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# THE EFFECT OF OIL PRICE ON STOCK MARKET RETURNS WITH MODERATING EFFECT OF FOREIGN DIRECT INVESTMENT & FOREIGN PORTFOLIO INVESTMENT: EVIDENCE FROM PAKISTAN STOCK MARKET

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## ABSTRACT

This paper investigates the moderating impact of FDI & FPI in the association of macro-economic variables along with Oil prices & Index returns. Monthly data has been used from the period 2005 to 2018. Efficient unit root & breakpoint unit root tests results indicate that all variables are stationary at 1st difference. Co-integration test results signify the presence of long-run relationship in model. GARCH (1,1) model has been applied for analyzing the volatility in the data series. Furthermore, least square method is employed to check dependency & fitness level of model. In order to investigate the moderating impact, regression technique has been applied. Findings of LSM technique indicate that index returns aren't significantly dependent on macro-economic variables on 1st difference of data series because variables predicting behavior has been changed with respect to stationarity of data. Exchange rate & interest rate have negative significant association with index returns. Oil prices & foreign direct investment have positive relationship with stock market return. FDI & FPI are unable to moderate significantly model dynamics. For estimating the panel regression model, 11 different sectors data is used and results show that exchange rate & oil prices have positive significant impact on sector wise price change but interest rate has significant negative association.

**Contribution/ Originality:** This study contributes in the existing literature of finance through checking moderating impact of FDI & FPI in the relation of macro-economic variables along with oil prices from KSE 100 index return. Moreover, findings of study allow investors & government to take better decision regarding investment philosophy in volatile market.

## 1. INTRODUCTION

### 1.1. Background to the Study

Stock market volatility, due to macroeconomic risk factors & less investor confidence is a fundamental concept in finance literature & many economist highlighted this issue, as Sadorsky (2001) documented that association between oil price shocks, macro-economic factors & financial variables have a dynamic process. From decades, scholars tried to discover the responsiveness of equity market with respect to risk factors of macroeconomic

variables & from last few years, this concept get an enormous attention of economists. For diversifying risk, developing understanding about the complex link between macro-economic variables & index fluctuations is crucial (Khan *et al.,* 2018). Oil price & stock market return have a dynamic association, which should be explore in detail.

First methodology had been developed on that model by Ewing and Thompson (2007). Lee and Chiou (2011) Imply a univariate method for investigating the relation across oil prices & index return. In 1980, developed countries reduced the restrictions on investing in financial markets by financial liberalization concept & due to that concept foreign investment theory emerged. Portfolio investment & direct investment are the two main components of foreign investment in any market. FPI has a temporary affect whereas FDI has a long term influence on the economic indicators (Lipsey *et al.,* 1999). Ferrer *et al.* (2016) argues that high interest rates attracts the foreign portfolio investment. Therefore, emerging economies always need to get foreign investments in both ways either direct or portfolio (Broto *et al.,* 2011).

As per current data released by Ministry of Finance, petroleum sector import bill is 24% of total import bill. Asian countries are the major consumers of crude oil although falling demand in Asian region lead to fall in the global demand of Oil of any country (Sadorsky, 2001) however, oil prices are the most fundamental driver in the financial growth of country's economy in terms of inflow of money for oil producing countries & expense for oil consumption countries. Hence energy sector is the major contributor (Hamilton, 1983).

In developing countries, stock market return depends on the economic indicators. The performance of PSX index from last two years was flourishing, Filis *et al.* (2011) although massive decline had observed within the last quarter of this year which indicate high volatility in the market, uncertain situation made investors unable to clearly get the risk factors behind that (Khan, 2017).

Oil prices changes are affected by the different macroeconomic channels of a country. Oil importing countries like Pakistan recorded decline in balance of payment, which subsequently put downward pressure on exchange rates, making imports more costly and exports less profitable consequently real national income fall. This is because of extensive oil usage for transportation, power, and input for production process. Therefore, effective decisions require this information.

Pakistan imports large quantity of crude oil on annual basis. Furthermore, country's population is growing significantly faster than the availability of oil & its relevant items for household, textile, agribusiness & others.

As stock market is a major factor for measuring economic growth & in case of Pakistan where many development projects are in process, stock market behavior is the fundamental aspect which needs to be explored. Currently, due to CPEC country is facing an energy crises or trade deficit problems. Whereas, import bill consist of 25% weighted of oil import. So in a whole scenario stock market behavior with respect to macro-economic variables is a phenomena which needs to be addressed for effective decision making.

This study also helps to develop understanding about how macro-economic elements influence share price of corporations & different market sectors. This is also an essential prerequisite for investors, portfolio managers, analysts, economists & policy makers to make better investing decisions in a current scenario of country's economy because from last few years stock market index drops significantly. However, market faced an anonymous challenges, which needs to be addressed for developing an appropriate understanding about the market fluctuations (currency devaluation, political instability, security threats etc.) (Ferrer *et al.,* 2016). Moreover, it help to get an insight about the implications of investment philosophy in a diverse domain of financial management such as, portfolio management, asset allocation, mitigating risk, fixed income analysis & fiscal or monetary policy planning.

This exploration is an effort to fill the gap between literature & financial market of Pakistan through exploring moderating effect of foreign direct investment & foreign portfolio investment in the relation of exchange rate fluctuations, oil price volatility & interest rate fluctuations from stock market returns moreover, also perform sectoral basis analysis on eleven different sector along with same determinants as well. There is no evidence is available from previous literature regarding moderating impact of FDI & FPI on key economic variables of

economy. Moreover, no previous research has been conducted in the context of Pakistan financial market along with that model specification.

### 1.2. Problem Statement

In recent years, Pakistan as an emerging economy encountered from many fundamental risk factors i.e. (interest rate, exchange rate & Oil Prices) moreover, it has been observed that equity market is unable to respond all that financial crises. Monetary policy statement of SBP reported that Pakistan foreign reserves declined to its historical level of $9 Billion & GDP growth is reduced to 5% annually. On the other hand monthly current account deficit has been inclined to $3 billion, which is also effected by the continuous decline in exports. Therefore the current scenario of Pakistan's economy contains various risk factors which leads towards the loss of investor's confidence. According to Sadorsky (2001) risk & returns of equity are the major tradeoffs of each other & uncertain economic condition of a country's economy may the cause of losing investors' confidence (Mehr-Un-Nisa and Nishat, 2011) when investor were unaware regarding which risk factors has been driven the market so, investment become more reluctant.

The inconsistency of Pakistan's equity market has encountered a massive shortage of investments & because of that stock market is unable to properly cater the FPI in daily trading. On the other hand stock market performance declines when there is a decline in exchange rates due to the increase in Oil Price (Sadorsky, 2001). Rahman and Mustafa (2018) suggested in a long run Oil prices has very insignificant effect on stock returns but Phan *et al.* (2018) explore that Crude Oil price uncertainty has a negative significant effect on corporate investment. There are different scholars that have various perspectives with regards of association across macro-economic variables & stock market deviations, Sathyanarayana *et al.* (2017) oil price shocks has a huge potential to transmit fluctuations in to stock return, but in case of oil producing countries, oil prices leads to high returns (Sadorsky, 2001) when development project set aside in a country hence macro-economic variables react differently.

### 1.3. Gap Analysis

In a current scenario of Pakistan, mega developmental projects is in process & our foreign reserves are also been decreases on continuous basis & due to that foreign investor losses their confidence. Previous literature never explored this phenomena as well as none of the previous researcher focused on the moderating impact of foreign portfolio investment and its relationship with exchange rate, interest rate, & oil prices with respect to various industry's stock returns.

This research is an exertion to fill the gap between literature & financial market of Pakistan through exploring the moderating effect of foreign direct investment in the relation of exchange rate fluctuations, oil price volatility & interest rate fluctuations from stock market returns on sectoral basis as well as no insight has been given from previous literature regarding moderating impact of FDI on key economic variables of economy, because of that practitioners in market are not quite familiar with moderating impact of FDI in the context of Pakistan investment market. Moreover, no previous research has been conducted in the context of Pakistan financial market with that variables or model specification.

### 1.4. Research Objectives/Significance

This study effort to explore empirically:

- How FDI moderates the relationship between macro-economic variables & equity return of different sectors of market.
- How macro-economic variables explained the behavior of different sectors of PSX.
- How relationship between macro-economic variables & stock market return could evolve due to moderating impact of foreign direct investment & foreign portfolio investment.

For developing testable hypothesis discussing the dimensions of price uncertainty of crude oil & how it'll effect on share price of different companies because when prices of crude oil fluctuated so due to that inflationary pressures also adjusted in the economy & in response of that currency & interest rate fluctuations occur. Whereas, country's economy is highly vulnerable on foreign sources & stock market is one of the fundamental determinant of economy & from last year stock market faces a number of challenges such as political instability, circular debt, high trade deficit, low growth in GDP & continuous decline in reserves. All that elements leads to high risk in a market & behavior of foreign investor changes, as portfolio theory by Sadorsky (2001) documented that higher risk leads to high risk premium which causes the change in investment decision. So, in a whole scenario exploring the moderating relationship across model is an extensive need of a literature & moreover, it hasn't been addressed previously.

*1.5. Hypothesis*

**Ha1:** There is a significant relationship between macro-economic variables & kse 100 index return.

**Ha2:** There is a significant relationship between macro-economic variables & kse 100 index sectoral basis return.

**Ha3:** Moderating impact of foreign direct investment in the relationship of macro-economic variables & kse 100 index return.

**Ha4:** Moderating impact of foreign portfolio investment in the relationship of macro-economic variables & kse 100 index return.

## 2. LITERATURE REVIEW

There are several macroeconomics factors that affect the returns on the stocks of different sectors of economy. Many researchers has worked on this phenomena by taking different sectors and variables. According to Mehr-Un-Nisa and Nishat (2011) explore the preceding behavior of stock prices, company size, previous earnings per share are the most imperative elements. However, macroeconomic factors like, GDP growth, rate of interest and financial debt has strong association with index fluctuations. Market to book value, share turnover ratio and inflation can also effect the index deviations. While prices of crude oil also impact significantly on stocks returns. As Sadorsky (2001) found that the increased prices of crude oil effect positively on the return of Canadian oil and gas companies but term premium and exchange rate effected negatively Whereas, when it comes to oil supply shocks on listed oil and gas companies stock returns it was examined by Ewing et al. (2018) that the declining supply of oil will effect on stock market differently (Gay, 2016) revealed that emerging market stocks doesn't show any significant response to respective exchange rate or oil price variations & show the week foam of market efficiency (Maghyereh, 2004) in emerging economies do not have strong association among stock returns & oil price shocks as well no fluctuations occur due to variation of stock market (Aloui et al., 2012) in case of emerging stock markets oil price risk is relatively high moreover, during rising oil markets relationship become more significant (Cong et al., 2008). Oil price shocks don't have a significant impact on Chinese equity market except in manufacturing/oil & gas sector however, fluctuations among oil prices leads to speculation across mining & pharma companies & raise their stocks. Sadorsky (2001) oil demand fluctuations effect significantly on oil producing countries (Oyerinde, 2019). Found, foreign portfolio investment has long term significant association with stock market return moreover also suggested that exchange rate & inflation are the key indicators for deciding the trend of stock market especially in developing countries. While in Asian crises (Omay and Iren, 2019) foreign investors investment is more sensitive as their herding behavior while crises & due to that stock market become more volatile when market is concentrated towards foreign portfolio (Tsagkanos et al., 2018). Explored foreign direct investment has week symmetric influence on stock market.

Phan et al. (2018) Concluded that price uncertainty of crude oil has an inverse effect on corporate investment however, economies that are oil producers effected more as compared to oil consuming economies (Rahman and

Mustafa, 2018). Moreover, significant change for gold prices but insignificant for Oil but in long run, relationship become change from negative to equilibrium point (Narayan and Narayan, 2010). Foreign portfolio investment held in the same period & second is change in number of participants in the stock market. Similarly, Sathyanarayana *et al.* (2017) also found the significant positive impact of crude oil price volatility on Indian stock market or even have a huge potential or competency to transmit shocks over it.

Faff and Brailsford (1999) Results reveal that positive oil price sensitivity in the Oil and Gas and Diversified Resources industries. While negative oil price sensitivity in the Paper and Packaging, and Transport industries. Waheed *et al.* (2018) found direct strong association between oil price changes & stock return (Filis *et al.*, 2011) found strong negative relationship between stock market prices and oil price in case of any non-economic crisis.

Tahmoorespour *et al.* (2018) showcased that price volatility of oil, mainly impact the oil & gas industry as well as chronological impact on mining industry but have an insignificant or least effected food & beverage industry. Arouri (2011) findings, highly significant linkage across Oil Prices & Stock market returns in majority of the sectors of European market but sensitivity of market against Oil prices dependent on the characteristics of the sectors (Ayub, 2018) findings indicate that the volatility is transmitted to the returns of exchange rate and different commodities & the volatility spillover is also observed from crude oil to exchange rate, equity market, sugar and palm oil.

Khan *et al.* (2018) found no causal link between exchange rate & stock prices (Rehman *et al.*, 2018) indicated that India, Bangladesh & Pakistan has not be the random walk process markets & foam inefficient hypothesis means all three markets are more predictable due to consistency in the returns While discussion of Javorci (2004) study revolved around a very famous ideology that foreign direct investments (FDI) are always beneficial for any growing economy and observed a consistent positive impact due to the presence of FDI. A one standard-deviation increase in the foreign presence in downstream sectors is results in a 15-percent rise in output of each domestic firm in supplying industries.

## 3. RESEARCH METHODOLOGY

### 3.1. Theoretical Framework

Oil price shocks on stock market also vary with respect to long-run & short run period. Oil price variations effect is dynamic on stock market (sector-wise), as food/beverage sector has a lesser effect than the financial & energy sector which is largely dependent on oil prices (Tahmoorespour *et al.*, 2018). Chen *et al.* (1987) proposed the multifactor asset pricing model which is used to predict the direction of macroeconomic variables in the economy & also helpful for developing innovative models through observing variations across macroeconomic variables (Sadorsky, 2001). Explained the relationship between macroeconomic variables & oil companies stock price fluctuations by using the multifactor market model i.e. various market risk factors directly affect the price level of shares on index. CAPM also predicts the market returns through measuring risk factor hence it depicts that, required return of market increases simultaneously as the risk gets higher (Gay, 2016). Documented that increased level of oil prices is one of the major risk factor because it leads to inflationary pressure on oil consuming economy instead of oil producing economies (Mudhaf and Goodwin, 1993). Examine the two- factor model & concluded that risk of oil price fluctuations with respect to NYSE returns are highly unpredictable. In the light of earlier mentioned literature the most confronted risk is the dynamics of macro-economic variables.

Stock market is the fundamental factor for economy growth & provides a channel for FPI of different economy sectors. Additionally, FPI indicates the high investor confidence of our economy which is a positive sign for economic development. The responsiveness of market return fluctuation due to macro-economic variables depend on the oil intensive or less oil intensive economies; (Waheed *et al.*, 2018) heterogeneous market changes, the relationship & reaction of market becomes changed (Rahman and Mustafa, 2018). Furthermore, as we know raw material of industrial product is directly related to the world oil prices (Ayub, 2018) enlightens that high oil prices

leads to high inflation in the economy, but it should be consider that oil prices fluctuations depends upon economy dynamics and varies from market to market. Whereas, another relevant risk dimension is exchange rate risk, which is crucially relevant in the context of Oil prices since the prices has been set internationally & the globally dominated currency is U.S. Dollars (Gomez and Zapatero, 2003).

Signaling theory, explains investment dynamics of two parties (personals or corporations) in the stock with respect to access and processing of different information by both parties. All market stakeholders requires information for making portfolio risk management, capital allocation & taking investment decisions, hence the information revealed in the market have a significant effect on their decision making process (Stiglitz, 2000). Highlighted that information asymmetries emerges when market participants don't have a same sort of information & asymmetry occur when one participant hold a private information & doesn't share to earn high level of profit. Signaling theory endorsed strong relationship with this study & illustrate that variations of oil prices, interest rate & exchange rate effects the stock market & also conveys a positive signs for the expectation of rise in inflation.

Efficient market hypothesis (EMH) also supports this study by concluding that asset prices set precisely in the market only when information flow is equally maintained between all market participants. In other words, material nonpublic information flow is entirely restricted. When market players forecast that there'll be a rise in oil prices in next few months so, on this anticipation they'll start adjusting their product price or cost and due to those adjustments there'll not be a massive impact on firm market value. Oppositely, in case of high uncertainty regarding oil prices globally it'd be challenging to adjust their cost accordingly.

### 3.2. The Model

To investigate that relationship, regression model has been used for estimating the results.

For prognosis, following basic econometric model is specified in Equation 1:

$$LSR_t = \alpha_1 + \beta_1 LOIL_t + \beta_2 LEX_t - \beta_3 LINT_t + \beta_3 LFDI_t + e_t \qquad (1)$$

**GARCH (1,1)**

Mean Equation 2:

$$GARCH = C_1 + C_2*(IV) + e \qquad (2)$$

Variance Equation 3:

$$GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1) \qquad (3)$$

Where, LSR = Log of Sector Return, LOIL = log of Oil, LEX = log of exchange rate, LINT = log of interest rate, LFDI = log of foreign direct investment, e = random error term & t = on specific time notation.

This study hypothesized positive relationship between oil prices & stock return of different sectors as other studies, Sadorsky (2001); Narayan and Narayan (2010); Faff and Brailsford (1999) documented that emerging markets stock markets were have a positive response against increases oil prices (Ma and Kao, 1990). And Mukherjee and Naka (1995) suggested that currency devaluation is favorable for export oriented economies but in Pakistan, export level is relatively low in comparison of import & on the other hand when dollar appreciates FPI losses their confidence & in result stock market effect significantly. The relationship between interest rate & stock market returns are hypothesized negatively because when required return of market increases, intrinsic value of stock reduces. Markowitz portfolio theory also suggested raise in risk − free rate of market leads to higher required return & due to that risk of the market increases. Moreover higher rates also provide the diversification opportunity for the investor.

### 3.3. Data

Monthly Data of 13 years from 2005 to 2018 have been taken. Data for variables have been taken from World Development Indicators, investing.com, SBP, IMF & PSX websites. The data of number of tourist arrivals have been taken from Pakistan yearly statistical book.

## 4. RESULTS & DISCUSSION

Non-stationarity is the fundamental problem in the time series data & for resolving that problem multiple tools have been used in the empirical part of the study. Both dickey fuller & break point unit root tests endorse the non-stationarity in the data series of all variables at log-level 1 & on 1$^{st}$ difference data series of variables become stationary. Long term relation between variables is checked through co-integration model & volatility of stock market with respect to macro-economic variables is tested by using (GARCH (1,1)) model.

### 4.1. Least Square Test (LSM)

Results shows that at level, data series are non-stationary. The results of LSM reveal that stock market is 90.03% dependent on model's variables & after adjusting into R-Square degree of influence of macro-economic variables reduces to 89.78% which is exhibited in Table 1. LSM results shows that overall model has a significant impact on stock market return as P-value is less than 0.05 but has a weak relation with oil prices as the p-value of oil prices is greater than 0.05, indicating that oil prices reduces model's significance. Moreover, as per equation estimation statistics, stock market has a positive relationship with FDI & ER but negative with oil prices & interest rates. If one unit changes in independent variable, so in result, dependent variable changes β times with respective directions.

**Table-1**. Least Square Method Statistics.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 5776.580 | 2710.825 | 2.130931 | 0.0347 |
| ERP | 485.2710 | 21.76666 | 22.29424 | 0.0000 |
| OPP | -20.40958 | 18.78535 | -1.086463 | 0.2789 |
| IRP | -3010.880 | 176.6644 | -17.04294 | 0.0000 |
| FDIP | 1.184040 | 0.300045 | 3.946215 | 0.0001 |
| R-squared | 0.900341 | F-Statistics | | 354.59169 |
| Adjusted R-squared | 0.897802 | Prob(F-Statistics) | | 0.0000000 |
| Durbin-Watson stat | 0.276283 | | | |

**Source:** World Development Indicators, Investing.com, State bank of Pakistan, International Monetary fund reports & PSX Website.
Note: Least Square Model Test on E-Views 9.
ERP stands for exchange rate price, OPP stand for oil prices, IRP stand for interest rate price and FDIP stand for foreign direct investment.
*Implies significance at 5% level.

In regression model, multi-collinearity problem is often faced due to high correlation among the variables. Because of this problem, results could be regressed & anomalies may be encountered in the data analysis. To check multi-collinearity problem variance inflation factor (VIF) model has been used & standard of VIF test is centered VIF values should be less than ten and this specifies existence of no association between model variables. See Table 2.

In time series data, correlation between data series observations also exist which is examined by employing serial correlation (LM) test & results reveal that auto-correlation problem exists in the model. In order to eliminate auto-correlation generalized LSM has applied. After application of this technique, outcome of serial correlation (LM) test Prob. value changed from significant to insignificant which means that association between variables has been removed & now the trend hasn't regressed the results. See Table 2.

**Table-2.** Variance Inflation Factor.

| Variable | Coefficient Variance | Un-centered VIF | Centered VIF |
|---|---|---|---|
| C | 7348571. | 68.97221 | NA |
| ERP | 473.7874 | 36.68348 | 1.188881 |
| OPP | 352.8894 | 19.80822 | 1.611540 |
| IRP | 31210.30 | 28.27969 | 1.751652 |
| FDIP | 0.090027 | 2.366022 | 1.044722 |
| **Breusch-Godfrey Serial Correlation LM Test:** | | | |
| F-statistic | 0.780566 | Prob. F(1,154) | 0.3783 |
| Obs*R-squared | 0.806888 | Prob. Chi-Square(1) | 0.3690 |

**Source:** World Development Indicators, Investing.com, State bank of Pakistan, International
Monetary fund reports & PSX Website.
VIF stand for Variance Inflation Factor.
*Variance Inflation Factor Test on E-Views 9.
*Implies significance at 5% level.

## 4.2. Unit Root test

Statistical data of variables have increasing trends & mostly time series data are non-stationarity. Graphs of data series is shows Figure 1.
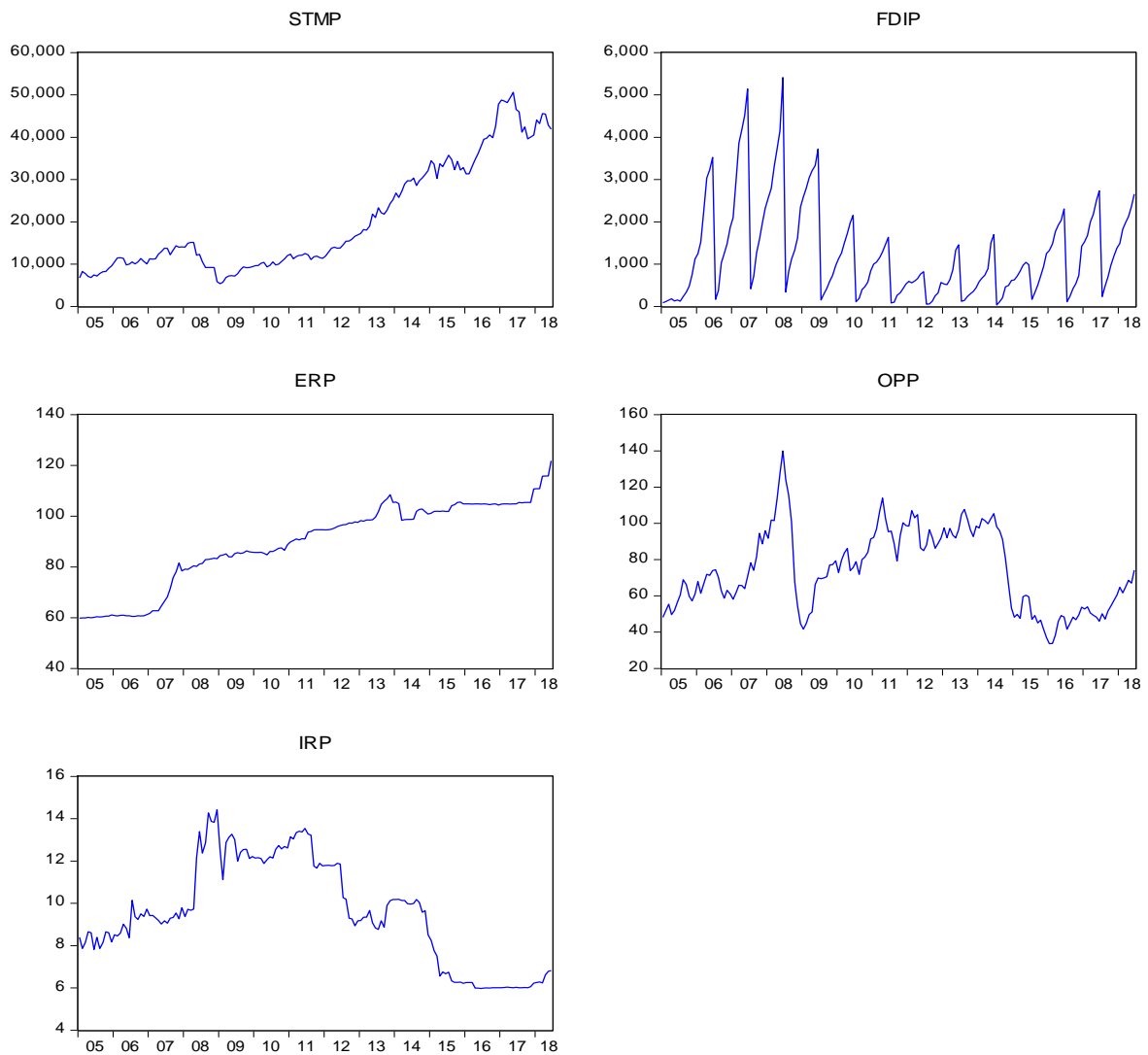


**Figure-1.** Nonstationary data Graphs.

**Source:** World Development Indicators, Investing.com, State bank of Pakistan, International Monetary fund reports & PSX Website.
*Graphical visualization through E-Views 9.

For resolving the non-stationary problem in corresponding data set, a unit root test namely Dickey-Fuller Test is employed, which first checks existence of unit root on level 1 and then on first difference. The results of Table 3 indicate that all data series are non-stationary at level but on 1st difference data series become stationary. See Table 4.

When data series has a unit root at level one, it indicates existence of spurious regression and observations of variables itself predict the trend. This lead to spurious LSM results. When we applied the least square test on stationary data, model's significance changed from significant to insignificant. The results are exhibited in Table 5.

When we eliminated the spurious regression from data series by unit root method, the dependence & co-efficient of variables also changed. The results show that macro-economic variables only predict 5.4% of stock market returns and 94.6% of the variation in stock market returns is explained by other factors & oil prices relation changed from negative to positive but still significant & co-efficient of exchange rate changed from positive to negative but relation between variables is insignificant.

**Table-3.** Level one Dickey-Fuller Unit Root Test.

| Variables | t-Statistic | Prob.* |
|---|---|---|
| Augmented Dickey-Fuller test statistic STMP | 0.009110 | 0.9573 |
| Augmented Dickey-Fuller test statistic ERP | -0.154785 | 0.9403 |
| Augmented Dickey-Fuller test statistic OPP | -2.707716 | 0.0749 |
| Augmented Dickey-Fuller test statistic IRP | -1.11456 | 0.7095 |
| Augmented Dickey-Fuller test statistic FDIP | -4.974185 | 0.0000 |

*MacKinnon (1996) one-sided p-values.

**Table-4.** 1st Difference Dickey-Fuller Unit root Test.

| Variables | t-Statistic | Prob.* |
|---|---|---|
| Augmented Dickey-Fuller test statistic (D)STMP | -12.67820 | 0.0000 |
| Augmented Dickey-Fuller test statistic (D)ERP | -10.4053 | 0.0000 |
| Augmented Dickey-Fuller test statistic D(OPP) | -9.480470 | 0.0000 |
| Augmented Dickey-Fuller test statistic D(IRP) | -13.3565 | 0.0000 |
| Augmented Dickey-Fuller test statistic D(FDIP) | -14.04185 | 0.0000 |

*MacKinnon (1996) one-sided p-values.

**Table-5.** Least Square Model.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 242.6474 | 105.6272 | 2.297206 | 0.0229 |
| D(ERP) | -87.99492 | 80.27134 | -1.096218 | 0.2747 |
| D(FDIP) | 0.002601 | 0.124525 | 0.020884 | 0.9834 |
| D(IRP) | -409.5354 | 203.3633 | -2.013812 | 0.0457 |
| D(OPP) | 34.70793 | 15.24392 | 2.276838 | 0.0242 |
| R-squared | 0.054027 | Mean dependent var | | 218.4069 |
| Adjusted R-squared | 0.029771 | S.D. dependent var | | 1301.046 |
| S.E. of regression | 1281.533 | Akaike info criterion | | 17.18006 |
| Sum squared resid | 2.56E+08 | Schwarz criterion | | 17.27576 |
| Log likelihood | -1377.995 | Hannan-Quinn criter. | | 17.21892 |
| F-statistic | 2.227379 | Durbin-Watson stat | | 1.981972 |
| Prob(F-statistic) | 0.068506 | | | |

**Source:** World Development Indicators, Investing.com, State bank of Pakistan, International Monetary fund reports & PSX Website.

The need of implementing unit root is to satisfy assumption of co-integration model. Co-integration test examines any possible long run relation among exchange rate, interest rate, oil prices & FDI from stock market returns.

### 4.3. Co-Integration Tests

Long-run relationship among the variables has been explored by employing johansen co-integration test. There is a possibility of long run association between stock returns & its anticipated determinants. Johansen co-

integration technique has been proposed by Johansen and this methodology allows to empirically estimate strong long-run association. Johansen co-integration test has been based on Vector autoregressive model (VAR).

Johansen Co-integration method is constructed on maximum likelihood methodology and comprises of time trend which takes into account the probable outcome of a trending stock market returns. In co-integration model two test are used i.e. trace test & max statistic test. Trace test inspects the null hypothesis that the number of co-integrated trajectories in structure r, is less than or equal to r0 where r0<p & p is the number of determinants is the model, although alternative claim is that the impact matrix is a full rank. K max test inspects the null hypothesis that there are r0 integrated vectors against the alternative of r0 + 1 integrated vectors.

Results in Table 6 indicate the existence of co-integration in the relationship of stock market return, oil prices, exchange rate, FDI & interest rate.

**Table-6.** Unrestricted Co-integration Rank Test (Trace).

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.221502 | 89.80219 | 88.80380 | 0.0423 |
| At most 1 | 0.109566 | 49.73990 | 63.87610 | 0.4254 |
| At most 2 | 0.097621 | 31.17252 | 42.91525 | 0.4342 |
| At most 3 | 0.072048 | 14.73724 | 25.87211 | 0.5964 |
| At most 4 | 0.017183 | 2.773166 | 12.51798 | 0.9023 |

Trace test indicates 1 integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon *et al.* (1999) p-values

**Unrestricted Cointegration Rank Test (Maximum Eigenvalue)**

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.221502 | 40.06229 | 38.33101 | 0.0313 |
| At most 1 | 0.109566 | 18.56738 | 32.11832 | 0.7610 |
| At most 2 | 0.097621 | 16.43528 | 25.82321 | 0.5062 |
| At most 3 | 0.072048 | 11.96408 | 19.38704 | 0.4185 |
| At most 4 | 0.017183 | 2.773166 | 12.51798 | 0.9023 |

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon *et al.* (1999) p-values

**Source:** World Development Indicators, Investing.com, State bank of Pakistan, International Monetary fund reports & PSX Website.

### 4.3.1. Residual Diagnostics tests

In order to investigate volatility in the model, GARCH (1,1) model has been employed & in first step the breakpoint unit root test has been applied for checking the stationarity level in data series because first assumption of using GARCH model is data should be stationary on 1st difference so, as showed in Table 7, all data series become stationary at 1st difference & as per results there is no unit root in the data series $p < 0.05$.

**Table-7.** Break Point Unit Root Test.

| Variables | t-statistics | Prob*. |
|---|---|---|
| Augmented Dickey Fuller Statistic (DSTMP) | –13.94 | < 0.01 |
| Augmented Dickey Fuller Statistic (DERP) | –11.00 | < 0.01 |
| Augmented Dickey Fuller Statistic (DFDIP) | –06.76 | < 0.01 |
| Augmented Dickey Fuller Statistic (DOPP) | –03.82 | < 0.01 |
| Augmented Dickey Fuller Statistic (DIRP) | –14.91 | < 0.01 |

**Source:** World Development Indicators, Investing.com, State bank of Pakistan, International Monetary fund reports & PSX Website.

The GARCH (1,1) is basically applied for capturing foremost features of time series data, such as stationarity by means of fat tails & volatility clustering. Furthermore, arch effect is completely opposite from the random walk concept. To analyze the model, all three GARCH (1,1) tests have been employed namely, correlogram q – statistics, correlogram squared residuals & heteroscedasticity. The correlogram q-statistics investigate the accuracy of

equation which has been regressed on constant to check whether to modify or not, so as per result showed in Table 8, stock return, interest rate & FDI equations do not need to be modified on AR (1) process but data series of exchange rate & oil prices need to be modified through AR (1) process & after modification it'll become insignificant.

To examine the presence of autocorrelation in the residuals Q − statistic test is employed. The above table shows the acceptance of the null hypothesis that states that there is no auto correlation in the time series data. The above correlogram of squared residuals test results direct that the residuals are not auto correlated as the p value is greater than 0.05 at all lags and now the series can be used for hypothesis testing and forecasting.

**Table-8.** Residual Diagnostics tests.

| Prob Values | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Correlogram Q-Statistics | | | | | Correlogram Squared Residuals | | | | |
| STMP | ERP | OPP | IRP | FDIP | STMP | ERP | OPP | IRP | FDIP |
| 0.719 | | | 0.285 | 0.115 | 0.515 | 0.666 | 0.861 | 0.066 | 0.362 |
| 0.93 | 0.268 | 0.267 | 0.468 | 0.042 | 0.807 | 0.732 | 0.473 | 0.094 | 0.657 |
| 0.974 | 0.004 | 0.538 | 0.2 | 0.052 | 0.934 | 0.364 | 0.599 | 0.177 | 0.629 |

**Source:** World Development Indicators, Investing.com, State bank of Pakistan, International Monetary fund reports & PSX Website.
*Implies test on E-views 9 at 5% significance level.

*Garch (1,1)*

For estimating volatility across stock market & its respective elements (GARCH(1,1)) heteroscedasticity test is applied to get insight about the impact of macro-economic variables on stock market returns. The (GARCH(1,1)) model has been applied for testing significant characteristics of time series data, such as stationarity by using fat tails and volatility clustering.

It is apparent from Table 9 mentioned below that macro-economic variables have a positive co-efficient from Karachi stock market except interest rate, that shows increasing trend in oil prices, exchange rate & FDI will cause high volatility in Karachi stock index but when interest rates increase, the behavior of index gets change & react negatively against interest rate fluctuations due to negative correlation. Furthermore, p-value of all variables are less than 0.05 that shows that last trading day value doesn't affect the next trading day. In addition to explain volatility, consider Resid(-1) value that is also shows significance level that means volatility is effected from previous day residuals. Conditional variance is also effected from previous observation. Moreover, Best model for all the data series is (GARCH 1,1) because in this condition resid & Garch both co-efficients are positive & sum of both coefficients is less than 1.

*4.3.2. ARCH Effect Test*

To inspect the existence of heteroscedasticity in the data series of the residuals, ARCH technique is applied & outcomes of test explain that there is no ARCH effect in the residuals. Out of five predictors three variables i.e. stock market, exchange rate & interest rate data series have an ARCH effect on level 1 but on 1st difference the effect has been removed through using AR(1) process but oil prices & interest rate data series don't have an ARCH effect on level 1. In the light of final results of heteroscedasticity test we can say that there is no ARCH effect in the residuals. In other words, there is no heteroscedasticity in the data series; thus, the residuals can be said to be homoscedastic.

**Table-9.** GARCH Results.

| STMP | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std. Error** | **z-Statistic** | **Prob.** |
| C | 1.426245 | 0.632079 | 2.256435 | 0.024 |
| Variance Equation | | | | |
| C | 2.932957 | 2.028045 | 1.446199 | 0.1481 |
| RESID(-1)^2 | 0.09001 | 0.037169 | 2.421676 | 0.0154 |
| GARCH(-1) | 0.85086 | 0.066028 | 12.88643 | 0 |
| **ERP** | | | | |
| C | 0.325047 | 0.099278 | 3.274099 | 0.0011 |
| AR(1) | 0.047224 | 0.117129 | 0.403184 | 0.6868 |
| Variance Equation | | | | |
| C | 0.182709 | 0.058713 | 3.111896 | 0.0019 |
| RESID(-1)^2 | 0.380393 | 0.145665 | 2.611426 | 0.009 |
| GARCH(-1) | 0.615416 | 0.103787 | 5.929576 | 0 |
| **FDIP** | | | | |
| C | 0.325047 | 0.099278 | 3.274099 | 0.0011 |
| AR(1) | 0.047224 | 0.117129 | 0.403184 | 0.6868 |
| Variance Equation | | | | |
| C | 0.182709 | 0.058713 | 3.111896 | 0.0019 |
| RESID(-1)^2 | 0.380393 | 0.145665 | 2.611426 | 0.009 |
| GARCH(-1) | 0.615416 | 0.103787 | 5.929576 | 0 |
| **IRP** | | | | |
| C | -0.04544 | 0.381094 | -0.11923 | 0.9051 |
| Variance Equation | | | | |
| C | 5.803235 | 2.835215 | 2.046841 | 0.0407 |
| RESID(-1)^2 | 0.147826 | 0.084069 | 1.758385 | 0.0787 |
| GARCH(-1) | 0.607372 | 0.171051 | 3.550819 | 0.0004 |
| **OPP** | | | | |
| C | 2.230411 | 1.218036 | 1.831154 | 0.0671 |
| AR(1) | -0.02001 | 0.182076 | -0.10987 | 0.9125 |
| Variance Equation | | | | |
| C | 25.08111 | 40.67005 | 0.616697 | 0.5374 |
| RESID(-1)^2 | 0.944249 | 0.464674 | 2.032066 | 0.0421 |
| GARCH(-1) | 0.061886 | 0.615844 | 0.10049 | 0.92 |

**Source:** World Development Indicators, Investing.com, State bank of Pakistan, International Monetary fund reports & PSX Website.
*Implies GARCH test on E-views 9 at 5% significance level.

To inspect existence of heteroscedasticity in the distribution of the residuals, an ARCH test was implemented. Outcomes of ARCH test are portrayed in Table 10 for all the five variables. The ARCH test results specify that there is no ARCH effect in the residuals. In other words, there is no heteroscedasticity in data series; thus, the residuals can be said to be homoscedastic.

**Table-10.** Results of Arch test.

| Variables | F-statistic | Obs*R-squared | Prob. F(1,158) | Prob. Chi-Square(1) |
|---|---|---|---|---|
| STMP | 0.41 | 0.41 | 0.52 | 0.52 |
| ERP | 0.18 | 0.18 | 0.67 | 0.67 |
| OPP | 0.03 | 0.03 | 0.86 | 0.86 |
| IRP | 3.34 | 3.31 | 0.07 | 0.07 |
| FDIP | 0.81 | 0.81 | 0.37 | 0.37 |

**Source:** World Development Indicators, Investing.com, State bank of Pakistan, International Monetary fund reports & PSX Website.
*Implies ARCH test on E-views 9 at 5% significance level.

### 4.4. Moderator Analysis

In order to analyze the moderating impact of FDI & FPI in the relation of macro-economic variables & stock market returns, we used the regression model through estimating co-efficient while making moderator through multiplying Mean equation where mean of data series become zero.

When FDI is introduced as a moderator in the model, then behavior of index returns against macro- economic variables changes which is exhibited in Table 11 dependency of macro-economic variables deviate significantly from 90% to 25% but significance of the model doesn't change means with moderating impact model fitness is accurate, as P-Values & co-efficient of determinants has not changed except oil prices & exchange rate relation from index return i.e. without moderating impact, oil prices had negative relation which changed into positive due to moderating impact of FPI & exchange rate had a positive relation which then became negative.

Moreover, moderator in the model is unable to change the relation across the variables but overall dependency of index return changed significantly. See Table 12 & 13.

**Table-11.** Model Summary.

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .236[a] | .056 | .032 | 1280.31321 |

**a. Predictors:** (Constant), MFDIP, OPP, IRP, ERP.

**Table-12.** ANOVA.

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 15119662.683 | 4 | 3779915.671 | 2.306 | .051[b] |
| | Residual | 255715497.316 | 156 | 1639201.906 | | |
| | Total | 270835159.998 | 160 | | | |

**Table-13.** Coefficients.

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 241.606 | 105.506 | | 2.290 | .023 |
| | ERP | -95.880 | 81.436 | -.093 | -1.177 | .241 |
| | OPP | 35.110 | 15.201 | .182 | 2.310 | .022 |
| | IRP | -396.569 | 203.362 | -.154 | -1.950 | .043 |
| | MFDIP | 148.713 | 272.542 | .043 | .546 | .586 |

**a.** Dependent Variable: STMP.

When FPI is introduced as a moderator in the model, the behavior of index returns against macro- economic variables changes which is shown in Table 14. Dependency of macro-economic variables deviated significantly from 90% to 26% but significance of the model did not change, meaning with moderating impact model fitness is accurate, as P-Values & co-efficient of determinants has not changed except oil prices & exchange rate relation from index return i.e. without moderating impact oil prices had a negative relation which changed into positive due to moderating impact of FPI & exchange rate had a positive relation which became negative.

Moreover, moderator in the model is unable to change the relation across the variables but overall dependency of index return changed significantly. See Table 15 & 16.

**Table-14.** Model Summary.

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .267[a] | .072 | .048 | 1269.62897 |

**a.** Predictors: (Constant), MFPIP, OPP, ERP, IRP.

**Table-15.** ANOVA.

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 19369756.657 | 4 | 4842439.164 | 3.004 | .020[b] |
| | Residual | 251465403.341 | 156 | 1611957.714 | | |
| | Total | 270835159.998 | 160 | | | |

a. Dependent Variable: STMP
b. Predictors: (Constant), MFPIP, OPP, ERP, IRP.

**Table-16.** Coefficients

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 259.899 | 105.086 | | 2.473 | .014 |
| | ERP | -86.525 | 79.496 | -.084 | -1.088 | .278 |
| | OPP | 34.504 | 15.059 | .179 | 2.291 | .023 |
| | IRP | -406.185 | 200.384 | -.158 | -2.027 | .044 |
| | MFPIP | 479.443 | 279.647 | .132 | 1.714 | .088 |

**a.** Dependent Variable: STMP.

### 4.5. Panel Co-Integration Model

Panel estimation results shows in Table 17, full sample include Cement, Chemical Commercial banks, Engineering, power generation & distribution, fertilizer, food & personal care products, oil & gas marketing companies, oil &gas exploration companies, Pharmaceuticals & refinery. Panel co-integration method has been used for estimating long run relationship across macro-economic variables & stock returns of different sectors. All data series are non-stationary at level 1 but become stationary on 1st difference which fulfill the basic requirement of panel data estimation. Three tests include pedroni, individual intercept & individual trend & no-intercept & no trend test have been applied. The results show that no-integration exists in the model means no long term relation prevails between macro-economic variables & stock returns of different sectors.

**Table-17.** Kao Residual Co-Integration Test.

| Measures | t-Statistic | Prob. |
|---|---|---|
| ADF | -0.332093 | 0.3699 |
| Residual variance | 3017.789 | |
| HAC variance | 1348.757 | |

**Source:** Panel data analysis on E-views 9

Fixed & random effect model results show that exchange rate & oil prices have positive significant relation with sector wise stock returns but interest rate has negative impact on returns of sectors & dependency of returns is 17% & model is fit for analysis. See Table 18

**Table-18.** Co-efficient.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 168.9680 | 63.57295 | 2.657859 | 0.0079 |
| ERP | 2.210392 | 0.239310 | 9.236509 | 0.0000 |
| IRP | -21.94747 | 1.980705 | -11.08063 | 0.0000 |
| OPP | 0.416492 | 0.210614 | 1.977511 | 0.0481 |
| R-squared | 0.167462 | Mean dependent var | | 12.17287 |
| Adjusted R-squared | 0.166057 | S.D. dependent var | | 169.1819 |
| S.E. of regression | 154.4977 | Sum squared resid | | 42440065 |
| F-statistic | 119.2126 | Durbin-Watson stat | | 0.132472 |
| Prob(F-statistic) | 0.000000 | | | |

**Source:** Panel data analysis on E-views 9

## 5. DISCUSSIONS

The findings reveal that oil prices, exchange rate, interest rate & foreign direct investment are co-integrated with stock market return means long term relation has been exist across variables. As this result also validate the results (Narayan and Narayan, 2010) also found the strong long term association between the variables moreover, in order to validate the findings. LSM has been used for predicting the dependence level of index return on macro-economic factors. Before removing spurious regression from model, dependence level of market return on its determinants were highly significant but when we eliminate spurious regression through using Log technique dependence level become change significantly. Exchange rate has statistically negative & insignificant relationship from index return which is also consistent from previous research findings because exchange rate fluctuation leads to high risk in the market & stock markets are conditionally risk sensitive (Abdalla and Murinde, 1997) also found the same results except in Philippines, due to change in investing behavior. FDI has very week relation with stock

return which should be investigate further. In case of oil prices positive & significant relation has been exist which is impulsive with theoretical prospects (Phan *et al.*, 2018). Documented, increase in oil price reduces market return & thus increase business cost, it effect negatively on stock prices but in Pakistan this relation behave differently due to low growth in industrial sector which leads to high goods demand. This is because when oil prices increases so overall economy price level increases which affect corporate profitability positively. Interest rate have negative relation with stock market & because risk free rate always provide a perfect hedge for stock market, it always been a negative correlation with index return but FDI has very week relation with stock return.

Panel regression model results explained that exchange rate & oil prices has positive significant impact on sector wise price change but interest rate has negative significant association which also similar to the findings of LSM test. Moreover, FDI & portfolio investment significantly moderates the relation of macro-economic variables & index price variations. These results fulfill the extensive niche in the literature & via these findings investors & practitioners are now more equipped & able to take more concrete investing decisions while market confronted many internal or external challenges including vulnerability on foreign investment furthermore, also provide help to reveal insights in terms of investing behavior & also highlight the reasons of stock market volatility.

### 5.1. Conclusion

The goal is to first investigate the association between macro-economic variables & stock market return volatility & then examine how moderators moderates the behavior of stock market with respect to its determinants. The sectoral basis analysis also run, to examine the association between macro-economic variables & share price variations of 11 different PSX 100 index sectors. From last few years, declining trend had observed in PSX index 100 that is almost 26% to 30%. The contemporary variations of stock market has been captured by many economist, practitioners or analysts & urge to get it know what's reasons of this drastic fluctuations which cost almost millions of dollar to the economy. After reviewing literature, got to know interest rate, exchange rate & specially oil prices are the main determinants of stock market but in case of Pakistan common perception & many analysts also believed that market is more dependent on sentiments & political influence instead of its determinants. So here's the gap has been arises, moreover, also from last few years ratio of foreign investment increases significantly in different sectors of Pakistan economy due to CPEC & literature didn't explained, how this phenomenon will transpose the relation across macro-economic variables & stock market. For investigating the dependence of PSX return fluctuations on macro-economic variables LSM has been used, co-integration model explained the long-term relation between variables & volatility in the data series were captured through (GARCH(1,1)) model. For estimating all the models, monthly time series & panel data were gathered for the period of 2005 to 2018.

Many factors still need to be addressed which can't be explore in this study due to lack of technology or unavailability of data as Pakistan is a developing country & availability of historical data is one of the major concern. For further research, sectoral analysis could be conducted on other remaining sectors & also causality between the model variables needs to be analyze.

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