



Impact of Macroeconomic Variables on Stock Market Index (A Case of Pakistan)

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ABSTRACT

The relationship between stock market and various macroeconomic variables has always been divisive. Studies indicate that stock market is influenced by changes in macroeconomic variables. Some of which affect the stock market returns and index positively while others have an adverse impact on stock market returns and index. This article examines the impact of four macroeconomic variables i.e. GDP per capita, gross domestic savings, inflation and discount rate on KSE index of Pakistan. It covers a period of 20 years from 1991 to 2010. Statistical Package for Social Sciences (SPSS) is used to test the multiple regression model. Analysis results indicate that GDP per capital and gross domestic savings have a significant and positive impact on KSE Index. On the other hand, discount rate and inflation (being measured through CPI) possess a significant but negative impact on KSE Index. Explanatory variables under study accounted for 98% variation in KSE Index. Therefore, it is suggested that government should take remedial measures to control inflation. Also it should work on maintaining appropriate discount rate. There should be a balance between excessive high and low discount rate. It will boost investments in stock market and consequently stock returns and index.

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Introduction

Stock markets play a vital role in development and growth of any modern economy. It is hard to imagine a prosperous economy in the absence of stock markets. Role of these markets is important in the way that they mobilize the domestic resources of the economy and channel them to productive investment (Comincioli, 1995). The performance of stock market is gauged through movements in its index which is influenced by many factors such as companies' specific factors, domestic factors (macroeconomic, social & political) and international factors.

The focus of this study is to determine the impact of certain macroeconomic variables on stock market index of Pakistan. At present there are three stock exchanges operating in Pakistan named Karachi Stock Exchange, Islamabad Stock exchange and Lahore stock exchange. For this study, KSE 100 index has been selected as sample. Karachi Stock Exchange (KSE) was inaugurated in 1947 but KSE-100 index was introduced in 1991 which later on transferred on electronic processing system in 1998.

There are many macroeconomic variables that can affect stock market index of Pakistan such as exchange rates, inflation, foreign exchange remittances, domestic & international oil prices, gross domestic products (GDP), interest rates, money supply, trade balances, country reserves, foreign direct investment etc. Most important and crucial economic variables that may affect the developing countries including Pakistan are inflation, discount rate, GDP per capital and gross domestic savings. Massive number of studies reveals the relationship of these variables with stock market index but this research will focus to trace down the effect of these variables specifically on

KSE-100 index. The relationship between macroeconomic variables and stock market index has always been of immense attraction for finance practitioners since many years. Studies show that inflation and interest rates have negative relationship with stock market index whereas GDP growth has a positive relation with stock market index (Sohail and Hussain, 2011).

Inflation is defined as the upward movement in prices of goods and services in an economy due to excessive demand of goods and services exceeding their money supply. It affects the purchasing power of the people and results in less saving which consequently results in increased money supply. Condensed saving reduces the economic growth by limiting investment in the economy. For measuring the effect of inflation on the economy Consumer Price Index (CPI) has been used. Consumer Price Index is the weighted average of prices of consumer goods and services. It is calculated by taking changes in prices for each item and then averaging them.

Discount rate is the interest rate charged by central banks from commercial banks on the provision of credit/loan to commercial banks. It is used as a tool of monetary policy to control inflation i.e. in the regime of higher inflation; central bank increases this rate for commercial banks. It is for the purpose of controlling excessive money supply in the country. With limited funds, banks will trim down provision of loans to the customers which will ultimately affect further investments and businesses. This study will determine how discount rate can affect investment in stock market as stock market plays a vital role in economic growth and how it is related to stock market index.

Gross Domestic Product Per Capita is a measure to gauge the standard of living of people in a country. It is among one of the

major macroeconomic variables used to access total goods produced per person by a country. It is an indicator of economic financial condition.

Gross Domestic Savings (% of GDP) are calculated by subtracting final consumption expenditure (total consumption) from GDP. Higher GDP per capita and gross domestic savings indicates economy growth meaning by higher investment in capital and money markets. This study will counter check this concept in context of impact of GDP per capita and gross domestic savings on Karachi Stock Exchange index.

The motive of this study is to explore the influence of macroeconomic variables i.e. inflation (measured through CPI) discount rate, gross domestic product per capita (GDPPC) and gross domestic savings as %age of GDP on KSE 100 index. Various studies have been carried out in the past to study such relationships by using different macroeconomic variables according to researchers' choice like Taulbee (2001), Nishat & Shaheen (2004), Sing (2009), Ali (2011) and Sohail and Hussain (2011).

It is enduring discussion whether macroeconomic variables significantly affect the stock market index or not. However, studies reveal that there is not much divergence among the researchers. Inflation has a negative impact on stock market prices and has causal relationship explored by Nishat & Shaheen (2004) & Ali Bazeed (2011). Stock market index is positively affected by growth in real GDP and consequently in GDP per capita and it is the largest determinant of stock prices (Taulbee, 2001).

Literature Review

Emmanuel and Samuel (2009) studied the impact of real GDP, inflation rate and interest rates (independent variables) on stock market returns (dependent variable) in Nigeria. They applied multiple regression analysis technique for their analysis comprising ten years longitudinal data of the said variables. The results of the study showed that there is significant relationship among these variables. Increase in inflation and interest rates adversely affect the stock market returns whereas there is positive relation between real GDP and stock market returns. About 95.6% of the variations in stock market returns were explained by real GDP, inflation rate and interest rates.

Léon (2008) studied the effects of interest rates volatility on stock market returns and volatility in Korea. GARCH model was used in the analysis. Results showed that interest rates have strong predictive force for stock market return but a weak predictive force for volatility. Meaning by that there is a negative relationship between interest rates and stock market returns. A high interest rate leads to increased savings and less investment towards stockmarket.

Research by Boyd, Levine and Smith (2000) supported the impact of inflation on financial sector performance. Financial sector performance was measured through banking sector performance and equity market returns. Research showed that there is negative relationship between inflation (being measured through changes in CPI on aggregate) and financial sector performance. Also their relationship is nonlinear. It also showed that when inflation rate exceeds the threshold rate, the marginal impact of inflation on stock market returns and banking sector performance diminishes.

Gan, Lee, Yong and Zhang (2006) studied the relationship and interactions between stock market returns and macroeconomic on New Zealand stock market for 1990-2003. They used co-integration tests for determining the relationship

among variables, Johansen Maximum Likelihood and Granger-causality tests to determine whether stock return is leading factor for changed in macroeconomic variables and innovation accounting analysis to check the linkages among the variables. The seven macroeconomic variables under study included Inflation rate, GDP, Exchange rate, Money supply, Long term interest rate, Short term interest rate and Domestic Retail Oil price (ROIL). Results of the study showed that there is a significant relationship (positive as well as negative) between macroeconomic variables and stock returns. Also it revealed that stock return is not a leading factor for changes in macroeconomic variables.

Gay (2008) studied the effect of macroeconomic variables on stock market returns on four emerging countries namely Brazil, Russia, India and China (BRIC). The independent variables under study included exchange rates and oil prices whereas stock market returns was the dependent variable. Box-Jenkins ARIMA model was applied on moving averages of time series data of exchange rates, oil prices and stock returns comprising a total of 1080 observations. Results of this research found that no significant relationship between exchange rates and oil prices on stock market returns exist. This may be due to the ignorance of domestic and international macroeconomic factors such as inflation, production, dividend yield, interest rates, etc. Also it revealed that there was no significant relationship between present and past stock returns indicating that BRIC have weak form of market efficiency.

Sharma and Mahendru (2010) studied the impact of macroeconomic variables on Bombay stock exchange (BSE). The explanatory variables included in study were inflation rate, foreign exchange reserves, exchange rates and gold prices. Explained variable was the stock prices of BSE. Simple regression analysis had been applied to study the relation. Results of the study revealed that exchange rates have high negative correlation with stock prices; inflation rate has low negative correlation with stock prices and does not affect the stock prices. Foreign exchange reserves have positive correlation while the gold prices have moderate correlation with stock prices.

Another study conducted by Hosseini, Ahmad and Lai (2011) on stock markets indices of China and India. The selected macroeconomic variables in the study were crude oil price, money supply, industrial production and inflation rate of China and India. Findings disclosed that in long run, crude oil price, money supply and industrial production have positive impact on China stock market index but negative in case of India. However rise in inflation rate negatively effect the stock market index in case of both countries.

On other hand, in short run, crude oil price has positive impact on Bombay stock market (India) while it is negative but also insignificant when considered the Shanghai stock market (China). Money supply has positive impact on Chinese stock market index and negative on Indian stock market index, however, in both countries, these effects are insignificant. Inflation has positive significant effect on Chinese stock market but has negative insignificant relation with index of Indian market.

One of the studies to find out the impact of Macroeconomic variables on stock market index was conducted by Hsing (2011). Exponential GARCH (Nelson, 1991) model was used to study the impact of various economic variables that cause fluctuation in South Africa's stock market index. Findings of the study were that index of South Africa stock market has positive relation with

growth in real GDP, US market index and the ratio of M3 money supply to GDP but has the negative relation with government deficit to GDP ratio, the domestic real interest rate and the inflation rate, the nominal effective exchange rate and the U.S. government bond yield.

Taulbee (2001) explored relationship of interest rate, unemployment, real GDP and fisher effect on S&P 500 index. The study also revealed some effects of other indexes in the S&P500 like transportation index, utility index etc. The paper also examined the relationship in economy and four types of industry i.e. defensive, growth, cyclical and interest sensitive. In the paper, S&P 500 Index (sp500) was dependent variable and Real GDP, unemployment fisher effect were independent variables. The paper used Double Log (GLS) regression model and it showed that Real GDP was the largest determinant of stock prices and it was having positive influence on stock index. During boom, economy's maximum return was possible by investing growth industry. Investor might get best return by investing in defensive industry during good economic condition.

Ali (2011) explored the relationship between some macroeconomic variables on stock market return in Dhaka. Multi Regression Model was used to trace down the relationship between stock market return and macroeconomic variables. Inflation, foreign remittances, market PE and industrial production index were repressors whereas stock market return was dependent variable in the study. Only one unilateral causal relationship was revealed between stock market return and market PE by Granger Test. Inflation and foreign remittances were having negative relation; on the other hand, industrial production index and market PE were having positive influence on stock market return. Less information efficient market was also proved by the result of less causality relationship among variables through Granger Test.

Objectives of the Study

Objectives of the study are to determine and ascertain correlation and causal relationship between Karachi Stock Exchange (KSE) index and macroeconomic variables through regression analysis. It is intended:

- ◆ To ascertain the dependency of KSE 100 index on selected macroeconomic variables
- ◆ To calculate relationship and causality between selected macroeconomic variables and KSE 100 index
- ◆ To trace the strength of relationship of these macroeconomic variables with KSE 100 Index

Methodology

This study examines the impact of GDP per capita (GDPPC), Gross Domestic Savings (% of GDP), Discount Rate and Consumer Price Index on KSE 100 index while impact of other macroeconomic variables has been assumed to be constant. Data has been analyzed through Ordinary Least Square (OLS) technique.

Data Collection Sources

The study is based on secondary data. It is a time series study covering the period of twenty years from 1991 to 2010. Annual economic data for CPI has been collected from "Economic Survey of Pakistan" published by Government of Pakistan, Ministry of Finance. For GDPPC and Gross domestic savings, data has been retrieved from "The World Bank Indicators" available on World Bank's website. To have uniformity in the analysis, available monthly data of KSE 100 index and discount rate has been converted into annual average data.

Model Specification

Forward selection technique has been applied to select the model and the finalized one is as follows:

$$KSEI = \alpha + \beta_1 GDPpc + \beta_2 GDPsav + \beta_3 CPI + \beta_4 DiscR + \varepsilon$$

Where:

KSEI = Karachi Stock Exchange Index

GDPpc = GDP Per Capita (expected to have positive impact on KSE Index)

GDPsav = Gross Domestic Savings represented as % of GDP (expected to have positive impact on KSE Index)

CPI = Consumer Price Index (expected to have negative impact on KSE Index)

DiscR = Discount Rate (expected to have negative impact on KSE Index)

ε = stochastic variable or error term

Durbin-Watson test's result doesn't indicate positive or negative autocorrelation meaning by there is no autocorrelation among the residuals. Residuals follow normal distribution. Results of Kolomogrov Siminov (K.S) test indicate that calculated value (0.653) is greater than the level of significance (0.05) meaning by normality of residuals See table: 1 for details. Moreover, residuals have zero mean value and there is homoskedasticity among residuals.

Hypothesis of the Study:

Study is based on the following hypothesis:

Null hypothesis (H_0): CPI, discount rate, GDP per capita and gross domestic savings (% of GDP) have no significant impact on KSE 100 index of Pakistan.

Data Processing Tool:

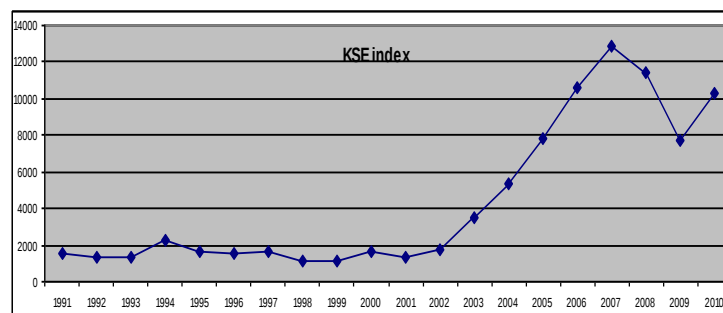
Statistical Package for Social Sciences (SPSS) has been used to process the data and to examine the nature of relationship between dependent and explanatory variables. Model has been tested using t-test at 5% level of significance.

Data Analysis

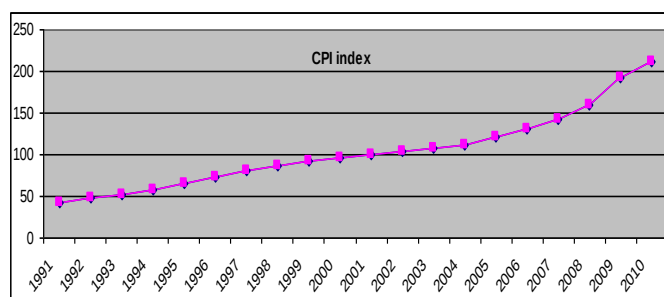
Classical Linear Regression Model is used in this study as our model fulfills the assumptions of Classical Linear Regression Model which are:

- ◆ Model is linear in parameters.
- ◆ There is no perfect multicollinearity among explanatory variables as indicated through the results of collinearity diagnostics. See table: 2 for details

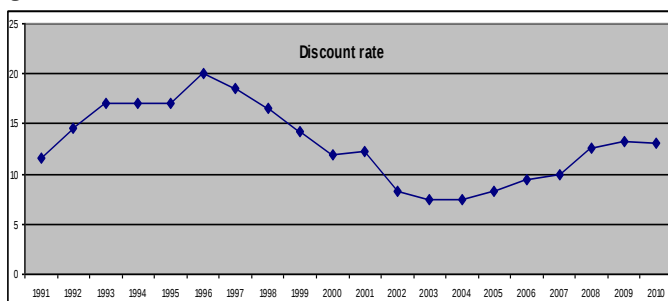
Descriptive Analysis



Highest KSE 100 index has been recorded in 2007 at 12877 whereas, in 1998, the lowest KSE index was recorded at 1178. KSE 100 index was above 10000 in 2006, 2007 and 2010. On the other hand, minimum growth in KSE index was from 1995 to 2000. Average index of these six years was only 1470. From 2003 to 2010 it has increasing market index.

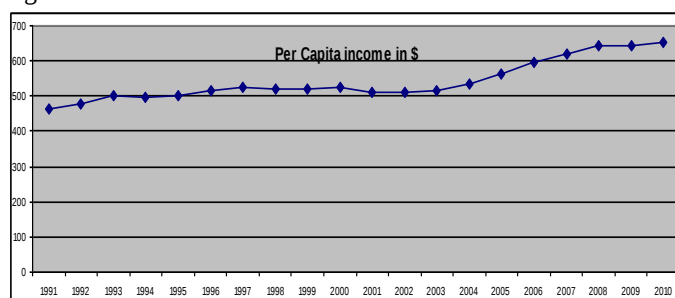


CPI was observed minimum in 1991 at 43.3% which gradually increased over the number of years and in 2010 it has been recorded at 212.4%. per cent age increase in CPI was gradual from 1991 to 2007, thereafter, high volatility was observed onward and 2009 the %age in CPI is recorded as highest i.e. 21%.

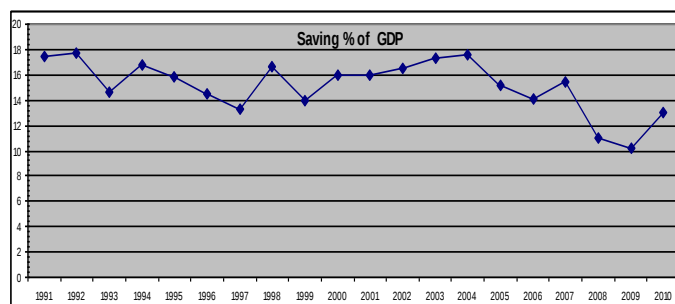


Discount rate has been low from 2002 to 2005 and it has been recorded high from 1993 to 1997.

Minimum discount rate was in 7.5 in 2002 and 2003 whereas highest rate was observed in 1997 at 18.5%.



Increasing trend has been in Per capita income from 1991 to 2010. It was lowest in 1991 at \$465 and reached at its highest level in 2010 at \$653.



Gross saving to GDP ratio was highest in 2004 and lowest in 2010. This ratio was more volatile during 2007 -2010.

Empirical Results

The results of regression analysis obtained by using SPSS reveals that model is significant as the p-value (0.000^a) of the model is less than the pre decided level of significance (0.05) therefore, we reject the null hypothesis means selected explanatory variables have significant impact on KSE index.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.092E8	4	7.731E7	120.00	.000
	Residual	9663054.28	15	644203.62		
	Total	3.189E8	19			
a. Predictors: (Constant), Discount, Savpgdp, CPI, GDPPC						
b. Dependent Variable: Kse.index						

Forward selection confirms the significance of selected variables under study. All variables (CPI, discount rate, GDPPC and gross domestic savings) are significant. However, the most significant variable of the model is GDPPC. See table: 3 for details

Model also possess high explanatory power i.e. almost 98% which means 98% variation in KSE index is explained by CPI, discount rate, GDP per capita and gross domestic savings and the rest is unexplained due to other factors.

Model Summary ^b					
Model	R	R Square	Adjusted R Square	Std. Error of Estimate	Durbin-Watson
1	.98 ^a	.97	.96	802.62	1.77
a. Predictors: (Constant), Discount, Savpgdp, CPI, GDPPC					
b. Dependent Variable: Kse.index					

GDP per capita has positive significant impact on KSE Index and its co-efficient is 142.661. It means with one dollar increase in GDPpc, KSE Index increases to 142.661 points provided other variables remains constant.

Gross domestic savings (being represented as % of GDP) possess positive significant relationship with KSE Index with coefficient value being 541.593. It supports the concept of economics that savings leads to investments.

Regression co-efficient of CPI shows the negative relationship of CPI with KSE index i.e. for one per cent increase in CPI, KSE index decreases to (-90.005) points if other variables remains constant.

Discount rate also has negative significant impact on KSE index as reflected by its regression co-efficient. Provided other variables constant, for one per cent increase in discount rate, KSE index decreases to (-297.254) points.

Coefficients ^a						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	-67917.84	7244.31		-9.37	.000
	GDPPC	142.66	11.64	1.99	12.25	.000
	Savpgdp	541.59	174.03	.28	3.11	.007
	CPI	-90.00	14.01	-1.0	-6.42	.000
	Discount	-297.25	73.04	-.27	-4.07	.001
a. Dependent Variable: Kse.index						

The estimated regression model is:

$$\text{KSEI} = -67917.842 + 142.661 \text{ GDPpc} + 541.593 \text{ GDPsav} - 90.005 \text{ CPI} - 297.254 \text{ DiscR}$$

The economic corollary is that inflation and discount rate have negative relation with KSE Index. Stable inflation and discount rate will lead the investors towards investment in capital market. On the other hand, increased GDPpc and gross domestic savings positively affect the KSE Index as held by the analysis.

		Unstandardized Residual
N		20
Normal Parameters ^{a,,b}	Mean	.00
	Std. Deviation	7.13149216E2
Most Extreme Differences	Absolute	.164
	Positive	.097
	Negative	-.16
Kolmogorov-Smirnov Z		.73
Asymp. Sig. (2-tailed)		.65
a. Test distribution is Normal.		
b. Calculated from data.		

Coefficients ^a							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	-67917.84	7244.310		-9.37	.000		
CPI	-90.00	14.011	-1.01	-6.42	.000	.08	12.27
Discount	-297.25	73.048	-.27	-4.07	.001	.44	2.26
GDPPC	142.66	11.644	1.99	12.25	.000	.07	13.14
Savpgdp	541.59	174.03	.28	3.11	.007	.25	3.99

a. Dependent Variable: Kse.index

ANOVA ^c						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.584E8	1	2.584E8	76.88	.000 ^a
	Residual	6.049E7	18	3360769.30		
	Total	3.189E8	19			
2	Regression	2.814E8	2	1.407E8	63.74	.000 ^b
	Residual	3.752E7	17	2206932.80		
	Total	3.189E8	19			
3	Regression	2.986E8	3	9.952E7	78.32	.000 ^c
	Residual	2.033E7	16	1270667.16		
	Total	3.189E8	19			
4	Regression	3.092E8	4	7.731E7	120.00	.000 ^d
	Residual	9663054.28	15	644203.62		
	Total	3.189E8	19			
a. Predictors: (Constant), GDPPC						
b. Predictors: (Constant), GDPPC, Savpgdp						
c. Predictors: (Constant), GDPPC, Savpgdp, CPI						
d. Predictors: (Constant), GDPPC, Savpgdp, CPI, Discount						
e. Dependent Variable: Kse.index						

Conclusion

The motive of this study is to trace the effect of selected macro-economic factors on KSE 100 index. Ordinary Least Square (OLS) method is used to capture the empirical evidences on this topic. All the tests like KS Test, heteroscedasticity, Durban Watson and multicollinearity are performed on this data. All results obtained from this data are from biased decision and depicts a clear picture in the range of statistical boundaries.

The finding reveals that all the four macro-economic variable i.e. CPI, discount rate, per capita income and saving to GDP ratio caused 98% movement in KSE 100 index. Consumer price index and discount rate have negative significant relationship with KSE 100 index while the Per capita income and gross domestic saving to GDP per cent age have positive significant relationship. All these relationships are confirmed by different research papers from all over the world and have a lot of empirical evidences to support our finding.

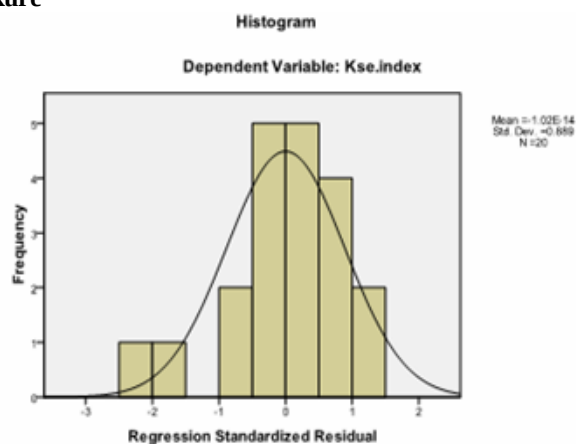
Recommendations

This study provides not only in-depth analysis of KSE 100 index but also gives the solid suggestion for the policy makers. Some of key recommendations are:

If policy makers control the inflation rate and discount rate in the economy, they can boost the KSE100 index toward defined target. Increase the stock exchange index will lead to the investor willingness to invest in the stock market which is very helpful for monetary and fiscal purposes of the government.

Stock market is very sensitive to the movements in inflation rate. Findings of this study indicate that negative relationship exists between KSE index and inflation (being measured through CPI). Higher inflation leads to higher interest rates and subsequently investors require higher rate of return on their equity investments and it lowers the value of the equity stocks. Rational investors avoid investing in a bear market and those who invest require to be compensated for extra risk. Consequently, stock market index fall down. Government should take measures to control inflation through infrastructural development. There should be stable and low inflationary environment. Also the study indicates negative relationship between discount rate and KSE Index. There should be a balance between extremely high and low discount rate. On one side, reducing discount rate will increase the money supply in the country so more investment opportunities will be available. This is because banks will ascent towards giving loans to the customers. As a result investors will invest in stock market keeping in view the perception of bull market. It will boost the stock market index. While on the other side, lowering discount rate will cause excessive money supply in the country which in turn will cause inflation. Therefore, special attention should be given by the Government to maintain balance between extremely high and low discount rate. Similarly by increasing the Per capita income and percentage to GDP may also increase KSE100 Index significantly.

Annexure



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