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Macroeconomic Factors and Equity Market of Pakistan: Evidence from Bound Testing Technique

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This essay appraised an influence of macroeconomic variables on stock market returns using monthly time-series data from November 1993 to December 2016 for Pakistan. Macroeconomic variables are represented by the exchange rate change, inflation rate, interest rate, industrial production growth, and the crude oil price. The ARDL bound testing approach to cointegration associating with Granger causality was conducted to reveal such relationship. This study displayed single bidirectional causativeness in stock returns and exchange rate changes, while inflation and interest rate Granger-caused stock market returns. Main findings revealed that variables are cointegrated and evident that industrial production and interest rate are negative determinants of stock returns in the long run. Yet the findings in short-term clearly support that all the macroeconomic indicators in the model drive stock market return. Moreover, the error correction coefficient suggested a very high magnitude of convergence headed for the long run equilibrium after experiencing shocks in a month. As observed, the stock market is mainly fluctuated by its own influences and the downfall situations that exist in Pakistan since 1998 to 2000 and 2008 to 2013 owing to internal and external administrative and economic unrest happened during the period. This analysis can facilitate investors for making optimal decisions regarding their business investments. Furthermore, this study would provide eloquent insights in the body of literature, policy makers as well as the practitioners.

Keywords: Stock Market; Macroeconomics; Causality; ARDL; Bound Testing Approach

I. Introduction

The stock market in developed economies is a major channel of financial resources from surplus elements to deficit elements. This transfer of funds

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is mutually advantageous to both groups. The recipients (publicly owned entities) of these funds are enabled to employ them in profitable investments, while the surplus elements (households) shared in the future profits of these firms (Khilji; 1993). On the other hand, smaller markets (particularly developing countries) have still not received that much attention. This is probably owing to the fact that these markets more often lack the profundity, regulatory framework, consistency in macroeconomic factors and structural precautions that characterize capital markets in developed economies. Trading in stock markets of developing countries is generally thin and inconsistent thus lack continuous and systematic nature of price movements. There is no controversy that unanticipated changes in macroeconomic environments generally effect on stock returns, hence less agreement is noticed in the context of a relationship in macroeconomic variables and equity market performance. Recently the augmenting prominence of equity markets in the world has unveiled a new direction of research. Therefore the perpetual deliberations in economics are whether financial progression instigates economics growth or it is the repercussion of increased economic endeavor (Nishat and Shaheen; 2004).

The previous studies attributed mixed and contrasting empirical results by applying different statistical methods. With a view to circumvent the "omitted variable" problem as the regression models were mostly based on two variables yet, there was need of other macroeconomic variables in the model. The major concern of investors for managing their portfolios is to make a choice regarding stocks available in the equity market while considering the performance of macroeconomic factors causing substantial influence on future returns. Many experiential studies divulge that influence of macroeconomic indicators on stock prices do not properly identify by the asset pricing theories [Fama (1981), Chen, et al. (1986) and Maysami and Koh (2000)]. Generally, these researches employ Eagle and Granger (1987) technique or Johanson and Jusilieus (1990, 1991) system in Vector Autoregressive (VAR) context. Similarly, Fazal (2006) and Nishat (2001) used Johanson and Jusilieus (1990, 1991) method for analyzing the connection amongst stock prices and macroeconomic indicators in Pakistan.

After an extensive appraisal of the literature on the upshot of macroeconomic factors on stock return, the study opted to embrace other pertinent economic indicators for instance; inflation, interest rate,

industrial production growth rate and crude oil prices beside exchange rate changes for robust tests. The present study examined that relationship in the context of Pakistan by performing an Auto Regressive Distributive Lag (ARDL) bounds testing approach intended by Pesaran, Shin, and Smith (1996, 2001). This technique extensively used for evaluating the consequence of macroeconomic indicators on economic growth, though underperformed in relation to the capital market filament of literature. This technique is more favorable to the other methods. Primarily, the order of integration is not an essential requirement for this approach as the estimates of long-run coefficients are consistent. Moreover, ARDL approach investigated an accurate dynamic structure whereas other econometric methods not evidently distinguished between short-run and long-run relations.

This paper studies the data covering the timeframe since the 1990s to date, which embraces several turbulent events encompassing Asian and global financial crisis, continuing financial liberalization in the region, the imposition of economic sanctions on account of nuclear tests, political unrests, and devaluation in currency value etc. Therefore an improved understanding and the evaluation of pertinent stock returns to the profound influence of macroeconomic factors is the aim of this research. The residual part of this paper is followed as; Section II and III endow with Pakistan stock market overview and the literature review. Section IV covers the sources of data and model specification. Section V describes methodology and techniques of analysis. Empirical results are discussed in section VI, while the summary and conclusion are contained in section VII.

II. An overview of Stock Market of Pakistan

In the developing Asian countries, Pakistani stock market is considered as an embryonic market due to its superficiality, asymmetrical trading behavior, information deficiency and high volatility in nature. Further markets cannot ignore the presence of insiders and market makers.

Stock exchange of Pakistan formerly named as Karachi stock exchange (KSE) established in September 1947 and became functional in 1949 with five companies and total paid up capital of Rs. 37 million, which then reached to Rs. 117 million with 15 companies in 1950. Trading in KSE started with 50 shares index, which improved to 100 shares indexes in

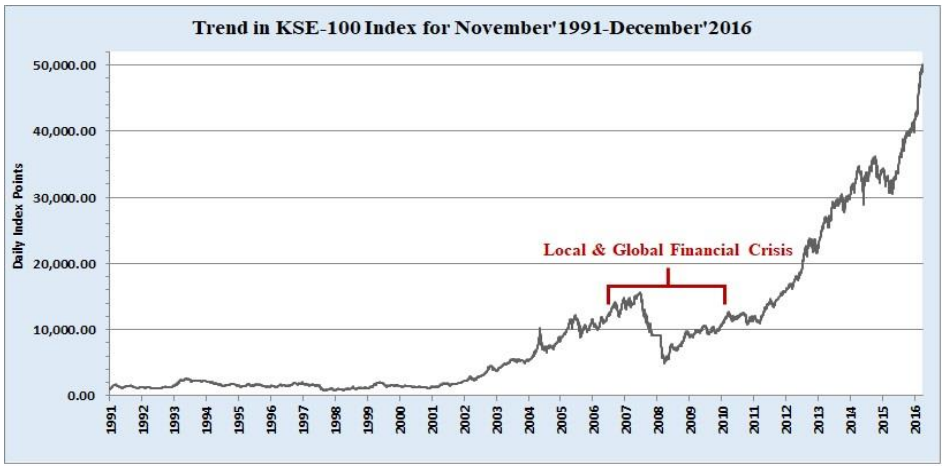
1990. KSE rapidly grew after ten years' time when the listed companies reached to 81 with the market capitalization of Rs. 1.9 million in 1960, which was five times greater than 1950. The stock market spotted growth in the early 1990's on account of the huge progress mainly includes; the financial liberalization due to increase in foreign portfolio investment, and the massive privatization process hence introducing new portfolios in the market. In 1998 the capital market crashed viciously and touched the lowest ebb in July 1998. The number of factors were responsible for this sharp decline included: contagion effects of South East Asian financial debacle, global recession, crash of stock markets of some leading economies, economic sanctions imposition on account of nuclear trials in May 1998, and other local factors such as, withdrawal of many institutional foreign and law and order situation. After touching the lowest position the capital market displayed some modest recovery. In the smooth continuation of that rising flow level in 2000's, the economy observed a consistent and gradual increase in productivity. The KSE introduced in 2002 a computerized trading system, i.e. KATS (Karachi Automated Trading System) with one million trades per day volume for the provision of the transparent and cost-efficient marketplace for stockholders.

The market followed a descending inclination and became extremely volatile during the fiscal year 2008 and 2009. Major macroeconomic factors showed least satisfactory execution owing to frequent deviations in the political environment and global financial crisis. The financial year 2007-08 instigated with the incident of Red Mosque, subsequently the reinstatement of Chief Justice of Pakistan. The presidential election proclamation and subsequently Mr. Musharraf re-appointed in October 2007 responded positively to the stock market. The market reaction to the bomb blasts incident during reception pageant of Ms. Benazir Bhutto on October 18, 2007. A single day biggest collapse in the market recorded on November 5, 2007, as a result, an emergency act executed in the country. Suspension of Pakistan from the Commonwealth and Moody's downgraded the country's position from steady to negative which headed to a sharp decline in stock prices. Karachi stock market, woe on the shooting of Benazir Bhutto, witnessed the all-time biggest crash.

From 2009 onwards, market started experiencing bullish trends by following several steps towards recovery. After two decades of reforms in August 2012, KSE reported a total of 591 listed companies with the

total market capitalization of Rs. 3755 billion. During this period capital markets in Pakistan have been through several embellishments, counting; announcement of new Securities Act, 2015, demutualization of exchanges and amalgamation of three indigenous stock exchanges into a one integrated stock exchange, named Pakistan Stock Exchange (PSX). A significant and smooth rise in the stock market indices was recognized in the year 2016 due to an induction of investment projects backed by CPEC.

Figure 1:



Source: State Bank of Pakistan

III. Literature Review

In the recent years, a research trend shifted more towards an application of advanced econometric techniques and ease of access to data. This led an extensive discussion on the subject of stock market progress in the developed and now more in emerging economies. The outcomes of ample econometric research explained variable conclusions for correlation holding in development of the stock market and different sets of macroeconomic variables of an economy. The impact of these variables was noticed either individually or collectively. In the initial studies, Fama (1981) inspected an effect of variable factors on stock prices and found strong positive correlation between them. Similarly, Levine and Zevos (1988), Levine (1991), and Levine and Zervos (1995, 1996 and 1998) reported positive correlation in the performance of the stock market and economic growth mainly in evolving economies. Hitherto various studies concentrated on the relationship using only two variables, whereas limited

studies explored an influence on capital market by multiple economic variables. The research study of Aggarwal (1981) advocated that variations in exchange rates result positive changes in stock prices. Focusing on emergent economies, Abdalla and Murinde (1997) observed unidirectional causations in Korea, Pakistan, and India from exchange rates to stock prices; though in Philippines causal effect was in the reversed direction. Rafay et al. (2014) also observed one-way link in exchange rate and KSE 100 index. In most findings, it was observed that when currency appreciated it led to increases stock prices or vice versa. In few researches association in stock prices and interest rates has also been empirically analyzed for the period of time. Mukherjee and Naka (1995) disclosed that there is a negative correlation between interest rates and equity market returns by employing VECM model.

Consistent with Fisher's Hypothesis (Fisher, 1930), most of the studies have concluded either positive or negative impact of inflation on stocks subject to the aptitude to hedge by investors and the application of pecuniary policies. However, strong positive causation in stock returns exhibited by unexpected inflation during financial shrinkages in the economic cycle, indicating larger instability in stock movements explained by rise in price indices. In India Chatrath et al. (1997) noticed negative relation between inflation and stock returns. Hasan and Javeed (2009) explored similar results for Pakistan. However, positive relationship between these variables was spotted in Ratanapakorn and Sharma (2007). Moreover, industrial production explained mainly a positive relation with stock market returns (Nishat and Shaheen; 2004 and Sohail and Hussain; 2009). Correspondingly, numbers of economic and financial findings are presently available endorsing the significant association amid crude oil prices and equity returns, Pinho and Madaleno (2016). Shahzadi and Chohan (2011) concluded an inverse relationship amidst Karachi stock returns, crude oil, and gold prices. However, on the contrary to this, other studies found a direct relation between equity returns and oil prices as well Pönkä (2016).

In the current studies, more vigorous procedures were used to provide a better evaluation of the consequence of an assortment of macroeconomic variables on equity prices. In pursuit of appraising growth of equity market in Pakistan, Nishat and Shaheen (2004) revealed that macroeconomic variables influence on stock price movements by scrutinizing long-term connection amid such indicators for Pakistan.

Similarly, Ali and Ahmed (2008); and, Sohail and Hussain (2009) explored an association between economic growth indicators and KSE index of Pakistan in the long-term. The result for Mohammad et al (2009) displayed significant stimulation of foreign exchange reserve, foreign exchange rate, interest rate and money supply (M2) with stock prices. Few studies explained insignificant outcomes of macroeconomic components on share markets, include; gay (2008) proved inefficiency in stock market while examining the given relationship for India, Russia, Brazil, and China.

This relationship has been observed in various empirical studies in the framework of ARDL bound testing cointegration. In the same ground, Akbar et al. (2012) found short-term positive cointegration of stock prices with interest rates and negative relation with inflation and foreign exchange reserves. Kaleem and Shahbaz (2009) also revealed long run and short run positively significant influence of FDI on stock market capitalization. Similarly, Khan (2008) by employing ARDL approach elaborated a positive cointegration of financial improvement and investment on economic growth.

IV. Data description and Methodology

The dataset consists of monthly averages[3] of stock market returns (SR_t), exchange rate changes (ER_t) and monthly observations for inflation rate (IR_t), interest rate (DR_t), industrial production growth (IPG_t) and crude oil prices (COP_t) for Pakistan. The equity market price indices for Pakistan (Karachi Stock Exchange-KSE100 Index) have taken from the State Bank of Pakistan. The foreign exchange rates have taken in terms of local currency with respect of Dollar (PKR/USD) have been adopted from oanda.com. The Entire sample size for interest rate and industrial production growth have undertaken from State bank of Pakistan, inflation rate data have taken from Pakistan bureau of statistics and oil prices (with price index (2005 = 100), simple average of three spot prices; Dated Brent, Dubai Fateh and the West Texas Intermediate) in terms of Pak Rupee per Barrel earned from indexmundi.com. Furthermore, owing to unavailability of statistics for all variables, the sample period for Pakistan ranges from November 1993 to December 2016.

[3] Monthly averages calculated from the daily closing observations taken for share prices and currency rates.

Due to the nature of the research question, model specifications and the estimation techniques, the size of the sample has been restricted. The exchange rate changes ER_t and stock returns SR_t are calculated from the following equation:

$$SR_t = ln\, S_t = ln\left(\frac{S_t}{S_{t-1}}\right) \quad (1)$$

$$ER_t = ln\, E_t = ln\left(\frac{E_t}{E_{t-1}}\right) \quad (2)$$

Where exchange rates (E) and stock market prices (S) at time t and $(t-1)$.

Multivariate Cointegration

The incidence of a long-run equilibrium amongst the set of time series which converges over time is explained by an econometric notion called cointegration. Consequently, cointegration determines a dynamic foundation for error correction system, which generates both short-term and long-term evidence in demonstrating variables. There are several tests of cointegration, among them, Autoregressive Distributed Lag cointegration technique becomes the focal point of this paper.

When one cointegrating vector exists, Autoregressive Distributed Lag (ARDL) technique become necessary to be applied for a long run relationship proposed by Pesaran and Shin (1995) and Pesaran et al (1996), regardless of either the concerned variables are stationary at the level, at first difference, or a blend of both. This condition elaborates more accurate and effectual estimates using the application of ARDL approach.

The specification for ARDL $(p, q_1, q_2, \dots\dots, q_k)$ paradigm given as follows;

$$A(L,p)y_t = a_0 + \sum_{i=1}^{k} B_t(L,q_i)x_{it} + \delta w_t + \mu_t \quad (5)$$

Where;

$$A(L,p) = 1 - \alpha_1 L - \alpha_2 L^2 -, \dots, - \alpha_p L^p$$

$B(L,q) = 1 - \beta_{i1}L - \beta_2 L^2 -, \dots, - \beta_q L^q$ for *i=1,2,…….k,* $u_t \sim iid\ (0;\delta^2)$

y_t is the regressand alongside its lags as regressor, and x_t is the lagged exogenous variable and μ_t being the random error. In general, *L* is the lag used for each element of a vector. $L^k x_t = x_{t-k}$, it explains the lag polynomial $A(L)$ and polynomial vector $B(L)$. w_t is $s \times 1$ vector of regulating elements for constant term, slope, recurrent dummies, or independent variables with the static lags, $p = 0, 1, 2, \dots, m$, $q = 1, 2, \dots, m$, and, $i = 1, 2, \dots, k$: explicitly a total of $(m+1)^{k+1}$ diverse ARDL models. The largest lag orderliness m is taken automatically by the EVIEWS 9 software. Sample time is $t = m + 1,\ m + 2, \dots, n$. Provided that error margin μ_t is a white noise process, or static and impartial of $x_t, x_{t-1}, ..$, and $y_t, y_{t-1}, ..,$.

Hence the empirical link between Pakistan stock returns, and the relevant macroeconomic indicators to be estimated in this study is customized from a simple demonstration explained by Mukherjee and Naka (1995), Gjerde and Sættem (1999), Narayan (2004), Narayan (2005) and Kandir (2008).

$$SR_t = f(ER_t, IR_t, DR_t, IPG_t, COP_t)$$

A detailed description of the model considering all the selected number of variables of this study is presented below, considering the equation (5);

$$\begin{aligned}\Delta SR_t &= a_0 + \sum_{i=1}^{p} \alpha_1 \Delta SR_{t-i} + \sum_{i=0}^{q_1} \alpha_2 \Delta ER_{t-i} + \sum_{i=0}^{q_2} \alpha_3 \Delta IR_{t-i} + \sum_{i=0}^{q_3} \alpha_4 \Delta DR_{t-i} \\ &+ \sum_{i=0}^{q_4} \alpha_5 \Delta \mathrm{IPG}_{t-i} + \sum_{i=0}^{q_5} \alpha_6 \Delta \mathrm{COP}_{t-i} + \delta_1 SR_{t-1} + \delta_2 ER_{t-1} + \delta_3 IR_{t-1} \\ &+ \delta_4 DR_{t-1} + \delta_5 IPG_{t-1} + \delta_6 COP_{t-1} \\ &+ \mu_t \end{aligned} \quad (6)$$

where Δ states the first difference operator and μ_t is the random error. The F-statistic for the joint null hypothesis is performed describing that coefficients of the lagged variables are zero. δ narrates the long-term relationship, while $(\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6)$ symbolize the short-run details of the model.

Once the valuation of the given model is carried out, the long-term causativeness appraised by the outcomes from the F-statistics of the Wald test. Intimating null hypothesis of the experiment will be:

H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = 0$ (no long-run relationship).

Against the alternative hypothesis;

H_1: $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq 0$ (a long-run relationship occurs hence cointegration).

The results obtained from F-statistics for this experiment is then analyzed on the suggested critical observations of the Narayan within the boundaries of the decided level of significance through unrestricted and no trend series.

The ARDL model is re-parameterized into Error Correction Model (ECM) when amid the variables there exist a single cointegrating vector, and produced short-run and long-run dynamics of the underlying variables. The regression of long-run variables and inclusion of error term as an exogenous variable developing error correction model (ECM) is spotted below;

$$\begin{aligned}\Delta SR_t = a_0 &+ \sum_{i=1}^{p} \alpha_1 \Delta SR_{t-i} + \sum_{i=0}^{q_1} \alpha_2 \Delta ER_{t-i} + \sum_{i=0}^{q_2} \alpha_3 \Delta IR_{t-i} \\ &+ \sum_{i=0}^{q_3} \alpha_4 \Delta DR_{t-i} + \sum_{i=0}^{q_4} \alpha_5 \Delta \mathrm{IPG}_{t-i} + \sum_{i=0}^{q_5} \alpha_6 \Delta \mathrm{COP}_{t-i} \\ &+ \Psi ECM_{t-1} \\ &+ \mu_t \end{aligned} \quad (7)$$

The term ECM_t since the adjustment constraint of speed towards equilibrium is the consequent of error margin in the cointegration model, where the variables are gained by standardizing the equation for SR_t. The ECM_t explains the extent of the level to which the disequilibrium is being corrected, that is, how disequilibrium in the preceding period is modified in the SR_t. Positive value of coefficient stipulates a divergence, however convergence is the resultant of negative coefficient.

V. Empirical Explanations

The analyses begin by providing descriptive statistics for each variable. The statistical characteristics of the sample are set out in Table 1.

Table 1: Descriptive Statistics For All The Variables

Notes: This table shows means, median, maximum and minimum, standard deviations, skewness, kurtosis, coefficients of variation, Jarque-Bera and probabilities for the Stock Market Returns, Exchange Rate Changes, Inflation Rate, Interest Rate, Industrial Growth and Crude Oil prices for the Entire period of observations. The sample consists of average monthly observations Pakistan. The critical value Jarque-Bera statistic for normality from a χ^2 distribution with 2 degrees of freedom is 5.99 for the 5% level of significance.

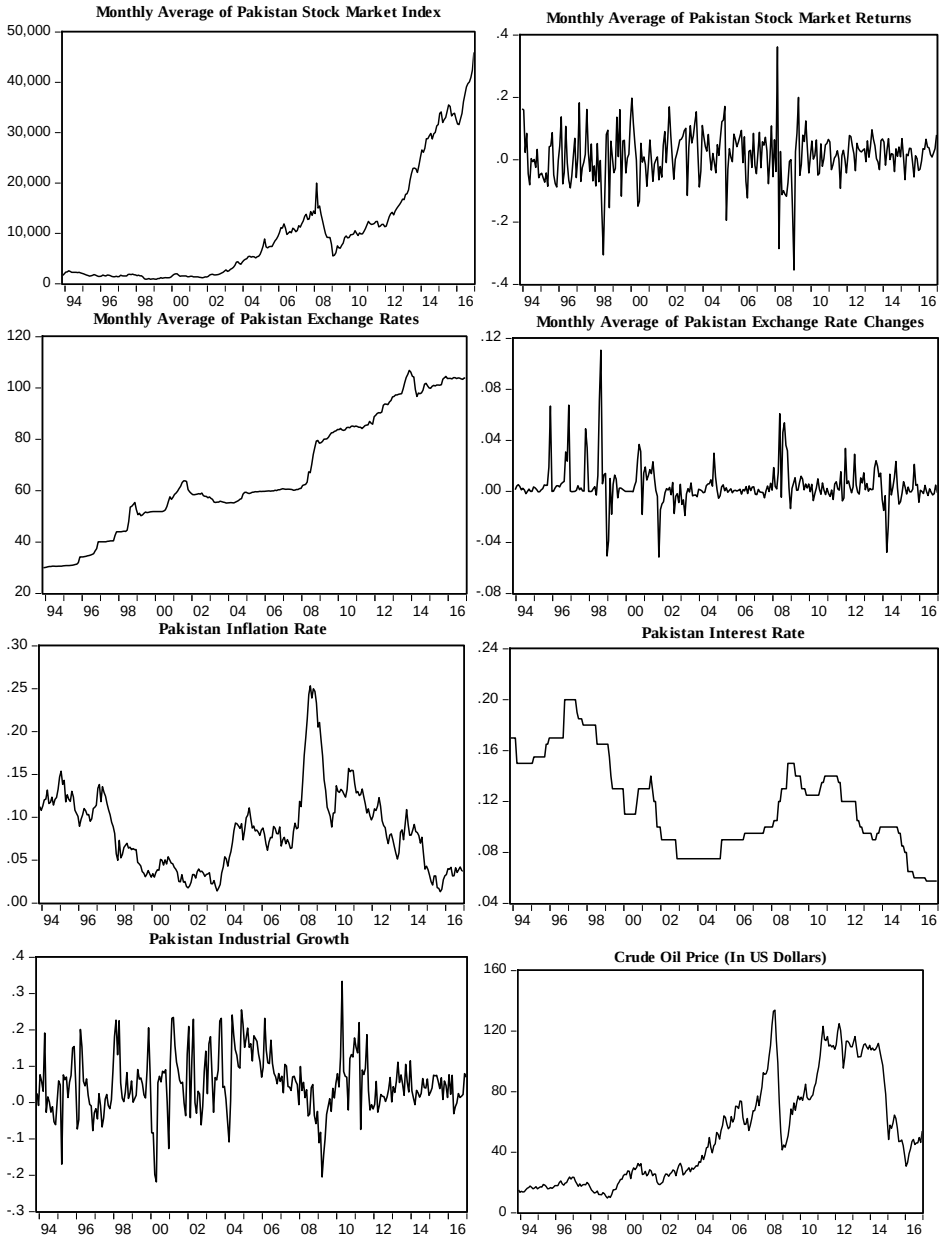
Statistics	Stock market returns	Exchange rate changes	Inflation rate	Interest rate	Industrial production growth	Crude oil price
Mean	0.0120	0.0045	0.0842	0.1175	0.0531	52.3192
Median	0.013013	0.001803	0.0822	0.11	0.05167	43.38
Std. Dev.	0.0781	0.0154	0.0473	0.0368	0.0821	34.9159
Skewness	-0.4716	2.0089	0.9913	0.3629	0.0955	0.6400
Kurtosis	6.8245	15.5799	4.4774	2.2406	4.0180	2.0631
Jarque-Bera	179.0861	2012.8270	70.5554	12.7337	12.3816	29.0376
Probability	0.0000	0.0000	0.0000	0.0017	0.0020	0.0000
Coefficient of Variation	652.6800	343.9929	56.1575	31.3465	154.4659	66.7364
Observations	277	277	277	277	277	277

Source: Author's Calculations

The mean values and standard deviations for all variables were observed small signifies variables are clustered closely around the mean explaining volatility in the financial market of Pakistan. Skewness coefficient for only stock returns, interest rate, and Industrial production growth is found normally distributed and symmetrical. However, exchange rate changes and crude oil prices witnessed highly positively skewed, and positively moderate skewness noted in the inflation rate. The kurtosis coefficient for almost all the variables is Leptokurtic demonstrating series are slim and have fatter tails, though interest rate and oil prices series found Platykurtic with slim and a long tail. All variables observed positive and higher value of Jarque Bera (JB) with their respective probability values lower than 0.05 specifying not normal distributions. Similarly, the coefficient of variation for stock returns and the macroeconomic variables are noted significantly high expresses more volatility which implies that the series is less stable or less uniform. Figure 2 represents the trend charts for stock

market index and stock market returns trends, exchange rates and exchange rate changes, inflation rate, interest rate, industrial production growth and crude oil prices for Pakistan for the overall size ranges.

Figure 2: Pakistan Financial Markets



Prior to exerting ARDL cointegration approach, this study begins with examining the time series properties of the variables. Though it is not an obligation for bound testing, hence the integration of all variables in the similar order is required for an unbiased estimation of Granger causality. The results exhibits in Table 2 for Augmented Dickey-Fuller[4] tests explain that three variables SR_t, ER_t, and IPG_t were found stationery at I(0) and I(1) including with constant, and constant and linear trend. However, IR_t, DR_t and COP_t elucidated that the null hypotheses is reject for unit root only at first difference embracing in both constant, and constant and linear trend.

Table 2: Augmented Dickey-Fuller Stationary Tests

Variables	Augmented Dickey-Fuller Stationary Test			Test Statistics
Stock Market Returns	**Constant**	**Level Series**	t Statistics	-14.1463***
			Probability	0.0000
		First Difference	t Statistics	-6.6752***
			Probability	0.0000
	Constant and Linear Trend	**level Series**	t Statistics	-14.2211***
			Probability	0.0000
		First Difference	t Statistics	-6.6646***
			Probability	0.0000
Exchange Rate Changes	**Constant**	**level Series**	t Statistics	-7.8023***
			Probability	0.0000
		First Difference	t Statistics	-10.2497***
			Probability	0.0000
	Constant And Linear Trend	**level Series**	t Statistics	-7.8972***
			Probability	0.0000
		First Difference	t Statistics	-10.2333***
			Probability	0.0000
Inflation Rate	**Constant**	**level Series**	t Statistics	-1.3045
			Probability	0.6281
		First Difference	t Statistics	-8.8964***
			Probability	0.0000
	Constant and Linear Trend	**level Series**	t Statistics	-1.2995
			Probability	0.8858
		First Difference	t Statistics	-8.8786***
			Probability	0.0000
Interest Rate	**Constant**	**level Series**	t Statistics	-1.1850
			Probability	0.6816
		First Difference	t Statistics	-9.9898***
			Probability	0.0000

[4] For calculating ADF an automatic lag length has been followed considering Akaike information criterion by the statistical Eviews 9 software.

	Constant and Linear Trend	**level Series**	t Statistics	-1.6343
			Probability	0.7770
		First Difference	t Statistics	-9.9725***
			Probability	0.0000
Pakistan Industrial Growth	**Constant**	**level Series**	t Statistics	-3.6493***
			Probability	0.0054
		First Difference	t Statistics	-6.5890***
			Probability	0.0000
	Constant And Linear Trend	**level Series**	t Statistics	-3.6294**
			Probability	0.0292
		First Difference	t Statistics	-6.5933***
			Probability	0.0000
Crude Oil Prices	**Constant**	**level Series**	t Statistics	-1.9625
			Probability	0.3035
		First Difference	t Statistics	-10.8953***
			Probability	0.0000
	Constant and Linear Trend	**level Series**	t Statistics	-2.5552
			Probability	0.3014
		First Difference	t Statistics	-10.8888***
			Probability	0.0000
Test critical values	**Constant**		**Constant and Linear Trend**	
	1% level	-3.6010	1% level	-4.2050
	5% level	-2.9350	5% level	-3.5266
	10% level	-2.6058	10% level	-3.1946

Source: Author's Calculations
Note: *, **, *** denote significant at 10%, 5% and 1% significance levels, respectively.

Granger Causality test

Granger Causality experiment is performed to know there exist any type of causal relationship among the variables in Pakistan. Taking into account the results derived may be sensitive to the lag length selection[5], the lag four has been chosen for Pakistan where the optimal value of Akaike Information Criterion (AIC) is obtained.

[5] The optimum lags length chosen on the criteria aboriginally proposed by Campbell and Perron (1991). The selection of an adequate lag order has been considered amongst the classical practices of information criteria, for instance Akaike (AIC), Schwarz (SC) and Hannan-Quinn (HQ) (Lutkepohl, 1993). The optimal lag length has been selected from the results obtained for each information criterion on the ground of minimum value. In general AIC produced a lowest value of lag length for estimating the quality of each model.

Table 3: Granger Causality Test

Pairwise Granger Causality Tests	**PAKISTAN**		
Lag Length	**Lags: 4**		
Null Hypothesis:	**Obs.**	**F-Statistic**	**Prob.**
$ER_t \nRightarrow SR_t$	273	2.9535**	0.0206
$SR_t \nRightarrow ER_t$		11.9912***	0.0000
$IR_t \nRightarrow SR_t$	273	4.7605***	0.0010
$SR_t \nRightarrow IR_t$		0.8450	0.4977
$DR_t \nRightarrow SR_t$	273	4.8765***	0.0008
$SR_t \nRightarrow DR_t$		1.0010	0.4075
$IPG_t \nRightarrow SR_t$	273	0.5161	0.7240
$SR_t \nRightarrow IPG_t$		1.8857	0.1133
$COP_t \nRightarrow SR_t$	273	1.0683	0.3726
$SR_t \nRightarrow COP_t$		2.2052*	0.0688
$IR_t \nRightarrow ER_t$	273	2.4890**	0.0438
$ER_t \nRightarrow IR_t$		0.2393	0.9159
$DR_t \nRightarrow ER_t$	273	2.0275*	0.0909
$ER_t \nRightarrow DR_t$		2.6704**	0.0326
$IPG_t \nRightarrow ER_t$	273	0.4531	0.7701
$ER_t \nRightarrow IPG_t$		1.6986	0.1507
$COP_t \nRightarrow ER_t$	273	0.9997	0.4082
$ER_t \nRightarrow COP_t$		3.5045***	0.0083
$DR_t \nRightarrow IR_t$	274	1.1645	0.3268
$IR_t \nRightarrow DR_t$		6.1061***	0.0001
$IPG_t \nRightarrow IR_t$	274	0.1597	0.9585
$IR_t \nRightarrow IPG_t$		1.2877	0.2751
$COP_t \nRightarrow IR_t$	274	2.6912**	0.0316
$IR_t \nRightarrow COP_t$		1.5602	0.1853
$IPG_t \nRightarrow DR_t$	274	0.3709	0.8293
$DR_t \nRightarrow IPG_t$		0.8538	0.4923
$IPG_t \nRightarrow DR_t$	274	0.4393	0.7802
$DR_t \nRightarrow COP_t$		0.7587	0.5530
$COP_t \nRightarrow IPG_t$	274	0.5153	0.7246
$IPG_t \nRightarrow COP_t$		0.5669	0.6869

Source: Author Calculations

Note: *, **, *** denote significant at 10%, 5% and 1% significance levels, respectively. Null Hypothesis for no causal relationship is rejected. Appropriate lag length was determined by Akaike Information Criterion.

The results of Granger Causality test for stock returns with the impact of different macroeconomic indicators reflected interesting outcomes. The results presented in Table 3 are quite indifferent. Bidirectional relationships were only noticed between exchange rates changes and stock market returns ($ER_t \leftrightarrow SR_t$) and exchange rate changes and

interest rate ($ER_t \leftrightarrow DR_t$). However unidirectional causality was witnessed from inflation rates to stock market returns ($IR_t \longrightarrow SR_t$), from interest rate to stock market returns ($DR_t \longrightarrow SR_t$), from stock market returns to crude oil prices ($SR_t \longrightarrow COP_t$), from inflation rates to exchange rate changes ($IR_t \longrightarrow ER_t$), from exchange rate changes to crude oil prices ($ER_t \longrightarrow COP_t$), from inflation rates to interest rates ($IR_t \longrightarrow DR_t$) and from crude oil prices to inflation rates ($COP_t \longrightarrow IR_t$). These results gave a direction to examine the incidence of both long-run and short-run correlation in macroeconomic variables and stock returns. In this regard, Autoregressive Distributive Lag Model (ARDL) approach was found more appropriate.

Cointegration test

From the findings obtained for unit root test, all the series produced a combination of mixed outcomes and likewise the performance of Granger causality test witnessed very weak casual relationships among the variables in Pakistan leaded to pursue an Autoregressive Distributive Lag Model (ARDL) for further evaluations.

According to Pesaran and Shin (1999), and Narayan (2004) the optimal lag length order in the ARDL technique is chosen by using Akaike Information Criterion (AIC) [6] to be included in the conditional ECM considering lowest value of criterion, while confirming the absence of autocorrelation in the model as emphasized by Pesaran et al. (2001).

Bound testing for cointegration analysis

The cointegration test outcomes exhibited in Table 4, evident that the calculated F-statistics for Pakistan $F_{PK} = 38.8606$, is found greater than the upper bound critical values[7] using unrestricted constant and no drift.

Table 4: Bound testing for cointegration

Computed F- Statistics	**Critical Bounds**					
	10%		**5%**		**1%**	
38.8606	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	2.2600	3.3500	2.6200	3.7900	3.4100	4.6800

Source: Author's Calculations.

6 Ibid., 17.

7 Critical value bounds are obtained from Pesaran and Shin (2001).

These results indicate that stock markets of Pakistan have shown binding of cointegration for its respective currency changes and other macroeconomic variables in their equity markets during the selected time span. Hence, the study proceeds for further ARDL procedure.

Elasticities and Re-parameterization to the ECM

The ARDL model for Pakistan with the lag order (1, 2, 3, 5, 0, 4)[8] is followed while taking Pakistan stock market returns (SR_{PK}) as the dependent variable. The Table 5 reported long-run and short run elasticities respectively including with error correction term and diagnostic tests performances. In the long-run exchange rate changes (ER_{PK}) showed negative and insignificant relationship with the stock returns in Pakistan, while in short-run 1percent increase in Exchange rate changes with one period lag raised stock returns by 0.5 percent. This implied positive though weakly significant relationship between the two variables expressing volatility in PKR/USD causing only short-term impact on stock returns. Inflation rate showed negatively insignificant impression on stock returns in long-run though in the short-run inflation rate produced negatively significant influence, indicating one percent reduction in inflation caused 0.87 percent increase in stock returns. The regression model further explained negatively significant impact of interest rate and industrial production growth in the long run and short on the dependent variable. These outcomes signified longtime internal political and economic volatility, the distrust of investors for continuous changes in governments, and for the imposition of international sanctions on the showcase of atomic power in the region. Although crude oil prices found insignificant in long run though oil prices with three periods lag reflects positively significant impact on stock returns expressing very minor impact as this is mainly an import item.

The mechanism of error correction (ECM) accustomed to validate the short-run liaison between the variables. According to Bannerjee et al. (1998), the occurrence of a stable long-run relationship is further corroborated by the significant value of error correction term. The error correction coefficient is –0.94, suggests that convergence concerning to

[8] Due to the presence of heteroskedasticity, HAC variances are used in the model. Whether there exist an autocorrelation or heteroskedasticity in the model no biasness exists in the coefficient estimates though only variance inflated. Therefore this situation can be cured by applying HAC test.

the long-run equilibrium is very strong. This means that approximately 94 percent of disequilibria from the previous month's shock unite back to the long-run equilibrium in the prevailing month. This, further, supports the contention that long-run causality is contending from economic growth variables to stock returns.

Diagnostic statistics for autocorrelation, heteroscedasticity and normality tests were performed. The results showed absence of autocorrelation in the model though heteroskedasticity is found beside the model reported not normal. Since the problem of variability of the variables was corrected by using HAC[9] (Newey-West) standard errors & covariance test for remedying the model, therefore, it became more data congruent and free from specification errors. Thus, the strong link between stock market returns and economic growth indicators no more observed spurious.

Table 5: Results of ARDL (1, 2, 3, 5, 0, 4) for a Long run and Short run Form selected based on AIC for Pakistan.

Note: Dependent variable is Pakistan Stock Market Returns (PKMSR). The critical value Jarque-Bera statistic for normality from a χ^2 distribution with 2 degrees of freedom is 5.99 for the 5% level of significance. HAC standard errors & covariance (Pre-whitening with lags = 6 from AIC max lags = 6, Bartlett kernel, Newey-West automatic bandwidth = 8.0606, NW automatic lag length = 4).

Long run Coefficients				
Regressors	**Coefficients**	**Std. Error**	**t Statistics**	**Probability**
Exchange Rate Changes	-0.3648	0.3263	-1.1179	0.2647
Inflation Rate	-0.1508	0.1471	-1.0253	0.3062
Interest Rate	-0.4040*	0.2077	-1.9451	0.0529
Industrial Growth	-0.1118*	0.0583	-1.9190	0.0561
Crude Oil Price	0.0000	0.0001	0.1523	0.8790
Constant	0.0758	0.0209	3.6201	0.0004
Short run Impact of Macroeconomic Indicators on Pakistan Stock Market Return - Results of ECM model.				
Regressors	**Coefficients**	**Std. Error**	**t Statistics**	**Probability**
ΔExchange Rate Change	-0.5212	0.3371	-1.5460	0.1234

[9] NeweyWest is a suitability line to vcovHAC treating Bartlett kernel weights portrayed in Newey & West (1987, 1994). The automatic bandwidth choice was made as default (Newey & West; 1994). HAC test is used to solve an issue of significance in the model. The HAC robust Wald p-value is marginally greater than the F-statistic p-value, yet observed significant at standard test levels.

ΔExchange Rate Change(-1)	0.4625*	0.2773	1.6680	0.0966
ΔInflation Rate	-0.8748**	0.4114	-2.1264	0.0344
ΔInflation Rate(-1)	1.9430*	1.0455	1.8584	0.0643
ΔInflation Rate(-2)	-1.2334*	0.6787	-1.8173	0.0704
ΔInterest Rate	-2.1704**	1.0937	-1.9844	0.0483
ΔInterest Rate(-1)	-1.0079	1.3295	-0.7581	0.4491
ΔInterest Rate(-2)	-2.7090*	1.3805	-1.9623	0.0508
ΔInterest Rate(-3)	-0.1346	1.5142	-0.0889	0.9293
ΔInterest Rate(-4)	1.9115	1.2289	1.5555	0.1211
ΔIdustrial Growth	-0.1052**	0.0534	-1.9706	0.0499
ΔCrude Oil Price	0.0013	0.0010	1.3309	0.1844
ΔCrude Oil Price(-1)	-0.0008	0.0016	-0.5277	0.5982
ΔCrude Oil Price(-2)	-0.0026	0.0023	-1.1157	0.2656
ΔCrude Oil Price(-3)	0.0029**	0.0014	2.0983	0.0369
ΔECM(-1)	-0.9405***	0.0952	-9.8748	0.0000
Adjusted R Squared		0.1569		
DW Test		1.9935		
Diagnostics Statistics		**Chi Square**		**Probability**
LB (12)		13.0110		0.3680
LB Square (12)		38.3790***		0.0000
Serial Correlation Test		2.5263		0.7725
ARCH Test		19.8386***		0.0013
Jarque Berra Test		85.0508***		0.0000

Source: Author Calculations

*, **, *** denote significant at 10%, 5% and 1% significance levels, respectively.

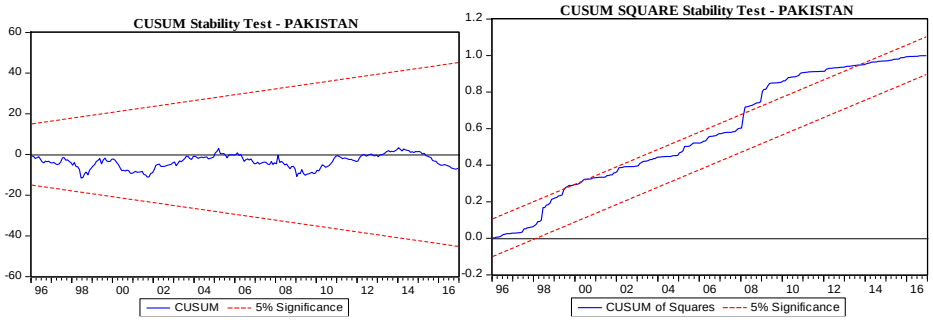
Stability Analysis: (CUSUM and CUSUM square Tests)

The stability of the relationship between the variables is assessed by applying the recursive estimates at five percent level of significance. The most used tests of steadiness are the CUSUM and CUSUM square tests. The parameters of the equation are thought to be stable if the sum total of recursive errors moves outside the two critical boundary lines. Figure 3 (a & b) have shown test statistics of cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMsq). CUSUM test confirms that the equation is dynamically stabilized. Nevertheless, the CUSUM square line found on and outside the critical upper band explained instability in the mannequin. The CUSUM line first touched the upper band from October 1999 to August 2000. Many factors were responsible for this instability in the model, which includes; contagion effects of South East Asian financial debacle, global recession, crash of stock markets of some leading economies, enforcement of economic sanctions on account of nuclear tests in May 1998, and other local factors such as, withdrawal of institutional foreign investors from the market, law and order situation,

government froze foreign currency accounts and unresolved dispute with the Independent Power Projects. After touching the lowest decline capital market displayed meek retrieval when government took several measures to rehabilitates the distraught economy, such as commencement of prompt privatization process, allowed foreign direct investment, reduced interest rate, and substantial progress in economic rudiments like; better collection of revenue, dampening inflation, mounting export balances and industrial progression, etc.

For the duration from March 2008 to August 2013, CUSUM square line again led outside the upper margin of significance level explaining unsteadiness in the model. This instability was caused as many macroeconomic indicators unveiled inadequate performance in the region due to hasty deviations in the political panorama and global financial crisis. On the incident of the assassination of Benazir Bhutto, the KSE witnessed its unprecedented massive clash. Other factors involved pitiable law enforcement condition beside enormous insurgence upraised the uncertainties of foreign capital evasion, depreciation of the Pak - rupee and increasing fiscal deficit. However, after this period, CUSUM line seems within the critical bands indicating stability in the economy over time.

Figure 3 (a) **Figure 3 (b)**



VI. Conclusion

The dynamic influence of macroeconomic variables on the Pakistan stock market returns has interpreted in conjunction with the socio-economic climate prevalent in the country during the period of this study. Using monthly time-series data, the macroeconomic variables are represented

by the exchange rate change, inflation rate, interest rate, industrial production growth, and the crude oil price. The Granger causality and bound testing approach to cointegration were conducted to reveal the interesting conclusions. The results indicated a weak "causal" relationship between the variables. This study displayed a bidirectional relation only between stock returns and exchange rate changes, while inflation and interest rate Granger-caused stock market returns. Main findings for the long-run and short-run estimates of ARDL also bring out variable conclusions. The results evident that in the long run industrial production and interest rate are the negative determinant of Pakistani stock returns proving downfall situations that exist in Pakistan 1998 to 2000 and 2008 to 2013 caused by changes in internal and external economic structure. Yet the findings clearly support the view that all the macroeconomic indicators in the model drive stock market returns in short-run. Moreover, the error correction coefficients suggested a very strong convergence concerning to the long-run steadiness explaining high adjustment of speed to the equilibrium after experiencing a shock in the economy (Puatwoe & Piabuo, 2017).

As observed, the stock market mainly fluctuates by its internal influences, changes in political situations within the country and due to the impact of external financial crises happened during the period. The study suggests that monetary legislatures should attempt suitable monetary procedures to regulate inflation, currency devaluation, and interest rates so that the variability in the stock markets can be curtailed. Additionally, concerned authorities ought to formulate such policies which support industrial production to promote stock market. Since the results emitted mixed response to capital market performance, it provides potential researchers ample opportunity for further research where other methodologies could also be suggested.

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