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Is Oil Prices Volatility Taking Toll: Sectoral Analysis of Pakistan Stock Exchange

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ABSTRACT: Oil is a crucial non-renewable power resource for a country, indicating its financial stability. Oil prices' stability, directly and indirectly, impacts inflation, economic conditions, and trade stability. The present study examines the relationship between oil price volatility and firm profitability. It also studied the effect of the fluctuation of oil prices on different sectors. The scope of the study includes all the non-financial sectors of Pakistan. The data was extracted from the Financial Statement Analysis of the State Bank of Pakistan (SBP) from 2015 to 2020. The fourteen (14) sectors selected for this research include 292 firms. The ordinary least squares method (OLS) was used to evaluate the oil price volatility-profitability relationship. The results indicate that oil volatility negatively and weakly affects the firm's profitability. In addition, it negatively impacts firm profitability in the textile, motor vehicles, trailers and auto parts, coke and refined petroleum products, and electrical machinery and apparatus sectors. However, a significant positive relationship exists in industries like chemicals, chemical products, pharmaceuticals, mineral products, fuel, and energy sectors. Overall, it is also found that oil price fluctuations significantly impact different sectors. The study has important implications for bankers and managers. Firm managers must reduce the negative consequences of oil price volatility and reconsider forming early warnings to improve organizational performance.

Keywords: Oil Price Volatility, Price Uncertainty, Firm Performance, Pakistan Stock Exchange (PSX), Sectoral Analysis.

INTRODUCTION:

Among all other commodities, oil has been more volatile in price (Regnier, 2007). It is usually considered the lifeblood of any economy; therefore, fluctuations in its price have asymmetrical but

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significant impacts on economies worldwide (Le, Le, and Le, 2021). Emerging countries like China find this favourable as prices fall and their outflows reduce. On the contrary, it brings unfavourable conditions for those who export oil, such as Saudi Arabia, as their inflow reduces and vice versa in times of high prices (Le, Le, and Le, 2021). Zhang & Qu (2015) also mentioned in their work that oil has high economic value worldwide as it is an essential source of elemental energy. Therefore, it is considered that oil prices have a significant impact on economic development and stability. Narayan & Narayan (2007) state that the more the oil price fluctuates, the more it brings uncertainty to both oil importer and oil exporter economies. In addition, the author adds that oil price volatility also contributes to unstable economic conditions, which lead to high inflation and recession. Furthermore, oil price fluctuation always impacts macroeconomic indicators adversely, for example, an increase in the cost of production and business operations (Rafiq, Salim, and Bloch, 2009).

Fluctuations in oil prices disturb the aggregate supply and demand of an economy. Iwayemi & Fowowe (2011) highlight that when oil prices increase, production costs automatically increase, which is why productivity and overall output decrease and supply falls. On the contrary, demand also falls because high oil prices lead to a rise in inflation and a reduction in real income available for consumption. Oil price volatility creates uncertainty for every energy input, which affects corporate investment decisions. Oil price fluctuations increase the option value of waiting to make efficient investment decisions, such as launching a new product, entering a new market, and introducing new technologies; as investment reduces, it reduces the firm's returns on these investments (Alaali, 2020). The cost of the oil differs for each company. In these circumstances, firms are exposed to high risks, negatively influencing their cost productivity and future investment decisions. As a result, inefficient firms' performance and declining profits can be witnessed (Alaali, 2020). Understanding the dynamics of increasing prices is crucial to understanding the firm's development pattern and potential uncertainties.

Bagirov & Mateus (2019) highlight that many scholarly articles study the impact of oil price volatility concerning economic growth and economic factors. However, there is a limited amount of research conducted on the effects of oil price volatility on corporate performance. Furthermore, another area that seemingly remains untapped by the literature is how oil price changes affect different sectors. Due to differences in nature and characteristics, fluctuating prices might negatively impact other sectors. The decisions followed by various corporations are a different matter of discussion, including policies and multiple investments.

This research has used data from several businesses across diverse sectors or industries to investigate the influence of oil price volatility on a firm's performance and whether different sectors observe the impacts of oil price volatility differently or not. The heightened oil prices have a significant impact on several stakeholders, including corporate managers, investors, and policymakers, leading to adverse outcomes. Data from Pakistan's non-financial sector from 2015 to 2020 has been taken for analysis. This sample provides a distinct data set for this study for multiple reasons. Firstly, Pakistan is a developing oil importer that observes severe fluctuations. Secondly, Pakistan produces electricity using oil as the primary source of raw material, and Pakistan's manufacturing or industrial sector hugely depends on the electricity supply (Zameer and

Wang, 2018). Additionally, there are almost 34 industrial units in Pakistan; thus, it provides robust sample data with many observations (Bugshan, Bakry, and Li, 2021).

According to the hypothesis designed by Bugshan et al. (2021), which was established considering the data from oil firms and their markets, the volatility of oil prices in a firm is the cause of upsetting and distressing performance in the firm. It further impacts many organizations and companies that are somehow associated with oil firms. Many pieces of evidence depict that the effects are lopsided and off-centre on overall performance, including profitability and production. There are many countries around the world where the jewels of reserved crude oil are present. Their economic stability and gross domestic product (GDP) heavily rely on oil prices. They make most of their revenues through oil production. The steadiness and firmness in the oil market are highly dependent, and their significance cannot be overlooked as they can positively influence a firm's prudence and desirability.

To examine the hypothesis, this research used several control variables to assess the association between oil prices and the overall performance of the organization. The measurement of oil price volatility is determined by calculating the standard deviation of oil costs. Operating measures like net income, market capitalization, firm size, growth, and leverage were considered. A few diagnostic tests of the data were also applied to ensure the rigor of the model. Results show mixed effects, i.e., positive, adverse, and no impact.

This paper holds great importance as it will help develop a thoughtful insight into the relationship between the volatility of oil prices and the relative firm's performance. It primarily includes the effects on non-financial companies or firms. Market capitalization is also considered, which will help the regulators find out the needs and apply economic diversity by supporting those associated with non-oil sectors. This will help improve the firm's performance and the volatility of oil prices by detecting, noticing, and identifying the true sense of economic doings and happenings.

Furthermore, bankers and regulators will get help regarding the solvency and receivership of the products and instruments that involve interests. The firm's managers need to ensure the consistency and regulation of price volatility so that the adverse outcomes of the increased oil price can be limited. An effective managerial system is a requirement for every organization to improve its performance. A few restrictions also help to run the system smoothly. Different industries may have other economic impacts on oil prices (Bugshan, Bakry, and Li, 2021).

This paper proceeds as follows: section 2, literature review, and development of the hypothesis. Section 3 unfolds the data and empirical methods. Section 4 describes the findings and results, followed by the conclusion of this study.

LITERATURE REVIEW:

The research has a dual objective, which is reflected in the division of the literature into two distinct categories. One study examines the correlation between the profitability of enterprises and the volatility of oil prices, while the other provides insights into the varying reactions of various industries to fluctuations in oil prices.

Oil price volatility and the firm's performance:

Oil prices have always been a determining factor in the economy and wealth of a state (Kiani, 1996). Economic conditions, trade stability, and inflation are major factors that suffer because of oil price volatility (Yasmeen *et al.*, 2019). Oil price fluctuations almost always affect trade and firms positively and negatively due to their impact on the prices of products made from petroleum resources, directly or indirectly (Akinsola and Odhiambo, 2020). The effect depends on various factors, like whether the country is dependent on oil through imports or is self-sufficient, like the GCC countries, or the general economic condition of the country. In addition, Al-sasi et al. (2017a) highlight that the increment in oil costs in countries that are not self-sufficient in petroleum is far more adverse due to its impact on the national budget, financial status, and foreign investment. It affects both consumers and producers. The author adds that in recent years, significant shifts in oil prices have been seen worldwide due to various international events, especially the COVID-19 pandemic, which rotted the world's economy due to low oil demand during that period. Pakistan is a developing country with an unstable economy. It depends on GCC countries and oil-producing nations for oil and petroleum. Almost every sector, from micro to macro level, runs on oil, making it the 35th largest oil importer.

Many researchers investigated the uncertainty of oil prices concerning the global economy. The economy of any country, mainly oil-importing countries, is sensitive to changes in oil prices. If a surge in oil prices benefits oil exporters, it must be detrimental to oil importers and vice versa (Akhmad *et al.*, 2019). The data comprised seven industrialized countries, three Middle Eastern OPEC countries, and three Asian countries throughout different periods. The method used for analysis was the Granger causality test. The results suggest that although the relationship between the two variables is not entirely clear, doubtful oil prices hurt the global world economy. Oil price surge makes oil importing countries economically unstable. However, the G-7 group of countries performs adequately when oil prices are unstable due to implications and regulations by the governments of these countries.

Rahman et al. (2019) studied and investigated oil price volatility and its impact on firms. Using the data from the Pakistan Stock Exchange, the Energy Information and Administration (EIA) website, and the companies' liability and asset sheet analysis from 2012 to 2017, based on the study results, an increase in the price of oil negatively impacts the profitability of enterprises. Hence based on the studies, the following can be hypothesized:

H1: Oil price volatility has a negative relationship with firm profitability.

Oil Price volatility and its impact on different sectors:

The Pakistani economy runs heavily on the oil imported from Gulf countries, which increases the volatility of oil prices and is suspected of surging even more. Since Pakistan is a developing country, it barely manages to operate things, usually under the increment in oil prices, leading to the high cost of production, reduction in the national budget, poverty alleviation, and overall, an economic downfall. Yasmeen et al. (2019) determined the uncertainty of oil prices and its consequences on multiple economic zones of Pakistan, like manufacturing, transportation,

livestock, and electricity, in a short and long period. This research used the dataset of almost four decades - from 1976 to 2017 and acknowledged the sectors' vulnerability to oil price shocks. It suggests a policy framework to address oil price volatility. The model employed for this study was regular linear regression models under autoregressive distributed lag (ARDL). Initially, the study involved ADF and PP unit root tests to check the stationarity of data being utilized to evaluate the effects of oil price shocks on the real growth of sectors. The outcomes revealed that three of these four sectors, i.e., electricity, livestock, and manufacturing, face adverse effects if the prices of oil fluctuate; Nevertheless, it has been shown that fluctuations in oil prices have a positive influence on the transportation and communication sector. Since a direct oil input and high electricity usage are required to run the manufacturing industry, it is more susceptible to oil price shocks. An amplifying factor in the vulnerability of the manufacturing industry to oil price variation is the high electricity input which also faces negative impacts from oil price volatility. The energy sector, or electricity, is highly vulnerable to oil price shocks because of its demand. Electricity is used in each part of the country; it is essential for running the country. Oil price fluctuations cause significant power shortages, one of Pakistan's running issues.

Oil prices and Macroeconomic factors of any country are closely related. However, oil price volatility is different for different countries because a country with a better economy and monetary policy can cope with adverse impacts more quickly than a developing, already struggling country. Furthermore, its effect varies significantly in oil importers and self-sufficient countries (Liu *et al.*, 2022).

Waheed et al. (2018) examine alteration in oil prices obtained from a dataset of more than a decade, from 1998 to 2014, on stock returns at an industrial level. The study analyses how endurable oil prices impact firms differently and inspects the positive and negative effects on stock returns. The study used the yearly panel data of all 397 commercial enterprises from 1998 to 2014; financial firms were not included due to non-oil dependence. It was found that the surge in the cost of oil increases equity returns at firms in Pakistan. A positive shift in oil prices can be due to a higher need and demand for petroleum by different industrial sectors to carry out production promptly. This positively impacts the stock market, attracting investors' interest to buy and sell such assets. It also positively impacts the stock market.

On the contrary, the Pakistani government does not profit from it at an industrial level when the oil prices are lowered. Consequently, the transportation cost, the price of raw goods, and production fares remain the same (Akhmad *et al.*, 2019). Therefore, a reduction in oil prices can either positively or adversely affect the firms and the stock returns sector in Pakistan.

Siddiqui & Nabeel (2013) also suggested that the variation in the prices of stocks can be caused by a company's macroeconomic factors, which depend on GDP, inflation, stock exchange, and, eventually, oil prices. Oil price fluctuations significantly affect a country's development. However, it depends on the country's economic status; for instance, an increment in the cost of petroleum strengthens the currency of oil-exporting countries but weakens the value of money in oil-importing countries (Akhmad *et al.*, 2019).

In 2002, global oil prices started to decline, but those of Pakistan still rose. The data analysis showed a dismissive effect of increasing oil prices on GDP and, eventually, the country's economy. Fluctuations in oil prices were also found to be damaging for different industrial sectors of Pakistan, especially the energy and transportation sectors, increasing the country's inflation rate and unfavourable economic status. Malik (2007) explained the challenges faced by Pakistan when oil prices fluctuate, the damage it poses, and the different industrial sectors it affects. An extensive study of Pakistan's energy sector and oil prices is presented. About 32 percent of oil is consumed in the power industry and makes electricity and energy.

Further insight is provided on how oil is priced and capped in Pakistan, along with the percentage of the tax imposed and the imported cost. The outcomes suggested that the economy of Pakistan and different industrial zones face uncertain conditions when oil prices are vulnerable. To make Pakistan less sensitive to oil price shocks, formulate energy-efficient policies and try to make the country self-sufficient in energy.

AHMED & Mohammad (2022) investigated damage imposed by the uncertainty of oil prices and the power sector and stock returns of Pakistan before and amidst COVID-19. They analysed a dataset from 2011 to 2021. The studies showed an obstructive impact of unreliable oil prices on Pakistan's economy, energy firms, and stock returns. The COVID-19 pandemic further amplified this effect since industries went through severe demand- and supply-side shocks.

Tock & Psx's (2021) results illustrated the distinct effects of all the traditional factors and the oil price volatility. This study examined the effects of oil prices on the returns and volatility of publicly traded companies in Pakistan by using the GARCH model. Furthermore, an examination of the correlation between the various sectors within the Pakistan Stock Exchange (PSX) has been conducted, specifically focusing on the categorization of these sectors into oil producers, consumers, and replacements. The time frame for this investigation spans from January 2015 to December 2019. The number of firms found significant was highest among oil substitutes, followed by oil producers and users.

The main focus of the abovementioned literature is that oil is an essential commodity in any country (Al-Sasi, Taylan, and Demirbas, 2017). It is the determinant of how well-established the economy of the country is. The mentioned studies and research papers have investigated oil price volatility to firm profitability, firm-level stocks, and different industrial sectors of Pakistan (Waheed *et al.*, 2018). Pakistan is an oil importer and a developing country with a barely stable economy. Like all other nations, it needs oil to run different industries, produce electricity and thermal power, and power the whole country. Thus, all the studies on this topic converge to the common point that on a global scale, when the price of oil fluctuates, it negatively impacts a country's economy; however, in some sectors, the impact can be positive (like transport and communication industry).

Based on the literature, this study hypothesized the following:

H2: Oil price fluctuations pose different significant impacts over different sectors.

DATA AND METHODOLOGY:

Sample Construction

As a developing oil-importer country, Pakistan provides a relevant data set for this study. The data is extracted from the Financial Statement Analysis of the State Bank of Pakistan (SBP) from 2015 to 2020. We incorporate non-financial firms from all sectors of Pakistan. Only Pakistan Stock Exchange (PSX) listed firms are included in the data set. We excluded financial firms for two reasons: firstly, because financial firms are primarily not dependent on oil, and secondly, to make our study comparable to previous ones. In this study, we aim to do sector analysis which is why we incorporated all fourteen (14) sectors having 410 firms. However, sixty-three (63) firms were later excluded as they were categorized as defaulters. An additional fifty-five (55) firms were dropped due to data unavailability or inaccuracy, making a final sample of 292 firms. A list of sectors, along with the number of firms in each sector, is shown in Table I.

TABLE I: Sector-Wise Number Of Firms Used In The Sample

SECTOR	SYMBOL	No. of firms included in the sample
Textile	TEX	83
Sugar	SUG	23
Food	FOOD	13
Chemicals, Chemical Products, and Pharmaceuticals	CC&P	39
Manufacturing	MAN	29
Mineral Products	MP	9
Cement	CEM	15
Motor Vehicles, Trailers & Auto parts	MTA	17
Fuel and Energy Sector	FES	19
Information and Communication Services	ICS	14
Coke and Refined Petroleum Products	CRPP	10
Paper, Paperboard, and Products	PP&P	7
Electrical Machinery and Apparatus	EM&A	6
Other Services Activities	OSA	8

Note: This table shows the names of sectors along with their symbols and the number of firms used in this study.

Variables:

Return on Assets (ROA) is considered a measure of profitability, hence taken as a dependent variable. To evaluate the hypotheses, the independent variable chosen is the annualized volatility of Oil prices (VOL). This variable is determined by computing the standard deviation of the daily oil price. Following the model used by (Bugshan, Bakry, and Li, 2021), a few firm-level and country-level control variables are also taken into the model. Firm-level controls include the size of the Firm (SIZE), Leverage Ratio (LEV), Firm's Capital expenditure (CAPEX), Market Share captured (MSHARE), firm's growth (GROWTH), firm's efficiency (ATURN), and tangibility of the Firm (PPE). Dummy variables for each sector have been used to do the sectorial analysis. The summary of variables used in the research is shown in Table II.

Table 2: Summary of Variables

Variables	Symbols	Description
Profitability	ROA	Return on asset is used to assess the firm's profitability, calculated by dividing net income by total assets.
Oil volatility	VOL	The standard deviation of daily crude oil price is taken to calculate the annualized volatility in oil prices.
Firm Size	SIZE	Firm size is measured by taking a natural log of total assets.
Firm Leverage	LEV	Leverage of the Firm is measured by dividing total liabilities by total assets
Capital Expenditure	CAPEX	It is measured by dividing capital expenditure by total asset
Market Share	MSHARE	The firm's market share is calculated by taking the firm's revenue relative to the industry revenue
Firm's Growth	GROWTH	The firm's revenue annual growth is taken to gauge the firm.'
Firm's efficiency	ATURN	It is measured by asset turnover. Sales to total assets are calculated to get the firm's asset turnover.
The tangibility of the firm	PPE	Tangibility of the Firm is measured by dividing property plant and equipment by total assets
Macroeconomic Conditions	RGDP	The real gross domestic product assesses the country's growth. The annual growth of Pakistan's GDP is taken for this research.
Sectors	SECT	A dummy variable of each sector is used. For example, the variable for the Textile sector (TEX) equals one for the firms from the textile sector and zero for other sector firms, and so on. The list of sectors along with their symbols is shown in Table I.
Note: This table shows the symbol and description of all the variables used in this study		

Model:

Following the earlier research, the static panel model is applied to check the hypothesis. Results are obtained using EViews 9.0, while Microsoft 365 Excel is also used for data sorting.

The results of equation (1) help understand the effect of oil price volatility on the profitability of KSE- all shares firms. The following model is used to check hypothesis 1 (H1). Return of assets ($ROAi_t$) is the focus variable, depending on the oil volatility (Volit), while other variables in the equation control the model.

$$ROA_{it}=\beta_0 + \beta_1 Vol_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CAPEX_{it} + \beta_5 MSHARE_{it} + \beta_6 GROWTH_{it} + \beta_7 ATURN_{it} + \beta_8 PPE_{it} + \mu_{it} \quad \text{Equation (1)}$$

Hypothesis 2 (H2) attempts to check how oil volatility will affect the firms in different sectors differently. To assess the effect of oil volatility on each sector, we have run equation (2) for each industry independently. For this purpose, a dummy variable for the industry (SECTOR) has been incorporated into the model. Hence, for this study, we have run the same model 14 times, each time for one particular sector.

$$ROA_{it}=\beta_0 + \beta_1 Vol_{it} * SECTOR + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CAPEX_{it} + \beta_5 MSHARE_{it} + \beta_6 GROWTH_{it} + \beta_7 ATURN_{it} + \beta_8 PPE_{it} + \mu_{it} \quad \text{Equation (2)}$$

RESULTS AND DISCUSSION

Univariate Analysis:

The summary statistics of all the variables used in the study are shown in Table III. The descriptive statistics include Mean, median, standard deviation, and minimum and maximum values. The mean (median) of ROA is 0.033 (0.03), whereas the minimum ROA in the whole sample was negative -1.91, and the standard deviation shows that returns of the entire sample fluctuate or deviate 0.13. From 2015 to 2020, the mean (median) oil price volatility was 10.02(7.88), while the minimum and maximum range in which oil price volatile was 3.56 to 19.52.

The minimum firm size was 9.56, and the maximum firm size was 20.57 making a standard deviation of 1.73, whereas the average (median) size of all firms was 15.69(15.66). The research sample has the highest leverage ratio of 4 while the lowest leverage ratio was 0.1, adding further mean (median) leverage ratio of the whole sample was 0.54 (0.52) with a standard deviation of 0.29.

The whole sample has an average of 0.46 plant, properties, and equipment, ranging from 0 to 7.19, where the minimum of 0 tells that some firms don't have any Property Plant and equipment on their books. Moreover, the average (median) money spent on capital expenditure was 0.07 (0.04), among which the maximum Capex was 6.48 while the minimum was negative -2.34. The standard deviation of Property Plant & Equipment and Capex was 0.27 and 0.23, respectively.

The average (median) growth of sales revenue was 27.87 (0.08), and the firms' efficiency in generating sales revenue (ATURN) on average was 1.01 (0.9). The minimum growth was -1.00, and the minimum asset turnover was 0, indicating that the firm's assets are inefficient enough to generate sales revenue. On the other hand, the maximum growth and asset turnover were seen at 27,758.41 and 5.74, respectively.

Table 3: Summary Statistics of KSE – All shares Firms

Name	Mean	Median	Standard Deviation	Minimum	Maximum
ROA	0.033	0.03	0.13	-1.91	0.76
VOL	10.02	7.88	5.43	3.56	19.52
SIZE	15.69	15.66	1.73	9.56	20.57
LEV	0.54	0.52	0.29	0.01	4
CAPEX	0.07	0.05	0.23	-2.34	6.49
MSHARE	0.05	0.016	0.011	0.00	0.06
ATURN	1.01	0.9	0.64	0	5.74
PPE	0.46	0.46	0.27	0	7.19
GROWTH	27.67	0.08	752.24	-1	27,758.41

Note: This table shows the summary statistics of all the data used in the regression model.

We checked the correlation among independent variables to check the multicollinearity issue. The correlation matrix in Table IV shows that only oil price volatility and leverage negatively correlate with ROA, i.e., the firm's profitability. At the same time, the rest of the variables are positively related. Furthermore, variables have very low to no correlation among them. Hence no multicollinearity issue is present, and further multivariate analysis can be done.

Table 4: Correlation Matrix

	ROA	VOL	SIZE	LEV	CAPEX	MSHARE	GROWTH	ATURN	PPE
ROA	1.000								
VOL	-0.023	1.000							
SIZE	0.232	-0.011	1.000						
LEV	-0.402	0.004	0.064	1.000					
CAPEX	0.027	0.006	0.470	0.082	1.000				
MSHARE	0.086	0.001	0.475	0.073	0.311	1.000			
GROWTH	0.049	0.003	0.480	0.123	0.381	0.405	1.000		
ASTURN	0.248	0.026	-0.030	0.023	-0.120	0.047	0.213	1.000	
PPE	0.008	-0.002	0.573	0.148	0.826	0.352	0.461	-0.167	1.000

Note: This table shows the correlation among the variables considered for the study.

Multivariate Analysis

Table 5 and 6 shows the findings of the multivariate analysis. First, we took the whole sample and ran the model using equation (1). Secondly, to assess our hypothesis 2, we incorporated dummy variables of each sector, each at a time. These dummy variable helps to differentiate between firms of all 14 sectors. For example, the Textile industry (TEX) dummy variable equals one if a firm is from the textile sector and zero if a firm is from another industry. An interaction term was created by multiplying each sector dummy variable by oil volatility (VOL*SECTOR). This interaction variable is the key variable of interest in the model.

The regression result of the whole sample is depicted in Table 5, which shows that oil volatility is negatively weakly significant to the firm profitability, i.e., with ROA. Our results align with a few earlier pieces of research, which found a meaningful negative relationship between oil prices and profitability in developing countries (Akinsola & Odhiambo, 2020b; Waheed et al., 2018).

Table 5: Regression Results of all sectors of the Pakistan Stock Exchange (PSX)

Variable	Coefficient	p-Values.
VOL	-0.001 *	0.090
SIZE	0.022***	0.000
LEV	-0.163***	0.000
CAPEX	0.102***	0.000
MSHARE	-0.006	0.810
GROWTH	0.000***	0.000
ATURN	0.050***	0.000
PPE	-0.080***	0.000

Note: This table shows the results of the OLS model run to know the impact of oil price volatility on the Pakistan Stock Exchange (PSX) from 2015 to 2020. *, **,* shows the level of significance at 10%,5% and 1% respectively.**

In the context of this study, the control variable of business size was assessed by logarithmically transforming the total assets, and the resulting coefficient demonstrates a statistically significant and positive association with return on assets (ROA). This indicates that when a company's size increases, it will positively impact profitability; hence firms will see an increase in profitability. The findings are consistent with previous literature (Bugshan et al., 2021). The leverage was calculated as a total liability to total asset, and the result of the model reveals that when a firm incorporates debt in their business, they face a decrease in their profitability. Therefore, leverage has a significant negative relationship with ROA, and the same findings have been observed by previous studies that used the same measure of leverage (Habibniya *et al.*, 2022). Capital expenditure measured as total capital expenditure by total assets has a significant positive relationship with firm ROA. This indicates that when a firm increases its capital intensity, its profitability decreases. When a firm increases its level of capital expenditure, it automatically increases its profitability. The findings are aligned with the literature of (Bugshan et al., 2021), whose sample consists of firms from GCC countries. In Pakistani firms, we saw the same result. The firm's annual growth and asset turnover share a significant positive relationship with ROA Rahman et al. (2019) observe the same effect. The market share has a weak meaningful but

negative relationship with ROA, and the finding is inconsistent with previous literature. Plant property and equipment tell capital intensity in the firm, and the result shows that it shares a significant negative relationship with ROA. Finally, the annual growth of the country's gross domestic product (GDP growth) has a positive, meaningful relationship, but the significance is weak.

The sector-wise analysis of equation (2) is shown in Table 6. Investigating each sector independently reveals that oil volatility negatively affects firm profitability in Textile, Motor Vehicles, Trailers and auto parts, Coke and Refined Petroleum Products, and Electrical Machinery and Apparatus sectors. This means when oil prices increase, the firms of these mentioned sectors face a decrease in their profitability and vice versa. Among all seven sectors, i.e., Sugar, Food, Manufacturing, Cement, Information and Communication Services, Paper, Paperboard and Products, and Other Services Activities, p-values show an insignificant relationship between oil volatility and firm profitability. Whether the price of oil increases or decreases, firms in these seven sectors face no impact on their profitability. Rest sectors, i.e., Chemicals, Chemical Products and Pharmaceuticals, and Mineral Products, the p-value shows a significant positive relationship between oil volatility and firm profitability. Firms in these sectors will see an increase in their profitability with an increase in oil prices and vice versa. At the same time, Fuel and Energy Sector P-values show a weak positive significant relationship between oil volatility and profitability. Consistent with the findings of (Rahman et al., 2019; Waheed et al., 2018; Yasmeen et al., 2019) Difference in the result is seen due to differences in the characteristics and nature of Sectors.

Table 6: Sector-wise analysis of the effect of oil price volatility

	TEXTILE		**SUGAR**		**FOOD**	
Variable	**Coefficient**	**P value**	**Coefficient**	**P value**	Coefficient	P value
VOL*SECTOR	-0.001*	0.007	0.001	0.448	0.001	0.365
SIZE	0.022***	0.000	0.022***	0.000	0.022***	0.000
LEV	-0.162***	0.000	-0.163***	0.000	-0.163***	0.000
CAPEX	0.100***	0.000	0.102***	0.000	0.102***	0.000
MSHARE	-0.007	0.800	-0.006	0.816	-0.007	0.784
GROWTH	0.000***	0.000	0.000***	0.000	0.000***	0.000
ASTURN	0.051***	0.000	0.050***	0.000	0.050***	0.000
PPE	-0.075***	0.000	-0.081***	0.000	-0.080***	0.000
CHEMICALS, CHEMICAL PRODUCTS, AND PHARMACEUTICALS			**MANUFACTURING**		**MINERAL PRODUCTS**	
Variable	Coefficient	P value	Coefficient	P value	Coefficient	P value
VOL*SECTOR	0.001**	0.021	0.000	0.740	0.003**	0.039
SIZE	0.022***	0.000	0.022***	0.000	0.023***	0.000
LEV	-0.162***	0.000	-0.163***	0.000	-0.164***	0.000
CAPEX	0.100***	0.000	0.102***	0.000	0.102***	0.000
MSHARE	-0.001	0.962	-0.006	0.813	-0.014	0.595
GROWTH	0.000***	0.000	0.000***	0.000	0.000***	0.000
ASTURN	0.050***	0.000	0.050***	0.000	0.051***	0.000
PPE	-0.078***	0.000	-0.080***	0.000	-0.081***	0.000

CEMENT			MOTOR VEHICLES, TRAILERS & AUTO PARTS		FUEL AND ENERGY SECTOR	
Variable	Coefficient	P value	Coefficient	P value	Coefficient	P value
VOL*SECTOR	0.002	0.105	-0.002**	0.025	0.002*	0.060
SIZE	0.022***	0.000	0.022***	0.000	0.022***	0.000
LEV	-0.162***	0.000	-0.164***	0.000	-0.162***	0.000
CAPEX	0.102***	0.000	0.104***	0.000	0.104***	0.000
MSHARE	-0.005	0.861	-0.006	0.820	0.000	0.990
GROWTH	0.000***	0.000	0.000***	0.000	0.000***	0.000
ASTURN	0.051***	0.000	0.052***	0.000	0.052***	0.000
PPE	-0.083***	0.000	-0.084***	0.000	-0.080***	0.000
INFORMATION AND COMMUNICATION SERVICES			**COKE AND REFINED PETROLEUM PRODUCTS**		**PAPER, PAPERBOARD, AND PRODUCTS**	
Variable	Coefficient	P value	Coefficient	P value	Coefficient	P value
VOL*SECTOR	0.001	0.316	-0.006***	0.000	0.000	0.817
SIZE	0.022***	0.000	0.023***	0.000	0.022***	0.000
LEV	-0.164***	0.000	-0.163***	0.000	-0.163***	0.000
CAPEX	0.102***	0.000	0.101***	0.000	0.102***	0.000
MSHARE	-0.007	0.795	-0.025	0.343	-0.007	0.786
GROWTH	0.000***	0.000	0.000***	0.001	0.000***	0.000
ASTURN	0.051***	0.000	0.055***	0.000	0.051***	0.000
PPE	-0.079***	0.000	-0.079***	0.000	-0.080***	0.000
ELECTRICAL MACHINERY AND APPARATUS			**OTHER SERVICES ACTIVITIES**			
Variable	Coefficient	P value	Coefficient	P value		
VOL*SECTOR	-0.003**	0.027	-0.001	0.505		
SIZE	0.022***	0.000	0.022***	0.000		
LEV	-0.162***	0.000	-0.163***	0.000		
CAPEX	0.105***	0.000	0.102***	0.000		
MSHARE	0.004	0.878	-0.004	0.876		
GROWTH	0.000***	0.000	0.000***	0.000		
ASTURN	0.050***	0.000	0.050***	0.000		
PPE	-0.083***	0.000	-0.081***	0.000		

Note: This table shows the results of the OLS model run to know the impact of oil price volatility on different sectors of the Pakistan Stock Exchange (PSX) from 2015 to 2020. *, **,* shows the level of significance at 10%,5% and 1% respectively.**

CONCLUSION:

Oil has great importance and is usually considered any economy's lifeblood. Therefore, oil price volatility brings asymmetrical but significant impacts on economies worldwide. While prior studies extensively examined price volatility's effects on corporate decisions, few studies examined oil price volatility's impacts on non-financial firms' profitability. This study tests the relationship between oil price volatility and firm performance. Further, concerning the sectoral

analysis, we investigate how oil price volatility impacts each sector differently, as each industry has its nature and characteristics.

We used the sample data of 14 sectors containing 292 listed firms from the Pakistan Stock Exchange between 2015 and 2020. We applied descriptive statistics and the OLS regression method, which shows a weakly significant but negative relationship between oil volatility and ROA. Further, it indicates that TEX, MTA CRPP, and EMA firms have a meaningful negative relationship between their profitability and oil price volatility. On the contrary, CCP, MP, and FES firms have a significant positive relationship. The remaining seven sectors reveal an insignificant relationship. The work of (Tock and Psx, 2021) supports asymmetric effects among all industries. This helps our hypothesis that oil price volatility impacts different sectors, as their findings differ between companies from various sectors. Both positive and negative impacts were observed. An increase in oil prices will increase the stock prices of 87% of the companies in the oil alternative sector. 75% of the oil-producing firms reported the same pattern. The third and final category, which includes oil consumers, saw significant results from 62% of the enterprises, which were all positive. Additionally, (Yasmeen *et al.*, 2019) highlights that heterogeneous characteristics among sectors, and oil price impacts differently on each industry differently, as their findings support it and reveal that Changes in oil prices hurt three of the four selected economic sectors both in the long run and the short term. The manufacturing, livestock, and electrical industries are these three. However, when it comes to the transportation and communication sectors, increases in oil prices have a positive effect. The reasons behind this surprising correlation can be because of several complex relationships between different variables like model shift, supply chain propagation, etc (Cline, 2002).

This study has implications for several groups of people. Firstly, it will provide valuable insight to the policymakers to assess which sectors may need support or subsidization during higher oil price volatility. Secondly, through this research firm's manager will better understand the relationship between oil price volatility and firm profitability. The managers of more sensitive industries can ensure the consistency and regulation of price volatility so that they can limit the adverse outcomes of the increased oil price in the firms and efficiently make strategies to reduce the hazardous consequences of volatility over profitability. Moreover, stock market investors may also be conscious of industry-specific risks during oil price instability. Additionally, for financial institutions, the findings posited by the research will help them make better analyses and make decisions about financing.

This research also holds limitations. The study incorporates the period from 2015 to 2020, which is comparatively less volatile than the current period. More research can be carried out by increasing the period. Furthermore, this paper only includes data from a single market, as this study has considered only PSX firms. Future research can analyze country-based data from different developing countries. Analysis for this research is done through using OLS, future research may use some other sophisticated methodologies. Further research can also be carried out to explore

the reasons behind the industry wise reasons behind the disparities in relationship between oil price volatility and profitability

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