

Commodity Market Volatility around National Elections of Pakistan

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Abstract

This paper examines does the event of national election induces higher volatility in commodity market of Pakistan during 2007 to 2013. In a sample of two national elections, the paper computed commodity return's for a time window of 41 days i.e. 20 days prior, the Election day and 20 days after the election, moreover, 120 days returns before the time window were analyzed as a benchmark. It is found that both positive and negative significant above the average commodity return's i.e average abnormal return (AABR) and cumulative average abnormal return (CAABR) around the national elections using market model and GARCH market model. Additionally, CAABR are measured for various time span and results indicate significant above the average returns for the all the national elections. Hence, the results reveal the inefficient behavior of Pakistan mercantile exchange around the national elections.

Keywords: Pakistan Mercantile Exchange, National Elections, Market Efficiency, Market Model, Average Abnormal Return, GARCH Market Model, Cumulative Average Abnormal Return

Introduction

Market efficiency is among one of the basic theories in the field of finance as well as the main theory for the reaction of the market to news events. Fama (1970) reveal that share prices fairly absorbed in the available information and based on new publicly available information, assets values changes accordingly in Efficient Market Hypothesis (EMH). The researcher further explicate that the security prices immediately set back to equilibrium, as early as market respond to public news. So, no one in the market can usually gain risk-adjusted extra returns. According to Fama (1970) and Barberis and Thaler (2003) in

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EMH all participants rationally behave and market friction is insignificant or negligible.

The weak form, semi-strong form, and strong form are the three main types of EMH (Fama, 1991). Security prices absorb both present and historical information in the EMH semi strong form. Similarly, new information when publicly available only changes security prices and any fluctuation from equilibrium prices is usually eradicated very quickly. Therefore, especially in the long-run, by using fundamental or technical analysis, investors can't earn excess returns. EMH semi-strong type supports investors once the information is available, share's fair value is the best estimate of market price (Downe, O'Connor, Shapiro, & Reid, 2004). Corrado (2001) is in-line with the notion of Fama's that since immediately all available information are fully absorbed in stock prices, therefore, financial information can't be exercise to determine under or overpriced security. Jensen and Ruback (1983) elucidated that in EMH semi-strong form market takes signals from the appearance of specific events, which then adjust stock prices. Moreover, Event study is based on semi-strong form of EMH.

The literature on the commodity market has covered a number of different research areas. Roll (1972) investigates the commodity price index and states that due to returns significant serial correlations, the market is inefficient. Disputes such claim Danthine (1977) indicates that commodity spot markets inefficiency does not imply even by the violation of the standard martingale condition with a favor of no arbitrage opportunities and risk aversion. Kristoufek and Vosvrda (2014) considered various groups- grains, soft commodities, energies, metals and other agricultural commodities in total of twenty five commodity futures to investigate market efficiency. Currently suggested Efficiency Index was utilized in the study to find out and reported that heating oil is the most efficient between all of the tested commodities and nearly followed by wheat, cotton, coffee, and WTI crude oil. While feeder cattle and live cattle found on the other end of the raking scale. The study found that efficiency belongs to specific commodities groups characteristics, that is, the least efficient groups include other agricultural commodities (mainly composed of livestock) while most efficient include energy commodities.

Zunino et al. (2011) argue that it is broadly recognized that commodity markets are not completely efficient. There is a presence of long-range dependence, and hence only as a first approximation, the celebrated Brownian motion of prices can be considered. The study used a novel approach deduced from Information Theory in order to study the predictability in commodity markets. To distinguish the stage of security

market development, recently shown the complexity-entropy causality plane to be a useful statistical tool because differences among developed and emerged security markets can be easily visualized and discriminated with this representation space (Zunino, Zanin, Tabak, Pérez, & Rosso, 2010). The study considered 20 basic commodity future markets over the sample period of twenty years from 1991.01.01 to 2009.09.01, and by estimating the permutation statistical complexity and permutation entropy in order to define an associated ranking of efficiency. In these prime markets, the existence of patterns and hidden structures is quantifying by this ranking. Furthermore, the complexity-entropy causality plane permits us to recognize periods of time for the temporal evolution of the commodities where the underlying dynamics is more or fewer forecast-able.

Lee and Lee (2009) considered the sample period from 1978 to 2006 for OECD countries used total energy price and 4 types of various disaggregated prices of energy i.e. electricity, gas, oil, and coal to examine efficient market hypothesis (EMH). The study used panel data stationarity test which is highly flexible of (Carrion-i-Silvestre, Barrio-Castro, & López-Bazo, 2005), which assimilates multiple shifts in slope and level, through bootstrap methods thereby restraining for cross-sectional dependence. They found overwhelming evidence in support of the broken stationarity hypothesis, meaning that by an efficient market, energy prices are not characterized. Hence, it indicates that among energy prices, there is existence of profitable arbitrage opportunities. They argue that with the most critical events, the estimated breaks are coincided and meaningful which affected the prices of energy. Wang and Yang (2010) argue that they for the first time thoroughly investigated using high frequency data the *intraday* efficiency of 4 most important energy i.e. natural gas, gasoline, heating oil, crude oil futures markets. As opposed to prior studies which concentrate on in-sample evidence and suppose linearity, the study used several model evaluation criteria and various nonlinear models to investigate market efficiency in an out-of-sample predicting context. Overall, for 2 of the 4 energy future markets i.e. natural gas and heating oil, the study report evidence of intraday market inefficiency, which not exists around the bear market condition but exists particularly around the bull market condition. Against the model over-fitting problem and data-snooping bias, the study evidence is robust and it has very substantial economic significance.

Herbert and Kreil (1996) examine efficiency of the United States natural gas markets and for natural gas in the USA, discussed some important features of the natural gas cash and futures markets as well as in these markets, some interesting and important problems are also

summarized. For example, throughout the USA, the market does not happen to be informationally efficient. By the initiation of a 2nd futures contract market; this lack of efficiency has been addressed. Moreover, swaps and options are also traded in a very active deregulated derivatives market. While to better react to market conditions changes, the market have changed significantly. Gebre-Mariam (2011) as a case study used the Northwest United States natural gas markets in order to investigate efficiency, co-integration, causality, and unit root of the natural gas market. The study results show that after the first differencing, prices of natural gas market are stationary. Moreover, there is a movement in a similar direction of futures and spot natural gas prices. Contracts maturity with less than 1 year, there is significant influence of spot prices on future prices, but contracts maturity is more than 1 year, there is influence of futures prices on spot prices. Compared with monthly and weekly market price, daily market prices have no arbitrage opportunities. Furthermore, for contracts maturity with less than 1 year, there is a high risk premium exhibits in the markets. The EMH remains true only for contracts maturity with only about a month.

Kim, Oh, and Kim (2011) argue that in constructing a portfolio, the crucial issue is to understand the dependence structure among the stock and commodity markets. It can also assist us to implement spread trading through discovering new opportunities classified in the 2 different markets using multiple assets. By using the network analysis and random matrix theory, the paper examines the dependence structure of the stock and commodity markets. They report that except for the gold and oil markets, the commodity and stock markets must be handled as totally separated asset classes. So, mean-variance portfolio is significant for the performance enhancement as expected. They found strong correlation for 4 oil-related stocks and WTI one month futures, using a machine learning technique called the AdaBoost algorithm they were chosen as fundamental ingredients to complement the multi-spread convergence strategy for trading. For non-myopic investors, this strategy performance can improved significantly on a risk measurement basis and endure short-run loss.

Kim et al. (2011) used method of detrended fluctuation analysis (DFA) in order to study the Korean agricultural market long-run memory effects. Generally, various financial data, including commodity prices, foreign exchange rates, and security indices returns time series are uncorrelated in time, whereas, there is a strong correlation in volatility time series. Though, the study reports that there is anti-correlated in time for return time series of prices of Korean agricultural commodity, whereas, there is a correlation in volatility time series. The paper also

investigates nn-point correlations of time series and report that there is existence of multifractal in prices of Korean agricultural market.

Kaminsky and Kumar (1990) explores commodity futures markets efficiency by an econometric investigation. There is no consent on the efficiency of the market, regardless of extensive empirical literature. The paper proposes that expected excess returns to futures speculation for certain commodities are nonzero. But, these results do not necessarily mean that negotiators do not perform rationally. The study also noted hedging, for the cost of using futures market and futures prices power to predict future spot prices.

Cashin, McDermott, and Scott (1999) argue that unrelated commodities prices move together is a common perception. This idea is re-examine in the study by using concordance. Concordance is a co-movement measure of economic time series. Proportion of time is measure by concordance that 2 commodities prices are simultaneously in the same downturn period or same boom period. The authors report that there is no evidence of co-movement in prices of commodity by using data of several unrelated commodities prices.

The objectives of this study extracted relevant literature and research questions i.e. to determine the Pakistan's commodity market volatility during general elections and to examine the market efficiency (semi-strong form) for Pakistan's commodity market volatility around general elections.

Data and Methodology

Secondary data has been used to test the hypotheses. The secondary source of data was articles on the internet from different websites. The data of Commodity market was taken from PMEX website. The data of National Elections was gathered from Election Commission of Pakistan website.

Hypotheses

H₁₁: The average abnormal return (AABR) in the Pakistan's commodity market during general elections is statistically significant.

H₁₂: There is a statistical significant cumulative average abnormal return (CAABR) for all the time windows in the commodity market during national assembly elections of Pakistan.

The null hypotheses would imply that the Commodity market of Pakistan is efficient in semi-strong form.

Sampling Procedure

Commodity market data i.e. commodity index and different commodities price around the last two national assembly elections that is held in 2008 and 2013, for which 140 days before, the Election Day, and 20 days after the elections were taken. Similarly, the 120 days out of 140

days before the elections was considered as a benchmark. Furthermore, day zero is referred to as Event day, likewise the day on which National election held in Pakistan is considered as day 0/Event day. In addition, in the case of Pakistan, National elections held around the weekend or on the holiday, therefore, the last trading day before the national assembly election held is referred to day 0/event day.

Techniques/ Models

For the type of event studies, paper used the convention adopted in the literature described by (Ahmad, Khan, Usman, Ahmad, & Khalil, 2017; Akbar & Baig, 2010; Khan, Aman, & Khan, 2015). To estimate the market model, the study took data of PMEX index and the prices of each commodity and calculated the market returns and commodity returns respectively for 120 days 20 days prior to the Election Day.

$$E(R_{it}) = \alpha_i + \beta_i R_{mt} + \mu_i \tag{1}$$

where

$E(R_{it})$ = is the expected return of i commodity on any given day t ,

α_i = is the constant term,

β_i = is the sensitivity of commodity i to market returns R_{mt} .

For the market model, the actual returns on each commodity are estimated of 41days window as follows:

$$AR_{it} = (P_{it} - P_{it-1})/P_{it-1} \tag{2}$$

where

AR_{it} = actual returns of i commodity on any given day t ,

P_{it} = closing price of commodity i on any given day t ,

P_{it-1} = closing price of commodity i the previous day $t-1$.

Likewise, the formula used to estimate the market returns as:

$$R_{mt} = (PMEX_t - PMEX_{t-1})/PMEX_{t-1} \tag{3}$$

where

R_{mt} = market returns on any given day t ,

$PMEX_t$ = the PMEX index value on any given day t ,

$PMEX_{t-1}$ = the PMEX index value of the previous day $t-1$.

Subsequently, using the market model, the researcher calculated the returns for 20 days prior, the Election Day, and 20 days post-Election day for each commodity. Afterward abnormal returns are analyzed on each of the 41 days for each commodity as:

$$ABR_{it} = AR_{it} - \hat{R}_{it} \tag{4}$$

Where ABR_{it} = abnormal returns of i commodity on day t . AR_{it} is the actual return on any given day t for i commodity. \hat{R}_{it} is the estimated return of i commodity on given day t using market model. Average daily abnormal returns for each of the 41 days are calculated as:

$$AABR_t = \sum_i^n ABR_{it}/n \tag{5}$$

where $AABR_t$ is the average abnormal return on a given day and n is the number of sample companies. Further cumulative average abnormal returns ($CAABR_t$) are calculated as:

$$CAABR_t = \sum_{t=ti}^{tj} AABR_t \quad (6)$$

To examine the national election cumulative effect, the author's specified time window using ti and tj . As the study considered the before and after 20 days window, the time windows of (-1, 0), (-1, +1), (0, +5), (-5, +5), (-10, +10) and (-20, +20) has also been estimated in the study. The study considered these time windows to determine that before and after the national assembly election how these particular time windows behave, moreover, it enables to point out any significant holding period for which above the average returns might be significant.

The paper employed a parametric test that is t -test to evaluate the statistical significance of $AABR_t$. Moreover, the cross sectional standard deviation of abnormal returns ($AABR_t$) has been utilizes for t -test. The statistical representation is as follows:

A simple test for testing $H_0: AABR=0$ is given by

$$t_{AABR_t} = \sqrt{N} \frac{AABR_t}{S_{AABR_t}} \quad (7)$$

Where S_{AABR_t} is the standard deviation across commodity at time t

$$S_{AABR_t}^2 = \frac{1}{N-1} \sum_{i=1}^N (AR_{i,t} - AABR_t)^2 \quad (8)$$

Test statistics for testing $H_0: CAABR=0$ is given by

$$t_{CAABR} = \sqrt{N} \frac{CAABR}{S_{CAABR}} \quad (9)$$

where is the standard deviation of the cumulative abnormal returns across the sample

$$S_{CAABR}^2 = \frac{1}{N-1} \sum_{i=1}^N (CAR_i - CAABR)^2 \quad (10)$$

Additionally, the Wilcoxon Signed Rank test (WCSRT) that is the nonparametric test for $AABR_t$ has been employed in the study to know the robustness of the results. The author employed this test due to parametric test rejection too often, in a scenario for testing positive above average performance as well as negative abnormal performance too rarely. Similarly, the normality assumption of excessive returns is violated, due to not well specification of parametric test. It is obvious that the WCSRT takes both important parameters of abnormal return i.e. sign and magnitude. The formula for nonparametric test is as follows:

$$W = \sum_{i=1}^N r_i^+ \quad (11)$$

Where, excess returns absolute value of the positive rank is r_i^+ . Further, the measure proposes that absolute each value is unequal and different from zero. In a circumstance a normal distribution approximately will be

the S_N distribution with a large-scale N and H_0 of uniformly likely negative or positive excessive returns:

$$E(W) = \frac{N(N+1)}{4}$$

$$\sigma^2(W) = \frac{N(N+1)(2N+1)}{24} \quad (12)$$

The parameters of market models are most likely calculated using ordinary least square (OLS), afterward; it is used to estimate the excessive returns and is connected with the event examined. The assumptions should be considered i.e. consistent test statistics and efficient parameters measures. Similarly, the homoscedasticity in residual and constant coefficients of market model are more assumptions that should be included. Akgiray (1989) and Corhay and Rad (1994) in US market and European markets respectively reveal that inconsistency in test statistics and parameter estimates inefficiency is due to the exclusion of time dependence in the series of stock return. Thus, the empirical features of returns and series in residual is described in Generalized Autoregressive Conditional Heteroskedastic (GARCH) by (Bollerslev, 1986); Bollerslev (1987), it further permit for non-linear inter-temporal dependence. Hence, the researcher also employed GARCH market model for the type of event studies described by (Corhay & Rad, 1996).

The GARCH market model is as under:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$

$$\varepsilon_{it} = R_{it} - \alpha_i - \beta_i R_{mt} \quad (2)$$

$$\varepsilon_{it} | \psi_{it-1} \sim D(0, h_{it}, d)$$

$$h_{it} = a_{i0} + \sum_{k=1}^p a_{ik} \varepsilon_{it-k}^2 + \sum_{j=1}^q b_{ij} h_{it-j} \quad (3)$$

Where, on commodity i through time t , ψ_{it} is the set of all information. For firm i , h_{it} is the conditional variance, and with d degree of freedom, D is a student- t distribution, and $q > 0$; $b_{ij} \geq 0$, $j = 0, \dots, q$; $p > 0$; $a_{ik} \geq 0$, $i = 0, \dots, p$.

Findings

AABR and CAABR using MM of Commodity Market for 2008 National Election

The results of average abnormal return (AABR) and cumulative average abnormal returns using Market Model (MM) of the event study analysis of the commodity market for 2008 national election for the proposed time window of 20 days before and 20 days after the event are reported in Table 1. The t -values of AABR based on MM model report that the entire time window shows a statistically significant both positive and negative abnormal returns except on day -11, day +9 and day +15. The highest significant MM AABR is 1.969% reported on day 17 before

Emerging Issues in Economics and Finance

the event. Moreover, the CAABR for MM model in the complete time window are positive as well as statistically significant for all the days in time window. Day 12 after the event shows a highest significantly different from zero return i.e. 3.263%. Furthermore, the study hasn't found any ARCH effect in the market model residuals, so only the MM model was applied.

Table 1: 2008 National Election AABR and CAABR via MM Model of Commodity Market

Days	AABR (MM)	<i>t</i> -test	CAABR (MM)	<i>t</i> -test
Day -20	0.01401	<i>547.446</i>	0.01401	<i>547.446</i>
Day -19	-0.00391	<i>-129.94</i>	0.0101	<i>247.498</i>
Day -18	-0.00173	<i>-72.14</i>	0.00838	<i>129.798</i>
Day -17	0.01969	<i>678.264</i>	0.02807	<i>485.745</i>
Day -16	-0.01058	<i>-281.51</i>	0.01749	<i>585.436</i>
Day -15	-0.00803	<i>-101.6</i>	0.00946	<i>110.049</i>
Day -14	0.00048	<i>22.5605</i>	0.00994	<i>115.683</i>
Day -13	0.00448	<i>126.62</i>	0.01442	<i>131.422</i>
Day -12	0.00196	<i>607.327</i>	0.01639	<i>153.538</i>
Day -11	0.00009	0.9662	0.01648	<i>121.885</i>
Day -10	0.00309	<i>4.6132</i>	0.01957	<i>24.3044</i>
Day -9	-0.00806	<i>-73.845</i>	0.01152	<i>12.8163</i>
Day -8	0.01038	<i>131.479</i>	0.0219	<i>26.3746</i>
Day -7	-0.00054	<i>-15.596</i>	0.02136	<i>25.1643</i>
Day -6	0.00167	<i>101.874</i>	0.02303	<i>27.0302</i>
Day -5	-0.00084	<i>-17.126</i>	0.02219	<i>24.9538</i>
Day -4	-0.00477	<i>-173.36</i>	0.01742	<i>19.9784</i>
Day -3	0.00105	<i>59.4447</i>	0.01847	<i>20.7941</i>
Day -2	0.00045	<i>12.3863</i>	0.01892	<i>21.8755</i>
Day -1	0.00176	<i>71.1979</i>	0.02068	<i>23.4067</i>
Day 0	-0.00735	<i>-129.77</i>	0.01333	<i>16.0945</i>
Day +1	0.00774	<i>687.833</i>	0.02107	<i>25.3319</i>
Day +2	-0.00323	<i>-50.365</i>	0.01784	<i>22.2141</i>
Day +3	-0.00018	<i>-2.2883</i>	0.01766	<i>20.3051</i>
Day +4	-0.00369	<i>-172.89</i>	0.01397	<i>16.3681</i>
Day +5	-0.0005	<i>-37.829</i>	0.01346	<i>15.6431</i>
Day +6	0.00722	<i>288.957</i>	0.02069	<i>23.4912</i>
Day +7	-0.009	<i>-152.12</i>	0.01169	<i>12.7402</i>
Day +8	0.01037	<i>2105.44</i>	0.02205	<i>24.1291</i>
Day +9	0.00042	0.6665	0.02248	<i>25.2296</i>
Day +10	0.00036	<i>5.6176</i>	0.02283	<i>25.9662</i>
Day +11	0.00028	<i>35.6325</i>	0.02311	<i>26.1624</i>
Day +12	0.00952	<i>217.276</i>	0.03263	<i>37.3541</i>
Day +13	-0.00059	<i>-33.907</i>	0.03204	<i>36.1048</i>
Day +14	-0.00456	<i>-194.01</i>	0.02748	<i>31.0796</i>
Day +15	0	0.7141	0.02748	<i>30.9155</i>
Day +16	-0.00461	<i>-239.38</i>	0.02287	<i>26.0392</i>
Day +17	-	-	-	-
Day +18	-	-	-	-
Day +19	-	-	-	-
Day +20	-	-	-	-

2008 National Election CAABRs via MM Model for Various Intervals of Commodity Market

The MM model CAABR for six various time intervals of commodity market for 2008 national election are shown in Table 2. The table *t*-test reveals that there is a positive CAABR values of time window (-20, +20), (-10, +10) and (-1, +1) are 2.287%, 0.635% and 0.215% respectively, while, the CAABR for MM model are negative for the time window of (-5, +5) is -0.956%, (0, +5) is -0.722%, and (-1, 0) is -0.559%, they all are statistically significant at 5 percent.

Table 2: CAABRs and t-test for Various Intervals of Commodity Market (2008 National Election)

Period		CAABR (MM)	<i>t</i> -test
-20	+20	0.02287	24.8910
-10	+10	0.00635	8.2421
-5	+5	-0.00956	-222.3678
0	+5	-0.00722	-297.3805
-1	+1	0.00215	42.9147
-1	0	-0.00559	-122.8241

2013 National Election AABR and CAABR via MM and MMG Model of Commodity Market

The market model and GARCH market model based average abnormal return and cumulative average abnormal return for the time window of -20 days, +20 days and the event day of the commodity market for 2013 national election are shown in Table 3. Using *t*-test and WCSRT *z*-test, the AABR for MM are statistically significant both positive and negative abnormal returns in the entire window except on day 8, day 4 before, the event day, and day 4 after the event, in addition, day -17 and day -5 are statistically insignificant only by *t*-test and *z*-test respectively. Likewise, the MMG AABR also reveals the same results that day -8, day -4, day 0, day +4 as per both *t*-test and WCSRT; similarly, day 17 before the event via only *t*-value and day -5 for only *z*-test are statistically insignificant. The remaining time window show both positive and negative significantly different from zero excess returns.

The CAABR based on MM model in the complete proposed window have negative statistically significant abnormal returns by both *t*-test and *z*-test. Similarly, the MMG CAABR shows result in the same manner, as all the CAABR using MMG in the window are negatively significantly different from zero using both *t*-test and WCSRT. The significant returns indicate the market inefficiency in the semi-strong form of the commodity market during the 2013 national election.

Table 3: 2013 National Election AABR and CAABR via MM and MMG Model of Commodity Market

Days	AABR				CAABR			
	t-test		WCSRT (z-test)		t-test		WCSRT (z-test)	
	MM	MMG	MM	MMG	MM	MMG	MM	MMG
Day -20	-0.03462 (<i>c</i>) 11.9036	-0.03465 (<i>c</i>) 11.9213	- 0.03462 (-6.155)	- 0.03465 (-6.155)	-0.03462 (<i>c</i>) 11.9036	-0.03465 (<i>c</i>) 11.9213	- 0.03462 (-6.155)	- 0.03465 (-6.155)
Day -19	-0.04747 (-7.2101)	-0.04748 (-7.2123)	- 0.04747 (-4.755)	- 0.04748 (-4.755)	-0.08209 (-8.7443)	-0.08212 (-8.7514)	- 0.08209 (-5.334)	- 0.08212 (-5.334)
Day -18	0.01154 (7.7526)	0.01148 (7.6766)	0.01154 (5.102)	0.01148 (5.102)	-0.07055 (-8.8786)	-0.07065 (-8.9033)	0.07055 (-5.334)	0.07065 (-5.344)
Day -17	0.00260 (1.6869)	0.00260 (1.6849)	0.00260 (2.496)	0.00260 (2.496)	-0.06795 (-9.0749)	-0.06805 (-9.0951)	0.06795 (-5.421)	0.06805 (-5.421)
Day -16	0.00271 (2.8653)	0.00269 (2.8454)	0.00271 (2.409)	0.00269 (2.409)	-0.06525 (-8.3755)	-0.06536 (-8.4020)	0.06525 (-5.479)	0.06536 (-5.479)
Day -15	0.00436 (5.7703)	0.00436 (5.7638)	0.00436 (4.369)	0.00436 (4.369)	-0.06089 (-8.1781)	-0.06100 (-8.2026)	0.06089 (-5.460)	0.06100 (-5.459)
Day -14	0.00943 (7.1072)	0.00941 (7.0815)	0.00943 (4.900)	0.00941 (4.880)	-0.05146 (-7.6717)	-0.05159 (-7.7029)	0.05146 (-5.469)	0.05159 (-5.469)
Day -13	-0.00790 (-6.6624)	-0.00791 (-6.6705)	- 0.00790 (-5.257)	- 0.00791 (-5.373)	-0.05937 (-7.6481)	-0.05950 (-7.6757)	0.05937 (-5.421)	0.05950 (-5.431)
Day -12	0.00674 (7.1632)	0.00672 (7.1450)	0.00674 (5.286)	0.00672 (5.247)	-0.05263 (-7.0245)	-0.05278 (-7.0593)	0.05263 (-5.180)	0.05278 (-5.237)
Day -11	0.01917 (8.5624)	0.01917 (8.5615)	0.01917 (5.546)	0.01917 (5.546)	-0.03346 (-6.2828)	-0.03361 (-6.3292)	0.03346 (-5.102)	0.03361 (-5.102)
Day -10	-0.00524 (-7.0277)	-0.00527 (-7.0624)	- 0.00524 (-5.691)	- 0.00527 (-5.691)	-0.03870 (-6.5640)	-0.03888 (-6.6101)	0.03870 (-5.402)	0.03888 (-5.411)
Day -9	0.00922 (7.8582)	0.00922 (7.8651)	0.00922 (5.595)	0.00922 (5.595)	-0.02948 (-6.0379)	-0.02966 (-6.0965)	0.02948 (-5.073)	0.02966 (-5.073)
Day -8	-0.00126 (-0.6817)	-0.00127 (-0.6904)	- 0.00126 (-1.019)	- 0.00127 (-1.019)	-0.03074 (-5.2355)	-0.03093 (-5.2756)	0.03074 (-4.687)	0.03093 (-4.687)
Day -7	-0.00914 (-7.6861)	-0.00914 (-7.6794)	- 0.00914 (-5.276)	- 0.00914 (-5.276)	-0.03988 (-5.7492)	-0.04007 (-5.7816)	0.03988 (-4.668)	0.04007 (-4.668)
Day -6	0.00735 (5.4728)	0.00733 (5.4707)	0.00735 (4.851)	0.00733 (4.851)	-0.03253 (-4.8739)	-0.03274 (-4.9180)	0.03253 (-4.378)	0.03274 (-4.378)
Day -5	0.00170 (2.4035)	0.00170 (2.4026)	0.00170 (1.057)	0.00170 (1.057)	-0.03083 (-4.8892)	-0.03104 (-4.9406)	0.03083 (-4.002)	0.03104 (-4.050)
Day -4	-0.00022 (-0.1713)	-0.00024 (-0.1833)	- 0.00022 (-1.762)	- 0.00024 (-1.762)	-0.03106 (-4.2802)	-0.03128 (-4.3251)	0.03106 (-3.944)	0.03128 (-4.040)
Day -3	-0.00516 (-4.0713)	-0.00516 (-4.0730)	- 0.00516 (-4.040)	- 0.00516 (-4.040)	-0.03621 (-4.5575)	-0.03644 (-4.6005)	0.03621 (-4.118)	0.03644 (-4.118)
Day -2	0.00431 (4.3015)	0.00430 (4.2861)	0.00431 (2.785)	0.00430 (2.756)	-0.03190 (-4.1171)	-0.03215 (-4.1627)	0.03190 (-3.915)	0.03215 (-3.963)
Day -1	-0.00344 (-3.4831)	-0.00345 (-3.4879)	- 0.00344 (-3.529)	- 0.00345 (-3.529)	-0.03534 (-4.3965)	-0.03559 (-4.4415)	0.03534 (-4.118)	0.03559 (-4.118)
Day 0	-0.00123 (-1.4339)	-0.00124 (-1.4492)	- 0.00123 (-1.752)	- 0.00124 (-1.752)	-0.03657 (-4.6537)	-0.03683 (-4.7037)	0.03657 (-4.118)	0.03683 (-4.118)
Day +1	-0.00695 (<i>c</i>) 11.6116	-0.00696 (<i>c</i>) 11.6134	- 0.00695 (-5.672)	- 0.00696 (-5.672)	-0.04352 (-5.4533)	-0.04379 (-5.5069)	0.04352 (-4.118)	0.04379 (-4.118)

Emerging Issues in Economics and Finance

Day +2	-0.00254 (-3.7414)	-0.00255 (-3.7551)	-	-	-0.04606 (-5.4322)	-0.04634 (-5.4825)	-	-
Day +3	-0.01088 (-5.2779)	-0.01089 (-5.2823)	0.01088 (-4.407)	0.01089 (-4.407)	-0.05694 (-5.4877)	-0.05723 (-5.5319)	0.04606 (-4.118)	0.04634 (-4.118)
Day +4	0.00057 (0.9091)	0.00056 (0.8889)	0.00057 (0.719)	0.00056 (0.719)	-0.05637 (-5.3523)	-0.05667 (-5.3991)	0.05694 (-4.118)	0.05723 (-4.118)
Day +5	-0.01106 (-7.2235)	-0.01106 (-7.2320)	-	-	-0.06743 (-5.6932)	-0.06773 (-5.7389)	0.05637 (-4.118)	0.05667 (-4.118)
Day +6	0.01808 (9.1849)	0.01807 (9.1686)	0.01106 (-4.851)	0.01106 (-4.851)	0.01808 (5.440)	0.01807 (5.440)	0.06743 (-4.311)	0.06773 (-4.349)
Day +7	-0.01108 (-)	-0.01108 (-)	-	-	-0.04935 (-4.9428)	-0.04967 (-4.9950)	0.04935 (-3.741)	0.04967 (-3.741)
Day +8	10.1135 (-6.9388)	10.1172 (-6.9476)	0.01108 (-5.633)	0.01108 (-5.633)	-0.06043 (-5.4910)	-0.06075 (-5.5401)	0.06043 (-4.446)	0.06075 (-4.446)
Day +9	-0.00577 (-6.9388)	-0.00578 (-6.9476)	-	-	-0.06620 (-6.0043)	-0.06653 (-6.0549)	0.06043 (-4.446)	0.06075 (-4.446)
Day +10	0.01074 (9.9941)	0.01073 (9.9754)	0.00577 (-5.778)	0.00578 (-5.836)	0.01074 (5.527)	0.01073 (5.527)	0.06620 (-4.610)	0.06653 (-4.610)
Day +11	-0.00274 (-7.0972)	-0.00276 (-7.1182)	0.01074 (5.527)	0.01073 (5.527)	-0.05547 (-5.2653)	-0.05580 (-5.3142)	0.05547 (-4.118)	0.05580 (-4.118)
Day +12	0.00312 (3.6708)	0.00312 (3.6578)	-	-	-0.05821 (-5.3782)	-0.05856 (-5.4274)	-	-
Day +13	-0.00504 (-4.1448)	-0.00505 (-4.1618)	0.00274 (-5.218)	0.00276 (-5.218)	0.00312 (2.785)	0.00312 (2.785)	0.05821 (-4.118)	0.05856 (-4.118)
Day +14	0.00518 (3.4294)	0.00518 (3.4215)	0.00504 (-3.403)	0.00505 (-3.403)	-0.05509 (-5.3433)	-0.05544 (-5.3930)	0.05509 (-4.118)	0.05544 (-4.224)
Day +15	0.00754 (7.7004)	0.00753 (7.6723)	-	-	-0.06012 (-5.4634)	-0.06049 (-5.5161)	0.06012 (-4.118)	0.06049 (-4.118)
Day +16	-0.01124 (-9.0664)	-0.01124 (-9.0693)	0.00518 (3.307)	0.00518 (3.307)	-0.05494 (-5.3110)	-0.05531 (-5.3612)	-	-
Day +17	0.00754 (7.7004)	0.00753 (7.6723)	0.00754 (5.073)	0.00753 (5.073)	-0.04740 (-4.9573)	-0.04778 (-5.0102)	0.05494 (-4.291)	0.05531 (-4.291)
Day +18	-0.01124 (-9.0664)	-0.01124 (-9.0693)	-	-	-0.04740 (-4.9573)	-0.04778 (-5.0102)	0.04740 (-4.147)	0.04778 (-4.146)
Day +19	0.01157 (9.6726)	0.01156 (9.6515)	0.01124 (-5.276)	0.01124 (-5.276)	-0.05863 (-5.5260)	-0.05902 (-5.5749)	0.05863 (-4.291)	0.05902 (-4.330)
Day +20	0.01157 (9.6726)	0.01156 (9.6515)	0.01157 (5.546)	0.01156 (5.546)	-0.04706 (-4.9283)	-0.04746 (-4.9827)	0.04706 (-4.147)	0.04746 (-4.146)
Day +21	-0.00535 (-6.7483)	-0.00536 (-6.7645)	-	-	-0.05241 (-5.2436)	-0.05282 (-5.2986)	-	-
Day +22	0.00123 (3.8858)	0.00122 (3.8605)	0.00535 (-4.658)	0.00536 (-4.658)	-0.05118 (-5.2163)	-0.05160 (-5.2743)	0.05241 (-4.291)	0.05282 (-4.291)
Day +23	0.00314 (5.6423)	0.00313 (5.6376)	0.00123 (3.760)	0.00122 (3.760)	-0.04804 (-5.0599)	-0.04846 (-5.1215)	0.05118 (-4.291)	0.05160 (-4.291)
Day +24	-0.01608 (-5.6844)	-0.01609 (-5.6920)	0.00314 (4.243)	0.00313 (4.243)	-0.04804 (-5.0599)	-0.04846 (-5.1215)	0.04804 (-4.291)	0.04846 (-4.378)
Day +25	-0.01608 (-5.6844)	-0.01609 (-5.6920)	-	-	-0.06412 (-5.3916)	-0.06456 (-5.4491)	-	-
Day +26	-0.01608 (-5.6844)	-0.01609 (-5.6920)	0.01608 (-4.378)	0.01609 (-4.378)	-0.06412 (-5.3916)	-0.06456 (-5.4491)	0.06412 (-4.118)	0.06456 (-4.118)

Note: *t*-values and *z*-values are in parentheses at 5% level of significance
2013 National Election CAABRs via MM and MMG Model for Various Intervals of Commodity Market

Table 4 illustrates the commodity market cumulative average abnormal returns for different alternative time windows via market model and GARCH market model for 2013 general election. The results indicate that CAABR are negative throughout the six various time windows as per MM and MMG. Moreover, the MM and MMG have statistical significant returns i.e. CAABR in the entire proposed different time interval windows as evident by both *t*-test and WCSRT *z*-test.

Table 4: CAABRs using MM and MMG, t-test, and WCSRT for Various Intervals of Commodity Market (2013 National Election)

Period		CAABR			
		t-test		WCSRT (z-test)	
		MM	MMG	MM	MMG
-20	+20	-0.06412 (-5.3916)	-0.06456 (-5.4491)	-0.06412 (-4.118)	-0.06456 (-4.118)
-10	+10	-0.02475 (-4.0181)	-0.02495 (-4.0627)	-0.02475 (-3.654)	-0.02495 (-3.838)
-5	+5	-0.03490 (-5.5003)	-0.03499 (-5.5289)	-0.03490 (-4.320)	-0.03499 (-4.320)
0	+5	-0.03209 (-6.9427)	-0.03214 (-6.9682)	-0.03209 (-4.320)	-0.03214 (-4.320)
-1	+1	-0.01162 (-9.1600)	-0.01164 (-9.1824)	-0.01162 (-5.846)	-0.01164 (-5.865)
-1	0	-0.00467 (-5.1006)	-0.00469 (-5.1205)	-0.00467 (-3.374)	-0.00469 (-3.384)

Note: *t*-values and *z*-values are in parentheses at 5% level of significance

Conclusion

The paper basic aim was to examine the Pakistan's General Elections impact on commodity market i.e. Pakistan mercantile exchange (PMEX). The study considered last two national assembly elections held in Pakistan from 2007 to 2013. The commodity return's AABR and CAABR are computed for different time windows around national elections by employing market model and GARCH market model MM and GMM respectively.

The results indicate that in Pakistan commodity market average abnormal return and cumulative average abnormal returns based on market model for 2008 national election have a statistically significant excess return in the entire window except for three days. Similarly the CAABR show significant abnormal return for the entire window. Moreover, the results for various time intervals of CAABR, it is evidenced that all the proposed windows have significant returns. These evidences show that around 2008 national election, Pakistan Mercantile Exchange (PMEX) exhibit inefficiency in its semi-strong form.

The performance of commodity return in response to 2013 national election illustrates the inefficiency of commodity market around general election by showing a significant abnormal return both positive and negative before and after the election event except for only six days in the complete window. Additionally, the MM and MMG CAABR also shows negative statistically significant returns for the entire window both according to *t*-values and *z*-values. The inefficiency of the market is further evidenced by CAABR that is considered for various alternative

time windows using t -test and WCSRT z -test shows a significantly different from zero negative returns.

Hence, it is evident that there is an inefficient behavior in PMEX. It is obvious that investors can beat the market via fundamental analysis. The results show that around these general elections in Pakistan, there is a drastic change in commodity prices. This study implication is that investors should take precautionary measures before trading commodity markets in the period of political uncertainty particularly during national election.

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