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DOMESTIC OIL PRICE REDUCTIONS AND AUTOMOBILE & SPARE PARTS INDUSTRY STOCKS; AN APPLICATION OF EVENT STUDY

Rana Yassir Hussain, Jiangsu University, School of management, Zhenjiang, China/University of Education, Department of Economics and Business Administartion, Lahore, Pakistan.
Ilyas Ahmad, University of Education, Department of Economics and Business Administartion, Lahore, Pakistan
Haroon Hussain, Noon Business School University of Sargodha, Pakistan
Muhammad Usman, University of Education, Department of Economics and Business Administartion, Lahore, Pakistan
Shahbaz Khan, Faculty of Management Sciences, Foundation University, Islamabad

ABSTRACT- This study has a focus on the oil price reductions in the domestic market of Pakistan and its impact on the stock prices of automobile & spare parts industry of Pakistan. Oil price reductions notified by OGRA are considered as events, so an event study methodology is applied to capture any abnormal returns generated in the stock prices of this sector. This study tends to capture the variance both in time series and cross section context. To make the study statistically more rigorous both parametric and non-parametric techniques like Patell's(1976), Boehmer et al(1991), and Corrado Rank tests are applied to the data. Three consecutive oil price reductions in the last three months of the year 2014 are included in this study. A total sample of 19 companies is included, depending on the availability of data. The results prove that oil price reductions have a significant positive impact on the stock prices of automobile & spare parts industry of Pakistan.

Keywords: Local Oil Price, Automobile & Spare Part Stocks, Event Study.

I. INTRODUCTION

Oil is the life blood not only for the machines but also for this highly automated world. It is the most valuable resource possessed by any country and is often blamed as a primary reason of wars and tensions among various geographic regions. It is equally important for oil producers as well as oil consumers. This study will emphasize on the effect of recent oil price reductions on the stock returns of Pakistani automobiles and spare parts industry. Automobiles feed on oil and their hunger is met with the money in the driver's pocket. Expensive fuel will turn humans to use other alternate sources of conveyance and transportation and low fuel cost will enable them to buy vehicles with inefficient petrol consumption. Nandha and Brooks (2009) found that oil prices have a reasonable role in determining of transport sector returns in developed countries whereas in Latin American and Asian countries no such evidence was found. Oil is also used as an input in various manufacturing operations and thus price reduction will also make manufacturing operations more cost effective. Therefore, it is helpful for any company, whether from a cost point of view or sales point of view as reduction in cost of production or increased sales will result in firm's profitability which is the ultimate objective of an organization. So, it can be said that a reduction in oil prices should be considered a positive signal by the investors and if the market is efficient any announcement in price reductions must be reflected in the stock prices of the automobile and spare parts industry specifically.

It is a common debate in the local press to link the oil prices in Pakistan with international crude oil prices, but most of the times it happened to an increase in price but no relief was forwarded when there comes a reduction in international oil price.Oil prices are beyond a nation's control specially an oil consumer and hence regarded a macroeconomic factor. Most of the previous studies prove a negative link between the stock prices and oil prices, but a few report positive relationships and have justified such results as an increase in industrial demand for oil. Kubarych (2005) argued that oil price increase is more harmful for carcompanies as compare to the other sectors of the economy. Jones and Kaul (1996) studied the impact of oil prices on stock prices and found that this relationship is country specific. This argument further strengthens our opinion to study such variation in domestic market. Many of the researchers have studied this relationship on the aggregate stock market like Huang, Masulis and Stoll (1996), Park and Ratti (2008) and Sadorsky (1999) and there is also enough evidence that supports the relationship between oil prices and sector indices like Kilian and Park (2009), Arouri and Nguyen (2010), Narayan and Sharma (2011) and Scholtens and Yurtsever (2012). These studies prove that it is more meaningful to study the impact of oil prices on individual industries rather than an aggregate index because each country have different industrial strength so the results of an aggregate index cannot be generalized for all industries as the negative outcomes of any sector will be compensated by other sectors with better performance and vice versa. This paper will focus on the stock prices of automobile and spare parts industry in isolation in the light of the above mentioned studies. Moreover most of the researches have tried to establish a short run and long run relationship as well as linear and non-linear relationship between stock prices and oil prices and there is not enough evidence that considers oil price changes as a new information and its quick and immediate reflection in the stock price and also most of the previous researches have used international oil prices in their toil, whereas the domestic industries should be affected only if domestic oil prices are linked to the international market which is not the case in many of the world economies including Pakistan. This research addresses this issue; it considers the oil prices set by the Federal Government through the *Oil and Gas Regulatory Authority* (OGRA) in Pakistan. In the last three months of the year 2014, OGRA notified reductions in local oil prices as a consequence of international crude oil price reductions. Although these reductions are not same in magnitude as in the international oil market, but still they have been considered a positive sign by the commercial and domestic users. This study is divided into four parts; survey of the literature is done in the first step, methodology and variables secure second place, third step comprises of the interpretation of results and in the final step this paper is concluded with a conclusion.

II. SURVEY OF THE LITERATURE

There is a huge body of knowledge created over the years that targeted the relationship between oil prices and stocks. Most of the studies exhibit a negative relationship between oil prices and stock prices (Huang and Guo, 2008; Blanchard and Galí, 2007; Hamilton, 2011; Jones and Kaul, 1996). There is also an abundance of researches that prove a positive relationship between the stock price and oil price (Boyer and Filion, 2007; Scholtens and Wang, 2008) and the researchers also suggest that there is no or poor relationship between oil and stocks (Narayan and Sharma, 2011; Jammazi and Aloui, 2010; Apergis and Miller, 2009; Cong *et al.*, 2008; Huang *et al.*, 1996). If we categorize these relationships we will find certain distinct features which lead to the positive, negative or no relationship as listed below:

2.1 Demand and Supply Shocks

Previous literature reports that oil shocks are either demand driven or supply driven and these shocks do not have a similar impact on stock prices (Cashin, Mohaddes and Raissi, 2014). Kilian (2009) was the first to develop an understanding of this issue and was able to unscramble oil price shocks into precautionary demand, aggregate demand and oil supply shocks. First one originates due to the uncertainty about the future availability of oil and the second one is due to increased economic activity and production and the last one depends upon the supply of oil by oil producing countries. Relationship between stock prices and oil prices due to aggregate demand is found to be positive and it is found to be negative in case of precautionary demand and supply driven shocks as witnessed by Lippi and Nobili (2009), Kilian and Murphy (2010) and Abhyankar, Xu and Wang (2013). Peerson and Stevens (2010) further decomposed supply shocks into three subcategories, namely oil capacity, oil mark up and oil investment shocks. They argued that adverse mark up and investment shocks have negative effects on growth, whereas adversity in capacity shocks induces positivity in growth.

2.2 Aggregate Market and Individual Sectors:

We already established this argument that it is more meaningful to study the impact of oil prices on individual sectors rather than the whole market. An overall market index includes all the industries and individual behavior of each sector cannot be determined in doing so. Moreover, opposite patterns of different sectors will cancel out each other's impact in an aggregate index (Arouri, Foulquier and Fouqau, 2011). There are businesses which use oil as an input, sell oil as output and need oil for the functioning of their product and also businesses that have a combination of any of these. These businesses will have different effects on their stock prices with fluctuations in oil prices. Lis, Nebler and Retzman (2012), studied the impact of oil prices on the whole market and the stocks of car companies by using OLS and GARCH (1,1) in order to detect the linear relationship between these data series. They found that the market as a whole is more sensitive to oil price volatility as compared to car stocks. Their results showed sensitivity in German and US car stocks, but Japanese companies were insensitive to oil price changes. Alper and Torul (2008), argued that an increase in oil prices is a nightmare for few sub sectors in the manufacturing sector, whereas on the whole it do not have a significant effect on the manufacturing sector.Lee and Ni (2002), judged the impact of oil price on industries in the US and reported that industries like petroleum, which are directly dependent on oil bear oil shock as supply shocks whereas non-oil sectors absorb it as demand shocks. Rodriguez (2008), studied the impact of oil price shocks on manufacturing industries of six countries, namely France, Germany, Italy, Spain, UK and US. His aim was to capture the cross country and cross industry heterogeneity in industrial production due to oil price shocks. He found that this relationship showed diversity in France, Germany, Italy and Spain, but results for the US and the UK were similar.

2.3 Country Specific Effects:

Previous literature reports that impact of oil shocks on stock prices is country specific. Composition of the industrial base in all countries varies from region to region. Moreover, the impact of oil shocks on stocks also greatly varies in oil importing and oil exporting countries. The OECD nations like the US, the UK, Canada, France, Germany, Netherlands, Italy, and Japan have varied stock price behavior when exposed to oil price shocks (Jones and Leiby, 1996). Mork et al. (1994) said that these countries vary in their industrial base, sources of energy, government policies both at micro and macro levels. These countries also had variations in the structure of markets and institutions. Bohi (1989) also studied this relationship sector wise in Germany, Japan and the UK. Mehrara and Sarem (2009), found a significant asymmetric relationship between the oil prices and growth in Saudi Arabia and Iran, but no such relationship was detected in Indonesia both in the long and short run. Shaharudin, Samad and Bhat (2009), analyzed the relationship between oil prices, oil stocks, stock index, interest rates and industrial production for the data period of August 08, 2003 to August 08, 2008. They employed VAR (Vector auto regression), VECM (Vector Error Correction Model) and GARCH model to capture Short run and the long run relationship between these variables in UK, US and India. A significant co-integration was detected except for industrial production and oil stocks in the UK and US but it was significant in India.

2.4 Oil Prices as New Information:

A review of previous literature enables us to understand that previous authors have utilized their energies in understanding the effect of various economic and non-economic events on oil prices or tried to digest the effect of oil futures on either oil stocks or oil prices themselves. The reason is most of the studies have used oil prices as a time series and determined its linear or non-linear relationship on this assumption which is of course a use in true sense. There is not any noticeable research that may regard oil price adjustments as information or an event that may influence the stock prices on the date of announcement. This paper has addressed this novel issue to treat oil price announcements as an event and its effect on the stock prices of automobile and spare parts stocks.

III. DATA AND METHODOLOGY:

This study uses an event study methodology to check the impact of oil price reductions notified by government on the stock prices of automobile and spare parts industry which consists of 19 companies listed on Karachi Stock Exchange (KSE). The data are taken from the business recorder website for stock prices and the KSE 100 index data from the website of yahoo finance. A 189 days estimation period is used to estimate the expected return of each company included in the sample. A test period of 20 days before and after the event date is taken to capture any abnormal returns during this period and on the event date. Oil price reductions have been made three times during the last three months of the year 2014 hence, this process is repeated three times to put more rigor in our analysis. Event study has a built in error as there can be other events which may affect the returns. In order to cope with this issue smaller period is taken which is less than a year. We are dealing with three consecutive similar events month after month, but the economic magnitude may vary as oil price reductions differ in value.

Table I: Oil Price Reductions(Rupees & Percentage)

Sr#	Announcement Date	Reduction in Rs	Percentage Reduction
1	October 31st, 2014	8.16	8.53%
2	November 30th, 2014	4.34	4.96%
3	December 31st, 2014	11.26	13.54%

Source: *Authors' calculation (as per notified by OGRA).*

Estimation period of every next event will have the effect of previous event(s) to calculate expected returns in this study. To overcome this issue several non-parametric approaches are used in this study. We have used 'eventstudymatrics' software for the application of event study. Abnormal returns are captured by subtracting the expected returns from actual returns of the test period. Actual returns are calculated as under:

Rit = log (current price/previous price)

Expected return is calculated by using the capital asset pricing model (CAPM) which is most widely used as mentioned by MacKinley (1997) and it estimates returns for a stock on the basis of its systematic risk and market returns. The determination of a model is a basic assumption that leads to the assumed or expected returns and variation of these returns is regarded as abnormal returns.

$$(E)R = \alpha + \beta\,(Rmt) + \acute{\varepsilon}t \qquad (1)$$

Where, (E)R = Expected return on stock 'i'.

α = Estimated intercept.

β = Estimated Slope

Rmt = Return on market index, i.e., KSE100 Index.

$\acute{\varepsilon}$ = Error term

3.1 Abnormal Returns:

Abnormal returns are the variation of returns from those that are determined through CAPM regression. So, the actual returns of this industry are subtracted from the returns estimated to capture any abnormal change in return values.

$$\text{ARit} = Rit - (\alpha + \beta(Rmt) + \varepsilon t) \qquad (2)$$

This abnormal return for individual days before and after the event date accumulates over the event period to determine the cumulative abnormal return (CAR) which is given as below

$$\text{CAR(t1, t2)} = \sum_{t=t1}^{t2} ARit \qquad (3)$$

Like many researchers, including Goh and Ederington (1993), Liu, Fazal and Smith(1999), Li *et al.* (2006) and Han *et al.* (2009) t-test value is used to determine the significance of abnormal returns if its value is less than 1.96, it loses significance and has a significant value if greater than 1.96.

3.2 Non-Parametric and Parametric Approaches:

3.2.1 Corrado Rank Test:

Moreover, Corrado Rank Test (1989) which is a non-parametric test is employed. It relaxes the normality assumption and can produce more robust results. The excess returns for each security used in the market model are assigned their relative ranks both for estimation and the event window period as it assumes each day of event period and the estimation period as single time series. The basic equation (4) & (5) for the Corrado Rank test is as follows:

$$CT = \frac{\frac{1}{N}\sum_{i=1}^{N}(K_{i,0}-\bar{K})}{S_k} \quad (4)$$

Where,

$$S_k = \sqrt{\frac{1}{T}\sum_{t=T_o}^{T2}\left[\frac{1}{N}\sum_{i=1}^{N}(K_{i,0}-\bar{K_i})\right]^2} \quad (5)$$

3.2.2 Boehmer et al (1991):

Further, null hypothesis are not accepted on the basis of conventional t-test if slight advances are observed in case of event induced variations. It is true in case of average abnormal returns with values equal to zero. Therefore, following two equations (6) and (7) proposed by Boehmer et al (1991), are used to inhibit the event induced influences while calculating t-stats for AAR on day t and CAR for event window period T.

$$Z_{AR_t} = \frac{\bar{SAR}_t}{\sqrt{\frac{1}{n(n-1)}\sum_{i=1}^{n}\left[SAR_{it} - \sum_{i=1}^{n}\frac{SAR_{it}}{n}\right]^2}} \quad (6)$$

and

$$Z_{CAR_T} = \frac{\sqrt{\sum_{t=t1}^{t2} Z^2 AR_t}}{\sqrt{(t_2 - t_1 + 1)}} \quad (7)$$

3.2.3 Patell's Test:

Finally, Patell's (1976) test is used, it considers independence in cross sections. It is standardized abnormal return (SAR) approach that implies the standardization of abnormal returns during event period with the help of standard deviations in the anomalous returns of the estimation period. It controls the impact of large standard aberrations on such test. It also controls for event conscious change in the variance of abnormal returns. It is represented in equation (8) & (9) as under:

$$S_{AR_{i,t}} = \frac{AR_{i,t}}{\boldsymbol{\delta}_{AR_{i,t}}} \quad (8)$$

Whereas variance in abnormal returns is captured as

$$\boldsymbol{\delta}^2_{AR_{i,t}} = \frac{\sum_{k=T_1}^{T2}(AR_{i,k})^2}{D_i - 2}\left[1 + \frac{1}{D_i} + \frac{(R_{mt} - \bar{R}_m)^2}{\sum_{k=T_1}^{T2}(R_{mk} - \bar{R}_m)^2}\right] \quad (9)$$

In this setting, if $SAR_{i,t}$ does not trail the t distribution up to D_i-2 standards, the alternate hypothesis proved.

IV. RESULTS AND DISCUSSION

Following figure.1 presents a clearer view of CAAR behavior for the event periods denoted.

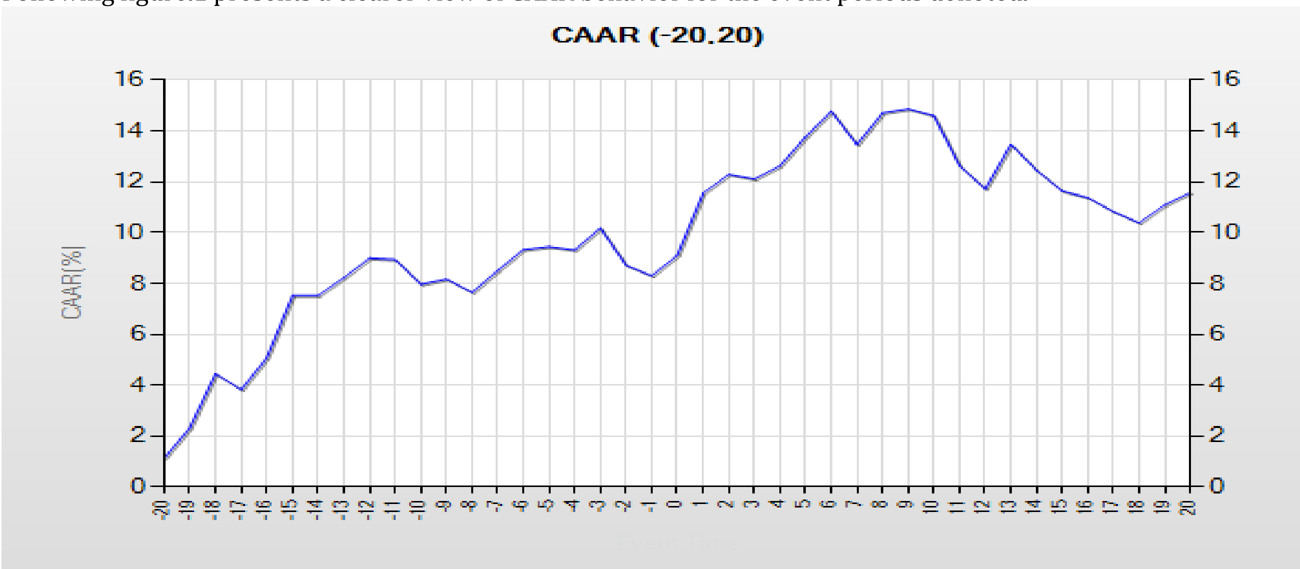

Figure 1: Graph of CAAR values (-20.20**)**

There is an increasing trend in CAAR values, but there is a slight reduction on days -2 and -1. It is a period of most uncertainty in Pakistan and mostly there occurs a petrol drought in the country, as almost all of the petrol pumps stop their sales in the country and people find it extremely difficult to get any fuel to roll their wheels. It can have some negative impact on stocks temporarily, but it needs to be empirically tested before making any final judgments. However, it is seen that stock prices blew strong and high on the date of announcement and implementation which continued onwards during the test period. It is a strong recommendation for the acceptance of Efficient Market Hypothesis as the prices of this sector proved highly sensitive to this sort of information and it is incorporated in the stock prices immediately.

Table II: Cummulative Abnormal Reurns in Time Series & Cross Sections

Date (1)	**CAAR (2)**	**pos : neg (3)**	**t-test time-series (4)**	**prob. (5)**	**t-test cross-sectional (6)**	**prob. (7)**
(-20...20)	0.1158	41:16	***4.2025	**0	***4.4652	**0
(-10...10)	0.0565	33:24	***2.8656	**0.0042	***2.3681	*0.0179
(-7...7)	0.058	37:20	***3.4827	**0.0005	***3.2875	**0.001
(-5...5)	0.0443	38:19	***3.1034	**0.0019	***3.0218	**0.0025
(-2...2)	0.0211	36:21	***2.1904	*0.0285	***2.4611	*0.0139
(0...0)	0.008	37:20	1.8662	0.062	***2.7838	**0.0054

Significant:** **p<0.01,*p<0.05 & t>+1.96 or t<-1.96*

The above table 2 reports positive CAAR values for all the event window periods.It is highest for (-20,20) period event window, i.e., 0.1158 with p value=0 in both time series and cross sections with t values equal to 4.20 and 4.46 respectively. The lowest CAAR value of 0.08 is obtained on the event date, but in a time series context, it is insignificant with a t-value of 1.86 and a p value of 0.062. However, in cross section context the level of significance is acceptable with a t-value of 2.78 and p-value of 0.005. All the CAAR values are statistically significant when evaluated in time series terms, except on the date of the event, but in cross sectional terms all the event windows, i.e, from (-20,20) to (0,0) there are significant positive values. Probability values are also statistically significant in all the scenarios except event date that too in a time series context, but the case is different when an investigation is made in cross sectional terms.The third column in this table represents positive and negative values for the nineteen companies for each of the three price reductions making a total count of 57. This ratio for all the event windows, including the event date shows a greater proportion of positive values as compared to the negative ones. There is a highest count of 41 positive values for (-20.20) day event window. Overall the proportion of positive values is almost two folds than the negative ones.

Table III: Results for Patell, Boehmer et al and Corrado Rank Tests

Date (1)	**patell z (2)**	**prob. (3)**	**Boehmer et al. (4)**	**prob. (5)**	**Corrado rank (6)**	**prob. (7)**
(-20...20)	5.907	**0	3.0732	**0.0021	2.0188	*0.0435
(-10...10)	4.1873	**0	1.7948	0.0727	1.5511	0.1209
(-7...7)	4.9784	**0	2.243	*0.0249	1.7368	0.0824
(-5...5)	4.2214	**0	2.1807	*0.0292	1.3238	0.1856
(-2...2)	3.0251	**0.0025	1.6385	0.1013	1.0988	0.2718
(0...0)	2.6675	**0.0076	1.7666	0.0773	1.381	0.1673

***Significant**: **p<0.01,*p<0.05*

In order to rectify the built in prediction errors in ordinary t-tests, parametric approaches like patell z and boehmer et al are used. The table-3 reports the results for said techniques. Five event windows with periods ranging from (-20…20) to (-2…2) are used and it also includes the results of two tests on event date. Results portray a positive response with higher values for maximum period event window, i.e. 5.907 and lowest but positive value on event date, i.e. 2.6675 under Patell z estimation techniques present in the column (2). Probabilities also prove significant values for all the event windows under consideration, i.e., p value less than 0.01 as denoted in column (3). The other parametric technique is also consistent with the evidence that there exists a significant positive relationship between stock prices and domestic oil price reductions as represented in column (4). However, probabilities for (-10…10), (-2…2) and (0…0) represented in column (5) are insignificant which is mainly due to the uncertainty and non-availability of oil products for prior two or three days of the event. The only non-parametric approach used is Corrado Rank test and it indicates a positive impact on the stock prices for all the event windows, but their magnitude is relatively lower and probability values are insignificant for all the event periods except the (-20…20) event period with a p value of 0.043 as shown in column (6) & (7).

V. CONCLUSION

This study focuses on the sensitivity of sectoral stocks to the domestic oil price changes in a context of informational efficiency. The Automobile and Spare parts sector logically appear to have any relationship with oil prices and this study have made an effort to investigate it empirically in circumstances of oil price reductions. It has another specialty that it has used domestic oil price reductions instead of international oil prices because it is irrelevant to check the impact of international prices if their effect did not trickle down to the local industries. It is found that stock prices of Automobile and Spare Parts sector show informational efficiency as they show an upward movement in prices on and after the days in which this information is made available to the public by the government authority i.e. OGRA. This study is very helpful for the investors who wish to make investment in this sector and for the policy makers as well whether at the organizational or legislative levels.

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