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IMPACT OF EXCHANGE RATE, OIL PRICES, AND STOCK MARKET: EVIDENCE FROM PAKISTAN STOCK EXCHANGE (TIME SERIES DATA ANALYSIS)

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ABSTRACT

This article analyzes the correlation between oil prices, the exchange rate, and returns on the KSE 100 index over a short period. This article takes a time series approach, looking at the exchange rate, oil prices, and KSE 100 index of the Pakistan stock market daily from the first month of 2010 through the last month of 2018. This study performed a statistical analysis by using a VAR model, a cointegration test, and the ADF test. The exchange rate of the rupee to the dollar has a negligible correlation with the KSE 100 index. In contrast, oil prices correlate highly with stock market returns and have a short-term positive influence on the index.

KEYWORDS: Cointegration test, VAR model, Oil Price, US Exchange Rate, KSE 100 index

1. INTRODUCTION

Habibullah and Baharumshah (1996) examined the long-term relationship between stock prices, money supply, and actual returns while excluding the influence of exchange rate effects. Ibrahim (2000) examines the relationship between stock prices, currency exchange rates, money supply, and government reserves. However, the variables related to the commodity market are excluded. Ibrahim (1999) comprehensively analyzes various macroeconomic factors, explicitly emphasizing the relationships between stock prices and selected macroeconomic variables.

Several factors influence a corporation's market value and stock prices, with currency exchange rate movements being particularly significant. Despite the considerable attention devoted to the topic, a consensus has yet to be reached regarding the relationship between the exchange rate and the stock market. Based on financial theory, it is posited that currency and interest rates can influence the value of a company. Monetary policy and exchange rate fluctuation positive impact on market efficiency (Jamil, 2022a, 2022b).

Fluctuations in exchange rates may impact the share price of a business. Foreign direct investment (FDI) plays a pivotal role in the stock market of Pakistan, and its dynamics can be significantly affected by fluctuations in the exchange rate, whether it is a depreciation or appreciation. Likewise, variations in stock prices have an impact on currency exchange rates. The rise in asset values prompts local investors to augment their investments in the domestic market, resulting in an increased demand for the local currency and potentially leading to the sale of international assets. The escalation in demand for the domestic currency will result in a rise in interest rates, enticing foreign investors and augmenting profits. According to the Portfolio Balancing Method, the local currency's exchange rate is anticipated to appreciate relative to the foreign currency, leading to a negative correlation. The emparical investigation contribution toward markets, financial and economic indicated developed markets timely exchange rate regimes decision have positive impact on stock and economies of developed countries while developing countries long away (Jamil, Rasheed, Maqbool, & Mukhtar, 2023). Corporate social environment enhance markets performance (Jamil & Rasheed, 2023a, 2023b; Jamil, Rasheed, & Mukhtar, 2022).

The conventional perspective upholds a favorable correlation between the foreign exchange market and the stock market, attributing the shift from exchange rates to the stock market to economic factors. This finding illustrates a positive correlation between exchange rates and stock prices. When the domestic currency experiences depreciation, it leads to enhanced competitiveness of local firms, resulting in a rise in export activities. Consequently, it is

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anticipated that the stock price will experience an eventual increase. In addition to the techniques above, an alternative approach referred to as the asset market method posits a limited or negligible correlation between the stock market and the exchange rate. Due to the potential influence of multiple factors, both variables may exhibit variability.

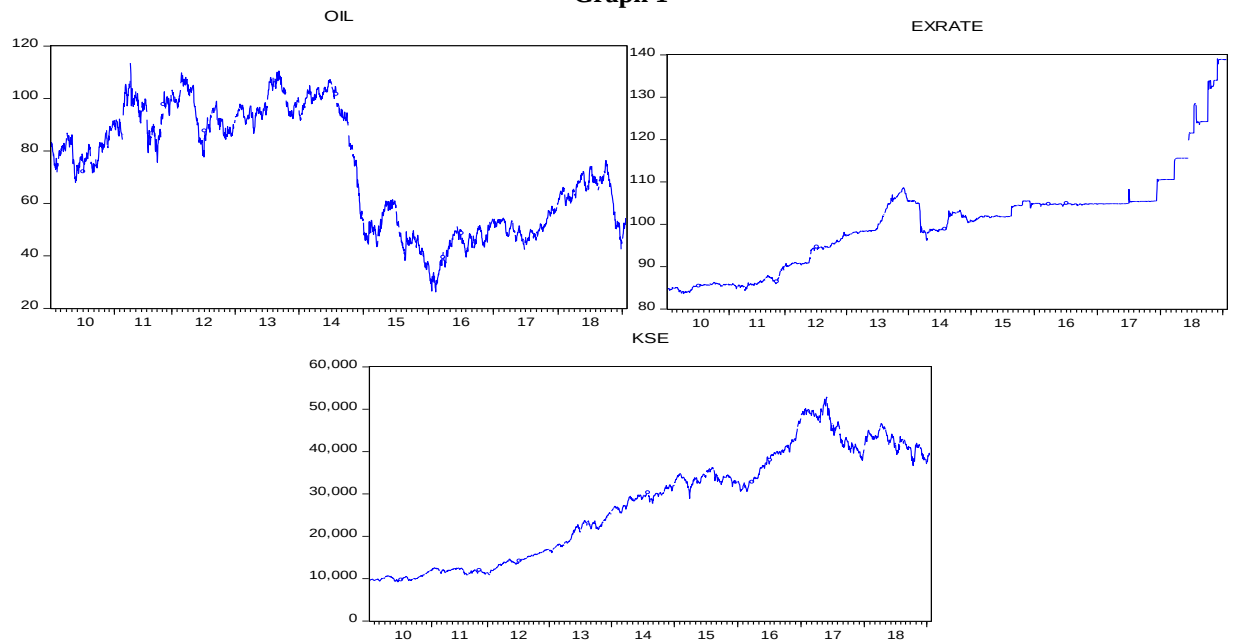
Huang et al. (1996) found no significant correlation between stock returns and oil prices in specific markets, such as the S&P 500 stock market. The pessimistic response of stock returns to increases in oil prices has been substantiated by various studies conducted by scholars such as Nandha and Faff (2008), Papapetrou (2001), Sadorsky (1999), and Issac. and Ratti (2009), and Shimon and Raphael (2006). According to Ciner (2001), a relationship exists between the future prices of oil and the actual returns of stocks. However, it is essential to note that this relationship is not linear. The interest of financial practitioners and market players has been diminished due to fluctuations in oil prices, which can be attributed to two primary factors. Firstly, it is essential to note that they significantly influence the strategic planning and project evaluation decisions made by producers and customers. Additionally, they impact investor decision-making regarding activities related to the oil industry and asset allocation and risk management strategies. The criticality of the financial sector's capacity to accurately predict variations in oil prices arises from the repercussions above.

Similarly, the study conducted by Issac and Ratti (2009) sought to investigate the enduring relationship between global crude oil prices and stock markets worldwide. From January 1971 to March 2008, the researchers utilized the VEC (vector-error correction) methodology. The findings of six OECD nations indicate a robust and enduring correlation between fundamental stock markets and oil prices, implying an adverse reaction to the profitability of actual stock prices. Many scholars have established a correlation between the adverse reaction of actual stock prices and the upward trend of oil prices, attributing it to the direct influence on cash flow and inflation resulting from this escalation. Undoubtedly, given the substantial impact of oil prices on production, businesses can streamline their cash flow with such prices.

A comprehensive examination of the existing body of literature indicates a scarcity of research investigating the interplay between oil prices, currency exchange rates, and stock market returns, specifically within developing nations. There is currently a lack of research examining the analysis of daily data and the short-term relationship between the exchange rate, oil prices, and stock market returns in the specific context of Pakistan. This study investigates the immediate relationship between stock returns, oil prices, and currency rates in emerging nations, explicitly focusing on Pakistan.

The research will employ the Augmented Dickey-Fuller (ADF) test, cointegration analysis, and Vector Autoregression (VAR) model to address the existing gap in knowledge. The economy of Pakistan has been impacted by the fluctuations in currency exchange rates and the escalation of oil prices. Figure 1.1, presented herein, illustrates the prevailing state of economic instability.

Graph 1



The impact of exchange rates and oil prices on Pakistan's foreign reserves has the adverse effect of deterring potential investors from participating in the country's stock market. Consequently, an examination was conducted to assess the impact of crude oil prices and currency exchange rates on the stock market's performance. According to Sadowski (1999), the stock market experiences a decline in performance when there is a decrease in the exchange rate due to an increase in oil prices.

The present study contributes to the existing body of literature by investigating the effects of exchange rates and oil prices on the short-term stock market return of the KSE 100 index. This analysis is conducted using daily time series data. The study's findings will enable investors to make more informed decisions regarding their investment strategy in a volatile market. The primary objective of this empirical investigation is to utilize a Vector Autoregression (VAR) model to examine the relationship between oil prices, the US dollar exchange rate to the rupee, and the stock market return of the KSE 100 index.

2. LITERATURE

The founding of a solid international economic system has assumed significant importance for nations. This has prompted numerous researchers to investigate the correlation between the stock market and currency valuations. In a study conducted by Mishra (2004), an examination was undertaken on the Asian financial crisis, the emergence of floating exchange rates during the early 1970s, and the implementation of financial market reforms in the early 1990s. As a result, researchers were prompted to investigate a potential correlation between these two variables. According to Nydahl (1999), fluctuations in the Swedish krona value significantly impact businesses operating in small, open economies.

The research conducted by Kiymaz (2003) utilized data from Turkey to support its findings. According to Griffin and Stulz (2001), the impact of weekly exchange rate fluctuations on stock markets in developed countries is relatively minimal. According to the findings of Kiymaz (2003), Turkish enterprises exhibit a high degree of sensitivity towards fluctuations in the value of the Turkish lira. In his study, Stavarek (2004) examined the correlation between stock prices and exchange rates by analyzing data from a selection of European Union member states, encompassing recently admitted and long-standing members. Upon examining the evidence spanning the years 1993 to 2003, it was observed that robust long- and short-term associations were present. The individual needed to ascertain that information during the period spanning from 1970 to 1992. According to the findings of Giovannini and Jorion's study, a consistent pattern of behavior was observed in the United States despite the distinctiveness of the two variables under investigation.

Phylaktis and Ravazzolo (year) conducted an empirical analysis of Pacific countries from 1980 to 1988, revealing a positive correlation between exchange rates and stock markets. Understanding the intricate relationship between the stock market and exchange rates can pose challenges. The outcome variation may be contingent upon geographical location, economic conditions, international diplomatic relations, and other relevant factors. The predictability of the effects of these two variables is challenging due to the potential for unidirectional, bidirectional, or multidirectional relationships. Rittenberg (1993) conducted a study examining the correlation between exchange rates and stock prices in Turkey, employing the Granger causality methodology. He posited the existence of a unidirectional relationship whereby alterations in the price level lead to corresponding changes in the exchange rate. A brief examination of Pakistani data was conducted by Ali Kemal and Haider (2005).

The analysis examines the interconnections between exchange rate fluctuations and price variations, interest rates, foreign exchange reserves, and trade balances. Numerous individuals have examined the actual exchange rate and have observed a strong correlation with the secondary exchange rate. No discernible correlation existed between the relative value and the secondary exchange rate. In 2002, Muhammad and Rasheed conducted two tests to examine the presence of cointegration and Granger causality. The researchers analyzed the fluctuations of stock prices in four Asian nations during the period spanning from 1994 to 2000.

The research conducted by the individual above demonstrates that in the Asian context, there is no discernible correlation between these two factors. They also concurred that there is no correlation between exchange rates and stock prices. Bhattacharya and Mukherjee (2003) conducted a study.

When oil prices went up and down throughout the 1970s, many people started writing about what happened to actual economic activity during that time. The term for this phenomenon is the "Oil Price Shock." A significant number of people have investigated the connection between a nation's GDP and the price of oil in many developed nations. Authors such as Hamilton (1983), Jimenez et al. (2005), and Cunado et al. (2005) are responsible for this action. According to Hamilton's research from 1983, the rise in oil prices contributed to the sluggish growth of the American economy. His work inspired a plethora of academics to conduct studies on the influence of oil prices on the functioning of macroeconomic systems.

Numerous studies indicate that the recent drop in oil prices has significantly impacted the level of macroeconomic activity in the G-7, Norway, and Asia. This is from the year 2005: Both Cunado and Perez de Gracia were present. Most of the research has focused on determining how changes in oil prices impact GDP; however, very few people have investigated how changes in oil prices impact stock markets. A significant number of individuals believe that Jones and Kaul (1996), Sadorsky (1999), Huang et al. (1996), El-Sharif and Al Dohaiman (2005), Naifar and Al Dohaiman (2013), and Chang and Yu (2013) are the works that have made the most significant contributions to this field (2012).

Similarly, Naifar and Al Dohaiman (2013) investigate the relationship between changes in the stock market, changes in the price of crude oil, and changes in macroeconomic variables. They divided the research they were doing into two parts. First, the authors investigate how regulatory shifts affect both the price of oil and the stock market's volatility. In order to accomplish this, they use models from countries that are members of the Gulf Cooperation Council. With the help of a Markov state change model, it was determined how likely it was that the oil market variables would change their current states. Both a crisis and a lack of a crisis In addition to two other models, we use Markov state change models. Second, they investigate how the cost of oil, the inflation rate, and interest rates shifted both before and during the subprime mortgage crisis. The researchers investigated various Archimedes copula models, each featuring a unique assortment of extremity-dependent structures. They discovered that the OPEC and GCC oil markets were highly dependent on one another. Only Oman stands out as a nation that does not appear to take things seriously. The results of the study demonstrate, in addition, that inflation and the price of crude oil have an asymmetrical structure. The most recent economic disaster has led to the construction of this structure. In addition, the canvasser instigated the importance that short-term interest rates and oil prices had a very close relationship during the financial crisis, which is why they were very close. This is because the relationship between the two factors was very close.

It is also essential to keep in mind that oil price fluctuations significantly influence the total amount of output possible across industries and the economy. Therefore, shifts in the cost of oil can be disastrous for a business because they impact the cash flow discount rate. This impacts the anticipated rate of inflation and the anticipated rate of genuine interest, which in turn impacts the cash flow discount rates. The high cost of oil has indirect and direct consequences that make business and economic conditions more precarious. Therefore, Bernanke (1983) and Pindyck (1991) demonstrate that when oil prices increase, there is a greater degree of uncertainty regarding what the prices will be in the future. Because of this, companies postpone making decisions regarding investments that cannot be undone in reaction to their forecasts of future earnings.

Additional research lends credence to the hypothesis that there is a correlation between stock prices and oil prices. Utilization of nonlinear effects is one of those things. According to Ciner (2001), the impact of oil price futures on stock returns was negative. According to O'Neil et al. (2008), falling stock prices occur whenever there is an increase in the price of oil. According to Park and Ratti (2008), when the price of oil increases in the United States and the 12 European countries that are net oil importers, stock prices fall (except attractions).

Using data from the S&P 500 and the Dow Jones Stoxx Europe 600, Reboredo and Rivera-Castro (2013) investigate whether or not there is a connection between the price of oil and the stock market returns. In addition, they analyzed daily data for the automotive and component manufacturing industries in the United States and Europe from 2000 to 2011. Then, they used wavelet multi-solution analysis to discover that shifts in oil prices did not significantly impact the stock market prior to a crisis. This was the conclusion they reached. The overall amount of time as well as the difficulty of each segment Their research indicates that a positive correlation exists between the price of oil and the price of stocks, both on an aggregate and industry level. This correlation became more pronounced as the global financial crisis worsened. El-Sharif et al. (2005) researched a model that included oil and gas companies headquartered in the United Kingdom. They investigated the relationship between the potential for fluctuating oil prices and the return on stock prices. In their research, the authors investigated the relationship between changing situations in the stock market, varying exchange rates, and fluctuating crude oil prices and how these factors affected the returns on gas and oil stocks.

Aloui and Jammazi (2009) developed Markov-transformed EGARCH models illustrating the connection between crude oil impact and stock prices. The findings indicate that pure oil prices share a significant responsibility for influencing the degree to which actual returns can fluctuate and, second, the likelihood that existing institutions will transform. They analyzed the data from January 1987 until December 2007 for France, the United Kingdom, and Japan.

3. DATA AND METHODOLOGY

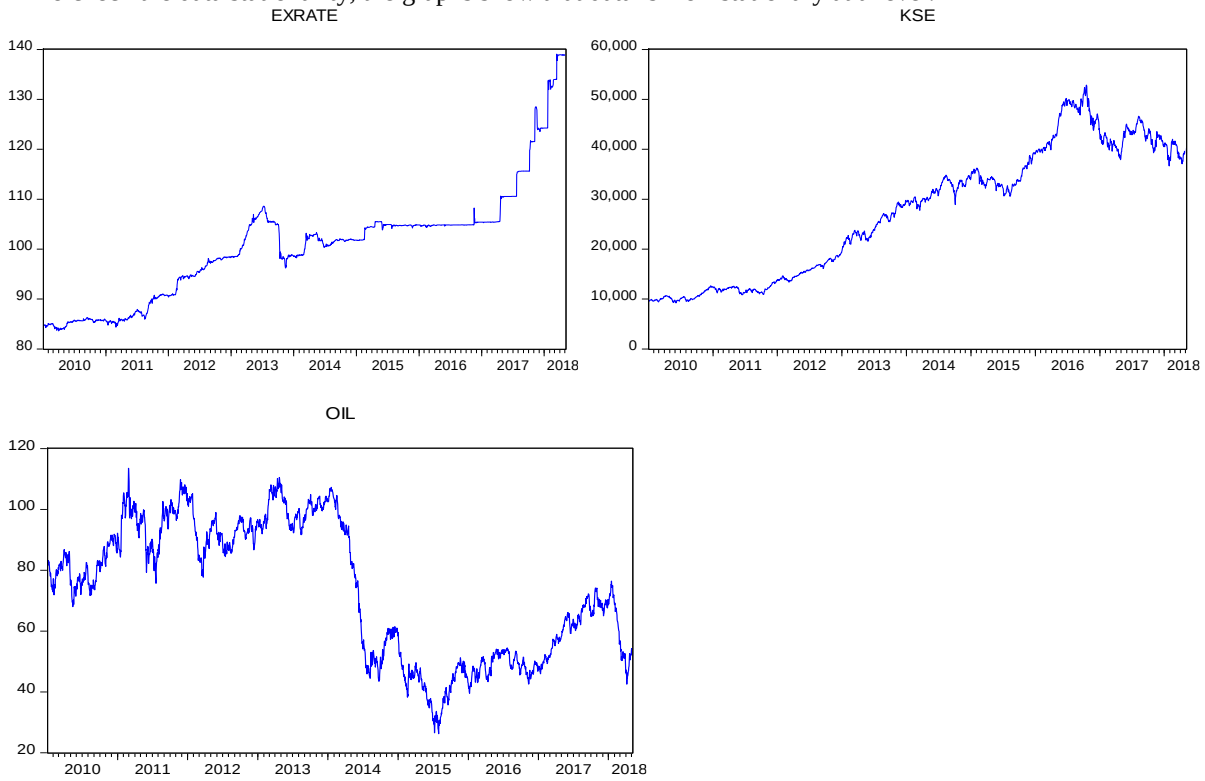
This investigation uses a time series data set, which contains daily data on Pakistan's stock market, the KSE 100 index, and Pakistan's exchange rate and oil prices for the period beginning in January 2010 and ending in December

2018. The WDI and the KSE 100 index are the data sources . The exchange rate is the value of one Pakistani rupee, about one US dollar. Utilizing time series analysis methods such as the Augmented Dickey-Fuller test, the Johnson Cointegration test, the VAR test, and the Granger causality test to determine the Granger causality between the exchange rate, oil prices and stock market returns; determining whether or not the data is stationary; determining whether or not cointegration exists; determining whether or not there is a short-run association between the exchange rate, oil prices, and stock market returns.

4. DATA ANALYSIS AND DISCUSSIONS

Graph 2: Unit Root Test Exchange Rate, Kse, Oil Prices

To check the data stationarity, the graphs show that data is Non-stationary at a level.



4.1. UNIT ROOT TEST (ADF)

The unit root test also detects the stationarity in time series data. However, this is mainly preferred compared to correlogram because it provides a better insight into the data.

4.1.1. ADF TEST OF EXCHANGE RATE AT LEVEL

Null Hypothesis: EXRATE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.21	0.999
Test critical values:	1% level	-3.43	
	5% level	-2.86	
	10% level	-2.56	

As Table 1 shows, the data is Non-stationary at the level of unit root test as P values are more than five percent, and the t-statistics value is less than the T-Critical value, which is 2.21< -3.43. So, the H° Null hypothesis will be accepted, and the H1 alternative hypothesis will be rejected.

4.1.2. EXCHANGE RATE AT FIRST DIFFERENCE

Null Hypothesis: D(EXRATE) has a unit root
Exogenous: Constant
Leg Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-46.17	0.0001
Test critical values:	1% level	-3.43	
	5% level	-2.86	
	10% level	-2.56	

The table shows that data is Stationary at the first difference of the unit root test as P values are less than five percent and the t-statistics value is more significant than the t-critical value, which is -46.17>-3.43, so the H° Null hypothesis is rejected and H1 Alternative hypothesis is accepted.

4.1.3. ADF TEST OF KSE AT LEVEL

Null Hypothesis: KSE has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.021	0.747
Test critical values:	1% level	-3.433	
	5% level	-2.862	
	10% level	-2.567	

As the above table shows, the data is Non-stationary at the level of the unit root test as P values are more significant than five percent and the t-statistics value is less than the t-critical value, which is -1.021<-3.433. So, the H° Null hypothesis will be accepted, and the H1 alternative hypothesis will be rejected.

4.1.4. KSE AT FIRST DIFFERENCE

Null Hypothesis: D(KSE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-39.240	1.066
Test critical values:	1% level	-3.433	
	5% level	-2.862	
	10% level	-2.567	

The above table shows that the first difference of unit root test data is Stationary as P values are less than five percent and t-statistics are greater than t-critical, which is -39.240>-3.433, so the H° Null hypothesis is rejected, and the H1 Alternative hypothesis is accepted.

4.1.5. ADF TEST OF OIL PRICES AT LEVEL

Null Hypothesis: OIL has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.321	0.621
Test critical values:	1% level	-3.433	
	5% level	-2.862	
	10% level	-2.567	

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

Table 1 shows that the data is Non-stationary at the level of unit root test as P values are more than five percent and t-statistics is less than t-critical, which is -1.321<-3.43. So, the H° Null hypothesis will be accepted, and the H1 alternative hypothesis will be rejected.

4.1.6. OIL PRICES AT FIRST DIFFERENCE

Null Hypothesis: D(OIL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-47.829	0.0001
Test critical values:	1% level	-3.433	
	5% level	-2.862	
	10% level	-2.562	

The table shows that the data is Stationary at the first difference of the unit root test as P values are less than five percent and the t-statistics value is greater than the t-critical value, which is -47.829>-3.433, so the H° Null hypothesis will be rejected. The H1 Alternative hypothesis will be accepted.

5. UNRESTRICTED COINTEGRATED TEST FOR OIL PRICES, EXCHANGE RATE, AND THE STOCK MARKET

Series: KSE OIL EXRATE
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.004	13.680	29.797	0.858
At most 1	0.001	4.377	15.494	0.870
At most 2	0.000531	1.148	3.841	0.283

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.0042	9.302	21.131	0.807
At most 1	0.0014	3.2295	14.263	0.930
At most 2	0.0005	1.1488	3.841	0.283

The max-eigenvalue test indicates no cointegration at the 0.05 level.
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

5.1. TRACE STATISTICS

As the above table shows, Trace Statistics is less than a five percent Critical value, So H° Null hypothesis will be accepted, and the H1 Alternative hypothesis will be rejected.

5.2. MAX-EIGEN STATISTICS

As the above table shows, the Max-Eigen statistics value is less than a five percent critical value, So H° Null hypothesis will be accepted, and the H1 Alternative hypothesis will be rejected.

6. VAR TEST

Vector Autoregression Estimates

	KSE	OIL	EXRATE
KSE(-1)	1.1682	2.652	-0.00013
	0.0211	9.975	2.688
	[55.217]	[0.265]	[-5.113]
KSE(-2)	-0.1695	-3.232	0.00013
	0.0211	9.976	2.689
	[-8.010]	[-0.324]	[5.087]
OIL(-1)	10.320	0.971	0.006
	4.558	0.021	0.005
	[2.264]	[45.191]	[1.137]
OIL(-2)	-10.408	0.024	-0.006
	4.556	0.021	0.005
	[-2.284]	[1.145]	[-1.096]
EXRATE(-1)	3.808	0.016	1.004
	16.812	0.079	0.021
	[0.226]	[0.206]	[47.011]
EXRATE(-2)	-2.884	-0.017	-0.002
	16.877	0.079	0.021
	[-0.170]	[-0.214]	[-0.095]
C	-40.731	0.525	-0.208
	78.394	0.369	0.099
	[-0.519]	[1.420]	[-2.094]
R-squared	0.999	0.996	0.998
Adj. R-squared	0.999	0.996	0.998
Sum sq. resides	185651293.352	4126.765	299.817
S.E. equation	292.765	1.380	0.372
F-statistic	696212.374	94132.553	344015.827
Log-likelihood	-15421.122	-3780.218	-931.333
Akaike AIC	14.199	3.485	0.863
Schwarz SC	14.218	3.504	0.881
Mean dependent	27655.890	73.462	100.789
S.D. dependent	12842.480	22.300	11.475
Determinant resid covariance (dof adj.)		22581.854	
Determinant resid covariance		22364.324	
Log-likelihood		-20131.599	

Since the first lag of the KSE-100 index has a coefficient of 1.16 and its t-calculated value is 55.21, which is higher than the critical value at the 5% significance level, it can significantly explain the day-to-day price fluctuations.
Since the second lag of the KSE 100 index has a coefficient of 0.169 and its t-calculated value is -8.010, greater than the critical value at the 5% significance level, it can significantly forecast the price change that occurs on the second day.
Because the first lag of oil has a coefficient of 10.32 and its t-calculated value is 2.26, which is greater than the critical value at a 5% level of significance, it can significantly explain the current price change when combined with the use of the KSE 100 index. It indicates that a rise in oil prices will lead to a 2.26 percent rise in the KSE 100 index. Therefore, an increase in oil prices will directly increase the KOSPI index.
Because the second lag of oil has a coefficient of -10.40 and its t-calculated value is -2.28, which is greater than the critical value at the 5% level of significance, it can significantly explain the next day's change in price when combined with the use 100 index. The price of oil affects the KSE 100 index, and since the association between the two is significant, an increase in the price of oil the following day will likely lead to a decrease in the KSE 100 index of -2.28 percent.
The first lag of the exchange rate has a coefficient of 3.80, and the t-calculated value is 0.22. Since this value is lower than the critical value at a significance level of 5%, the relationship between the first lag of the exchange rate and the kse 100 index cannot be considered significant.
The second lag of the exchange rate has a coefficient of -2.88, and the t-calculated value is -0.17; since this value is lower than the critical value at a significance level of 5%, the relationship between the second lag of the exchange rate and the kse 100 index cannot be considered significant.

6.1. R SQUARE

The explanatory power of a model can be determined by calculating its R square. In this model, the exchange rate and oil prices explain 99% of the dependent variable stock market return, with the remaining 1% of the error remaining unexplained. The model has a total explanatory power of 100%.

6.2. F STATISTICS

The F statistic shows the overall model significant, and here, in our case, the model is significant because the value of the F-calculated value is greater than the value of the F-tabulated value, Fcal >F tab.

7. CONCLUSION

This study investigated the correlation between oil prices, the Dollar exchange rate, and the stock market KSE 100 index Pakistan. As an oil importer country, the stock market of Pakistan is highly responsive to the change in oil prices by using the VAR model for the period of 2010-2018. The study aims to determine whether the association between these three variables is significant or insignificant. Moreover, to determine whether the relationship is long or short. This study used ADF for stationarity of data; the data of exchange rate, oil prices, and stock market is non-stationary at the level of the unit root test, and data became stationary at the first level of the unit root test. Therefore, we can use the cointegrated test because the stock market data, oil prices, and exchange rate became stationary at the first difference of the unit root test; the cointegration test is used to find whether cointegration exists or not between these three variables. However, the cointegration test showed that no cointegration exists between these variables.
This study used the VAR model, which shows that oil price has short-term momentous and positive effects on the stock market return KSE 100 index. The results show that an increase in current-day oil prices will tend to improve the KSE 100 index, showing a positive relationship, while predicted for the next day that increases in oil prices will lead to an expected decrease in the KSE 100 index. In the short run, the exchange rate has an insignificant effect on the KSE 100 index.

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