Dynamic Interaction Between Oil Price, Exchange Rate And Kmi-30 Index: Evidence From Pakistan

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Abstract

This paper examined the dynamic relation between crude oil price, exchange rate and Karachi Meezan index (KMI-30) in Pakistan over a period from 2009 to 2016 by using daily data in order to capture a real time effects. The variables included in the study were crude oil price (COP)USD per barrel, Exchange rate (EX)PKR/USDandKMI-30. The study applied co-integration test, Vector Autoregressive (VAR) model and lastly pairwise granger causality test. Based on results no cointegration was found among COP, EX and KMI-30 index. VAR model undertaken with lag five of the dependent and independent variables as suggested by AIC lag criterion method. The result showed one to four period lagged variables of KMI-30 Index(-1,-2,-3,-4) having significant positive effect on KMI-30 index while lagged five of KMI-30 Index(-5) have insignificant relationship with KMI-30 Index. The one period lagged variables of COP (-1) have significant positive effect on KMI-30 Index while lag five of COP (-5) have significant negative relation. The two, three and four period lagged variables of COP (-2,-3,-4) have insignificant effect on KMI-30 Index. The one, two, three, four and five lags of EX (-1,-2,-3,-4,-5) has insignificant relationship with KMI-30 Index. Granger causality test showed that COP granger caused KMI-30 Index while Karachi KMI-30 Index granger causes EX in short run. Hence, in long run oil price shocks do not affect KMI-30 Index while in short run oil price affect KMI-30 Index.

Keywords: Crude oil price, Exchange rate, Co-integration, VAR Model, Causality, KMI-30 index.

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Introduction

A few decades ago, it seemed a flow into oil price research, due to its greater essence and spillover on different macroeconomic indicators. Oil is the basic input that affects the growth and development of small and medium enterprises as well as large companies in an economy. It is one of the most important tradable goods in the world and is not only associated with major global progress but is believed to be the beginning of economic recession / inflation (Le and Chang 2011). Rising oil prices may disrupt countries' economies in different ways, often increasing the cost of commodity production, which in turn affects financial markets, inflation and consumer confidence (Hussain et al., 2012). Most of the previous literature exhibits the situation where United States collapse after World War II due to inflated and high oil prices (Hamilton, 1983).

One of the most important theories that are related to stock price is random walk theory. This theory describes the stock market randomness and it became ongoing discussion about the movement of stock. The theory was presented by Louis Bachelier in 1900 when random walk model introduced. The theory state that securities of stock market follow random walk and unpredicted path. So past trends or movement in stock price is not predicting the future prices of securities and shares. Therefore, each time the prices fully reflect the updated information and no abnormal profit can be taken by investor in such a situation (Lo and Mackinley, 1999).

Fama (1970) stated three types of market efficiencies to measure stock market efficiency. The weak form of market efficiency based on past (historical price), in this form of market today stock prices (SP) reflected by past stock prices. Theoretically, it urges that fundamental analyzes would use for the identification of overvalue and undervalue of stock prices. Hence keen investors search the financial statements of profitable companies to earn profit. The semi strong form of EMH was the first contribution of Fama (1965) and defined the concept of an efficient market as well. This form of EMH utilizes all publicly available information and past information. It implied that company can earn abnormal profit whenever only information's are not publicly available. The strong form EMH hold whenmarket incorporate both the private (inside) and all publicly information. So, any information which is known to a private source or to public should be reflected full in the current price of securities. The Forex market and oil market are potential markets that affect stock market indices. Especially, the oil price have fundamental effects on companies overall performance and goes to the

root of company's operations. Previously a lot of literature is available on oil spillovers on other indices and no such attention is given to KMI-30 index which is an Islamic index. So the study is analyzing this gap that how oil price and exchange rates are related with Karachi Meezan-30 index. The objective is to examine the short and long-run interaction between COP, EX and KMI-30 index. The 2nd objective pertains to causal relationship between COP, EX and KMI-30 Index. The novelty of article is focusing on a dynamic analytical framework for assessing and analyzing the precedents of a stochastic Islamic index in Pakistan. KMI-30 index is gaining more and more grounds for Individual investment and institutional investment in Muslim communities. As a researcher it is pertinent to study it in a macroeconomic framework. The oil price do not have any long run fellowship with KMI-30 index that evidently shows that most of these 30 companies do not depends on oil very much and the companies are not involve in oil exporting or importing, especially those compliant with sharia principals and criteria.

Review of Literature

In perspective of foreign analysis including Sharma and Mahendru (2010) examined cointegrating relationship of Bombay stock exchange (BSE) and Macroeconomic variables, like variation in Gold price, inflation rate, Forex reserves and EX. The outcome showed that EX and gold prices disturb whole BSE stock market. Hussain et al., (2012) analyzed the overall relation of oil price, macroeconomic variables and Islamic stock market (ISM) of Malaysia. The study applied vector autoregressive model (VAR) technique. The macroeconomic variables were COP, Foreign exchange rates of Ringgit to USD and FBMEMAS (The Bursa Sharia Index, Emas Malaysia). The results showedthat Islamic index, EX and Oil Prices are cointegrated. However cointegrating the variable of interest showed a positive relation of oil prices with that of Islamic index. Giri and Joshi (2017) perform a study on the macro variables and SP in India from 1979 to 2014. The study used Ng-perron unit test for data series properties. The results of Ng-perron suggested stationarity at 1st difference. Further in a analytical frame work of ARDL bounds test and VECM long and short interactions and causality was discovered. The empirical results showed long run positive interaction of EX, inflation, economic growth and stock price. The oil price revealed a negative relation with stock price.Delgado et al., (2018) analyzed in an analytical system of VAR the interactions between oil price, stock market and EX in Mexico. The monthly data time series

were analyzed by framework taken from 1972 to 2017. The author applied ADF, PP, and KPPS test for unit root. The empirically result of VAR model showed that first two lag of exchange rate were negatively and significantly related with stock index which implied that appreciation in Peso exchange rate effect index positively. The finding of oil price showed no significant relationship and no causal relationship with stock market index.

In perspective of Pakistan, Irshad et al., (2012) analyzed the Pakistani market in relation to gold prices and oil prices. The study utilized Johansen and Juslius co-integration method to show long-run relationship. Outcomes undoubtedly declare that no long-run relationship occurs among oil price, Pakistan equity and gold price of the economy. Baig et al. (2013) investigated that there is no bivariate and multivariate co-integration among oil prices, gold prices and KSE-100 index of Pakistan. However granger causality was not exist in case of KSE-100 and oil prices.

Jebran (2014) studied the cointegrating relation of SP and EX in three Asian equity markets such as china SSE (Shanghai stock exchange), Pakistan stock exchange (PSX) and Colombo stock exchange (CCS). The study used JJ co-integration technique for long runcointegrating relation of EX and SP. The author identified a long-run significant relation for China and Pakistan, however in case of Serilankan stock market no empirical evidence was founded regarding long run fellowship.Kayani et al., (2015) explored the relation betweenEX and SP in perspective of emerging economies. Author identifies the impact of exogenous shocks used numerous econometric methods like multivariate GC test. The study examined unit root problem by ADF test; for long run relationship cointegration test; and Vector auto regression model used for short run on daily data from 2007-2011 before, during and after the financial crisis. Results showed long term relationship between financial variables. During period, global stock return on Pakistan and china have significant impact but not on these countries exchange rate. Impact was significant for Brazilian and India exchange rate and global stock returns was no significant with above countries stock return.

Khati et al. (2017) recently explored relations between EX and SP in Asian emerging economies using secondary data of time series. The results revealed no co-integration for any country's (India, Pakistan, Sri lanka and Bangladesh). The results of VECM showed significant negative for Bangladesh and Sri lanka. Mehran et al., (2018) recently

examined relationship of longevity by taking the financial factors like KIBOR, deficit interest rate and T-bills rate and SP in Pakistan. The outcomes of co-integration showed long run relationship between variables. The correlation test outcomes of variables showed positive significant relationship with Pakistan stock exchange behavior.

Methodology

Time series daily data collected for exchange rate from website www.FX-rate.com and for oil price www.Economic research web site used. KMI30 index daily time series data obtained from Business recorder. The range of data was from 2nd July 2009 to 30th December 2016**.** In order to check unit root problems in data Phillip-Perron (1988) and Augmented dicky fuller (1981) test were being utilized in the study. Johansen and Juselius (1990) model is used to explore the maximum probability/likelihood between COP, EX and KMI-30 index. In 2nd hand, Vector Autoregressive Model is used to estimate the short run lead-lag relationship between KMI-30 index and COP and EX. In last Granger causality (GC) test is generally used to diagnose how two variables are affecting each other with respect to causality.

Results and Discussion

Variables	**ADF Test** With trend and intercept		**PP Test** With trend and intercept	
	T	P-value	T	P-value
COP	-41.8098	0.0000*	-41.8625	0.0000*
EX	-17.5403	0.0000*	-64.3202	0.0000*
KMI-30	-12.4515	0.0000*	-45.5767	0.0000*

Unit Root Analysis

Table: 1 Augmented Ducky-Fuller and Phillips-Perron test Results (At level)

Variables	**ADF Test** With Trend and intercept		**PP Test** With Trend and intercept	
	T	P-value	T	P-value
COP	-2.1954	0.4913	-2.1409	0.5219
EX	-1.4078	0.8587	-1.7495	0.7287
KMI-	-	0.93	-	0.75

30 index	1.04 66	57	1.70 19	03

Table 1 shows that all the variables under study are insignificant at level as evident from the p-value (P-values are greater than 0.05). This shows that all the variables are having unit root problem at level. By taking 1st difference the data were analyzed again in table 2.

Table: 2 Augmented Ducky-Fuller and Phillips-Perron test Results(At First Difference)

* Significant at 5% level.

Table 2 shows that all the variables are stationary at first difference at 5% sig. level.This suggests that at first difference overall variables p-values under study are less than 0.05. The results of PP and ADF tests recommends that all variables are integrated of order 1 or I/ (1) and do not have unit root problem.

Co-integration Analysis

Table: 3 Bivariate Co-integration Results between KMI-30 and Oil Price

Bivariate Tests	Hypothesized No. of CE(s)	Eigenvalue	Trace statistic	P-value
Trace test	None	0.0047	9.7958	0.2968
Maximum Eigenvalue test	Hypothesized No. of CE(s)	Eigenvalue	Maximum Eigenvalue statistic	P-value
	None	0.0047	8.0068	0.3780

Table 3 shows results of both Trace and Maximum Eigenvalue test and it is evident that there is no bivariate cointegration/longrun relation between COP and KMI-30 index as the p-vlaue for both is greater than 0.05. The results are consistent with Irshad et al. (2012) and with (Baig, et al. 2013; Raheem and Ayodeji2016).

Table: 4Bivariate Co-integration Results between KMI-30 and Exchange Rate

Tests	Hypothesized No. of CE(s)	genvalu	Trace statistic	P-value
Trace test	None	.0024	4.0522	0.8993
Maximum Eigenvalue test	Hypothesized No. of CE(s)	Eigenv alue	Maximu m Eigenvalu e statistic	P-value
	None	0.0024	3.9839	0.8610

Table 4 shows the results of trace and maximum Eigenvalue tests which show no co-integration between KMI-30 and exchange rate at 5% level of significance. The trace statistics and maximum Eigen value is less than its critical value and P-value is also more than level of significance (0.05). The result is consistent with (Bahmani and Shorabians1992; kutty2010 and Mansor, 2000). So, the overall result showed no bivariate co-integration between exchange rate and KMI-30 index and between oil price and KMI-30 index.

Table: 5Multivariate Co-Integration Rank test

Tests	Hypothesized No. of CE(s)	Eigenvalu	Trace statistic
Trace test	None	0.0047	12.1786
Maximum Eigenvalue test	Hypothesized No. of CE(s)	Eigenvalue	Maximum Eigenvalue statistic
	None	0.0047	7.928934

The Table 5 shows no multivariate long run relation between variables. The P-value at none is more than 5% level of significance. The results indicate that a null hypothesis of none or no cointegration cannot be rejected. Hence, both test suggested no multivariate co-integration between oil price, exchange rate and KMI-30 under study. The P-values suggest no co-integration at 5% level of significance.

Unrestricted Vector Autoregressive (VAR) Analysis

Table: 6Lag Order Selection for VAR Model

Lags	0	1	2	3	4	5
AIC	36.3289	20.3192	20.1513	20.1339	20.1230	20.1213*

*indicate lag order selected by the criterion

Akaike Information Criterion (AIC) has been used in VAR model to determine appropriate lags (Verbeek 2012) based on parsimony principle to avoid biasness (Nieh and lee 2001). AIC information criterion suggested that at least 5 lags must be taken to estimate accurate measure of VAR model.

Table: 7 Unrestricted VAR Model Results

No. of Lags	Coefficient	Error	t-Statistic	P-value
Lag-1				
KMI-30 index (-1)	0.9052	46	36.6869	0.0000*
EXRATE (-1)	7.4321	393	0.2298	0.8182
OILPRICE (-1)	23.1907	00	2.8354	0.0046*
Lag-2				
KMI-30 index (-2)	0.1066	33	3.1990	0.0014*
EXRATE (-2)	34.4494	416	0.9401	0.3472
OILPRICE (-2)	-19.8779	013	-1.7450	0.0810
Lag-3				
KMI-30 index (-3)	-0.0962	33	-2.8836	0.0039*
EXRATE (-3)	-39.3120	37.6814	-1.0432	0.2969
OILPRICE (-3)	0.6355	11.3878	0.0558	0.9555
Lag-4				
KMI-30 index (-4)	0.1005	0.0333	3.0124	0.0026*
EXRATE (-4)	-34.7423	36.7537	-0.9453	0.3446
OILPRICE (-4)	10.7403	11.3506	0.9462	0.3446
Lag-5				
KMI-30 index (-5)	-0.0169	0.0249	-0.6796	0.4968
EXRATE (-5)	36.4498	32.4524	1.1232	0.2614
OILPRICE (-5)	-15.1068	8.1162	-1.8613	0.0428*

Constant	-296.1342	293.7067	-1.0083	0.3134

The lag (-1,-2 and -4) of KMI-30 index have short run significant positive impact on leading values as shown in table 7. However lag (-3)of KMI-30 is having a negative effect on KMI-30 index. All the P-values are less than 5% level of significance which gives the evidence of lead-lag relationship. The results are consistence with Kurihara and Nezu (2006) but Lag-5 of KMI-30 Index showed insignificant relation with the current value of KMI-30 Index.This suggests that five days before KMI-30 Index have insignificant short run relationship with current value of KMI-30 index. This showsthat KMI-30 index is efficient and changes according to the new information in the market and adopts new information as develop.

The coefficient of lag-1 of oil price is positiveand P-value is less than 5% level of significance suggests that Crude oil and KMI-30 index have statistical positive significant relationship at lag-1. The result is consistent with (Adaramola2012 but contrary with the findings of (Ono 2011). The Lag-5 coefficient of COP showed negative significant short run with KMI-30. The result is consistence with the finding of (Fatima and Bashir 2014). While lag-2, lag-3 and lag-4 of the oil price is having an insignificant effect on KMI-30 Index. It suggests that all lags except lag-1 and Lag-5 of oil price has insignificant relationship with KMI-30 index which is consistent with the finding of (Abdul et al. 2010). The five lags of exchange rate have insignificant relationship with KMI-30 index which give the evidence that two variables are not related. The results areconsistent with (Wu 2000 and Granger et al. 2000).

Table: 8 Pairwise Causality Test Results

Null Hypothesis:	F-Statistic	P-value.
EXRATE does not GC KMI-30 Index	0.62089	0.6839
KMI-30 Index does not GC EXRATE	2.23788	0.0483
OILPRICE does not GC KMI-30 Index	2.32099	0.0411
KMI-30 index does not GC OILPRICE	1.41624	0.2153
OILPRICE does not GC EXRATE	0.60326	0.6975

EXRATE does not GC OILPRICE	4.68298	0.0003

Table 8 shows that exchange rate is not causing KMI-30 index for changes. The p-value (0.6839) of exchange rate and KMI-30 index is greater than 5% level of significance. The evidence suggests that there is no short run causal relationship between EX and KMI-30 Index. The same evidence presented by (Muhammad et al. 2002). Similarly, KMI-30 index granger causes exchange rate as the P-value of exchange rate and KMI-3 indicates. The result consistent with (Fama, 1991) But contradicted with (Smyth and Nandha2003) whose findings showed that share price index does not GC exchange rate. Kwon and Shin (1999) showed that stock price is not a leading indicator for exchange rate. The table also shows that crude oil price Granger causes KMI-30 index. The P-value is less than 5% level of significance which shows to accept alternative hypothesis. The result consistent with the results of (Adebiyi et al. 2009) who's result showed that stock market is explained by volatility in oil price. KMI-30 index does not granger causes COP because of greater P-value which is 0.2153 at 5% level of significance hence null hypothesis is accepted. The resultisconsistent with (Arouri and Rault2010), But contradicted with (Yahyazadehfar et al. 2012).

Conclusion

The study investigated the dynamic interaction between crude oil price, exchange rate and KMI-30 index. The bivariate and multivariate co-integration test used for long run dynamic interaction among time series variables. The bivariate test suggests that KMI-30 has no long run relationship with crude oil price. It is also studied that there is no bivariate co integration between KMI-30 Index and exchange rate means there is no long run co moment between those three variables. The multivariate co-integration result showed no long run relationship between variables. In short run, oil price has significant relationship with KMI-30 index because lag-1 variables of oil prices showed a significant positive relationship, where lag-5 of oil price is having a significant negative relationship with KMI-30 index. Lag-2, lag-3 and lag-4 of oil price have insignificant relationship with KMI-30 index. All Lags of Exchange rate has an insignificant relationship with KMI-30 Index. This finding concluded that the price of oil only (one day and five days before) is a valid variable to predict changes in the KMI-30 index. Furthermore, the KMI-30 (one to four days ago) predicts changes in the KMI-30 in the short term except five days. The Granger causality test

between oil price, exchange rate and KMI-30 index showed that oil price Granger causes KMI-30 index in short run while KMI-30 index Granger cause exchange rate. The VAR model is being undertaken on 5 lags, further, VAR model could be undertaken with more than five lags and could be identified more significant relationships. There is significant relation between crude oil prices and KMI-30 index in short run, suggesting the predictability power of oil prices in relation to KMI-30 Index one day and five days before. However, the investors can not realize abnormal return as very less time is available and significant to realize it. The study also recommends that there is supply-leading causal relationship between KMI-30 index and exchange rate, so the authorities can focus economic policies to stabilize stock market.

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