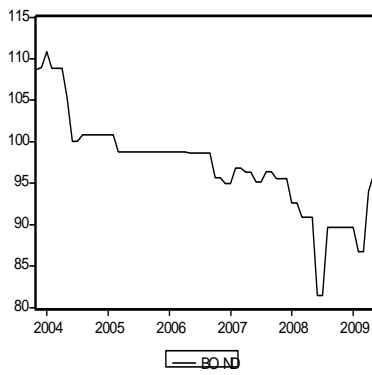
Volatility measures the general fluctuation in asset price and as volatility increases the risk would be increased. Husain and Uppal (1999) examines the stock return volatility by using autoregressive conditional heteroscedasticity and GARCH (1, 1) model on daily stock prices in Pakistan from Jan 1, 1989 to Dec 30, 1993. Results prove that future prices are predictable on the basis of past volatilities. Researcher identifies that effective steps should be taken for disseminating market information to investors and presented recommendation that analytical and technical skills of the brokers or members of the market should be developed to stimulate investor's confidence and share of individuals participating in the market should be raised by providing public awareness programs.

Hameed and Ashraf (2006), evaluates the conditional volatility and test for weak form efficiency of the stock returns in Pakistani market by using the GARCH model. The results reflect the KSE -100 to be the high risk market and observes that volatility mainly declines after May 2002 due to introduction of capital market reforms by SECP which includes implementation of T+3 system, rationalization of risk management measurement and imposition of circuit breakers. Volatility persistence is very high which means price shocks may affect the market for a longer period of time and returns are slightly improved by the imposition of circuit breakers. 9/11 leads to massive inflow of capital in stock market and reduces volatility which was not observed widely and researcher rejects the weak form efficiency hypothesis as past information appears to be helpful in predicting future prices and also mean variance hypothesis was rejected as investors are not benefited for taking additional risk.

Bonds are less volatile than stock and offers more yield and less risk to its investors. Liquidity of the bond market improves the allocation of credit but for this purpose supply of sovereign and corporate bonds should be raised and diversification of investment products and motive is required.

4 Empirical Analysis

4.1 Graphical Analysis of Dependent and Independent Variables



Interpretation of the Results

The plot of the data BOND, GDP, INT_RATE, KSE100, KSEALL, MONEYSUPPLY, and TBILL_RATE presents the time series data and by looking at these graphs (except for bond prices) the first impression that we get is that all variables are representing upward trend albeit with fluctuations. Only the bond prices are representing downward pattern, however, in 2009 they have shown some positive trait. The time series data shows all the variables are non-stationary.

4.2 Statistical analysis of hypotheses

Covarian Analysis

	BOND	GDP	INT_RATE	KSE100	KSEALL	MONEYSUPPLY	TBILL_RATE
BOND	34.91698	-88.37261	-14.35987	-20201.94	-14812.54	-4306.989	-17.38376
GDP	-88.37261	391.5298	48.91116	66140.32	47683.48	14350.34	58.98668
INT_RATE	-14.35987	48.91116	8.197655	10404.79	7625.081	2254.187	9.479778
KSE100	-20201.94	66140.32	10404.79	14784530	10774249	3112235.	12013.75
KSEALL	-14812.54	47683.48	7625.081	10774249	7893788.	2275615.	8779.593
MONEYSUPPLY	-4306.989	14350.34	2254.187	3112235.	2275615.	687037.5	2626.158
TBILL_RATE	-17.38376	58.98668	9.479778	12013.75	8779.593	2626.158	11.80391

From the above table, it is concluded that the highest value of covariance between the dependant variable KSE100 and independent variable MONEY SUPPLY is 3112235, whereas the lowest value of covariance between dependant variable KSE100 and independent variable BOND is -20201.94. The dependant variable KSE ALL also has highest covariance with independent variable MONEY SUPPLY of 2275615 and negative covariance with BOND of -14812.54.

Correlation Analysis

	BOND	GDP	INT_RATE	KSE100	KSE ALL	MONEYSUPPLY	TBILL_RATE
BOND	1	-0.7558175	-0.848765	-0.8891418	-0.89221262	-0.8793569	-0.85627317
GDP	-0.7558175	1	0.863338	0.869321	0.857714744	0.8749629	0.867678
INT_RATE	-0.84876493	0.863338	1	0.9451153	0.94788779	0.9498496	0.963697
KSE100	-0.88914183	0.869321	0.9451153	1	0.99733381	0.976514	0.909415
KSE ALL	-0.89221262	0.857715	0.9478878	0.997334	1	0.9771605	0.909534
MONEY SUPPLY	-0.879357	0.874963	0.9498496	0.976514	0.9771605	1	0.92218
TBILL_RATE	-0.8562732	0.867678	0.9636967	0.90941477	0.909534	0.922184	1

From the above table, we can conclude that KSE 100 has a highest positive correlation of 97.65% with MONEY SUPPLY and later 94.5% positive correlation with INT_RATE. KSE ALL has a highest positive correlation of 97.71% with MONEY SUPPLY and (94.71% with INT_RATE. It means share indexes have a high degree of positive association with money supply and interest rate. However KSE100 has 88.9% and KSE ALL has 89.2% negative correlation with bond prices, which means that both move in opposite direction.

Regression Analysis of KSE 100 Index

Dependent Variable: KSE100

Method: Least Squares

Date: 07/23/09 Time: 05:09

Sample: 2003:11 2009:05

Included observations: 67

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BOND	-105.7310	35.23075	-3.001100	0.0039
GDP	16.29616	10.51619	1.549625	0.1264
INT_RATE	428.5521	154.2502	2.778291	0.0073
MONEYSUPPLY	3.023924	0.435990	6.935765	0.0000
TBILL_RATE	-236.3101	111.2471	-2.124191	0.0377
C	4328.680	4211.976	1.027708	0.3081
R-squared	0.963506	Mean dependent var	8335.808	
Adjusted R-squared	0.960515	S.D. dependent var	3874.085	
S.E. of regression	769.8110	Akaike info criterion	16.21545	
Sum squared resid	36149148	Schwarz criterion	16.41289	
Log likelihood	-537.2177	F-statistic	322.1059	
Durbin-Watson stat	1.204343	Prob(F-statistic)	0.000000	

From the above table, it is concluded that the R-square and adjusted R-squared value is 96% which shows that it is a case of almost perfect regression, which means the explanatory variables are 96% efficient at predicting the variation in dependent variable. The negative coefficient of bond represents that by increase in bond prices by one unit on average may result in decline in share prices by 106 units. On the other hand, positive coefficient of interest rate explains that by one unit change in interest rate share prices would be increased by on average 429 units. The high value of F-Statistics shows the significance of the model. The probability of F-statistics is 0. The standard error of the model is unduly large and it measures the spread of observations around the regression line. Moreover, it would be near to zero less chances of error may exist.

The independent variables i.e. INT_RATE, GDP, MONEY SUPPLY have positive relations with KSE100 but it has negative relation with TBILL_RATE and BOND. The t-statistic is significant for MONEY SUPPLY as it is higher than 1.64 (in case of one sided test) and t-bill rate and bond as it is less than -1.64 at 5% level of significance. P- Values are less than .05 for all the variables except GDP which makes quite reasonable to reject the null hypothesis. The Durbin-Watson test is a test for first-order serial correlation in the residuals of a time series regression. A value of 1.204 for the Durbin-Watson statistic indicates it has an evidence of positive serial autocorrelation as it is less than 2, which is a condition of no autocorrelation. In presence of auto correlation, OLS estimates are subject to some element of bias in small samples and yields inconsistent OLS and standard error and t and F test becomes invalid. In order to remove this problem we will introduce lag variables on right hand side which will make d statistics invalid. The following results are reported after introducing lagged variables.

Dependent Variable: KSE100

Method: Least Squares

Date: 06/22/10 Time: 06:25

Sample(adjusted): 2003:12 2009:05

Included observations: 66 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1022.008	4590.175	0.222651	0.8246
BOND(-1)	-72.17994	38.22577	-1.888254	0.0638
GDP(-1)	8.333674	10.50165	0.793558	0.4306
MONEYSUPPLY(-1)	3.545892	0.460734	7.696188	0.0000
INT_RATE(-1)	289.7146	156.2901	1.853697	0.0687
TBILL_RATE(-1)	-152.4610	112.6521	-1.353379	0.1810
R-squared	0.962977	Mean dependent var	8427.473	
Adjusted R-squared	0.959892	S.D. dependent var	3829.857	
S.E. of regression	767.0064	Akaike info criterion	16.20938	
Sum squared resid	35297930	Schwarz criterion	16.40843	
Log likelihood	-528.9094	F-statistic	312.1234	
Durbin-Watson stat	0.874146	Prob(F-statistic)	0.000000	

After carrying out regression on lagged variables, it is concluded that by the introduction of lag variable, the R-square and adjusted R-squared value has been slightly decreased, which once again shows that it is a case of almost perfect regression. Standard error of the regression shows slight decrease from previous value. The F-Statistics have been slightly decreased from 322 to 312, which is still highly significant. The probability of F-statistics is 0. The independent variables i.e. INT_RATE, GDP, MONEY SUPPLY have positive relations with KSE100 but it has negative relation with TBILL_RATE and BOND. The t-statistic has been further improved for MONEY SUPPLY and still significant for bond but for the rest it is insignificant. P-values are less than .05 only for money supply and t-bill rate, thus we can reject the null hypothesis.

Regression Analysis of KSE All Index

Dependent Variable: KSE ALL
 Method: Least Squares
 Date: 07/23/09 Time: 05:10
 Sample: 2003:11 2009:05
 Included observations: 67

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BOND	-80.70349	24.87522	-3.244333	0.0019
GDP	4.072556	7.425120	0.548484	0.5854
INT_RATE	362.8464	108.9108	3.331594	0.0015
MONEYSUPPLY	2.230374	0.307837	7.245297	0.0000
TBILL_RATE	-183.0393	78.54776	-2.330293	0.0231
C	4210.152	2973.931	1.415686	0.1620
R-squared	0.965926	Mean dependent var	5658.309	
Adjusted R-squared	0.963133	S.D. dependent var	2830.793	
S.E. of regression	543.5369	Akaike info criterion	15.51936	
Sum squared resid	18021375	Schwarz criterion	15.71679	
Log likelihood	-513.8985	F-statistic	345.8405	
Durbin-Watson stat	1.170346	Prob(F-statistic)	0.000000	

From the above table, it is concluded that the R-square and adjusted R-squared value is 96.5% and 96.3% respectively, which is quite good enough to explain the variation in share prices. The value of F-Statistics has been further improved than KSE100, which shows the significance of the model. The probability of F-statistics is 0. The standard error of the regression has been improved from 770 to 544 which minimize the chances of errors. The independent variables i.e. INT_RATE, GDP, MONEYSUPPLY have positive relations with KSE100 but it has negative relation with TBILL_RATE and BOND. The t-statistic is significant for t-bill rate and MONEY SUPPLY and even better than KSE100. Except for GDP p-value is smaller than .05 which ones again make it possible to reject the null hypothesis. A value of 1.17 for the Durbin-Watson statistic indicates it has an evidence of positive serial autocorrelation. Now in order to remove the autocorrelation we will include lag variables on right hand side of the regression equation. The following statistics have been reported.

Dependent Variable: KSE ALL
 Method: Least Squares
 Date: 06/22/10 Time: 11:26
 Sample(adjusted): 2003:12 2009:05
 Included observations: 66 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4904.476	3091.421	1.586480	0.1179
BOND(-1)	-84.77771	25.74454	-3.293037	0.0017
GDP(-1)	0.310274	7.072721	0.043869	0.9652
MONEYSUPPLY(-1)	2.450852	0.310298	7.898385	0.0000
INT_RATE(-1)	278.6165	105.2593	2.646954	0.0104
TBILL_RATE(-1)	-153.6396	75.86966	-2.025047	0.0473
R-squared	0.968651	Mean dependent var	5722.411	
Adjusted R-squared	0.966038	S.D. dependent var	2803.058	
S.E. of regression	516.5685	Akaike info criterion	15.41880	
Sum squared resid	16010580	Schwarz criterion	15.61786	
Log likelihood	-502.8204	F-statistic	370.7821	
Durbin-Watson stat	0.906689	Prob(F-statistic)	0.000000	

From the above table, it is concluded that by the introduction of lag variable the R-square and adjusted R-squared value has shown slight improvement and is 96.9% and 96.6% respectively, which once again good

enough to explain the variation in share prices by explanatory variables. The F-Statistics have been further improved from 346 to 371, which show the significance of the model. The probability of F-statistics is 0. The independent variables i.e. INT_RATE, GDP, MONEY SUPPLY have positive relations with KSE100 but it has negative relation with TBILL_RATE and BOND. The t- statistic has been further improved for MONEY SUPPLY and bond but slightly decreases for T-bill rate, however, they are still significant. P-values are less than .05 for all the variables other than GDP, thus good enough to reject the null hypothesis.

ADF Analysis:

	LEVEL I (0)	LEVEL I (!)
KSE100	-1.11 (-2.6) at 10%	-4.452 (-3.54) at 1%
KSE ALL	-1.117 (-2.6) at 10%	-4.11 (-3.54) at 1%
BOND	-2.4 (-2.6) at 10%	-4.45 (-3.54) at 1%
MONEY SUPPLY	0.543 (-2.6) at 10%	-5.296 (-3.54) at 1%
INT_RATE	-0.89 (-2.6) at 10%	-4.133 (-3.54) at 1%
TBILL_RATE	-1.225 (-2.6) at 10%	-4.03 (-3.54) at 1%
GDP	-0.99 (-2.6) at 10%	-5.87 (-3.54) at 1%

On the basis of ADF test it was concluded that all the variables are not stationary at 1%, 5% and 10% but when ADF is carried out at first difference, all the variables become stationary at 1%.

Granger Causality Test:

On the basis of Granger causality test as reported in appendix, we can have following conclusions.

- 1) Causal factors for GDP are KSE 100, Int_rate, Money supply, KSE ALL and t-bill rate
- 2) Causal factors for money supply are Bond prices and KSE100
- 3) Causal factors for KSE ALL are Bond prices and Money supply
- 4) Causal factor for KSE 100 is Money supply
- 5) Causal factors for Int_rate are Bond prices, T-bill rate and Money supply.
- 6) Causal factor for Bond prices is Money supply.

GDP does not cause any variable but it is affected by all the variables except for bond prices. Overall, the money supply is the most influencing factor explaining the variation in other variables. As economically greater supply of money in the economy means there would be more production of goods and services which may stimulate economic growth thus providing better employment opportunities which may enhance the income of people where they can invest in different sources like bonds, share market and deposits of banks may also increase.

5) Conclusion

On the basis of least square technique the following results have been derived for the model.

For KSE 100 as a Dependent Variable

Substituted Coefficients:

=====

$$KSE100 = 1022.008293 - 72.17994177*BOND(-1) + 8.333674338*GDP(-1) + 3.545891692*MONEYSUPPLY(-1) + 289.7145676*INT_RATE(-1) - 152.4609852*TBILL_RATE(-1)$$

Interpretation:

KSE 100 varies inversely with bond prices (-72% variation is explained by bond prices)

KSE 100 varies directly with GDP (8.33% variation is explained by GDP)
KSE 100 varies directly with interest rate (290% variation is explained by interest rate)
KSE 100 varies directly with money supply (3.55% variation is explained by Money Supply)
KSE 100 varies inversely with T-bill rate (-153% variation is explained by T-bill rate)

The sign of interest rate has been resulted contrary to the expected one.

For KSE All as a Dependent Variable

Substituted Coefficients:

=====

$$\text{KSE ALL} = 4904.47636 - 84.77771185 \cdot \text{BOND}(-1) + 0.3102739859 \cdot \text{GDP}(-1) + 2.450851637 \cdot \text{MONEYSUPPLY}(-1) + 278.6164611 \cdot \text{INT_RATE}(-1) - 153.6395893 \cdot \text{TBILL_RATE}(-1)$$

Interpretation:

KSE ALL varies inversely with bond prices (-85% variation is explained by bond prices)
KSE ALL varies directly with GDP (0.31% variation is explained by GDP)
KSE ALL varies directly with interest rate (279% variation is explained by interest rate)
KSE ALL varies directly with money supply (2.45% variation is explained by Money supply)
KSE ALL varies inversely with T-bill rate (-154% variation is explained by T-bill rate)

The sign of interest rate reported here, is once again contrary to the expected one but it can be justified on the mere fact that increase in interest rate may encourage savings and when people may have excessive funds they might opt for maximizing the quick, easy and huge returns on short-term basis by investing in the equity market. Overall the most stimulating factor for share investment is money supply, as concluded from correlation, regression and granger test. It has positive and direct impact on share market. If money supply decreases in an economy, it hamper economic growth, production level, investment and saving levels and thus demand for shares and bonds investment declines and vice versa. Additionally, T-bill rates also affects investment in share prices but it has an inverse impact on equity prices as they offers easier and risk free return to the investors they would be less inclined to uncertain market.

6) Areas for further Research

The effect on separate sectors should be evaluated to know the effect on separate segments of economy and other variables should be added like inflation, exchange rate, market psychology etc.

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Appendix
GRANGER CAUSALITY TEST

Pairwise Granger Causality Tests

Date: 07/23/09 Time: 06:00

Sample: 2003:11 2009:05

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
GDP does not Granger Cause BOND	65	1.82923	0.16938
BOND does not Granger Cause GDP		3.05563	0.05448
INT_RATE does not Granger Cause BOND	65	1.37314	0.26116
BOND does not Granger Cause INT_RATE		3.94246	0.02462
KSE100 does not Granger Cause BOND	65	2.07194	0.13486
BOND does not Granger Cause KSE100		1.75801	0.18115
KSEALL does not Granger Cause BOND	65	2.09209	0.13234
BOND does not Granger Cause KSEALL		5.34886	0.00728
MONEYSUPPLY does not Granger Cause BOND	65	5.77515	0.00508
BOND does not Granger Cause MONEYSUPPLY		4.13330	0.02081
TBILL_RATE does not Granger Cause BOND	65	2.41923	0.09762
BOND does not Granger Cause TBILL_RATE		5.34403	0.00731
INT_RATE does not Granger Cause GDP	65	4.86539	0.01101
GDP does not Granger Cause INT_RATE		2.76673	0.07090
KSE100 does not Granger Cause GDP	65	7.37481	0.00137
GDP does not Granger Cause KSE100		0.28036	0.75650
KSEALL does not Granger Cause GDP	65	6.32117	0.00323
GDP does not Granger Cause KSEALL		0.31711	0.72946
MONEYSUPPLY does not Granger Cause GDP	65	5.34712	0.00729
GDP does not Granger Cause MONEYSUPPLY		0.08473	0.91887
TBILL_RATE does not Granger Cause GDP	65	5.45615	0.00665
GDP does not Granger Cause TBILL_RATE		0.86477	0.42633
KSE100 does not Granger Cause INT_RATE	65	1.67217	0.19647
INT_RATE does not Granger Cause KSE100		2.02537	0.14087
KSEALL does not Granger Cause INT_RATE	65	2.61864	0.08122
INT_RATE does not Granger Cause KSEALL		1.62007	0.20642

MONEYSUPPLY does not Granger Cause INT_RATE	65	3.70128	0.03050
INT_RATE does not Granger Cause MONEYSUPPLY		0.02453	0.97577
TBILL_RATE does not Granger Cause INT_RATE	65	3.28422	0.04431
INT_RATE does not Granger Cause TBILL_RATE		1.36696	0.26270
KSEALL does not Granger Cause KSE100 KSE100 does not Granger Cause KSEALL	65	0.38091 0.69830	0.68488 0.50143
MONEYSUPPLY does not Granger Cause KSE100	65	10.4277	0.00013
KSE100 does not Granger Cause MONEYSUPPLY		5.63361	0.00573
TBILL_RATE does not Granger Cause KSE100 KSE100 does not Granger Cause TBILL_RATE	65	2.99656 1.45233	0.05749 0.24213
MONEYSUPPLY does not Granger Cause KSEALL	65	8.39537	0.00061
KSEALL does not Granger Cause MONEYSUPPLY		3.13034	0.05092
TBILL_RATE does not Granger Cause KSEALL	65	2.62375	0.08084
KSEALL does not Granger Cause TBILL_RATE		1.52370	0.22622
TBILL_RATE does not Granger Cause MONEYSUPPLY	65	0.14534	0.86503
MONEYSUPPLY does not Granger Cause TBILL_RATE		1.47803	0.23627