IMPACT OF OIL PRICE, EXCHANGE RATE, AND INTEREST RATE ON STOCK MARKET OF PAKISTAN

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ABSTRACT

Stock market is important for the development of a country since it provides liquidity for the production process. Exchange rate and oil prices are the most vital economic variables that affect the stock market of an economy besides the interest rate which evidently have significant impact on stock returns. This study examines the impact of oil prices changes, exchange rate variations, and interest rate changes on stock returns of Pakistani stock market represented by KSE 100 index. Using monthly data for the period of January 2000 - December 2021 and employing bound testing approach to auto regressive distributed lag (ARDL) modelling, the short and long run relationship between these variables is examined. The study finds that oil prices, exchange rate and interest rate have significant impact on stock returns in Pakistan. The short run dynamics and interactions of these variables are further analysed by an appropriate error correction model.

Keywords: Exchange rate, interest rate, oil price, stock market
JEL Codes: F31, E43

1. INTRODUCTION

Crude oil is an important commodity and its importance cannot be overstated for the health of an economy. Fluctuation in oil prices affect economies differently. Some oil importing countries, including many Asian countries, are adversely affected by an upsurge in oil prices, whereas oil exporting economies are expected to have opposite effect of a rise in oil prices. A rise in oil price for oil importing countries leads to high import cost that has negative affect on balance of payments, inflation and GDP. On the contrary, oil exporting countries ride on the extra windfall coming from oil export in the face of higher oil prices and improves their important economic indicators. Moreover, high fluctuations in oil prices creates uncertainty in cash flows creating challenges for policy makers and business alike.

Starting from the first Oil shock of 70's that saw a rapid oil price increase, many studies have emerged that examine the linkage between oil price and other macroeconomic variables. Some studies conclude that higher oil prices lead to better economic outcome (Abimelech et al., 2017) and hence better stock returns for oil importing countries while some conclude that higher oil prices affect oil importing countries' economies adversely which ultimately has negative impact on stock market (Yanagisawa, 2012; Lemazoshvili, 2014; Shabhaz et al., 2017).

There is plethora of studies that document the effect of exchange rate variations on stock returns. For example, Eldomiaty et al., (2020) and Miralles-Quirós et al., (2017) have found a significant relationship between these two variables. The exchange rate variations have either adverse or favourable impact on the profitability of firms which depends if the firm is an importing or exporting entity. The net effect of parity fluctuations on stock market of a country also differs from country to country. It is interesting to see how this variable affects the Pakistani stock market. A study by Bagh et al. (2017) has found that exchange rate variations affect the stock market significantly.

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The literature has also established a significant effect of currency parity on stock returns. Any surge in interest rate is likely to impact the earnings of the firm and hence stock prices negatively, as future discounted valuations tend to be low due to discount rate increase. Moreover, investors are also likely to move to capital markets from stock market due to a rise in relatively risk-free financial assets' returns. A study by Ali (2014) has shown that there exists an inverse association between interest rate and stock prices for Pakistan.

Ansar & Asghar (2013) analysed that oil is the important factor which affects the GDP of any economy significantly. Pakistan's consumption of oil significantly out weights its production making it a net importer of oil to meet its basic energy needs. Oil prices affect stock market in many ways. An increase in oil prices may affect the cost of final goods and also creates inflation. Gavin (1989) estimated that Stock market booming has a positive impact on aggregate demand and if stock market is large, then real exchange rate and interest rate are unproductive.

The relationship between oil prices and other economic variables is investigated by many studies. For instance, Sadorsky (1999) and Jones & Kaul (1996) analysed the connection between oil prices and stock prices and found it to be negative. Chen et al. (1986), in contrast, found that oil affects stock positively. Similarly, Huang et al. (1996) study did indicate a negative relation between oil prices and stock market. However, Kilian & Park (2007) showed that oil price variations have negative impact on stock returns in numerous European countries.

Oil prices fluctuation depend on demand for oil in developing countries like Pakistan. In 2017 oil consumption in Pakistan was 588.616 barrel per day. The US energy information and Administration provides data for Pakistan on the consumption of oil. In 1980 consumption of oil was 104 thousand barrels per day but average value of oil consumption in 2015 was 290.31 thousand barrels per day. In emerging countries demand for oil is also rapidly increasing, *i.e.* China is second largest oil consuming country after US. Though exchange rate movement affect oil prices, oil price increase also leads to fluctuations in exchange rate. Bloomberg & Harris (1995) found negative relation between exchange rate and oil prices. Stock market is important variable for the grooming of a country. Without the vital role of stock market an economy cannot run in proper way. But oil price fluctuation can affect stock market and exchange rate has also an impact on stock market (Attari & Safdar, 2013).

In developing countries demand for oil is inelastic because when oil prices increase then demand for US dollar also increase. During 2011-2014 demand for oil increase much faster and more aggressively. Ajayi & Mougoue (2008) found that Currency also has influence on stock market. When currency devalue it will decrease the stock prices in short run and deflation in exchange rate put more inflation for future and because of this stock holders are doubtful for the organization administration which results stock prices to fall. The development of the country is depend upon stock prices which show the future cash flow that is why some people increase the value of stock prices and other decrease the value of stock market prices so stock prices are considered as the economy's vital variable. Oil is also an important variable for the cost of production. The influence of oil price volatility will be different in oil importing and exporting countries (Siddiqui, 2013).

Oil price fluctuations occur in all developing and developed countries. Pakistan is one of those countries in which economic growth has fallen because of the international fluctuations in oil prices. Increasing the price of oil is the reason of inflation in the country and because of inflation economics growth can be fall. Through different estimates economic growth of developing countries also affected by increase or decrease of oil prices because oil price is an important variable for the economy as when oil prices increase then economy will go to inflation which is not good for the economy. When currency increase or decrease then there is a change in oil prices and the economic growth will also change because change in oil prices will change the stock market. Increase in the oil prices will increase the stock exchange because when currency increases by the increase in oil prices (Khakan & Rabia, 2016).

Ghosh (2011) have examined the interaction between crude oil and exchange rate for India. He also estimates that demand for importing oil in India was not affected by the change in oil prices in international markets. This study concludes that crude oil prices have positive and negative impact on the exchange rate volatility in India. Study tells us that oil prices effect the exchange rate negatively which means that when increase the oil prices then exchange rate will decrease. Similarly, when there is an increase in oil prices then exchange rate will also increase. Ghosh (2011) analysed the negative and positive impact of oil prices on the exchange rate for the country India. Our rational view is to show that increase in the price of oil is a most important concern of inflation. This paper will show how oil prices affect the stock market in Pakistan along with exchange rate changes and interest rate changes. The exchange rate is also an imperative determinant of stock prices.

Many research studies examine the relationship between stock market and oil prices, however, according to authors' best knowledge there is no study which has been published to show the impact of exchange rate changes, oil price changes, and interest rate changes on the behaviour of Pakistani stock market, collectively. So, the main objective of this study is to examine the relationship between oil prices, exchange rate, interest rate and stock market. Understanding the relationship between these variables is important because they will have a larger influence on the economy.

2. LITERATURE REVIEW

This section succinctly explains some relevant studies on oil price shocks, exchange rate variations and stock returns. The findings of these studies differ according to the period of study, type of country and selection of methodology. One recent study is conducted by Sheikh et al. (2020) which analyses the interactions between oil price, exchange rate, gold prices, and stock market in the aftermath of financial crisis of 2008. The study used nonlinear autoregressive distributed lag models to find out the empirical results. 168 observations were used from the time period of 2014 to 2018. The results showed that before financial crisis investors' attitude was different and afterwards it changed a lot. This relationship should be kept in mind while making decisions by the investors, government, and stockholders. There is a study by Tian et al. (2020) which has analysed the dynamic effect of oil price shocks on the stock returns and the exchange rate. The paper used daily basis data from March 6th, 2011 to September 9th, 2019. TVP-VAR model is used by the authors to analysis the time-varying uncertainty across the markets. The results showed that OVX has dominant factor which makes change and has positive impact in other variables.

There is another study by Singhal et al. (2019) that examine the relationship among crude oil, gold, exchange rate and stock returns. The authors used data January 2006 to April 2018 on daily basis. The bound testing methodology based on Autoregressive Distributed Lag Model (ARDL) was applied. The findings suggested that gold prices positively affected stock price whereas oil prices have negative affect on stock prices. The study suggested some policy implications regarding pressure on stock and exchange market through crude oil and gold prices.

Al-hajj et al. (2018) investigated oil price shocks and stock returns nexus for Malaysia by using monthly data from 1990 to 2016. The paper used nonlinear ARDL approach for the empirical estimation. The results indicated that there is strong cointegration relationship among all variables. The results showed that Malaysian market is very sensitive to the changes in the oil prices. It also showed that there is asymmetric linkage among interest rate, oil price, inflation and stock prices.

Roubaud & Arouri (2018) empirically analyzed exchange rates, oil prices, and stock markets under regime switching. The study used the monthly data from 1979 to 2015. The study used Vector autoregressive (VAR) model for the estimation of model. The findings suggested that there is a significant interrelation among currency, oil and stock prices. There also existed nonlinear relationship among the variables. Oil plays a key role in stock and exchange market shocks.

Sharma et al. (2018) analysed the interdependence between international oil prices and stock returns for the period of 2010 to 2017 in case of India. They conclude that there is no cointegration between the variables and oil affects stocks negatively.

Najaf & Najaf (2016) estimated the influence of oil price changes on stock returns of Malaysia and Pakistan by using the data from 1989 to 2010. The study presented some descriptive analysis to explain the nature of the variables and applied simple regression model to estimate the model. The study revealed that changing in oil prices adversely affect the inflation, stock market and development of a country. However, the study has not used any indicator of inflation or economic development in the estimation.

Nordin et al. (2014) estimated the interaction among exchange rate, commodity prices, interest rate performance of stock market. The paper used bound test cointegration approach to estimate the results and concluded that a significant effect of palm oil prices on stock return is observed. However, the no significant relationship between gold and oil prices was found. Just like past empirical studies, interest rate and exchange rates showed significant influences. The authors suggested that policy makers and authorities must pay attention to the commodity prices as well as macroeconomic variables.

Attari & Safdar (2013) analyzed the relationship among macroeconomic variables and stock returns for Pakistan using the monthly data from 1991 to 2012. The study used ADF test to check unit root and ARCH test to check heteroskedasticity in the data. The study found the influential impact of macroeconomic indicators on stock market. The study also found that volatility in stock market also influence economy of a country.

A study by Hussin et al. (2012) revealed that crude oil price positively affect the Islamic stock market while exchange rate is inversely related with the stock market. Granger causality results indicated that stock market return only granger cause to oil prices in Malaysia.

On the other hand, Masih et al. (2011) study on the impact of oil prices on the Korean economy, concluded that oil price fluctuations affect the stock market accordingly with the time horizon. In the beginning, stock market rises and then slows down.

Arouri et al. (2011) also estimated the interaction of oil, stock markets in the Gulf region. Methodology used in this study was multivariate econometric VAR-GARCH model. The study concluded a statistically significant association between oil and stock returns in half of the council countries.

Filis (2010) analyzed the relationship among CPI, stock market, oil prices and industrial production for Greece over the time period of 1996 to 2008. This stud used the technique of cointegraion and vector auto regression to model the association among variables. This study found oil impacting stock market negatively, while oil prices and stocks having positive effect on CPI in the longer run.

Another study by Adebiyi et al. (2008) examined the impact of exchange rate changes and oil price changes on the real stock returns for African country Nigeria. The study used three samples set as data for estimation ranging from 1958 to 2008. Vector Autoregressive (VAR) model is used for determination of results. The findings suggested that oil affects sock returns negatively. It is important to note that causation returns to real exchange rate. Furthermore, the interest rate is more powerful influencer of stock returns than the oil prices.

3. MODEL SPECIFICATION

This paper uses the autoregressive distributed lag (ARDL) modelling approach that uses bound testing method to find the relationship between the stock returns proxied by changes in KSE 100 index and other variables of the model, i.e., the changes in oil prices, the variation in exchange rate measured as foreign currency per unit of domestic currency, and the short-term interest rate. The bound test approach was presented by Pesaran et al. (2001). This method of checking the cointegration between two or more variables is superior to Engle and Granger (1987) and Johansen and Juselius (1990) method. Pesaran et al. (1999) argue that this model is capable of incorporating series if they are integrated of order zero or one. However, ARDL method to find the long run relationship is incapable of handling series if they are integrated of order two or more.

Following Pesaran et al. (2001), we start from a general ARDL framework which can be transformed into dynamic error correction model (ECM) by a linear transformation.:

$$\Delta Y_t = A + \alpha Y_{t-1} + \sum_{j=1}^{p} \beta_j \Delta Y_{t-j} + u_t \quad (1)$$

In the above equation A is a $k+1$ vector which includes the parameters of intercepts; while $\alpha = I_{k+1} + \sum_{i=1}^{p} \varphi_i$ and$\beta_j = -\sum_{j=1+1}^{p} \varphi_j$ are the matrices having $k+1$ by $k+1$ order that contains the parameters of the short run and the long run. The term Yt is a vector defined as $Y_t = [SRt, \quad OPt, EXt, Rt]^{/}$ containing a normalised variable i.e., SR_t representing stock returns, and independent (forcing) variables, X_t, which are OPt, EXt, Rt, representing oil prices, exchange rate, and interest rate, respectively. As stated earlier, these variables may have any order of integration below two. The equation also contains a white noise error term, u_t.

If there exist a long run relationship among the variables of interest, equation 1 can be written as;

$$\Delta SR_t = \tau + \rho_{SR} SR_{t-1} + \rho_x x_{t-1} + \sum_{j=1}^{p-1} \omega_{SR,j} \Delta SR_{t-j} + \sum_{j=1}^{q-1} \omega_{x,j} \Delta x_{t-j} + \sigma \Delta x_t + v_t \quad (2)$$

where $\rho_{SR}$and $\rho_x$are the respective long run multipliers, and $\omega_{SR}$and $\omega_x$are the dynamics coefficients of short run.

According to Pesaran et al. (1997) the current first differenced of forcing variable(s) x_t may be incorporated in the equation 2 only if we have decided the independent or forcing variables in advance. In our theoretical model where these explanatory variables are expected to have some impact on stock returns, hence specifying the orders of change; we have taken the liberty of including the right-hand side of equation 2 of current first differenced x_t variables.

Now OLS can be applied for the estimation of equation 2. The null hypothesis that long run relationship between the variables in the model does not exist can be checked by calculating the F-statistics and using the hypothesis that H_0 :ρ_{SR}= 0 and ρ_x= 0 . The rejection of null or acceptance of alternative hypothesis $\rho_{SR}\neq$ 0 and $\rho_x\neq$ 0 indicates the presence of long run relationship shown as:

$$SRt = \phi_0 + \phi_x x_t + \varepsilon_t \quad (3)$$

where $\phi_o = -\tau/\rho_{SR}$, $\phi_1 = \rho_x/\rho_{SR}$ and ε_t is our usual random error.

As this is not a normal test and its critical values depend on the order of integration, time trend and intercept, and the number of forcing variables included in the model. The critical values of this test for I(0) and I(1) are tabulated by Pesaran et al. (2001) for the various level of significance. These critical values characterize two bounds, i.e., upper and lower bound. If the calculated value is greater than the critical value of the upper bound, the null hypothesis of no long run relationship among the variables can be rejected. Alternatively, null is accepted if calculated value falls below the lower bound. The result is inconclusive, if calculated value lies in between the two specified region.

4. DATA AND ESTIMATION RESULTS

The monthly data set used for estimation ranges from 2000-M1 to 2019-M12. The variables used in the model are stock returns (*SR*) proxied by KSE 100 index, oil prices (*OP*) represented by WTI spot prices, interest rate (*R*) represented by money market rate, and exchange rate (*EX*) measured as units of domestic currency per unit of dollar. All the data were obtained from international financial statistics (IFS) of IMF.

Table 1 Descriptive Statistics

Sample period	263 observations from 2000M2 to 2021M12			
Variables	SR	OP	EX	R
Maximum	27.2700	0.72568	0.019308	0 .20000
Minimum	-36.1600	-.043341	0.0056651	-0.16667
Mean	1.5140	0.0091196	0.012332	0.8665E-3
Std. Deviation	7.4216	0.10389	0.0039804	0.043821
Skewness	-0.40293	0.54108	0.031325	0.37129
Kurtosis - 3	3.1440	10.0592	-1.3380	7.0741
Coef of Variation	4.9020	11.3918	0.32277	50.5710

Source: Computed by the authors

The descriptive statistics of all the series involved in the estimation are reported in Table 1. The reported measures involve maximum and minimum values of all the variables, and their four moments including the mean (centre of the data series), the standard deviation (spread of the data), skewness (lack of symmetry of the series indicating that whether data lies more to the right or left of the mean), and the kurtosis (if the data is heavily or lightly tailed in comparison to normal distribution). Table also reports coefficient of variation which measures the ratio of the standard deviation to the mean. The symmetry implies that skewness for a normal distribution is zero and a negative (positive) value shows data is skewed left (right), which in our case remains close to zero for most of the series. The value 3 of kurtosis implies that distribution of the data is mesokurtic while a value > 3 indicates it is leptokurtic and a value of <3 means that the distribution is platykurtic. Except stock return, most of the series are not mesokurtic in our case. Coefficient of variation of the data shows that the values of series are not in the range of twenty to thirty indicting the relative size of the standard deviation compared to the mean.

Table 2 Correlation matrix

	SR	OP	EX	R
SR	1			
OP	0.200043	1		
EX	0.073667	0.033034	1	
R	-0.176709	-0.2160212	0.0011402	1

Source: Computed by the authors

The correlation matrix shows how the selected variables are correlated to each other. We can see that except the interest rate, all the remaining variables are positively correlated to stock returns with varying degrees. The interest rate is negatively correlated to stock returns which seems plausible at this stage as a rise in interest rate is expected to decrease the economic activity which ultimately has negative impact on stock market reducing the returns.

A graphical representation of stock prices, exchange rate, oil prices and interest rate is provided in the appendix for brevity.

Table 3 ADF Test

	Level		**1st Difference**	
Variables	Intercept	intercept and trend	intercept	intercept and trend
SR	-15.44924* (0.0000)	-15.48846* (0.0000)	—	—
OP	-12.79432* (0.0000)	-12.76964* (0.0000)	—	—
EX	-0.774100 (0.8242)	-2.462784 (0.3465)	-7.095651* (0.0000)	-15.21122* (0.0000)
R	-6.805443* (0.0000)	-6.812424* (0.0000)	—	—

Source: Computed by the authors
ADF statistics are given in the table, probabilities values are in parenthesis
* the level of significance at 1% level

Check the statistical properties of the series involve in the estimation of any model is a must. A time series, Y_t, is stationary if its distribution is free from time. On the other hand, first and second moments of a non-stationary series' are time variant. If such kind of series are employed in regression analysis it gives spurious results as stated by Granger and Newbold (1974). The Augmented Dicky Fuller test given by Dickey and Fuller (1979, 1981) is applied to establish the statistical properties of the series involved in our model. This test explains that if variables are stationary at level, 1st difference or at 2nd difference. When the probability value is less than 0.05 then the variables are stationary at 5% level. When probability value is less than 0.01 then variables are stationary at 1% level.

In table 3, the estimates of ADF test indicates that the stock return, the interest rate and oil prices are integrated of order zero, and the exchange rate is integrated of order 1, I(1). Therefore, we can conclude that our model has the variables which have mixed order of cointegration and none of them is integrated of order 2 or more. the variables used in the model represent the mixed order of integration. Consequently, we can safely conclude that we can apply autoregressive distributed lag model for estimation purposes.

The estimation results of the bound test where stock returns is normalised and the remaining variables are treated as forcing variables, as discussed in equation 2 are presented in table 4 and 5.

Table 4 Bound Test F-Statistics

F-Statistic calculated	95% level of significance	
	I(0)	I(1)
26.7771	3.1867	4.3745

Source: Computed by the authors

Table 5 Bound Test W-Statistics

W-Statistic calculated	95% level of significance	
	I(0)	I(1)
107.1085	12.7469	17.4981

Source: Computed by the authors

Equation 2 is estimated by applying OLS and the results are reported in tables 4 and 5. The F-test is used to establish the long run cointegration between stock returns and other variables included in the model. In the first estimation, 6 lags were selected for all the variables included. Based on the Akike information criteria an ARDL (4, 5, 5, 2) was estimated, where these numbers represent the number of lags on each variable involved, starting from normalised variable.

The F-statistics of the estimated ARDL (4, 5, 5, 2) model are presented in table 4 where it can be clearly seen that F-calculated value (26.77) lies well above the upper bound at 95 per cent significance level (3.1867) indicating the rejection of null hypothesis of no long run relationship between stock returns and the other variables included in the model. This implies that in the long run these variables move together. The W-state presented in table 5 also clearly indicates the presence of long run relationship among the variables when stock return is normalised.

An indirect way of testing the long run relationship between these variables is to observe the error correction term by estimating error correction model. This model is estimated and the results are presented in Table 5. It can be seen from this table that error correction term is negative and statistically significant, if compared with the standard *t*-distribution representing the existence of long run relationship between stock returns and other variables included in the model, i.e., exchange rate, interest rate and oil prices.

Table 6 Error correction model Estimation (4, 5, 5, 2)

Dependent variable is DSR			
Regressors	**Coefficient**	**Standard Error**	**T-Ratio (Prob.)**
DSR1	0.36347*	0.11309	3.2141(0.001)
DSR2	0.16393***	0.086962	1.8851(0.061)
DSR3	0.11307 ***	0.060405	1.8718(0.062)
DOP	6.7910	4.3399	1.5648(.119)
DOP1	-11.1950**	4.4186	-2.5336(0.012)
DEX	5516.4*	2052.8	2.6873(0.008)
DEX1	699.8624	2089.4	0.33496(0.738)
DEX2	8458.3*	2071.9	4.0824(0.000)
DEX3	-197.5549	2152.3	-.091789(0.927)
DEX4	4715.7**	2158.0	2.1853(0.030)
DR	-29.2645*	10.6613	-2.7449(0.007)
DR1	-11.4422	18.8011	-.60859(0.543)
DR2	8.7044	17.5674	0.49549(0.621)
DR3	0.9266	15.2658	0.25722(.797)
DR4	24.9994**	10.9801	2.2768(0.024)
ECM (-1)	-1.3833*	0.13610	-10.1639(0.000)

Source: Computed by the authors, *, **, *** indicates significance level at 1, 5, and 10 per cent, respectively.

Table 6 presents the estimation results of error correction model selected on the basis of Akike information criteria. The coefficient on ECM$t-1$ measures the speed of adjustment for the convergence of stock returns and other variables involved in the model in the long run. This value though significant and negative is higher than 1 indicating the possibility of over correction which is very common in stock market where the effect of new developments is immediately incorporated in the stocks as soon as the information become available. The value of error correction term being higher than one also indicates that convergence is not linear and may involve oscillations. Estimation results show that in the short run lag values of stock returns also influence the current behaviour of returns in Pakistani stock market, which is consistent with literature. Changes in oil prices, on the other hand, have mixed results. The lag values of oil prices are statistically significant in influencing the stock returns of Pakistani market in the short run negatively while the current changes in oil prices are not influencing the returns of Pakistani stock market for an oil importing country. The result is consistent again with the literature that a rise in oil price is likely to have negative impact on economy and hence stock market for oil importing country.

Regarding the effect of exchange rate variations on stock market, the estimation results reveal that it is a significant influencer for Pakistani stock market. A rise in exchange rate, which is defined as the units of foreign currency (USD) per unit of domestic currency (PkRs), exhibits a positive impact on stock returns. This shows that domestic currency appreciation implies a net inflow of foreign currency, which has positive impact on the economy particularly to stock market. Again, this result is plausible and consistent with other studies. Moreover, many of the lag values of exchange rate variations are statistically significant indicating that exchange rate appreciation's impact on stock returns has inertia. The unusually large coefficient does not have any impact on the statistical significance of the variable in this case but indicates that perhaps better scaling of the data could have been carried out.

As the literature clearly indicates that there is negative relationship between stock returns and interest rate via many channels. Overall, a tight monetary policy is expected to contain inflation at the cost of some loss in economic output at least in the short run. Our results are consistent with this prevailing evidence that, in the short run, an immediate rise in interest rate impacts stock returns significantly and negatively.

The estimation results of the long run accumulated impact of various variables on stock returns are presented in table 7. First thing to note in these results is that all the explanatory variables included in the model, i.e., oil price variations, exchange rate changes, and interest rate changes, are statistically significant in impacting the stock returns in Pakistani stock market proxied by KSE100 index justifying the inclusion of these variables in modelling stock returns. We also observe that currency appreciation impacts the stock returns positively in the long run. The coefficient on interest rate has correct sign indicating a negative impact of tight monetary policy on stock returns in the long run. Here we observe that the long run coefficient on oil price variations is statistically significant. However, the sign on this accumulated coefficient is positive implying that a positive change in oil price leads to higher stock returns in the long run. This result is matching with the studies which are in the line of Gbatu et al. (2017).

Table 7 Long Run Estimates of ARDL Model (4, 5, 5, 2)

Dependent variable is SR			
Regressors	**Coefficient**	**Standard Error**	**T-Ratio (Prob.)**
OP	14.8176*	4.9206	3.0113 (0.003]
EX	151.5886**	76.2003	1.9893 (0.048)
R	-31.1724**	13.7236	-2.2714 (0.024)
INPT	0.35241	0.99172	0.35535 (0.723)

Source: Computed by the authors, *, **, *** indicates significance level at 1, 5, and 10 per cent, respectively.

We have performed three types of tests to check the robustness of the results presented. In the first test we checked the serial correlation of residuals using Lagrange multiplier (LM) and F test. In the second type of tests we examined the misspecification of the model by performing Ramsey Regression Equation Specification Error Test (RESET), while the third type of test we performed was the cumulative sum commonly known as CUSUM and cumulative sum of square defined as CUSUMQ to gauge if the estimated coefficients are stable.

The LM test has a χ^2 distribution. This test is clearly unable to reject the null that there is no serial correlation, as the calculated p-value of 0.755 is well above the critical value of 0.05. The F- version test of serial correlation also supplements the result, as its p-value (0.81) also fails to reject null of no serial correlation. For a comparison of the results obtained from these two tests (Ahmad et al., 2012).

The model is also correctly specified, as the Ramsey RESET test for the misspecification of the model shows that calculated value (0.1) of the LM test is well below the table value at one degree of freedom (3.84) implying that we cannot reject the null hypothesis of no misspecification. The F-test results for misspecification also supplement the LM test results.

Test results of CUSUM and CUSUMSQ tests for the stability of estimated coefficients of ARDL model over time in figure 1 and figure 2 show that generally the residuals of the ARDL model are within the bound of 5 per cent level of significance critical values for most of the time period implying that the estimated coefficients of the model are stable.

5. SUMMARY AND CONCLUSION

The current study is an attempt to analyse the effect of interest rate changes, oil price changes, and exchange rate variations on stock returns in Pakistani stock market. The unit root analysis of the monthly data reveals that these variables have mixed order of integration. Moreover, none of the series is integrated of order 2 or more, which justifies the application of ARDL model. The estimation results of bound test presented in Table 4.4 and Table 4.5 reveal that there exists a long run relationship between stock returns, the change in oil prices, exchange rate variations, and interest rate. Moreover, the estimation results also indicate that oil price changes and exchange rate variations have positive impact on stock returns while an increase in interest rate impacts the return negatively. The positive impact of oil prices on stock returns is not very surprising to the fact that there are some studies which have come up with the same conclusion for oil importing countries as discussed in the introduction of this paper. Moreover, many important studies which try to examine the impact of oil prices on stock market for the US, an oil importing country, has also revealed that this relationship is not always straightforward and negative. The estimation results also indicated a positive influence of exchange rate appreciation on stock returns in Pakistan. This result is not surprising either as discussed by Ma and Tian (2009). They state that as the local currency appreciates, hot foreign capital flows into the local markets. This leads to domestic investors' speculation in stock market that boosts the stocks prices which in turn is based on the expectations that the domestic currency will further appreciate.

Based on estimation results we found that an increase in interest rate affects the stock returns negatively which is plausible. In the face of a rise in interest rate, investors move funds from stock market to capital markets, as these

markets become relatively more attractive. We can conclude that policy makers should keep an eye in the face of an increase in international oil prices as this rise is associated with an increase in stock prices which might indicate that businesses try to exploit this situation by increasing their profits at the expense of consumers. Moreover, another channel through which interest rate rise impacts the stock market is that with the rise of interest rate there are less business opportunities and less profit for the firms, which lowers the stock prices and their returns. Therefore, it is important for the developing country like Pakistan to maintain a steady rate of interest.

Figure 1

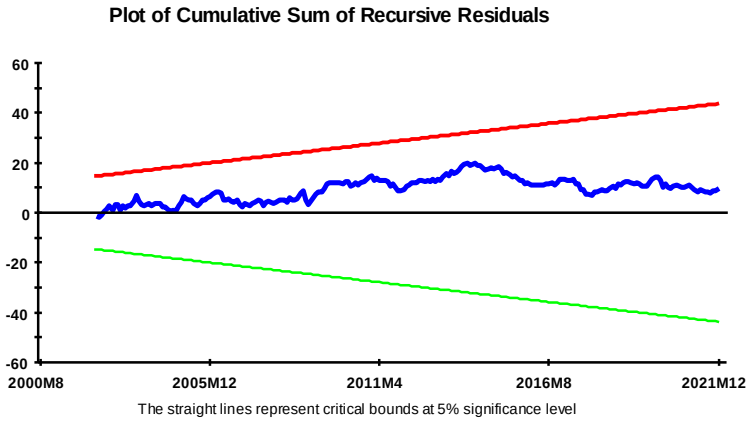
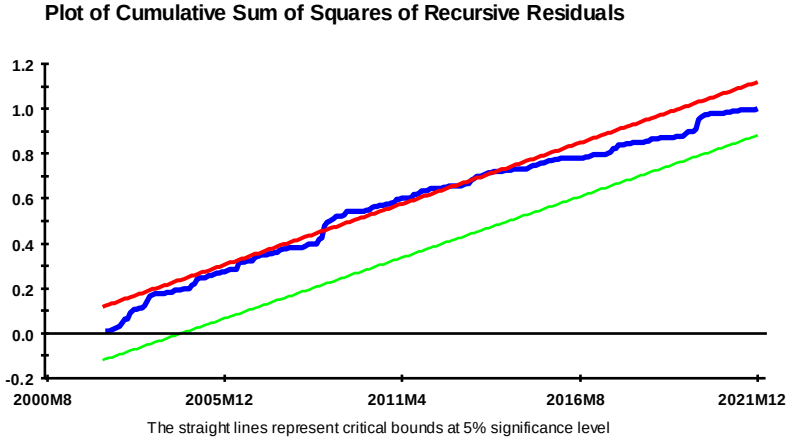


Figure 2



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APPENDIX

Graphical Representation of Variables

Figure A1

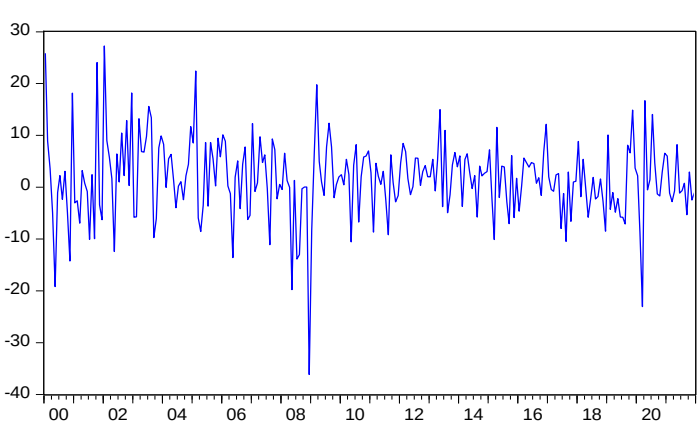

Figure A2

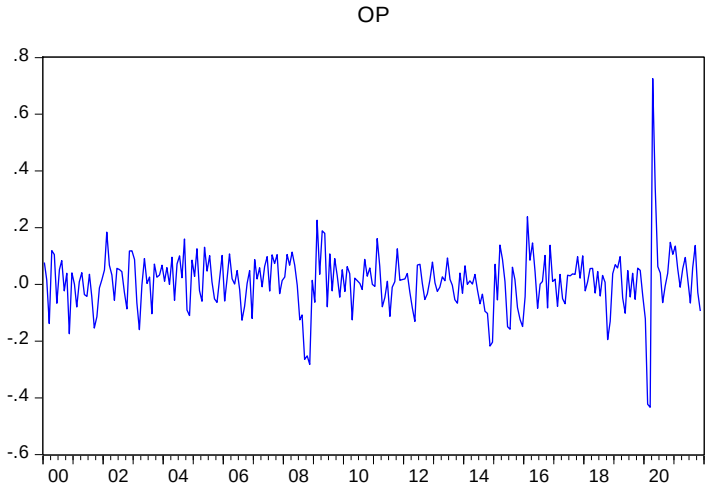

Figure A3

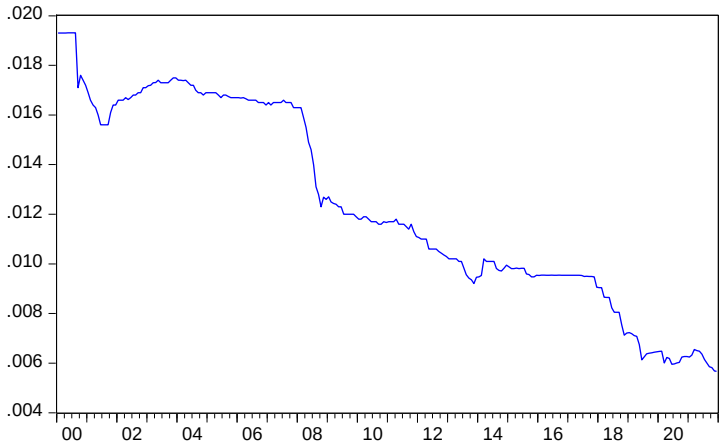

Figure A4