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# The Impact of International Oil Price Shocks on Pakistan Stock Market

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**ABSTRACT**

The aim of the study is to investigate the dynamic relationship between oil price and four highly capitalized sector of Pakistan stock market. Namely Oil and Gas Marketing Companies, Oil and Gas Exploration Companies, Commercial Banks, and Textile Companies, including Pakistan Stock Index. We retrieve daily data on stock prices from Pakistan stock Market and the oil price from Energy Information Administration covering the period 1ˢᵗ, January 2005 to 31ˢᵗ, December 2014. To end this, we apply the Vector Auto Regressive (VAR) Model to find out the relationship between oil price and stock price. In order to provide more effective and credible conclusions the Granger Causality and Impulse Response Functions are implemented. Within the VAR Model the results indicates that there are both Short run and long run relationship between the oil price and Pakistan Stock Market sectors. The Granger Causality test determines a unidirectional, Granger Causality relationship running from oil price to stock prices. In contrast, the Impulse Response Function suggests that oil price have both positive and negative responses to the stock prices. Thus, our main finding from overall results we conclude there is strong impact of oil price shocks on Pakistan Stock Market. This study provide the evidence for a complete understanding on the relationship between oil price and Pakistan Stock Market. This study likely to offer some valuable insights for policymakers and financial regulators for developing financial and economic policies.

**Keywords:**    International Oil Price, Pakistan Stock Market, Stock Price

**Introduction**

Throughout the modern history, the Global oil price has played a predominant part in shaping the developments of political and industrialized economies. In Particular, the role of the oil price is seen as an indispensable factor of financial development and global stability and has been extensively, documented.  For the first time Hamilton's dominant study, demonstrates that, since the World War II, every single recession in the U.S have preceded by the extreme upsurge in the cost of oil price except one  Hamilton (1983). For many decade the effects of oil price fluctuations on financial markets has become a matter of keen interest. Due to its vital role in the financial markets and economy, fluctuations in oil prices receive a distinct response in daily media. A slight change in the price of oil approximately, effects all the significant economic and financial variables. Fluctuations in the oil price are frequently considered a substantial features for understanding the conventional variations in stock prices. Oil prices effects stock prices or returns through their effect on expected earnings Tarak Nath Sahu and Kalpataru Bandopadhyay (2014).

As the world realizes the significance of oil, and stock markets continue to grow and develop around the world. Scholars and researcher are showing substantial interests in the relationship between the two variables. Despite the fact, an abundance of empirical and

theoretical works have been investigated by several researchers and scholars on the relationship between the oil price and stock prices. Though most of the earlier studies are exclusively concentrated on industrialized countries. Following the globalization of global capital markets recently there has been a rising academic interest in investigating the relationship between international oil price and stock prices of developing and emerging countries. Over the last decades, one of recent studies have been examined in China and India to determine the relationships between both the variables. However, no study has been conducted in the context of Pakistan to examine the impart of oil price shocks on stock prices.

Pakistan stock Market has seen a considerable growth over the few years. Thus it would be insightful to distinguish what type of relationship exist between Pakistan Stock Market and the global oil price. In this dissertation, we investigate the relationship of oil price shocks on stock prices of Pakistan Stock Market. Therefore we have selected four sectors stock prices on our sample which consist of primary sectors of Pakistan Stock Market in terms of their market capitalization. Commercial Banks has the market capitalization of 1327 Billion Rupees, Oil and Gas Exploration Companies has the market capitalization of 1086 Billion Rupees, Oil and Gas Marketing Companies has the market capitalization of 244 Billion Rupees, and Textile Companies has the market capitalization of 154 Billion Rupees, also included the Pakistan stock Index.

## Literature Review

From a theoretical perspective, the oil price variations can affect the financial market through various channels, the oil price can affect the economic activity, inflation, monetary policy, corporate earnings, and also asset prices. Oil can be considered the direct source of the contribution in the production of many goods. It is suggested that the oil price have an impact on future cash flows, when the oil price is high then there will be higher energy prices and in this case it will have direct and indirect effects on the cost of all business and the industries. Ultimately, when the energy price changes so the energy cost, and the opposite changes occurs in the stock prices. Now if we consider the effect on the specific stock, the outcome of that specific stock depends on whether the company is a net producer or net consumer of oil, if a company is a net producer oil price increases result is for higher earnings, and opposite if the company is net consumer result for decreased earnings. However for the world economic system as a whole, oil price is input to the world economic system as the price increases so the aggregate stock return would depress Huang et al. (1996). Previous studies have revealed on the effect of oil price shocks on stock markets of various countries, but no consensus has been made on the matter. Jones and Kaul (1996) investigated the relationship between oil price shocks and stock markets, focusing on the developed countries particularly the U.S, U.K, Canada and Japan quarterly data have been used for the period of 1947-1991. The Producer Price Index was used for Fuels as a measure for oil price in order to examine the oil price shocks' impact on the stock markets, can be explained by the future or current cash flows or fluctuations in the expected returns. Their outcomes determine a negative oil price effect on aggregate stock returns. However the effect, was not that strong for the Japan and U.K. Adding more to the list of papers Killian and Park (2009) examine a negative oil price effect the U.S stock market who uses a structural VAR model covering the period 1973-2006 using monthly data. One of their key outcomes states that in the long run, on average, 22% of fluctuations in aggregate stock returns can be explained by the oil price shocks, they also make distinction between supply and demand shocks. Papapetrou (2001) applied the multivariate VAR approach on the industrialized countries to examine the correlation between oil price and stock prices, real economic activity, interest rates, and employment for Greece. She used monthly, data for the period 1989 to 1999, and demonstrates that stock price is effected by the negative effect of oil price shocks.

Extending the research in the developed countries Park and Ratti (2008) applied multivariate VAR model using monthly, data for the period of 1986 to 2003 they found oil price shocks have a negative significant effect on the stock returns for 13 European countries and U.S. Apergis and Miller (2009) using VAR methodology with monthly data from 1981-2007 they found a small effect of oil price shocks on the global stock markets for sample countries like  Japan, the U.S, the U.K, France, Canada, Italy, Austria,  and Germany. Similar research have been conducted by the Nandha and Faff (2008) who investigated on industry level for 35 global industry indices for the period of 1983 to 2005, the increase in  oil price have negative effect on the equity returns for the entire sectors, excluding for oil and gas and mining companies. Many papers are now focusing on emerging economies and their importance regarding both consumption and production.  Basher et al. (2012) uses six variable structural VAR model with monthly data from 1988-2008 investigating the relationship between oil prices, exchange rate, and emerging stock prices, and found that positive oil price shocks depress the stock prices.  Considering current literature we have proposed three Hypotheses which are as follows.

## Hypotheses

**H1:** There exist a significant short-run relationship between the stock prices of Pakistan Stock Market and international oil price.

**H2:** There exist a significant long-run relationship between the stock prices of Pakistan Stock Market and international oil price.

**H3:** Oil prices Granger Causes the stock price of Pakistan Stock Market.

## Material and Methods

In this study, we will investigate the impact of oil price shocks on the four different sectors of Pakistan Stock Market including the Stock Index. Namely, Oil and Gas Exploration Companies, Oil and Gas Marketing Companies, Commercial Banks, Textile companies and Pakistan Stock index. Furthermore, the main objective of our study is to find out the relationship between oil price and stock prices, and as well the oil price shocks to the stock market. Therefore, to obtain this we propose the Vector Autoregressive Model (VAR Model) the VAR Model is implemented to forecast the time series data set, and also to find out the effect of dynamic shocks between the variables. Daily observation from the period of 1st January 2005 to 31st December 2014 is obtained. Data for stock price of different sectors were obtained from Pakistan Stock Market representative, including the Pakistan Stock Index data, and the data for the oil price were obtained from U.S Energy Information Administration (EIA).

Table 1 contains the summary statistics for the four sectors of Pakistan Stock Market including the stock Index and also the oil price. From the table 3.1 which indicates the mean is positive and highest for stock price of Oil & Gas Exploration Companies. The highest standard deviation is also for stock price of Oil & Gas Exploration Companies, which displays the highest volatility, while lowest is experienced for stock price of Commercial Banks, there are normal distribution for all three sectors, and oil price except Stock Index, which is highly Skewed, the distribution for stock price of Oil & Gas Exploration Companies, and Stock Index is Leptokurtic while the distribution for stock price of Commercial Banks, Textile companies, Oil & Gas Marketing Companies and oil price is Platykurtic.

## Results and Discussion

## Stationary Test

There are six variables used in the test, oil price, Stock Index, and the four sectors, Commercial Banks, Oil and Gas Exploration Companies, Oil and Gas Marketing Companies,

and Textile companies the results are reported in table 2. The outcomes of test at level for constant indicates the null hypothesis is non-stationary is not rejected for all the variables, Commercial Banks, Oil and Gas Exploration Companies, Oil and Gas Marketing Companies, Textile companies, oil price, and Stock Index at 5% of significance. However, in response to above the outcomes for trend and constant for the variable Commercial Banks, Oil and Gas Exploration Companies, Oil and Gas Marketing Companies, Textile companies, oil price, and Stock Index has also unit root at 5% level of significance. However, the outcomes for first difference for all variables Commercial Banks, Oil and Gas Exploration Companies, Oil and Gas Marketing Companies, Textile companies, oil price, and Stock Index, the null hypothesis on non-stationary is rejected at 5% level of significance, for both constant and trend.

**Table 1**
**Summary Statistic for stock prices and Oil Price**

| Variable | Mean | Maximum | Minimum | Std. Dev | Skewness | Kurtosis | No. of Obs |
|---|---|---|---|---|---|---|---|
| Stock Price CB | 55.148 | 145.290 | 33.870 | 19.918 | 0.0765 | 2.697 | 2347 |
| Stock Price Textile | 38.076 | 100.625 | 11.165 | 18.672 | 0.6766 | 2.736 | 2341 |
| Stock Price OGMC | 219.214 | 343.260 | 77.520 | 50.271 | 0.3303 | 2.557 | 2335 |
| Stock Price OGEC | 222.019 | 420.4325 | 84.312 | 58.189 | 0.694 | 3.416 | 2338 |
| Oil Price | 82.1096 | 145.290 | 33.870 | 19.893 | 0.0734 | 2.695 | 2338 |
| Stock Index | 13703 | 32148 | 4815 | 6392 | 1.373 | 3.972 | 2386 |

Note: Daily Stock Price: Commercial Banks, Textile Companies, Oil and Gas Marketing Companies, Oil and Gas Exploration Companies, and oil price and stock index is from the period 1/1/2005- 31/12/2014 Source: Pakistan Stock Market, Energy Information Administration

**Table 2**
**Augmented Dickey Fuller Unit Root Test**

| | Level | | 1st Difference | |
|---|---|---|---|---|
| Sector | Constant | Constant & Trend | Constant | Constant & Trend |
| Stock Price CB | t-stat-1.645(4) P (0.4588) | t-stat-1.935(4) P(0.6351) | t-Stat -27.781(3) Prob (0.0000) | t-stat -27.774(3) Prob*. (0.0000) |
| Stock Price OGEC | t-stat -2.350(3) Prob.*0.1562 | t-stat -2.544 Prob.* 0.3062 | t-stat -24.794 Prob.* 0.000 | t-stat -24.789 Prob.* 0.000 |
| Stock Price OGMC | t-stat -2.789(20) Prob.* 0.0599 | t-stat -2.868(20) Prob.* 0.1731 | t-stat -9.530(19) Prob.* 0.0000 | t-stat -9.536(19) Prob.* 0.000 |
| Stock Price Textile Co | t-stat 2.073(2) Prob.* 0.2556 | t-stat-1.734(2) Prob.* 07356 | t-stat -42.641 Prob.* 0.0000 | t-stat -42.658(1) Prob.* 0.000 |
| Oil Price | t-stat 2.701(0) Prob.* 0.0738 | t-stat -2.701(0) Prob.* 0.0738 | t-stat -46.203(0) Prob.* 0.0001 | t-stat -46.233(0) Prob.*0.0000 |
| Stock Index | t-stat 1.587 Prob.* 0.9995 | t-stat 0.146 0.9977 | t-stat -41.379 Prob.* 0.0000 | t-stat -41.454 Prob.* 0.0000 |

Note: Unit Root test for four sector of Pakistan stock Market Commercial Banks, Oil & Gas Exploration Company, Oil & Gas Marketing Company, Textile companies, including Stock Index and oil price. Test Critical Values for level are (1% =-3.432, 5% =-2.862,10%=-2.567) and for 1st difference are (1%=-3.961, 5%=-3.411,10%=-3.127)

**Co-integration Test**

The test for co-integration is reported in table 3 there are five models in which four sectors of Pakistan Stock Market and Stock Index are taken as dependent variables and the oil price is taken as independent variable. The first model which is Commercial Banks and oil price is not co-integrated with lag length of 7, the sector for Oil and Gas Exploration Companies is also not co-integrated with lag length of 8, while the Oil and Gas Marketing Companies and Textile companies is co-integrated with oil price and the final Model the Stock Index is also not co-integrated with the oil price.

**Table 3**
**Johansen Co-integration Test**

| Model | Lag | Co-integration Test |
|---|---|---|
| Commercial Banks & Oil Price | 7 | No |
| Oil & Gas Exploration Companies & Oil Price | 8 | No |
| Oil & Gas Marketing Companies & Oil Price | 8 | Yes |
| Textile companies & Oil Price | 8 | Yes |
| Stock Index & Oil Price | 6 | No |

Note: The selected lag is based on the minimum Akaike Information Selection Criterion

**VAR Estimates for Stock Price of Commercial Banks**

**Table 4**
**Vector Auto Regression Estimates for Commercial Banks**

| | Stock Price CB Dependent | | | Oil Price Dependent | | |
|---|---|---|---|---|---|---|
| | Coefficient | t-Statistic | Prob. | Coefficient | t-Statistic | Prob. |
| Stock Price (-1) | 0.7741 | 37.14392 | 0.0000* | 0.013088 | 0.880455 | 0.3787 |
| Stock Price (-2) | 0.1928 | 7.32913 | 0.0000* | -0.017302 | -0.92175 | 0.3568 |
| Stock Price (-3) | 0.0682 | 2.566882 | 0.0103* | 0.014672 | 0.773371 | 0.4394 |
| Stock Price (-4) | -0.0411 | -1.54708 | 0.122 | -0.030595 | -1.61375 | 0.1067 |
| Stock Price (-5) | 0.1015 | 3.82311 | 0.0001* | -0.013097 | -0.69103 | 0.4896 |
| Stock Price (-6) | -0.1151 | -4.36912 | 0.0000* | 0.007461 | 0.396896 | 0.6915 |
| Stock Price (-7) | 0.0170 | 0.824105 | 0.41 | 0.025282 | 1.711694 | 0.0871 |
| Oil Price (-1) | 0.0567 | 1.940134 | 0.0525 | 1.018298 | 48.82092 | 0.0000* |
| Oil Price (-2) | 0.0359 | 0.860738 | 0.3895 | -0.017903 | -0.60087 | 0.548 |
| Oil Price (-3) | 0.0405 | 0.972664 | 0.3308 | 0.066215 | 2.228806 | 0.0259 |
| Oil Price (-4) | -0.1106 | -2.65633 | 0.008* | -0.026666 | -0.89735 | 0.3696 |
| Oil Price (-5) | 0.0318 | 0.765626 | 0.444 | -0.123292 | -4.14981 | 0.0000* |
| Oil Price (-6) | 0.0159 | 0.382314 | 0.7023 | 0.081816 | 2.743492 | 0.0061* |
| Oil Price (-7) | -0.0725 | -2.46067 | 0.0139* | -0.004783 | -0.22745 | 0.8201 |
| R-squared | | 0.9947 | | Akaike info criterion | | -3.7688 |
| F-statistic | | 31289.65 | | Durbin-Watson stat | | 2.002073 |

Note: VAR system has been estimated with 7 lags according to Akaike Information Selection Criterion for the period of 1/01/2005 to 31/12/2014

Table 4 presents the estimation results of the VAR model for Commercial Banks Sector of Pakistan Stock Market and oil price. The results indicates that there is a significant relationship between oil price and the Commercial Banks Sector of Pakistan Stock Market on a daily basis. First Stock Price can be predicted by its on previous lag such as the (-1),(-2),(-3),(-5) and (-6) which indicate significant results. Second the Commercial Banks Sector stock Price can be predicted by the oil price as there is a negative significant relationship in (-4) and (-7). Finally, we can conclude that there is a negative relationship between oil price and stock price Commercial Banks Sector.

**VAR Estimates for Stock Price of Oil and Gas Exploration Companies**

Table 5 reports the results from the VAR model, for Oil and Gas Exploration Companies Sector of Pakistan Stock Market and oil price. The main results from the table 4.4 suggest that there is only one significant relationship between oil price and Stock Price of Oil and Gas Exploration Companies in (-1) of both stock price and oil price. When the oil price is considered as the dependent, we noticed a significant relationship (-3) and (-8) of stock price and (-1), (-5), (-6) of oil price. Based on these findings we can suggest that the Oil and Gas Exploration Companies stock Price are not predicted by the oil price except one lag which is significant, and the rest of lags represent insignificant relationship.

**Table 5**
**Vector Auto Regression Estimate for Oil and Gas Exploration Companies**

| | Stock Price OGEC Dependent | | | Oil Price Dependent | | |
|---|---|---|---|---|---|---|
| | Coefficient | t-Statistic | Prob. | Coefficient | t-Statistic | Prob. |
| Stock Price (-1) | 0.985095 | 46.97957 | 0.0000* | -0.039876 | -1.53768 | 0.1243 |
| Stock Price (-2) | 0.056362 | 1.912249 | 0.056 | -0.093249 | -2.55794 | 0.0106 |
| Stock Price (-3) | 0.056362 | 0.501566 | 0.616 | 0.235691 | 6.450309 | 0.0000* |
| Stock Price (-4) | 0.056362 | -1.85146 | 0.0642 | -0.082136 | -2.2308 | 0.0258 |
| Stock Price (-5) | 0.056362 | -0.35153 | 0.7252 | -0.000282 | -0.00765 | 0.9939 |
| Stock Price (-6) | 0.056362 | 1.189494 | 0.2344 | -0.025953 | -0.70505 | 0.4809 |
| Stock Price (-7) | 0.056362 | -1.43253 | 0.1521 | 0.076589 | 2.081033 | 0.0375 |
| Stock Price (-8) | 0.056362 | 0.615574 | 0.5382 | -0.06991 | -2.69875 | 0.007* |
| Oil Price (-1) | 0.056362 | 4.586729 | 0.0000* | 1.025978 | 49.0251 | 0.0000* |
| Oil Price (-2) | 0.056362 | -1.43353 | 0.1518 | -0.006385 | -0.21357 | 0.8309 |
| Oil Price (-3) | 0.056362 | -1.03981 | 0.2985 | 0.0495 | 1.65794 | 0.0975 |
| Oil Price (-4) | 0.056362 | -0.02377 | 0.981 | -0.034424 | -1.15656 | 0.2476 |
| Oil Price (-5) | 0.056362 | 1.453006 | 0.1464 | -0.115261 | -3.87752 | 0.0001* |
| Oil Price (-6) | 0.056362 | -0.63968 | 0.5224 | 0.080278 | 2.713863 | 0.0067* |
| Oil Price (-7) | 0.056362 | -0.86735 | 0.3858 | 0.014012 | 0.47332 | 0.636 |
| Oil Price (-8) | 0.056362 | -0.96705 | 0.3336 | -0.020422 | -0.97466 | 0.3298 |
| R-squared | | | 0.993615 | Akaike info criterion | | -4.88445 |
| F-statistic | | | 22379.91 | Durbin-Watson stat | | 2.000104 |

Note: VAR system has been estimated with 8 lags according to Akaike Information Selection Criterion for the period of 1/01/2005 to 31/12/2014

## VEC Estimates for Stock Price of Oil and Gas Marketing Companies

Table 6 presents the results of Vector Error Correction Estimates for Oil and Gas Marketing Companies and oil price, the results indicates that there is strong significant relationship between stock price of Oil Gas Marketing Companies and oil price. The (-1) of stock price is negative and significant which indicates that there is a long run relationship between stock price of Oil and Gas Marketing Companies and oil price. The other lags (-2), (-3) and (-6) also appears to be significant while the lags of oil price are mostly considered to be significant except (-7) which is not significant. The significant result of OGMC and oil price is the sign of strong long run relationship between the variables. There is bidirectional relationship, the oil price is also affected by Stock Price.

**Table 6**
**Vector Error Correction Estimates for Oil and Gas Marketing Companies**

| | Stock Price OGMC Dependent | | | Oil Price Dependent | | |
|---|---|---|---|---|---|---|
| | Coefficien | t-Statistic | Prob. | Coefficien | t-Statistic | Prob. |
| Stock Price (-1) | -0.00564 | -3.394554 | 0.0007* | -0.003366 | -2.300416 | 0.021* |
| Stock Price (-2) | -0.20096 | -9.254588 | 0.00000* | -0.090847 | -4.749897 | 0.000* |
| Stock Price (-3) | -0.107807 | -4.876756 | 0.00000* | -0.0038 | -0.195144 | 0.8453 |
| Stock Price (-4) | -0.043104 | -1.950897 | 0.0512 | 0.054866 | 2.819368 | 0.0049* |
| Stock Price (-5) | 0.016458 | 0.747207 | 0.455 | -0.027455 | -1.415138 | 0.1572 |
| Stock Price (-6) | -0.056783 | -2.593247 | 0.0096 | -0.06762 | -3.506132 | 0.0005* |
| Stock Price (-7) | -0.010581 | -0.482801 | 0.6293 | 0.104329 | 5.404542 | 0.0000* |
| Stock Price (-8) | -0.022048 | -1.008397 | 0.3134 | 0.055473 | 2.880554 | 0.004* |
| Stock Price (-9) | -0.025267 | -1.183704 | 0.2367 | -0.035488 | -1.887576 | 0.0592 |
| Oil Price (-1) | 0.226644 | 9.15785 | 0.00000* | 0.060866 | 2.792228 | 0.0053* |
| Oil Price (-2) | 0.105921 | 4.220986 | 0.00000* | 0.056414 | 2.552384 | 0.0108* |
| Oil Price (-3) | -0.048867 | -1.954572 | 0.0508 | 0.040805 | 1.853029 | 0.064 |
| Oil Price (-4) | 0.123901 | 4.970603 | 0.0000* | 0.017776 | 0.809621 | 0.4182 |
| Oil Price (-5) | 0.137124 | 5.478441 | 0.0000* | -0.022142 | -1.004345 | 0.3153 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Oil Price (-6) | -0.110988 | -4.413498 | 0.0000* | 0.01116 | 0.503846 | 0.6144 |
| Oil Price (-7) | 0.021173 | 0.839582 | 0.4012 | -0.044997 | -2.025785 | 0.0429* |
| Oil Price (-8) | 0.092979 | 3.683164 | 0.0002* | -0.006261 | -0.281595 | 0.7783 |
| Oil Price (-9) | -3.09E-05 | -0.051338 | 0.9591 | 3.48E-05 | 0.065538 | 0.9478 |
| R-squared | | | 0.13104 | Akaike info criterion | | -4.23093 |
| F-statistic | | | 20.4737 | Durbin-Watson stat | | 2.006657 |

Note: VAR system has been estimated with 9 lags according to Akaike Information Selection Criterion for the period of 1/01/2005 to 31/12/2014

**VEC Estimates for Stock Price of Textile Companies**

Table 7 reports the findings from the Vector Error Correction Model using stock price of Textile Companies of Pakistan Stock Market and the oil price. The main finding from the table indicates that there is significant relationship between Textile companies and oil price, as the first lag of stock price is significant and negative it suggests that there is long run relationship between both the variables. There are four lags which are significant with the previous lags of stock price. However, there are only two lags significant in oil price (-2) and (-6). In addition when the oil price is considered as the dependent variable we do not observe a strong significance level there are only two significance lag (-1) and (-2).

**Table 7**
**Vector Error Correction Estimates for Textile Companies**

| | Stock Price Textile Com Dependent | | | Oil Price Dependent | | |
|---|---|---|---|---|---|---|
| | Coefficient | t-Statistic | Prob. | Coefficient | t-Statistic | Prob. |
| Stock Price (-1) | -0.002666 | -2.283038 | 0.0225* | -0.001615 | -3.103167 | 0.0019* |
| Stock Price (-2) | -0.387631 | -18.52301 | 0.0000* | -0.028077 | -3.013852 | 0.0026* |
| Stock Price (-3) | -0.124193 | -5.520723 | 0.0000* | -0.010621 | -1.065985 | 0.2865 |
| Stock Price (-4) | -0.04046 | -1.792756 | 0.0731 | -0.000922 | -0.091683 | 0.927 |
| Stock Price (-5) | -0.048722 | -2.162104 | 0.0307* | 0.004734 | 0.471328 | 0.6375 |
| Stock Price (-6) | 0.001451 | 0.064452 | 0.9486 | 0.00286 | 0.285141 | 0.7756 |
| Stock Price (-7) | 0.009481 | 0.423947 | 0.6716 | -0.003473 | -0.348717 | 0.7273 |
| Stock Price (-8) | -0.094902 | -4.278408 | 0.0000* | -0.016477 | -1.667505 | 0.0956 |
| Stock Price (-9) | -0.004876 | -0.234283 | 0.8148 | -0.007517 | -0.810371 | 0.4178 |
| Oil Price (-1) | 0.017357 | 0.369607 | 0.7117 | -0.034922 | -1.670455 | 0.095 |
| Oil Price (-2) | 0.130915 | 2.798573 | 0.0052* | 0.006954 | 0.334093 | 0.7383 |
| Oil Price (-3) | 0.018823 | 0.400993 | 0.6885 | 0.004178 | 0.200025 | 0.8415 |
| Oil Price (-4) | -0.017091 | -0.368475 | 0.7126 | -0.014321 | -0.692551 | 0.4887 |
| Oil Price (-5) | -0.009984 | -0.215642 | 0.8293 | -0.021283 | -1.031282 | 0.3025 |
| Oil Price (-6) | 0.109435 | 2.373337 | 0.0177* | -0.014042 | -0.683178 | 0.4946 |
| Oil Price (-7) | 0.010599 | 0.230189 | 0.818 | -0.045483 | -2.216835 | 0.0267 |
| Oil Price (-8) | 0.068734 | 1.492456 | 0.1357 | 0.010392 | 0.506278 | 0.6127 |
| Oil Price (-9) | -0.00013 | -0.128159 | 0.898 | 0.000448 | 0.994443 | 0.3201 |
| R-squared | | | 0.152946 | F-statistic | | 24.30161 |
| Akaike info criterion | | | -3.20965 | Durbin-Watson stat | | 1.999222 |

Note: VAR system has been estimated with 9 lags according to Akaike Information Selection Criterion for the period of 1/01/2005 to 31/12/2014

**Vector Auto Regression Estimates for Stock Index**

Table 8 presents the estimation results of VAR system for Pakistan Stock Index and oil price. The results indicates that there is a significant relationship between Pakistan Stock Index and oil price on a daily basis. The Stock Index appears to be significant in (-1) and (-2). However the Stock Index receives a negative and significant impact from oil price the (-1) of oil price presents a positive significant relationship while (-6) and (-3) indicates a negative significant relationship. However, when oil price is considered as the dependent

variable we receive significant relationship. Thus, based on these findings, we can suggest that the oil price lead the Stock Index of Pakistan and that there is a bidirectional relationship between both the variables.

**Table 8**
**Vector Auto Regression Estimates Stock Index**

| | Stock Price SI Dependent | | | Oil Price Dependent | | |
|---|---|---|---|---|---|---|
| | Coefficient | t-Statistic | Prob. | Coefficient | t-Statistic | Prob. |
| Stock Price (-1) | 1.140397 | 54.88802 | 0.0000* | -0.089935 | -2.278632 | 0.0228* |
| Stock Price (-2) | -0.118433 | -3.751144 | 0.0002* | 0.119842 | 1.997642 | 0.0459* |
| Stock Price (-3) | 0.001998 | 0.063069 | 0.9497 | -0.026389 | -0.438459 | 0.6611 |
| Stock Price (-4) | -0.017407 | -0.550339 | 0.5821 | -0.0149 | -0.247946 | 0.8042 |
| Stock Price (-5) | -0.014877 | -0.472036 | 0.6369 | 0.02355 | 0.393223 | 0.6942 |
| Stock Price (-6) | 0.009008 | 0.435976 | 0.6629 | -0.010665 | -0.271662 | 0.7859 |
| Oil Price (-1) | 0.042489 | 3.87927 | 0.0001* | 1.019995 | 49.0228 | 0.0000* |
| Oil Price (-2) | -0.008913 | -0.571038 | 0.568 | -0.014061 | -0.474383 | 0.6353 |
| Oil Price (-3) | -0.035504 | -2.274071 | 0.0231* | 0.062153 | 2.096713 | 0.0361 |
| Oil Price (-4) | 0.015432 | 0.987099 | 0.3237 | -0.025279 | -0.851681 | 0.3945 |
| Oil Price (-5) | 0.027997 | 1.790945 | 0.0734 | -0.121696 | -4.102249 | 0.0000* |
| Oil Price (-6) | -0.043424 | -3.934412 | 0.0001* | 0.071007 | 3.387284 | 0.0007* |
| | R-squared | | 0.998883 | Akaike info criterion | | -5.726772 |
| | F-statistic | | 171791.9 | Durbin-Watson stat | | 2.010845 |

Note: VAR system has been estimated with 6 lags according to Akaike Information Selection Criterion for the period of 1/01/2005 to 31/12/2014

**Granger Causality Test**

To further investigate the relationships between oil price and Stock Prices in Pakistan Stock Market, we precede to Granger Causality tests on the different sectors of Pakistan Stock Market. Namely Oil and Gas Marketing, Oil and Gas Exploration Companies, Textile Companies Commercial Banks and Stock Index. Results are reported in table 9 the results indicates that there is bidirectional causality between oil price and Oil and Gas Marketing Companies similar results are obtained for Oil and Gas Exploration Companies. However there are unidirectional Granger Causality for Commercial Banks and Stock Index. In contrast, the Textile Companies do not granger cause by the effect of oil price.

**Table 9**
**Granger Causality Test**

| | Null Hypothesis | F-Statistics | Prob | Result |
|---|---|---|---|---|
| Model 1 | Oil Price does not Granger Cause CB | 7.3522 | 0.00008 | Reject |
| | CB does not Granger Cause oil Price | 1.3324 | 0.2306 | Do not Reject |
| Model 2 | Oil Price does not Granger Cause OGEC | 6.03697 | 0.00008 | Reject |
| | OGEC does not Granger Cause oil Price | 6.61967 | 0.0000* | Reject |
| Model 3 | Oil Price does not Granger Cause OGMC | 23.988 | 0.00008 | Reject |
| | OGMC does not Granger Cause oil Price | 13.5388 | 0.01* | Reject |
| Model 4 | Oil price does not Granger Cause Textile Co | 1.9063 | 0.055 | Do not Reject |
| | Textile Co does not Granger Cause oil Price | 1.51639 | 0.1461 | Do not Reject |
| Model 5 | Oil Price does not Granger Cause stock index | 8.07083 | 0.00008 | Reject |
| | Stock index does not Granger Cause oil Price | 1.0955 | 0.3625 | Do not Reject |

Note: This table reports the Granger Causality Test Between oil price and Stock Price of Commercial Banks, Oil and Gas Exploration Companies, Oil and Gas Marketing Companies, Textile Companies and Stock Index. for the period of (1/01/2005 to 31/12/2014), optimal lags are selected based on Akaike Information Selection Criterion.

**Impulse Response Function**

To better understand how shocks in the oil market are transmitted to the Pakistan stock market, the impulse response function is applied. Based on theoretical perspective the oil prices can have conceivable contemporaneous impact on the stock prices but not vice versa. The Impulse Response Function is estimated under the VAR/VECM framework to examine the dynamic relationship of Pakistan Stock Index and its sectors with oil price. The Plots Impulse Response analysis for the period of 30 days to one standard deviation shocks in oil price to Pakistan Stock Index and its sectors is reported in figure 1. The behavior of Commercial Banks and Textile Companies are both similar they both respond negatively to a shock in oil price throughout the 30 days. The behavior from Oil and Gas Exploration Companies and Oil and Gas Marketing Companies are both similar and both of the sectors respond positively to a shock in oil price, initial some days of OGEC present some negative sign but overall it is positive. At the end stock index behavior seems to be very dissimilar from the other sector
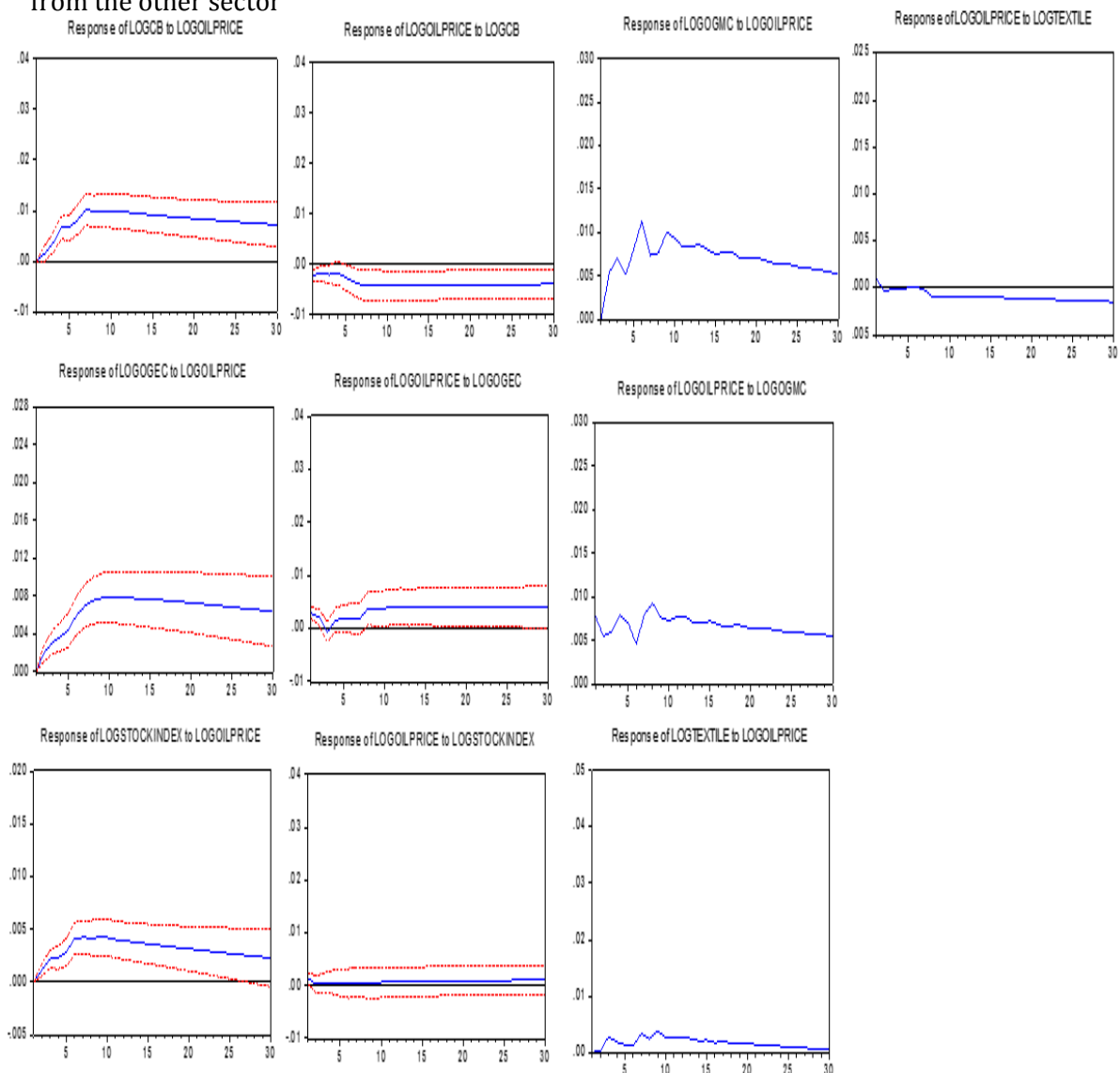


Figure 1

Impulse Response Function of Oil Price to Stock Price in VAR Notes: Figures are: First Row; Log Oil Price to Log Commercial Banks Stock Price, Log Oil and Gas Marketing Companies stock Price, Log Textile Companies Stock Price; Second Row: Log Oil and Gas Exploration Companies Stock Price, Log Oil and Gas Marketing Companies Stock Price; Third Row: Log Stock Index and Log Textile Companies Stock Price. The horizontal axis is period and vertical axis is the explanation of level of dependent variables to independent variables and period is set for 30 day

**Conclusion**

        The massive literature establishing vigorous results across numerous countries on the relationship between oil price and stock prices. This study examines the dynamic relationship between oil price and Pakistan Stock Market. While using the Vector Auto Regression Model we examine the dynamic interaction between the oil price and Pakistan Stock Prices. There are several sectors in the Pakistan Stock Market, the impact of oil price would differ between the sectors, we examine the stock prices of most capitalized sectors of Pakistan Stock Market we specifically examine the stock under Commercial Banks, Oil and Gas Exploration Companies, Oil and Gas Marketing Companies, and Textile Companies and Stock Index.

        According to our estimated VAR model, the findings suggest that Commercial Banks receives negative significant affect from oil price, while the Oil and Gas Exploration Companies do not seem to have any strong effect from the oil price. Furthermore, the Pakistan stock Index is also affected by the oil price as there is strong influence from the oil price to Pakistan Stock Index. However the VECM results suggested that the Oil and Gas Marketing Companies receive a significant effect from oil price. In addition, there is also long-run relationship between both the variables. The Textile Companies also indicates the long-run relationship as it seems to be affected by the oil price. While examining the Granger Causality test we find the price of oil price have significant causal effect on Pakistan stock prices, but found no opposite effect on oil price. To find out how the oil shocks transmitted to stock market we examined the Impulse Response Function. Commercial Banks, Textile companies and stock Index response was negative by the shock of oil price, while the Oil and Gas Exploration Companies and Oil and Gas Marketing Companies responded positively, by the shocks from oil price. The study provide the evidence for a complete understanding on the relationship between oil price and Pakistan Stock Market. This study likely to offer some valuable insights for policymakers and financial regulators for developing financial and economic policies. Policymakers are mostly, interested to examine the key factors of the stock market, and how the stock price movement influence the real economic activity. Overall the inter-relationship is also beneficial for portfolio managers and shareholders as it offers enhanced insights of portfolio structure and evaluation to progress the portfolio design and performance. Some more future research can be conducted to improve our understanding on this subject. The study can be extended by considering the effect of oil price along with the other necessary macroeconomic factors which might jointly, effect the Pakistan Stock Market.

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