

## **STOCK RETURNS AND INFLATION: AN ARDL ECONOMETRIC INVESTIGATION UTILIZING PAKISTANI DATA**

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**Abstract.** According to theory there establishes the relationship between stock market prices and inflation, this study investigates whether this holds for Pakistan, over the period 1971-2006. I examined the concerned relationship taking into account the existence of structural break over the considered time episode. The empirical practice utilizes ARDL, co-integration technique in said conjunction to detect the long run and short run affects between involves variable by Error Correction Approach (ECM). The results supports the hypothesis that stocks hedges against inflation in log run but not in short, while black economy promotes the stock market prices to heave both in long run as well as in short run.

### **I. INTRODUCTION**

The inflation rate in Pakistan has moved from 9.25 to 12.9 percent from 1991 to 1995. The towering rates of monetary enlargement, low rate of economic growth in three out of the five years and adjustment in administered prices contributed to the relatively high rates of inflation. The expansion in money during 1994 was mainly on the account of accumulation of net assets than domestic credit creation. So, build up of foreign reserves had become necessary because of a draw down of reserves in the previous years. Thus the reason for the increase in money supply in 1994 was qualified very different. In 2004, inflation came down to 8.44 percent and again creeping up to 10.1 percent in December 2006, in the main time turn over on share prices have gone up from 45.82 \$ USA (millions) in September (2003) to 190.81 \$ USA (millions) in January (2005) only in Karachi Stock Exchange while market

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capitalization rose 36379.73 \$ USA (millions) from 15194.45 in the same period. Finally, general price index also rose from 234.78 to 371.66 from September (2003) to January (2005) meaning that there is an upward trend in Karachi stock exchange.

Except for a turn down in September and October 2003, share prices continual their rising trend through most of the first ten months of fiscal year (FY) 2004, with the Karachi Stock Exchange (KSE)-100 index peaking at 5,621 on 19<sup>th</sup> April 2004. Subsequently, equity prices declined amid fluctuations, and the KSE-100 index fell to 5,297 on 30th June 2004. For the year as a whole, the index rose by 55.2 percent. Steady exchange rate, low interest rates, higher economic growth, improved corporate profitability, and improvement in relations with India were the key factors contributing to cheerfulness in the stock market in (fiscal year FY) 2004 (State Bank, 2005).

Theoretical and empirical research has shown that the monetary policy can significantly alter the course of real economic activity in the short-term, although in the long-term the impact of increase in excess money supply is only creation of inflation (Clarida *et al.*, 1999). As the objective of the monetary policy was achieved and growth had, in fact, overshoot the target generating inflationary pressures the State Bank of Pakistan (SBP), the central bank, in July 2004 onwards had to shift the gear and moved more decisively to tackle inflation (Riazuddin, 2005). In order to contain inflationary pressures in the economy, SBP pursued tight monetary policy throughout FY (2006). However, instead of increasing the discount rate, State Bank of Pakistan (SBP), focused more on draining excess liquidity from the inter-bank money market. As a result, short-term interest rates remained close to the discount rate (State Bank, 2006).

Concluding, the Karachi Stock market followed upward and downward fluctuations from 1971 to 2006, with fluctuations especially in 2002 and 2006 under the shade of economic reforms.<sup>1</sup> The generalized Fisher hypothesis predicts that equity stocks, which represent claims against the real assets of business, may serve as a hedge against inflation.<sup>2</sup> Whether stocks

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<sup>1</sup>Economic reforms in Pakistan started in 1991, a structural package by IMF.

<sup>2</sup>Stocks are said to provide a hedge against inflation if they compensate investors completely (and not by more) for increases in the general price level through corresponding increases in nominal stock returns, thereby leaving real returns unaffected. That is, stocks hedge against inflation if their real value or purchasing power is immune to changes in the general price level (Olesen Jan, 2006).

also provide a hedge against inflation empirically has been studied extensively in the literature, see, *e.g.*, Fama and Schwert (1977), Gultekin (1983), Boudoukh and Richardson (1993), Ely and Robinson (1997) and Barnes *et al.* (1999). With the only exception of Ely and Robinson (1997), *cf.* below, the literature has based its inference on return regressions where nominal stock returns are regressed on inflation and possibly further explanatory variables such as real production growth and changes in a relevant discount rate measure. The inflation hedge hypothesis is then put to a test by testing whether the coefficient to inflation is significant and equal to 1.<sup>3</sup> In such a case, investors would sell financial assets in the exchange for real assets when expected inflation is definite. Then, stock prices in nominal terms should fully effect the expected inflation and the relationship between these two variables should be positively correlated. While Bodie (1976) argued that equities are a hedge against inflation rate due to the fact that they represent a claim to real and, hence, the real change on the price of the equities should not be effected. In this situation, firms are able to predict their profit margins and since equalities are claims not on current but also on future earnings, which confirms that stock market operates as a hedge against inflation, at least in long run.

Literature supports the evidence that positive relationship between nominal stock returns and inflation over the long horizons. The relationship between nominal stocks returns and inflation in the United Kingdom is relative positive, a finding consistent with generalized Fisher hypothesis (Firth, 1979; Gultekin, 1983; Boudhouch and Richarson, 1993). Boudhouch and Richarson (1993) concluded that it is possible to recover a positive association between these two variables, however, the coefficient on inflation in long run horizons regression is 0.46, below the expected coefficient if the Fisher effect is held. Ioannidis *et al.* (2004) found evidence of positive

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<sup>3</sup>Some studies frame the test in terms of real rather than nominal stock returns, testing whether inflation has a significant influence on real stock returns; *see*, for instance, Fama (1981) and Kaul (1987). A survey of the literature including a detailed account of the empirical results is provided by Frennberg and Hansson (1993). The latter study at the same time represents an exception in the literature as the authors conclude that Swedish stocks provide a hedge against inflation even at fairly short horizons (down to one month). Another survey of the literature can be found in Sellin (1998). He concludes, "Stocks seem to be a good hedge against both expected and unexpected inflation at longer horizons" (Sellin 1998, p. 25). However, this conclusion is based on an imperfect hedge definition, which allows stock prices (or returns) to respond more than proportionately to shocks to the general price level (or to inflation).

relation between inflation and stock market returns in Greece between 1985 and 2003. Kessal (1956) concludes that unexpected inflation increases the firm's equity value if the firm is net debtor.

The general conclusion is that stocks do not hedge against inflation in short run (investment horizons less than 1-2 years), where inflation usually turns out to have insignificant effect on stock returns. In fact, at short horizons the estimated relation between nominal stock returns and inflation may even be negative, see, *e.g.*, Fama and Schwert (1977) and Gultekin (1983). There is some evidence of a significant positive relationship on longer horizons (more than 2 years) but often with a coefficient different from 1 so that the inflation hedge is not perfect, cf. Boudoukh and Richardson (1993). Hence, the hedge hypothesis comes closer to receiving support at longer horizons but the evidence is still weak.

Literature also provides support for negative relationship between stock nominal returns and inflation in long run. Fama (1981) found that there is negative association between stock returns and inflation rate. The negative correlation exists due to the association between inflation and future output. Spyrou (2001) suggested that there exists a negative correlation between stock market returns and the level of inflation in Greece for the period 1990 to 1995. Some studies established mixed results about the relationship between stock market returns and inflation. Mark (2001), found the mixed empirical evidence on the concerned issue. Amidhud (1996) reported negative correlations between stock prices and inflation in short run which followed by positive association in the long period of time.

The main focus of this effort is on the relationship between inflation and stock market returns in short run as well as in long run. The basic question we attempt to give an appropriate answer through the analysis of the above relationship is whether the stock market has been a safe place for investors in Pakistan from 1971 to 2006 (June). This empirical analysis is investigated by means of an ARDL co-integration as well as short run causal coefficients. The remaining part of paper is organized as: section II presents model, methodology and data description, section III reports on empirical estimation, while section IV presents a brief summary with some concluding remarks.

## II. MODEL, METHODOLOGY AND DATA

On the basis of theory of correlation between stock market returns and inflation, I developed the model for empirical investigation as given follows:

$$LSMI = \delta_0 + \delta_1 LSMI(-1) + \delta_2 LCPI + \delta_3 LBL + \mu_t \quad (1)$$

Where

*LSMI* = Log of stock market price index

*LCPI* = Log of consumer price index

*LBL* = Log of share of black economy (under-ground economy)

$\mu$  = Error term

The data of concerned variables has been obtained from *Monthly Statistical Bulletin* of State Bank of Pakistan and *Economic Survey of Pakistan* (Various issues).<sup>4</sup> In the time series realization is used to draw inference about the underlying stochastic process. So to draw inference from the time series analysis, stationarity tests become essential. A stationary test, which has been widely popular over the past several years, is unit root test. In this study Augmented Dickey Fuller (ADF) test applied to estimate the unit root. ADF test to check the stationarity series is based on the equation of the below given form:

$$\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + \alpha_i \sum_{i=1}^m \Delta y_{t-1} + \varepsilon_t$$

Where  $\varepsilon_t$  is a pure white noise error term and

$$\Delta y_{t-1} = (y_{t-1} - y_{t-2}), \Delta y_{t-2} = (y_{t-2} - y_{t-3}) \text{ etc.}$$

These test determine whether the estimates of  $\delta$  are equal to zero. Fuller (1976) provided cumulative distribution of the ADF statistics, if the calculate-ratio (value) of the coefficient  $\delta$  is less than  $\tau$  critical value from Fuller table, then  $y$  is said to be stationary.<sup>5</sup>

### **ARDL APPROACH FOR INTEGRATION**

Now, I employed the newly proposed autoregressive distributed lag (ARDL) approach for Co-integration (Pesaran and Shin, 1995, 1998; Pesaran *et al.*, 1996; Pesaran *et al.*, 2001). More recent studies have indicated that the ARDL approach to co-integration is preferable to other conventional co-integration approaches such as Engle and Granger (1987), and Gregory and Hansen (1996). One of the reasons for preferring the ARDL is that it is

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<sup>4</sup>Data of black economy has been taken from Social Policy and Development Center, Report No. 65, 2006.

<sup>5</sup>'t' ratio of coefficient  $\delta$  is always with negative sings.

applicable irrespective of whether the underlying regressors are purely  $I(0)$ , purely  $I(1)$  or mutually co-integrated. The statistic underlying this procedure is the familiar Wald or F-statistic in a generalized Dickey-Fuller type regression, which is used to test the significance of lagged levels of the variables under consideration in a conditional unrestricted equilibrium error correction model (ECM) (Pesaran, *et al.*, 2001). Another reason for using the ARDL approach is that it is more robust and performs better for small sample sizes (such as in this study) than other co-integration techniques.

The ARDL approach involves estimating the conditional error correction version of the ARDL model for variable under estimation. The Augmented ARDL ( $p, q_1, q_2, \dots, q_k$ ) is given by the following equation (Pesaran and Pesaran, 1997; Pesaran and Shin, 2001):

$$\alpha(L, p)y_t = \alpha_0 + \sum_{i=1}^k \beta_i(L, p)x_{it} + \lambda w_t + \varepsilon_t \tag{2}$$

$$\forall t = 1, \dots, n$$

where

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

$$\beta_i(L, q_i) = \beta_{i0} + \beta_{i1} L + \beta_{i2} L^2 + \dots + \beta_{iq_i} L^{q_i} \quad \forall i = 1, 2, \dots, k$$

$y_t$  is an independent variable,  $\alpha$  is the constant term,  $L$  is the lag operator such that  $Ly_t = y_t - 1$ ,  $w_t$  is  $s \times 1$  vector of deterministic variables such as intercept term, time trends, or exogenous variables with fixed lags.

The long-term elasticities are estimated by:

$$\phi_i = \frac{\hat{\beta}_i(1, \hat{q}_i)}{\alpha(1, \hat{p})} = \frac{\hat{\beta}_{i0} + \hat{\beta}_{i1} + \dots + \hat{\beta}_{i\hat{q}_i}}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - \dots - \hat{\alpha}_p} \quad \forall i = 1, 2, \dots, k \tag{3}$$

Where  $\hat{p}$  and  $\hat{q}_i, i = 1, 2, \dots, k$  are the selected (estimated) values of  $\hat{p}$  and  $\hat{q}_i, i = 1, 2, \dots, k$ .

The long run coefficients are estimated by:

$$\pi = \frac{\hat{\lambda}(\hat{p}, \hat{q}_1, \hat{q}_2, \dots, \hat{q}_k)}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - \dots - \hat{\alpha}_p} \tag{4}$$

Where  $\hat{\lambda}(\hat{p}, \hat{q}_1, \hat{q}_2, \dots, \hat{q}_k)$  denotes the OLS estimates of  $\lambda$  in the equation (2) for the selected ARDL model.

The error correction model (ECM) linked to the ARDL ( $\hat{p}, \hat{q}_1, \hat{q}_2, \dots, \hat{q}_k$ ) can be obtained by writing equation (2) in terms of lagged levels and the first difference of  $y_t, x_{1t}, x_{2t}, \dots, x_{kt}$  and  $w_t$ :

$$\begin{aligned} \Delta y_t &= \Delta \alpha_D - \alpha(1, \hat{p})EC_{t-1} + \sum_{i=1}^k \beta_{iD} \Delta x_{it} + \\ \lambda' \Delta w_t &- \sum_{j=1}^{\hat{p}-1} \alpha \cdot j \Delta y_{t-1} - \sum_{i=1}^k \sum_{j=1}^{\hat{q}_{i-1}} \beta_{ij} \Delta x_{i,t-j} + \varepsilon_t \end{aligned} \quad (5)$$

where ECM is the error correction model and it is defined as follows:

$$ECM_t = y_t - \alpha - \sum \hat{\beta}_i x_{it} - \lambda' w_t \quad (6)$$

$x_t$  is the  $k$ -dimensional forcing variables which are not co-integrated among themselves.  $\varepsilon_t$  is a vector of stochastic error terms, with zero means and constant variance-covariance.

The existence of an error-correction term among a number of co-integrated variables implies that changes in dependant variable are a function of both the levels of disequilibrium in the co-integration relationship (represented by the ECM) and the changes in the other explanatory variables. This tells us that any deviation from the long run equilibrium will feed back on the changes in the dependant variable in order to force the movement towards the long run equilibrium (Masih and Masih, 2002).

The ARDL approach involves two steps for estimating long run relationship (Pesaran *et al.*, 2001). The first step is to investigate the existence of long run relationship among all variables in the equation under estimation. The ARDL method estimates  $(p+1)^k$  number of regressions in order to obtain optimal lag length for each variable, where  $p$  is the maximum number of lags to be used and  $k$  is the number of variables in the equation. The second step is estimate the long run and short run coefficients of the same equation. We run second step only if we find a long run relationship in the first step (Narayan *et al.*, 2004). This study uses a more general formula of ECM with unrestricted intercept and unrestricted trends (Pesaran *et al.*, 2001):

$$\Delta y_t = c_D + c_1 t + \pi_{yy} y_{t-1} + \pi_{yx.x} x_{t-1} + \sum_{i=1}^{p-1} \psi'_i \Delta z_{t-1} + w' \Delta X_t + \mu_t \quad (7)$$

where  $c_0 \neq 0$  and  $c_1 \neq 0$ . The Wald test (F-statistics) for the null hypothesis  $H_D^{\pi_{yy}} : \pi_{yy} = 0, H_D^{\pi_{yx.x}} : \pi_{yx.x} = 0'$ , and alternative hypothesis  $H_1^{\pi_{yy}} : \pi_{yy} \neq 0, H_1^{\pi_{yx.x}} : \pi_{yx.x} \neq 0'$ . Hence the joint null hypothesis of the interest in above equation is given by:  $H_D = H_D^{\pi_{yy}} \& H_D^{\pi_{yx.x}}$ , and alternative hypothesis is correspondingly stated as:  $H_1 = H_1^{\pi_{yy}} \& H_1^{\pi_{yx.x}}$ .

The asymptotic distributions of the F-statistics are non-standard under the null hypothesis of no co-integration relationship between the examined variables, irrespective of whether the variables are purely  $I(0)$  or  $I(1)$ , or mutually co-integrated. Two sets of asymptotic critical values are provided by Pesaran and Pesaran (1997). The first set assumes that all variables are  $I(0)$  while the second set assumes that all variables are  $I(1)$ . If the computed F-statistics is greater than the upper bound critical value, and then we reject the null hypothesis of no co-integration and conclude that there exists steady state equilibrium between the variables. If the computed F-statistics is less than the lower bound critical value, then we cannot reject the null of no co-integration. If the computed F-statistics falls within the lower and upper bound critical values, then the result is inconclusive; in this case, following Kremers *et al.* (1992) and Bannerjee *et al.* (1998), the error correction term will be a useful way of establishing co-integration. The second step is to estimate the long-run coefficient of the same equation and the associated ARDL error coercion models.

### III. EMPIRICAL INTERPRETATIONS

Before I proceed with the ARDL bounds test, I tested for the stationarity status of all variables to determine their order of integration. This is to ensure that the variables are not  $I(2)$  stationary so as to avoid spurious results. According to Ouattara (2004) in the presence of  $I(2)$  variables the computed F-statistics provided by Pesaran *et al.* (2001) are not valid because bounds test is based on the assumption that the variables are  $I(0)$  or  $I(1)$ . Therefore, the implementation of unit root tests in the ARDL procedure might still be necessary in order to ensure that none of the variable is integrated of order 2 or beyond.

I employed ADF dickey-fuller test to obtain the order of integration of each variable as results shown in Table 1, which indicates that two variables LSMI and LCPI are  $I(1)$ , although LBL is integrated at  $I(0)$ . The ambiguities in the order of integration of the variables lend support to the use of the ARDL bounds approach rather than one of the alternative co-integration tests.



TABLE 1  
Unit-Root Estimation

Variables	Level ADF test statistics	Lags	1 <sup>st</sup> Difference test statistics	Lags
LSMI	-2.522597	1	-4.063177**	1
LCPI	-6.468837*	1	-6.881162*	1
LBL	-2.251068	1	-3.320563***	4

NOTE: \*, \*\*, \*\*\* significant at 1 percent, 5 percent and 10 percent level of significance.

After finding integrating order of all variables, the two-step ARDL Co-integration (see Pesaran *et al.*, 2001) procedure is implemented in the estimation of equation (1) for Pakistan utilizing annual data over the period 1971-2006. In the first stage, the order of lag length on the first differenced estimating the conditional error correction version of the ARDL model for conditional equation is usually obtained from unrestricted vector autoregression (VAR) by means of Schwartz Bayesian Criteria and Akaike Information Criteria which is 2 based on the minimum value (AIC)<sup>6</sup> as shown in Table 2.

The results of the bounds testing approach for Co-integration show that the calculated *F-statistics* is 9.087<sup>7</sup> which are higher than the upper level of bounds critical value of 7.52 at the 1 percent level of significance, implying that the null hypothesis of no Co-integration cannot be accepted and there is indeed a Co-integration relationship among the variables in this model. Having found a long-run relationship, I applied the ARDL method to estimate the long run and the short run elasticities (see Pesaran *et al.*, 2001 and Pesaran and Shin, 1999 for details). The total number of regressions estimated following the ARDL method in the conditional equation is  $(2 + 1)^3 = 27$ .

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<sup>6</sup>I used AIC for lag length selection.

<sup>7</sup>As can be seen from Table 2, although the results of the *F-test* changes significantly at lag order 1, support for co-integration is less. *F-test* statistics is highly sensitive with the lag order; there is strong evidence for co-integration because our calculated *F-statistics* is greater than its critical value when second lag is imposed.

TABLE 2

Lag order	Akaike Information Criteria	Schwarz Criteria	Log Likelihood	F-Statistics for Co-integration
1	-4.223445	-3.690182	85.91028	4.873
2	-4.576818	-3.634066	98.80591	9.087*
Short run Diagnostic Tests Serial Correlation LM Test = 0.878750 (0.426846) W-Heteroscedasticity Test = 0.700509 (0.688057) Ramsey RESET Test = 0.138988 (0.713415) Jarque-Bera Test = 1.096(0.6238)				

NOTE: \* representing the significant level at 1% level of significance while critical value is 7.52 respectively.

Long-run coefficients of the variables under investigation are shown in the Table 3. To test the impact of inflationary pressures on stock market prices, I regressed, the natural-log of the stock market price index on linear terms for the measure of inflationary pressures (consumer price index) and lag dependent variable because stock market prices are also affected by their previous trend.

TABLE 3

Estimated Long Run Coefficients Using the ARDL Approach

Dependent Variable: <i>LSMI</i>			
Variables	Coefficient	t-values	Prob-values
Constant	-0.242789	-0.356509	0.7239
LSMI (-1)	0.525613	3.644514	0.0010
LCPI	0.103085	1.761907	0.0879
LBL	0.669478	2.355411	0.0250
$R^2 = 0.747351$		Durbin-Watson stat = 1.5257	
Adjusted $R^2 = 0.722901$		F-Stat (Prob-value) = 30.56 (0.000)	

Coefficient of inflationary pressures represents that stocks are hedges against inflationary pressures (inflation) in long run in the case of Pakistan and significant at 10 percent level of significance. While, previous trend of stock market is also having positive impact on the current stock market price significantly at 1 percent significant level. Finally, and surprisingly black economy promotes the stock market prices means more under ground economy (black economy), there will be a rising trend in stock market prices in long run significantly.

TABLE 4  
Error Correction Representation for the Selected ARDL-Model  
(2, 1, 1)

Dependent variable: $\Delta LSMI$			
Variables	Coefficient	t-values	Prob-values
Constant	-0.02937	-0.487251	0.6297
$\Delta LSMI (-1)$	0.885764	2.686028	0.0118
$\Delta LCPI$	0.283966	0.631094	0.5329
$\Delta LBL$	1.064902	1.990976	0.0560
$CR (-1)$	-1.144181	-3.174132	0.0035
$R^2 = 0.324380$		Akaike info criterion = 0.023627	
Adjusted $R^2 = 0.231192$		Schwarz criterion = 0.248092	
Durbin-Watson stat = 2.012		F-statistic = 3.48 (0.02)	

After establishing the long run relationship between stock market prices and inflationary pressures in the case of Pakistan as discussed in Table 3. Table 4 gossips the short-run coefficient estimates obtained from the ECM version of ARDL model. The ECM coefficient shows the speed of adjustment of variables return to equilibrium and it should have a statistically significant coefficient with negative sign. The error correction term  $CE(-1)$ , which measures the speed of adjustment to restore equilibrium in the dynamic model, appears with negative sign and is statistically significant at 5 percent level, ensuring that long run equilibrium can be attained. Bannerjee *et al.* (1998) holds that a highly significant error correction term is further proof of the existence of stable long run relationship. Indeed, he has argued that testing the significance of  $CE_{t-1}$ , which is supposed to carry a negative coefficient, is relatively more efficient way of establishing Co-integration.

The coefficient of  $CE(-1)$  is equal to  $(-1.14)$  for short run model respectively and imply that deviation from the long-term inequality is corrected by (114) percent over the each year. The lag length of short run model is selected on basis of Akaike Information Criteria (AIC).

Short run dynamics results also provide evidence that lagged stock market price is associated positively with current stock price at 1 percent level of significance. Inflationary pressure (consumer prices) is also having positive impact on stock market prices but not significant which, explains that, stock market returns are not hedge against inflation in short run because inflation usually turns out to have an insignificant effect on stock returns. Coefficient of black economy (underground or unregistered economy) also affects the stock market prices positively and significantly in short span of time.

Diagnostic tests for serial correlation, normality, heteroscedasticity and functional form are considered, and results are shown in Table 2. These tests show that short-run model passes through all diagnostic tests in the first stage. The results indicate that there is no evidence of Autocorrelation and that the model passes the test for normality, and proving that the error term is normally distributed. Functional form of model is well specified and there is no existence of white heteroscedasticity in model. The presence of heteroscedasticity does not effect the estimates and time series in the equation are of mixed order of integration, *i.e.*  $I(0)$  and  $I(1)$ , it is natural to detect heteroscedasticity (Shrestha, 2005). Finally, when analyzing the stability of the long-run coefficients together with the short run dynamics, the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMsq) are applied.

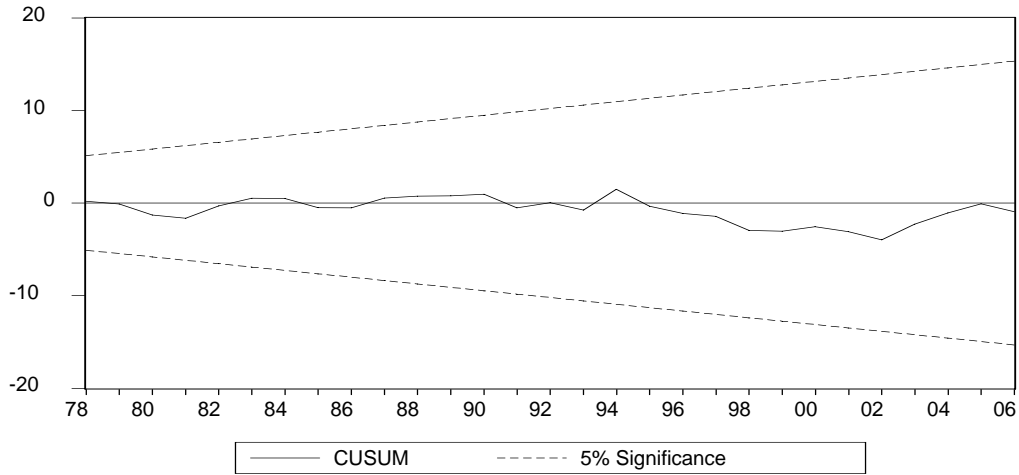
According to Pesaran and Shin (1999) the stability of the estimated coefficient of the error correction model should also be empirically investigated. A graphical representation of CUSUM and CUSUMsq is shown in Figures 1 and 2.

Following Bahmani-Oskooee (2004) the null hypothesis (*i.e.* that the regression equation is correctly specified) cannot be rejected if the plot of these statistics remains within the critical bounds of the 5% significance level. As it is clear from Figures 1 and 2, the plots of both the CUSUM and the CUSUMsq are with in the boundaries and hence these statistics confirm the stability of the long run coefficients of regressors that affect the stock returns in the country. The stability of selected ARDL model specification is evaluated using the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMsq) of the recursive residual test for the structural stability

(see Brown *et al.*, 1975). The model appears stable and correctly specified given that neither the CUSUM nor the CUSUMsq test statistics exceed the bounds of the 5 percent level of significance (see Figures 1 and 2).

FIGURE 1

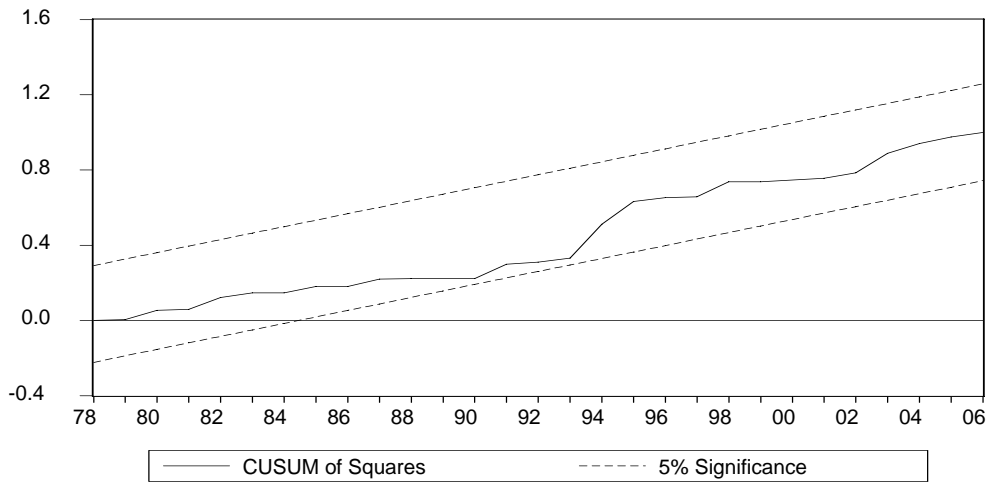
Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level.

FIGURE 2

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level.

#### **IV. CONCLUSIONS AND POLICY IMPLICATIONS**

In this paper the impact of inflation and black economy on stock market prices was investigated in the case of Pakistan by employing the ARDL for long run and Error Correction Method (ECM) for short run dynamics. Results supports the hypotheses that stocks returns are hedges against inflation in long run but not in short run, while, under-ground economy (black economy) promotes the stock prices to get higher in long run as well as in short run. Application of CUSUM and CUSUMsq tests confirm the stability of long run estimates of sample period.

For policy implication, government should regularize the share of black economy through stock markets.

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