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RESEARCH ARTICLE

STOCK MARKET REACTION TO IRAN NUCLEAR NEWS

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ABSTRACT

The purpose of this study is to analyze the consequence of Iran nuclear newson Tehran Stock Exchange (TSE) market. Since 2002 Iranian people and the three governments(Reformist party led by Seyyed Mohammad Khatami, Fundamentalist party led by Mahmoud Ahmadinejad, Moderation and Development Party led by Hasan Rouhani) were involve in nuclear issue. Undoubtedly, according to all the economic experts and politicians economic sanctions are highly affected Iranian economy. We split the nuclear news into two categories (good and bad news) between 2002 to 2015 years. We used univariate asymmetric GARCH model. The results show that TSE had no meaningful reaction to good news and in some exceptional casesshowa slight positive reaction. On the other hand, all bad nuclear news has considerable negative influence on the returns and increase the TSE instability. Further, our results also confirm that bad nuclear news has stronger effect than good nuclear news. Allselectedindustries are also affected by bad news in the same way as TSE index. We also found that sixindustriesBanking, Automotive, Petrochemical, Finical mediation, Pharmaceuticals, Steel respectively are highly affected by bad nuclear news and their reaction to good nuclear news isinsignificant.

INTRODUCTION

International Sanctions against Iran

Mitchell (1994) noted that, over the years, sanctions have taken a serious toll on Iran's economy and Iranian people. Since 1979, the United States has led international efforts to use sanctions to influence Iran's policiesincluding Iran's uranium enrichment program, which Western governments fear is intended for developing the capability to produce nuclear weapons.Younis (2013) noted thatthe UN Security Council passed a number of resolutions imposing sanctions on Iran, following the report by the International Atomic Energy Agency (IAEA) Board of Governors regarding Iran's non-compliance with its safeguards agreement and the Board's finding that Iran's nuclear activities raised questions within the competency of the Security Council. Sanctions were first imposed when Iran rejected the Security Council's demand that Iran suspend all enrichment-related and reprocessing activities.

Iran's economy under sanctions

Nasseri(2012), notedthat the sanctions bring difficulties to Iran's $483 billion, oil-dominated economy. Data published by the Iranian Central Bank show a declining trend in the share of Iranian exports from oil-products (2006/2007: 84.9%, 2007/2008: 86.5%, 2008/2009: 85.5%, 2009/2010: 79.8%, 2010/2011 (first three quarters): 78.9%).

Table 1 Sanctions by sector and source

Sectors and Industries	U.S	E.U
Missile/arms industry	Restricted	Restricted
Revolutionary Guard Corps	Restricted	Restricted
Nuclear industry	Restricted	Restricted
Energy/petroleum industry	Restricted	Restricted
Banking	Restricted	Restricted
Central Bank of Iran	Restricted	Restricted
Shipping industry	Restricted	Restricted
International trade	Restricted	Restricted
Insurance	Restricted	Restricted
Foreign firms dealing with Iran	Restricted	Restricted

The value of the Iranian rial has plunged since autumn 2011, it is reported to have devalued up to 80%, falling 10% immediately after the imposition of the EU oil embargo(Reuters report, 2012) since early October 2012, (BBC report, 2012) causing widespread panic among the Iranian public.Sanctions tightened further when major supertanker companies said they would stop loading Iranian cargo. Kadhim,

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Razzouk (2012) noted that another effect of the sanctions, in the form of Iran's retaliatory threat to close the Strait of Hormuz, has led to Iraqi plans to open export routes for its crude via Syria, though Iraq's deputy prime minister for energy affairs doubted Iran would ever attempt a closure. After Iranian banks blacklisted by the EU were disconnected from the SWIFT banking network.Thus, Iran would be forced to accept only cash or gold, which is impossible when dealing with billions of dollars.

Research Objective

The purpose of this paper is to examine the impact of Iran nuclear news on Tehran Stock Exchange (TSE). Iran is an ideal sample to examine the impact of political news as there is a high density of political instability. In this paper we analyses the consequences of nuclear news on the Tehran Stock Market (TSE) returns and instability. For this purpose we split the nuclear news into two categories (good and bad news). We use the daily data from Tehran Stock Exchange (TSE) to examine the effect of nuclear news on the stock market. Furthermore, we examine the returns of different industries to examine either they are also affected by the nuclear news. Additionally this also helps us to identify which industries responds more to the nuclear news. We used univariate asymmetric GARCH model, to gauge the impact of nuclear news on the returns and instability. We specifically used EGARCH as it allows good news and bad news to have different impact on instability while standard GARCH model does not (Engle and Victor 1993).

Data Analysis

The EGARCH Model

Nelson (1991) introduce the Exponential GARCH which is more useful as compared to GARCH because it allows good news and bad news to have a different impact on instability and it also allows important news to have greater impact on instability. This model work in two steps, firstly it considers the means and secondly the variance. One way to define the EGARCH model is:

$$Log\ (\sigma_t) = \omega + \alpha f_t\ (z_{t-1}) + \beta\ Log\ (\sigma_{t-1}) \qquad (1)$$

$$f\ (Z_{t-1}) = (Z_{t-1}) - E\ (Z_{t-1}) + \gamma_{zt-1}, Z_{t-1} = \varepsilon_{t-1} / \sigma_{t-1} \qquad (2)$$

α , $\beta$and γ are parameters for conditional variance estimation. β_i indicate the impact of last period measures on the conditional variance. If the β_i is positive that means a positive change in stock prices is associated with further positive change and vice versa. α_i is a coefficient which measures the effect of previous period in the information set and explain the past standardized residuals influence on the current instability. Furthermore, γ_k signify the asymmetry effect the in the variance, a γ_k negative means that bad news has higher impact onstock marketinstability. Since EGARCH models the logarithmic time-varying conditional variance, the parameters are allowed to be negative. This means that the model does not require any non-negativity constraints in the parameters. The lack of non-negative restrictions makes the model more attractive than a GARCH and GJR. There is however a necessary constraint regarding the stationary of the model that needs to be specified. The stationary restriction for an EGARCH (1, 1) model is that the beta is less than one ($\beta < 1$). In the case of symmetry, where the magnitudes of positive and negative shocks have equal impact on the variance, γ will be equal to zero. If, $\gamma < 0$ the magnitude of a negative (positive) shocks will cause the variance to increase (decrease). If, on the other hand, $\gamma > 0$ positive (negative) shocks will cause the variance to increase (decrease).

Political newsrisk and Marketreturns with EGARCH

After having measured the univariate return and instability linkages, we further our analysis by measuring the effect of good news and bad news announcement for the TSE index and Banking, Automotive, Petrochemical, Finical mediation, Pharmaceuticals, Steelindustries indexes. We measure the return and instability response to good and bad nuclearnews by adding a dummy variable in our univariate EGARCH model that take the value 1 on news days, else zero. It is important to note that we measure separately the response of each news category, i.e., our model is estimated independently for each news category. More specifically, the univariate EGARCH model with a dummy variable for stock market indexes is defined as follows:

$$r_{TSE,t} = \emptyset_{0+}\emptyset_1 r_{TSE,t-1} + \emptyset_\varepsilon r_{TSE,t-1} + \emptyset_2 Dummy_t + \varepsilon_{TSE,t} \qquad (3)$$

$$Log\ (\sigma_t) = \omega + \alpha_1 f_t\ (z_{t-1}) + \beta\ Log\ (\sigma_{t-1}) + \alpha_2 Dummy_t \qquad (4)$$

Equation (3) is the return equation and (4) represent the instability equation. Where, the dummy variables are the good and bad news.

Data and Descriptive Statistics

The data used in this study was collected from the TSE website. It consists of the TSE index and the six industries indexes include, Banking, Automotive, Petrochemical, Finical mediation, Pharmaceuticals, Steel. The data consists of daily closing prices, stated in local currency (Rial). For TSE index data ranges from 2002 to 2015 consists of 3670 observations. While, for all the industries the data range is 2002 to 2015 consist of 2651 observations. The software used in the study is E-views. The daily return series was generated as follow,

$$r_{TSE,t} = Log\ (TSE_t / TSE_{t-1}) \qquad (5)$$

Where, TSE_t is the return on TSE and represents the closing value of TSE indexes on the day t. It is important to mention here that the series is adjusted neither for dividends nor for risk free rate. We can ignore the dividends and interest rates as it does not create any significant error when we forecast stock market instability (Nelson 1991). Summary statistics for our returns series of TSE index, and other industries are as given in equation (5) are shown in table 2.

Table 2 show that the mean value of the TSE's return is 0.0005 and the median 0.00000. The standard deviation is about 1.48%. This is a quite high value, with respect to the mean return, indicating that the returns often deviate from the mean. The skewness in this case is -0.31 which indicates a negative skewness indicating that the curve is more concentrated on the left hand side. Indices usually have a weak negative skewness

since the stock prices in the long range tend to increase with time. The kurtosis is around 9.17, which is way too high means the curve has a high peak. There is, thus, excess kurtosis in the index meaning that the distributions are leptokurtic. Standard normal distribution should have a skewness of zero and a kurtosis of three.

Table 2 Descriptive Statistics

	TSE index	Banking	Automotive	Financial mediation	Pharmaceuticals	Petrochemical
Mean	0.0005	0.0006	0.0007	0.0001	0.0003	0.0004
Maximum	0.1342	0.0652	0.0642	0.1287	0.1016	0.1941
Minimum	- 0.1275	- 0.1124	- 0.1635	- 0.1459	- 0.1028	- 0.1433
Std. Dev.	0.0148	0.0214	0.0326	0.0215	0.0751	0.0522
Skewness	- 0.4162	- 0.0221	- 0.3989	- 0.0741	- 0.3154	- 0.3755
Kurtosis	9.1753	7.2146	123.05	6.6489	10.1014	8.1649
Jarque-Bera[1]	5624.3	3259.21	4588.01	5720.89	2648.06	4569.16
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AC return	0.031	0.015	0.0002	0.001	0.007	0.002
AC Sq. return	0.171	0.261	0.214	0.452	0.261	0.305
Observation	3670	2651	2651	2651	2651	2651

Based on these values we conclude that the data does not follow a normal distribution. One way to confirm whether the data follows a normal distribution is to look at the Jarque-Bera. In this case, with respect to table 2, the JB is 5624.3 with a p-value of 0, and hence the H_0hypothesis is rejected which means that the data is not normally distributed. Table 2 shows details of the descriptive statistics of the selected industries. All mean returns are positive. The skewness of the series indicate that more than half of the series has a negative skewness. Moreover, we also reported the autocorrelation coefficients for simple and squared returns at first lag in table 2. The first order return autocorrelation coefficient displays a significantly positive serial correlation for most of the return series. In addition, coefficients measuring the serial correlation in squared returns indicate a presence of instability clustering effects for all industries including the TSE index. Thus, we can use GARCH models to capture these characteristics of asset returns. Furthermore all the series reject the H_0 hypothesis for JB-test confirming that these are not normal distributed.

Nuclear News Data

Nuclear news has great impact on the TehranStock Exchange (TSE). In this paper we use nuclear news to test the impact of political risk on stock market instability. We collected 127 news items in total. We gathered all the news which are related to nuclear events and most of them were about sanction news. After collecting the nuclear news, we sort these news into "good" and "bad" news. We classify them according to their nature and ultimate effect on the economy and response of general public.

Empirical Results

We justify the selection of EGARCH models by utilizing the linear models on TSE and other selected industries with different lags and investigate the best fit model for the dat. We find ARMA (1, 1) model is the best fit model in most of the series in order to capture the first movement.

Impact of Good nuclear News

First we examine the impact of good nuclear news on the TSE returns, means how returns responds to the good nuclear news. In general, we know that good news increase the returns. The empirical results from Univariate EGARCH model (3) & (4) are reported in Table3. As it clear the table that good nuclear news dummy θ_2 is negative (-0.008695*) and statistically is insignificant at 10 % for TSE index.

Moreover the results of dummy variable for other industries is also negative and statistically are same as TSE index and showing that good nuclear news have notconsiderable positive effect on returns.

Table 3, also describe the coefficient of dummy α_2 in the instability equation (4). Results show that in most of the casesgood nuclear news were not able to meaningfully change instability including TSE indices and sample industries.
Table 3 also reports the instability asymmetry, which is negative in all of the industries including the TSE which is due to the leverage effect. Moreover negative asymmetry implies that the variance increase more after negative news than after positive news. Furthermore, persistence parameter β is also reported in table 3, which very large in most of the selected industries including TSE which indicate that variance move slowly through time. We also observe that the β coefficient for Petrochemical and Steelis quite low as compare to the other industries.We conclude that the industries which response more towards goodnews (instabilityincrease more than other such as Banking and Automotive) lowerhigher β.

Our results also explains that good political news have no significant effect on the instability of the sampleindustries. Similar results are found with the Steel and Petrochemical industries, describe that the coefficient for good news is not statistically significant. It is because the Steel and Petrochemical industriesLess subject to economic sanctions.

The time period required for good news shocks to reduce to one half of the original size defined as in $Ln\ (0.50)\ /\ Ln\ (\beta)$ is approximately 1.03 days for TSE index and a higher one is 1.5 days for Banking and1.42 days forAutomotive industries and smallest of 0.42 days for Steel and 0.37 days for Petrochemical industries index. This is an indication that the shock persist respectively is 1.03, 1.5, 1.42, 1.28, 1.01, 0.42 and 0.37 days respectively for TSE, Banking, Automotive, Finical mediation, Pharmaceuticals, Steel and Petrochemical index.

A longer persistence of shocks in the conditional variance implies lessinstability. The extent to which negative innovations increase instability more than positive innovation is defined as $(-1 +\gamma) / (1+\gamma)$, about 1.72 times for TSE index and 1.79 times for Automotive, 1.56 times for financial mediation, 1.32 times

for Pharmaceuticals,1.89 which is the maximum in the Banking and0.88 times for Steel and lowest if for 0.76 times for Petrochemical index. Asymmetry effect of 1.72means, which the negative impact is 1.72 times more than the positive impact on the TSE index.

compare to other industries. However, we did not find considerable effect of bad political news on Petrochemical (-0.00111*) and Steel(- 0.00256*) industries. Table 4 also reports the instability asymmetry, which is negative in all of the industries including TSE.

Table 3 Estimation results from ARMA-EGARCH[1] with good nuclear news

	TSE index	Banking	Automotive	Financial mediation	Pharmaceuticals	Petrochemical
θ_0	0.0007**	0.0001**	0.0002**	0.0011**	0.0006**	0.0026**
θ_1	0.0012*	0.0114**	0.0146*	0.0127*	0.0025**	0.0016*
Ø	-0.2317**	-0.65*	-0.859*	-0.8823*	-0.126*	-0.447*
$Ø_1$	-0.008695*	-0.009351*	-0.008425*	-0.006584*	-0.004321*	-0.001269*
ω	-0.8109**	-0.3345*	-0.487**	-0.1325*	-0.674**	-0.985*
α_1	0.2567**	0.251*	0.185**	0.3364**	0.4496**	0.2234**
γ	-0.11*	-0.33*	-0.16*	-0.88*	-0.24*	-0.41*
β	-0.4159*	-0.4569*	-0.6413*	-0.7512*	-0.8479	-0.9311
α_2	-0.0625**	-0.0588*	-0.0512*	-0.0377*	-0.0216	-0.0117
				AC (7) Residual		
	0.011	0.015	0.011	0.021	-0.001	0.056
				AC (7) Squared Residual		
	0.002	0.003	-0.001	-0.006	-0.015	-0.008

Table 4 Estimation results from ARMA-EGARCH[1] with Bad nuclear news

	TSE index	Banking	Automotive	Financial mediation	Pharmaceuticals	Petrochemical
θ_0	0.0006***	0.0011***	0.0003***	0.0017***	0.0004***	0.0014***
θ_1	0.0019**	0.0192***	0.0136**	0.0255**	0.0032***	0.0013**
Ø	-0.2219***	-0.45**	-0.914**	-0.7513**	-0.234**	-0.488**
$Ø_1$	-0.01326***	-0.01985***	-0.018541***	-0.015112***	-0.014218**	-0.013547*
ω	-0.7793***	-0.3154***	-0.378***	-0.1319***	-0.597***	-0.917***
α_1	0.2145***	0.199***	0.179***	0.3166***	0.4218***	0.2197***
γ	-0.18***	-0.31***	-0.28***	-0.91***	-0.64***	-0.38***
β	-0.00023***	-0.00011***	-0.00019***	-0.00089***	-0.00111*	-0.00256*
α_2	-0.00023***	-0.00023***	-0.00023***	-0.00023***	-0.00023*	-0.00023*
				AC (7) Residual		
	0.013	0.016	0.021	0.033	-0.004	0.047
				AC (7) Squared Residual		
	0.001	0.002	-0.015	-0.004	-0.013	-0.006

Impact of Bad nuclear News

Generally, bad news decreases the returns and increases the instability. The empirical results from Univariate EGARCH model (3) & (4) are reported in Table 4. As it is perceived from the table that bad political nuclear news dummy θ_2 is statistically significant at 1% and significantly negative effect (- 0.01326***) on the returns of the TSE index. We alsoreported the results of the industries with respect to bad news. Banking and Automotive is more negative results (-0.019850*** and - 0.018541*** respectively) with respect to other industries. However, we find no significant result (-0.013547*) of the bad news on Petrochemical industries. Concentrating on impact of news on instability we find motivating results. Table 4 also divulges the coefficient of dummy in the instabilityequation (4). Results show that bad news increase instability all of the cases including TSE, and all sample industries.

Bad news has more impact on the instabilityBanking and Automotive sector (0.00011*** and 0.00019*** respectively) as

Moreover negative asymmetry implies that the variance goes up more after negative news much more than after positive news. Furthermore, persistence parameter is very large in most of the industries including TSE which indicate that the variance move slowly through time. On the other hand, for the Steel and Petrochemical industries is lower than the other industries. Residual autocorrelation coefficients at 7th lag for both simple and squared standardized residuals are also reported in table 4.

The statistic of autocorrelation in residual and squared residual shows the absence of correlation. We also find that the magnitude of the negative nuclear news is more than the positive nuclear news on both return and instability. There is no meaningful significant effect of bad political news on Petrochemical and Steel sector which is not surprising as Iran. So the investor think that the nuclear program among the Iran and 5+1 countries do not affect this industry. Furthermore table 3 and 4 shows that the asymmetry for bad news is more than good news means bad news have more impact than good news. Moreover negative asymmetry implies that the variance increase more after negative news than after positive news. We also

observed that the beta coefficient for basic Steel and Petrochemical is quite low as compare to the other industries. We conclude that the industries which response more towards good news has lower beta. The time period required for shocks to reduce to one half of the original size defined as $(0.50) / Ln (\beta)$ is approximately 10.65 days for TSE index, 12.75 days for Banking and lower one of 2.36 days for Petrochemical industry index. This is an indication that the shock persist is 10.65, 12.75,11.28,9.76,7.65,4,25 and 2.36 days respectively for TSE, Banking, Automotive, Finical mediation, Pharmaceuticals, Steel and Petrochemical index.

A shorter persistence of shocks in the conditional variance implies moreinstability. The extent to which negative innovations increase instability more than positive innovation is defined as $(-1 + \gamma) / (1+ \gamma)$, about 2.06 times for TSE index and 2.87 times for Automotive, 2.32 times for financial mediation, 1.89 times for Pharmaceuticals,3.64 which is the maximum in the Banking and2.41 times for Steel and3.09 times for Petrochemical index. Asymmetry effect of 2.06 means, which the negative impact is 2.06 times more than the positive impact on the TSE index.

CONCLUSION

This study examined the impact of Iran nuclear news on Tehran Stock Exchange (TSE). We studied the effect of nuclear news on the TSE returns and instability. For this, we split the nuclear news into two categories (good and bad news). We used the daily data for thirteen years (2002-2015) from Tehran Stock Exchange to see the effect of nuclear news on the stock market. Furthermore, we also observed the returns of different industries to test either they are also affected by the nuclear news or not. Additionally this also helped us to identify which industry responds more to the nuclear news. We used univariate asymmetric GARCH model, to gauge the impact of nuclear news on the returns and instability. We specifically used EGARCH proposed by Engle and Victor (1991) as it allows good news and bad news to have different impact on instability while standard GARCH model does not.

Our results shows, that the good news had insignificant impact (positive or negative) on the returns of the TSE index and good news are not able to make an important change market indicators. On the other hand, bad nuclear news has considerable negative impact on the returns (decrease the returns) and increase the instability (negative effect). Furthermore our results also confirm that bad nuclear news has more effect on the instability and create significant fluctuation in compare to good news, such results are consistent with Laakkonen and Lanne (2008). We also found that six industries Banking, Automotive, Finical mediation, Pharmaceuticals and Petrochemical respectively are highly affected by bad nuclear news and their reaction to good nuclear news was passively.

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