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Impact of oil prices on firm stock return: industry-wise analysis

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Abstract The study investigates the impact of oil prices on firm-level stock returns in case of Pakistan over the period 1998–2014, as this relationship is neglected by the previous literature. By using the panel data estimation, the results of full sample indicate significant positive effect of oil price changes on firm stock returns in the same period, whereas the lagged oil price changes have significant negative effect on firms' stock return. Moreover, the industry-level analysis also confirms the similar findings; results indicate significant positive impact of oil price on firms' stock return in full sample, textile, chemical and miscellaneous industry, while the lagged oil price changes negatively affect the stock returns of full sample and all the industries except tobacco, jute and vanaspati industries. The study confirms that rise in oil price transfers a positive signal in the stock market that boosts the firm-level stock returns in Pakistan. In contrast to the negative shocks, the stock returns are significantly affected by the positive oil price shocks.

Keywords Oil price · Firm-level return · Pakistan

JEL Classification Q43 · C33, O13

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1 Introduction

In the period of oil crisis, the connection between oil price variations and macroeconomic factors has attained substantial consideration among academic scholars. Oil is the main source of energy in modern era that supports the economic growth, industrial production and other factors. From last few decades, the oil price fluctuations have affected the growth process of developing and developed economies. Although the effect varies, from country to country, due to different monetary policy, oil taxes, industrial infrastructure and oil dependence, most developed oil-importing countries impose high taxes on oil to fulfill economic requirement; such high tax ratio prevents them from oil price fluctuations by adjusting the tax rate, whereas developing countries impose fewer taxes on oil to support their industries but potentially weak to hedge such oil price shocks. Hamilton (1983, 1985) and Mork (1989) proved that oil price adversely affects economic growth. Chang et al. (2011) suggested that oil shocks varies for oil-exporting and oil-importing countries. They also suggested that higher oil price volatility will dampen macroeconomic activities of oil-importing countries due to more oil requirement.

A large number of studies also investigated the relationship between macroeconomic variables and stock return in developing and developed countries (Mukherjee and Naka 1995; Bailey and Chung 1996; Kwon and Shin 1999; Johnson et al. 2000; Haque and Sarwar 2012; Mireku et al. 2013; Garba 2014). Mukherjee and Naka (1995), Kwon and Shin (1999) and Haque and Sarwar (2012) reported the significance relationship between macroeconomic factors and stock return, whereas number of researches reported the inconclusive role of macroeconomic variables to determine the stock returns. Garba (2014) examined the impact of inflation, interest rate, exchange rate and gross national income on common stock return of Nigerian manufacturing firms; the results reported the insignificance of all macroeconomic variables to determine stock returns. Mireku et al. (2013) investigated the effect of inflation, exchange rate and interest rate on Ghana stock price movement and concluded low significance of these macroeconomic variables. Johnson et al. (2000) reported the insignificance of macroeconomic factors to determine the stock returns of 25 emerging economies.

Sharpe (1964), Lintner (1965) and Black and Scholes (1974) introduced the capital asset pricing model to examine the role of market premium to find out the stock returns. Although CAPM is known as first popular asset pricing model to comprehend the mechanism of asset price, later on many researchers criticized the CAPM (Fama and French 1992; Miller 2000) due to the inability to fully explain the stock market returns. Afterward, Fama and French (1992) enhanced the CAPM and presented a three-factor model (TFM) by augmenting size of the firma and book to market. Demirer et al. (2015) used the CAMP, TFM and oil price to explore the most significant predictor of stock return; the results highlighted the role of oil price. The reason behind the highly predictive power of oil price is the role of oil price news that suddenly spread in the market and investors take preemptive investment decisions accordingly. On the other hand, the news regarding companies fundamentals such as size and book to market is not easy to collect or can be speculative; such fundamental news is not able to provide true picture of the firm.

Recently, researchers in great number focus the relation of oil price fluctuations on stock market returns especially sector-wise. The reaction of oil returns varies from oil-intensive and less-oil-intensive sectors; the oil return responds differently across heterogeneous sectors (Arouri 2011; Elyasiani et al. 2011; Degiannakis et al. 2013; Moya-Martínez et al. 2014). Elyasiani et al. (2011) confirmed oil-user and financial sector show an unfavorable trend during oil price shocks, while favorable to oil-related sector. Moya-Martínez et al. (2014) reported that oil price has insignificant role in Spanish stock return, whereas Caporale et al. (2015), Huang et al. (2015) and Fan and Jahan-Parvar (2012) validated significant relationship among oil price and industry-level returns. Degiannakis et al. (2013) found asymmetry relationship between oil price and European industry-level returns. Recently, Teixeira et al. (2016) found the applicability of oil prices in Portuguese stock returns and, additionally, reported the significance asymmetric effect of oil prices on individual company stocks.

Overall, the above literature concludes the inability of CAPM, TFM and macroeconomic variables to predict the stock return. For such reasons, we limit this study to examine the role oil return, lagged oil return and oil price volatility to determine the stock returns in case of Pakistan. The proposed model of this study is similar to the model of Fan and Jahan-Parvar (2012) and Demirer et al. (2015) by limiting the lags and enhancing the oil price volatility.

1.1 Purpose of the study

In the base paper for our study, Narayan and Sharma (2011, 2014) tested liaison among oil price changes and stock returns of US firms further elaborating lagged effect of these shocks motivated to study for different location. There are two main purposes to conduct this research in Pakistan. Firstly, according to the author minor studies have been conducted to investigate the effect of oil prices on firm stock returns in developing countries. Ansar and Asghar (2013) and Siddiqui (2004) investigated the impact of oil price shocks and stock market index of Pakistan. Hence, this research is the pioneer one in the context of relation between oil price fluctuations and firm-level returns in Pakistan. Secondly, since last few years Pakistan is dealing energy crisis thus highly dependent on oil requirement to sustain its industries. The energy requirement of Pakistan was 34 million tons of oil equivalent (TOE) which has increased by 80% and reaches 61 million TOE in 1995–2010. Ansar and Asghar (2013) argued that Pakistan being an oil importer, oil price shocks impact energy sector which is a trigger to nation's progress. The research gap in the field is due to non-availability of firm-level data in Pakistan.

1.2 Objective of the study

The study investigates impact of oil price fluctuations on individual firm stock returns by using panel data econometric technique. The firms listed in Karachi stock exchange with available data from 1998–2014 have been included for the analysis. The study involves 397 non-financial firms which are further categorized into 12 industries for the research. There are three main objectives of the study which are: Firstly: the paper analyzes the impact of oil prices, lagged oil price and oil price volatility on stock returns at firm level. Secondly, the paper justifies the oil price, lagged oil price and oil price volatility impact on stock returns of different sectors. Lastly, the study examines the reaction of positive and negative oil price shocks on stock returns.

The subsequent part of paper provides literature review followed by data and methodology used to test the relation between oil price and stock returns. Finally, results are achieved by the panel data estimation which completes the paper providing concluding remarks.

2 Literature review

Growing concern on oil prices shocks led to many studies in this area. Oil prices influence macroeconomic factors interlinking to stock market. Escalations in oil prices are often pointing out inflationary pressure in the economy which leads to future of interest rates and investments. Sadorsky (1999) used vector autoregression, suggesting that the oil prices play vital role in impacting economic activity. He also discovered oil price fluctuation relates to stock returns volatility. The projected results suggest that positive oil price fluctuations dampen real stock returns and real stock returns volatility impact positively on production and interest rates.

2.1 Oil price effect on industry-level returns

The literature proves that firms belong to different industry and each industry has different intensity to oil requirement. Research on oil price impact individual firm returns has gained less attention. Researcher focuses more on oil prices fluctuation impacting stock market index. Siddiqui (2004) suggested that stock market performance is derived by many macroeconomic factors. Thus, he applied regression on oil price, exchange rate and foreign investment impact on KSE index of Pakistan stock market. He concluded a correlation between oil price, Pak rupee to US dollar and foreign portfolio investment with KSE100 index. A positive relationship between oil price and stock market performance was revealed in the study.

Cong et al. (2008) investigated oil price effect on Chinese stock exchange that stated significant impact of oil price on manufacturing and oil-related companies. They also concluded that oil price volatility increases speculation in mining and petrochemical industry causing rise in stock returns.

Fan and Jahan-Parvar (2012) used disaggregated data estimating oil price effect and proved significantly predicting equity returns supporting other literature as (Driesprong et al. 2008). They included forty-nine industry-level returns of the USA. Oil effect measured as percentage change in oil spot prices does not predict industry-level returns and same as variations in oil futures prices. Only one-fifth industry returns are predicted by oil price changes as per their study.

Ansar and Asghar (2013) researched the impact of oil price on CPI and stock exchange in Pakistan from 2005 to 2012. They found positive relation between oil price and stock market index of Pakistan. They also suggested that higher oil price will lead energy sector of a country to raise expense and thus inflation affects firm returns. Pakistan being an oil importer country, oil price hikes increase transportation cost, leading to more cost of production and affecting firm-level performance.

Degiannakis et al. (2013) hypothesized time-varying correlation between oil price shocks and stock indices of 10 European sectors. They believed that oil shocks are mostly caused by supply side shocks that have direct influence on stocks rather than demand-side shocks. Researcher is of the view that aggregate stock indices are equally significant as industrial stock indices. Moreover, their study showed that supply-side oil price variations positively affect stock indices, particularly oil and gas sector, but demand-side oil fluctuations indicated no influence on stock indices; however, aggregate stock indices depict noteworthy upward and downward movement..

Dhaoui and Khraief (2014) contributed by studying the impact of oil price on stock returns of eight developed countries. An EGARCH-in-M model was used to justify oil price impact on stock prices. They found negative relation between oil price shocks and stock returns. They justified the results believing increase in oil prices causes economic crisis and difficulties for industrial production and hence reduces firm returns.

Caporale et al. (2015) projected bivariate VAR-GARCH model to evaluate time-varying influence of oil price volatility on stock prices using weekly data of ten industrial indices in China. Aggregate demand-side shocks in all cases except for the consumer services, the financials and oil and gas sectors were found to be negatively affected by demand-side shocks. Financials and oil and gas sectors also responded negatively toward supply-side shocks, concluding that industry stocks vary with oil prices movement.

Chiwanza et al. (2015) selected time period 2009–2012 and highlighted the impact of crude oil price volatility on Zimbabwe stock indices by using econometric GARCH model. The researchers concluded that oil price shocks have been incorporated in Zimbabwe stock indices. The reserves of fuel prevent the economy to be affected, a time of lag from 9 to 30 days, by oil price fluctuations. Furthermore, they discovered global oil price benefiting industrial index and adversely affecting mining index of Zimbabwe stock market, hence proved to be positively correlated with industrial index and negatively with mining index. The author justifies mining industry faces more cost of production due to the rise in oil prices, concluding that high oil prices favor high share price.

2.2 Oil price effect on firm-level returns

Researcher elaborated a mix of studies proving oil price affecting economic factors and stocks indices at industrial level. However, a new field in this has been taken attention, which checks oil price effect on firm-level returns. Narayan and Sharma (2011) studied effect of oil prices on stock returns of 560 US firms at individual level. Firstly, they concluded that each firm reacts differently to oil price shocks depending on the type of industry or business. According to research, positive impact resulted in energy and transportation firms' return due to increase in oil price. Secondly, research concluded oil price impact firm returns with lag. This is justified as investor reacts gradually to oil price news. Wattanatorn and Kanchanapoom (2012) used panel data regression on 11 industries of Thailand stock exchange to measure oil price impact on firm's profitability considering same as impact on stock returns. Sector analysis proved significant and positive impact on food and energy sector.

Narayan and Sharma (2014) studied the impact of oil price shocks on firm-level stock return rather than US stock market index. The study proved oil price changes impacting differently at firm level. Lagged oil prices help to analyze the effect of such price shocks in the long run. High price shock for an importing country causes rise in cost of production. Narayan and Sharma (2014) used up to 8 lags to measure impact on firm-level return. They found some firms have persistent effect on oil prices shocks but sign resulted to be mixed. Furthermore, they also divided firms into 14 sectors proving banking sector gaining increase in stock returns as oil prices increase.

2.3 Asymmetry effect of oil price shocks on stock returns

Sadorsky (2001) showed that crude oil prices have large and significant impacts on stock price returns in the Canadian oil and gas industry. Hammoudeh and Li (2004) examined and compared the oil sensitivity of equity returns of non-Gulf, oil-based countries (Mexico and Norway) with that of two major oil-sensitive industries (US oil and transportation industries), and found that the oil price growth leads to the stock returns of the oil-exporting countries and the US oil-sensitive industries, with the US oil industry showing the greatest sensitivity. Hammoudeh and Aleisa (2004) investigated the relationship of oil and five Gulf Cooperation Council countries, including Bahrain, Kuwait, Oman, Saudi Arabia and United Arab Emirates. They found that only the Saudi stock market has a bidirectional causal relationship with oil price growth and Kuwait and Oman have no causal relationships with oil price changes.

Park and Ratti (2008) studied the effects of oil price changes on stock markets of USA and 13 European countries; they found that oil price shocks have a statistically significant impact on real stock returns, but there is no evidence of asymmetric effects on real stock returns of positive and negative oil price shocks except for USA and Norway. Bjomland (2009) analyzed the effects of oil price shocks on financial markets in Norway, an oil-exporting country. She showed that following a 10% increase in oil prices, stock returns increase immediately by 2–3%.

Arouri et al. (2011) showed that the link between oil and stock markets in GCC countries can be expected to vary across different economic sectors. Ramos and Veiga (2011) found that the oil and gas sector in developed countries responds more strongly to oil price changes than in emerging markets. Oil and gas industry returns also respond asymmetrically to changes in oil prices, which is different from the case in other industries related to commodities. Mohanty et al. (2011) found oil price changes have asymmetric effects on Gulf Cooperation Council (GCC) stock market returns at the country level as well as at the industry level.

Scholtens and Yurtsever (2012) investigated how 38 different industries respond to oil price shocks and found that the impact pattern along the different industries differs substantially. Aggarwa et al. (2012) studied companies included in the S&P Transportation industry index and found that while transportation firm returns are influenced negatively by oil price increases, risks are increased more by oil price declines. Through distinguish oil-dependent types of emerging countries, Aloui et al.

(2012) suggested that oil price risk is significantly priced in emerging markets and that the oil impact is asymmetric with respect to market phases. Teixeira et al. (2016) used the data of 54 Portuguese companies over the period 1993–2013; the results reported the applicability of oil prices on stock returns, additionally, reported the significant asymmetric effect of oil prices on individual company stocks.

3 Data and methodology

The study uses annual data of Pakistan taken from business recorder, state bank of Pakistan yearly report and energy information administration (EIA) database. The natural logarithm of crude oil WTI spot price (US dollars per barrel) is used as a proxy of oil price. Firm-level equity returns are calculated by taking natural logarithm of share's closing price at time t divided by share's closing time of closing price at time $t-1$. The study utilizes the yearly panel data of all non-financial listed firms from 1998 to 2014; due to non-oil dependence, we excluded the financial firms from this study. Furthermore, the firms having no data of last three years and the firms merged or acquired during study period or delisted from Karachi stock exchange are eliminated from this study. The final data set contains the panel of 397 non-financial listed firms of Pakistan. The panel estimation model of the current study examines the effect of current oil price and lagged oil price on firm-level stock returns. The model is as follows:

$$\mathrm{ER}_{it} = \beta_i + \gamma_0 \mathrm{OP}_t + \gamma_1 \mathrm{OP}_{t-1} + \gamma_2 \mathrm{OPvolatility}_t + \varepsilon_{it}$$

where ER_{it} is firm stock returns and is calculated by $[\ln(P_t/P_t - 1)]$; OP_t represents the current oil price return at time (t)[1] which is estimated by $[\ln(\mathrm{OP}_t/\mathrm{OP}_{t-1})]$; OP_{t-1} is the lagged oil price at time $(t-1)$; $\mathrm{OPvolatility}_t$ presents the oil price volatility.[2] We take the natural logarithm of current and lagged oil prices to standardize the variables. Firstly, we analyze the general results of full sample; secondly, we extend our study from general to specific by investigating the impact of oil returns on sector-wise stock returns. The reaction of oil returns varies from oil-intensive and less-oil-intensive sectors; the oil return responds differently across heterogeneous sectors (Arouri 2011; Degiannakis et al. 2013; Elyasiani et al. 2011; Moya-Martínez et al. 2014). For such reasons, the study further categorizes the data into 12 industries to investigate the significant difference in oil return impact on different non-financial industries: textile, chemical, engineering, sugar, paper and board, cement, fuel and energy, transport and communication, tobacco, jute, vanaspati and miscellaneous sector.[3] Finally, we examine the impact of positive and negative oil price shocks on stock returns. The study follows Mork (1989, 1994) studies to calculate the positive and negative oil prices; if oil price growth is positive, it is considered positive shock; otherwise negative shock.

1 Arouri et al. (2011) method is used to calculate the oil return

2 Oil price volatility is used by GARCH method.

3 These industries are classified using the Industry Classification Benchmark (ICB) that was developed by Dow Jones Indexes and FTSE.

Table 1 Descriptive statistics

	ER	OP
No. of obs	6326	6749
Mean	0.029	3.915
SD	0.452	0.615
Max	8.396	4.602
Min	−5.623	2.669
Skewness	0.602	−0.521
Kurtosis	33.121	1.932

4 Empirical results: discussion and comparison with previous studies

4.1 Descriptive

The descriptive statistics of the firm stock return (ER) and oil price (OP) is presented in Table 1; number of observation, mean, standard deviation, minimum value, maximum value, skewness and kurtosis are given in descriptive table. ER and OP have 6326 and 6749 number of observations, respectively. ER has the mean value 0.029 with standard deviation 0.452, while the minimum and maximum values are −5.623 and 8.396, respectively; this represents that there is no evidence of outlier in the given variable. The mean of OP is 3.915 with standard deviation 0.615; the minimum and maximum values also present no significant outlier in OP. The ER and OP are positively skewed and show leptokurtic distribution.

4.2 Regression analysis

Table 2 presents the panel estimation results of full sample that includes textile, chemical, engineering, sugar, paper and board, cement, fuel and energy, transport and communication, tobacco, jute, vanaspati and miscellaneous industries over the yearly data from 1998 to 2014. The data suffer the issues of cross-sectional dependence[4] and heteroskedasticity.[5] Generalized method of momentum (GMM) is the best fit for the econometric analysis to examine the effect of oil variables on stock returns.

The full sample results indicate the significant positive effect of oil price changes on firm equity returns on the same period; the result indicates that the change in oil prices is due to the demand-side pressure, the price increases because of oil demand by the Pakistani industries to enhance their operations which also provides positive signal in the stock market, and investors increase the trading of such stocks. The result of current oil return is inline with Gupta and Modise (2013) and Degiannakis et al. (2013). The positive significant effect of oil return on fuel and energy sector is proved by Elyasiani et al. (2011), Narayan and Sharma (2011) and Arouri (2011).

4 Pesaran's test of cross-sectional independence = 97.282, $Pr = 0.0000$.

5 Wooldridge test for autocorrelation in panel data (Prob > F=0.0000).

Table 2 Regression analysis

	OP_t	OP_{t-1}	OP Vol_t
Full sample result	0.2548*	−0.4957*	−27.5794*
Textile	0.3553*	−0.4966*	−24.7585*
Chemical	0.3565*	−0.4938*	−15.0067*
Engineering	−0.0447	−0.4154*	−53.20667*
Sugar	0.1165	−0.3053*	−13.848*
Paper and board	0.3494	−1.0431*	−20.0966
Cement	0.3076*	−0.6043*	−54.2864*
Fuel and energy	0.3111*	−0.5321*	−16.4008**
Transport and communication	0.1826	−0.4868*	−69.1812*
Tobacco	0.1046	−0.297	−34.0404**
Jute	−0.0758	−0.1291	−43.1765*
Vanaspati	0.1614	−0.367	−27.4461
Misc	0.1616**	−0.4589*	−31.5276*

*,** 5% and 10% level of significance, respectively

On the other side, there is a significant negative relationship between oil price change in previous year and current equity returns and it is similar with Fan and Jahan-Parvar (2012); the expected reason for the lagged negative relationship can be the increase in production cost. The continuous rise in oil prices pushes the production cost which in return increases the product prices; such inflationary pressure on the economy declines the purchasing power of the consumers. After that, firms decrease their production that adversely hits the financial earning of the company and transfers a negative signal in the stock markets. Resultantly, the investors decrease the trading in stocks which reduce the stock returns in Pakistani stock markets.

The volatility of oil prices creates uncertainty and has significant effects on growth and investor's confidence (Masih et al. 2011). The oil-importing countries are likely to be more affected by such oil price volatility, especially where infrastructure and policy makings are week. The finding of full sample confirms a significant negative effect of oil price volatility on stock returns; the high oil price volatility tends to decrease the stock returns, which is parallel with Kang et al. (2015); Diaz et al. (2016). The above results indicate that oil price volatility is the most significant factor to determine the stock returns in Pakistan.

4.3 Industry analysis

Results indicate significant positive impact of oil price on firms' equity return in textile, chemical, cement, fuel and energy and miscellaneous industries, while engineering, sugar, paper and board, Transportation and communication, tobacco, jute and vanaspati industries have insignificant impact. The significant positive relation indicates that oil price rise do not badly hurt the Pakistani industrial infrastructure and the stocks on aggregate level and industrial level absorb the oil price shocks.

During the study period, the oil prices continuously increase in global market, but the industrial infrastructure of Pakistan also progressed from 1998 to 2008, but after that, the industries gradually closed their operations, not because of the oil prices, bad policies, corruption and energy crisis. On the other side, when the oil price declines, the Pakistani government does not shift the advantage to the industry level and the individuals; the cost of transportation, cost of raw material, and cost of electricity remain the same. As a consequence, the declines in oil prices either insignificantly or adversely affect the industries and the stocks. The sharp decline in oil prices affects the oil-exporting economies, and the import of such countries shrinks down, as a result, the economies with industrial infrastructure which relies on exports were also badly affected. Such decline in exports reduces the firm's profit which transmits a negative signal in the stock markets.

Furthermore, the lagged oil prices negatively affect the stock returns of full sample and all the industries except tobacco, vanaspati and miscellaneous industries. The reason for this negative relation is the product cost aspect. The constant rise in oil price creates inflation and destabilizes the industrial production and financial earnings that negatively affect stock returns. The result of textile industry is consistent with Arshad and Bashir (2015) and Nandha and Faff (2008); the main reason of oil dependency of textile sector is that it heavily relies on fuel for their production operation and consumes 20% of total fuel energy consumed by Pakistani industries (International Resources Group 2011). The insignificant relation of tobacco industry is due to the continues rise in tobacco products prices and demand every year in Pakistan which improves the financial earnings; the investors focus the fundamentals values of tobacco industry and know that it is independent from oil price shocks.

Table 2 portrays the overall result findings of oil price shocks on particular industries but is unable to highlight the individual firms response. Furthermore, to extend the analysis, Table 3 presents the results of individual companies related to the same industries; the purpose is to analyze that the firms belong to identical sector have similar response due to oil price shocks. This micro-level approach further helps individual firms to form an appropriate plan according to the response of oil price shocks.

The results indicate that 32.75% companies respond to the oil price shocks in the current period; among them, 109 firms have positive influence, while 21 firms have reported significant negative relationship with oil price shocks. Oil and gas sector presents 28% firm's stock returns lead to increase in the current period due to the oil price shocks; the given result pointed out that oil and gas is the basic raw material to run the production operation, leading to the fact that rise in oil prices generates a greater margin of profit, which helps to attract the stock market investors. The results are similar to Teixeira et al. (2016), Arouri (2011), Ramos and Veiga (2011) and Nandha and Faff (2008). Textile, sugar, vanaspati and tobacco industries belong to consumer goods sector; most of the firm's stock return has positive relationship with current oil price shocks, except tobacco industry. Tobacco industry consists of three companies in the study; none of the stocks is influenced by the oil price shocks in Pakistan. The main reason for the insignificance of tobacco companies is the inelasticity of demand for tobacco products; these findings meet the study results of Teixeira et al. (2016), Arouri (2011) and Mohanty et al. (2011). Basic material sector consists of paper and

Table 3 Individual firm analysis

	No. of companies	OP_t				OP_{t-1}				OP Vol_t			
		Sig (+)	Sig (−)	InSig	Sig %	Sig (+)	Sig (−)	InSig	Sig %	Sig (+)	Sig (−)	InSig	Sig %
Full sample result	397	109	21	267	32.75	9	144	244	38.54	21	137	239	39.80
Textile	166	47	10	109	34.34	6	61	99	40.36	10	52	104	37.35
Chemical	33	11	3	19	42.42	0	14	19	42.42	2	13	18	45.45
Engineering	37	7	3	27	27.03	0	11	26	29.73	0	21	16	56.76
Sugar	34	7	1	26	23.53	0	9	25	26.47	3	6	25	26.47
Paper and board	9	1	1	7	22.22	1	2	6	33.33	0	7	2	77.78
Cement	19	3	1	15	21.05	1	8	10	47.37	0	7	12	36.84
Fuel and energy	25	7	0	18	28.00	0	9	16	36.00	0	5	20	20.00
Transportation and communication	11	1	0	10	9.09	0	1	10	9.09	0	4	7	36.36
Tobacco	3	0	0	3	0.00	0	1	2	33.33	0	1	2	33.33
Jute	4	1	1	2	50.00	0	2	2	50.00	0	2	2	50.00
Vanaspati	4	1	0	3	25.00	0	1	3	25.00	0	1	3	25.00
Misc	52	23	1	28	46.15	1	25	26	50.00	6	18	28	46.15

At 10% level of significance

board, jute and chemical industries; the firm's stock return belonging to this sector reacts significant positively to oil price shocks; the given results are in line with Arouri (2011) but differ from those of Narayan and Sharma (2011) who finds a significant negative relationship. However, 28 firms of basic material sector do not respond to movement in oil prices.

The industry sector in Pakistan is the one that proves to be mix evidence, while most of the firms have reported insignificant association with oil price shocks; the result resembles those of Teixeira et al. (2016) and Arouri (2011). Ten firms present the significant positive association with oil price shocks which contradict with Narayan and Sharma (2011) who conclude a significant negative association. All the studied firms, except one firm, in telecommunication sector, is insignificant to the movement of oil prices in case of Pakistan. The present results for telecommunication sector are consistent with Teixeira et al. (2016), and Nandha and Faff (2008). These findings also endorse the results of transportation and communication present in Table 2. Miscellaneous sector consists of small firms belonging to different industries.[6] 46.15% firms of this sector reported significant to oil price shocks; 23 out of 24 companies have testified positive relationship with oil price shocks.

Remaining columns of Table 3 represent the lagged oil price and oil price volatility effect in firm's stock returns. 38.54% firms are significantly affected by the movement in oil prices in the upcoming periods; 144 firms have positive relationship with such oil price shocks, while 9 firms reported negative association. This positive result validates the outcome of lagged oil price given in Table 2. Similarly, the volatility in oil price presents significant negative association in 137 firms and validates the negative relationship between oil prices and firm's stock return.

4.4 Asymmetry analysis

The oil price shocks affect the economic activities and stock returns. These oil price shocks have non-linear and asymmetric impact on stock returns. These asymmetric effects are due to the demand side shock, supply side shock and economic situation of countries (Jiménez-Rodríguez 2008; Kilian 2009; Kilian and Park 2009; Narayan and Gupta 2015).

Table 4 reports the asymmetric results of oil price shocks. The negative shocks of oil prices documented insignificance of negative oil price shocks on Pakistani industries, except textile and chemical industry; the finding of Mory (1993) also reported that the decreases in oil price have no significant effect on output, whereas lagged oil prices adversely affect the firm's stock returns in full sample, textile, chemical, paper and board, cement, fuel and energy sectors; the long-term decrease in oil prices supports the manufacturing industries to reduce the production costs and strengthen the financial statement that provides a positive signal to the stock market.

Moreover, Table 4 reports the results of positive oil price shocks on stock returns. In contrast to the negative shocks, the stock returns are significantly affected by the positive oil price shocks. The stock return of full sample, textile, chemical, engineering,

[6] Due to the less number of firms, we combine them in one head for better statistical analysis.

Table 4 Asymmetry analysis

	Negative shock		Positive shock	
	OP_t	OP_{t-1}	OP_t	OP_{t-1}
Full sample result	0.3883*	−0.3956*	0.5763*	−0.9874*
Textile	0.3674*	−0.4442*	0.7412*	−1.1226**
Chemical	0.4314*	−0.3049*	0.6856*	−0.9861*
Engineering	0.4391	−0.2834	0.2369*	−0.7943*
Sugar	0.0207	−0.1969	0.4571**	−0.7763*
Paper and board	−1.5594	−1.3873*	1.7241*	−2.6948*
Cement	0.4427	−0.6984*	0.3570*	−0.7425*
Fuel and energy	0.2386	−0.6486*	0.6169*	−0.9925*
Transport and communication	0.0096	−0.974	0.4701	−0.8545*
Tobacco	−0.7441	0.1704	0.5171	−0.7141*
Jute	0.2218	0.1619	0.4286	−0.8832**
Vanaspati	−0.3022	−0.2356	0.8364*	−1.3062*
Misc	−0.0546	−0.3531*	0.2888*	−0.6262*

*,** 5% and 10% level of significance respectively

sugar, paper and board, cement, fuel and energy, vanaspati and misc industry explains a positive significant; similar results are reported by Caporale et al. (2015) and Demirer et al. (2015). The increase in oil prices, during the study period, is caused by demand-side shocks by the industries to enhance their operations which deliver an optimistic view to the investors for stock trading; these results are inline with Narayan and Sharma (2011). The lagged oil prices reported that continues increase in oil prices adversely affects the stock returns; the rise in oil price over a period of time destabilizes the economy and industrial infrastructure which directly or indirectly hit the stock returns.

Summarizing the above results, we find a positive effect of oil price on firm's stock return in most of the firms for both current and full panel. Results explain that the rise in oil prices is due to the demand-side shock, indicating that industrial sector is growing and has a potential to upsurge the stock returns. In contrast, during the decline in global oil prices, the industries cannot enjoy the benefits because Pakistani government is not willing to decrease the oil prices. Resultantly, the cost of production remains same which adversely affects the exports and has a pressure on firm's financial performance and stock returns. However, the gradual rise in oil prices transmits bad signals in the market and has an adverse impact on cost of production and macroeconomic indicators which in turn reduce the stock returns.

5 Conclusion

There is a huge body of literature that investigates how the oil price affects stock returns. An apparent research gap, however, is present in this literature. Our approach is to concentrate on three specific issues. First, we examine the impact of oil prices on Pakistani firm returns; for this purpose we analyze the data of 397 listed firms over the period 1998–2014. The fixed effect method confirmed a significant positive relationship between oil prices and firm's equity return. Second, the study investigates whether the effect of the oil price on firm's equity return is the same for all industries; we confirm that it is not. The effect of the oil prices on firm-level equity returns is industry specific. We divide firms into 12 industries and unravel that, while for the most of the industries, a rise in the oil price generally increases firms' equity return; tobacco, jute and vanaspati are the only industries that prove insignificant. Finally, we examine whether the oil price affects firm-level equity return with lag, and whether such an association is industry specific. The results find that lagged oil prices affect adversely in most of the industries, except tobacco, vanaspati and miscellaneous industries.

The significant positive relation indicates that oil price rise do not adversely affect the Pakistani industrial infrastructure and the stocks on aggregate level and industrial level absorb the oil price shocks. The result indicates that the change in oil price can be due to the demand-side pressure during the study period; the price increases because of oil demand by the Pakistani industries to enhance their operations which also provide positive signal in the stock market and investors increase the trading of such stocks. On the other side, when the oil price declines, the Pakistani government does not shift the advantage to the industry level and the individuals; the cost of transportation, cost of raw material, and cost of electricity remain the same. As a consequence, the decline in oil price either insignificantly or adversely affects the industries and the stocks. The expected reason for the lagged negative relationship can be the increase in production cost. The continuous rise in oil prices pushes the production cost which in turn increases the product prices; such inflationary pressure on the economy declines the purchasing power of the consumers. After that, firms decrease their production that adversely hits the financial earning of the company and transfers a negative signal in the stock markets. According to the consequence, the investors decrease the trading in stocks which reduce the stock returns in Pakistani stock markets. The volatility of oil prices creates uncertainty and has significant effects on growth and investor's confidence (Masih et al. 2011). The oil-importing countries are likely to be more effected by such oil price volatility, especially where infrastructure and policy makings are week. In contrast to the negative shocks, the stock returns are significantly affected by the positive oil price shocks.

To summarize, the rise in oil price transfers a positive signal in the stock market that boosts the firm-level equity returns in Pakistan. The implication of the present study is multidimensional; firstly, as the industrial infrastructure is not capable enough to absorb the effect of oil prices for longer period of time, the managers and policy maker should formulate sound industrial policies to mitigate the adverse impact of oil prices over longer period of time. Secondly, from the investors perspective, the positive relationship between oil price and firms equity return indicates that during the rise in oil prices, the investors should buy the firm's stock to gain the higher capital gain, but should not hold them for longer period of time. Thirdly, financial managers can cope the risk of oil price fluctuations by implementing hedging activities.

Many questions remain unaddressed about the effect of oil price on stock returns due to unavailability of data before 1998. Karachi stock exchange is an emerging stock exchange that has different characteristics and operations, so the results and findings are not applicable for developed stock exchanges. For further research, the study can be divided according to the pre-crisis, during-crisis and post-crisis period to analyze the effect of oil prices on industries.

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