Considering Output Volatility Feedback of Share in Pharmaceutical, Vehicle and Oil Industry of Tehran Share Market

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Abstract— the whole index of Tehran share market in April 2009 was about 8000 units. This index was about 19000 units in October 2009. In this period the growth of 137 percent of Tehran share market had some consequences consisting of remarkable increasing of volatilities in Tehran share market. The relation between the output of share and it`s variance as a representative for risk, is an important subject in a financial research. Therefore, exact, transparent and reasoning knowledge of share volatilities and its relationship whit the output of share is important. Share risk is known whit volatilities in price of share or whit output volatilities, because the amount of output changes can be a reagent of distrust from not gaining of output. In this paper, volatilities feedback of Tehran share market has been considered among there groups of pharmaceutical, vehicle and oil, along whit comparing them. Volatilities feedback means share output impressionable from its risk and indeed explains the effect of share volatilities on its output. In spite of having upward procedure, some time series had volatility procedure and in some periods, they left more or less volatility behind. Since the researcher considering volatility feedback, among ARCH family models the M-GARCH model was used and the GARCH (1-1), the GARCH (1-1), the GARCH (2-2) were selected for pharmaceutical group, vehicle group and oil industry respectively. Also among outputs of time series, just daily index was used in time periods from 2006 to 2010. The result of research showed volatilities feedback in pharmaceutical and oil industry. Positive effect of volatilities reigns on output in pharmaceutical group, when this effect was negative in oil group. Also it was not confirmed in vehicle group.

Index Terms— share volatilities, volatilities feedback, Tehran share market, share index, share output, ARCH model, GARCH model, GARCH in mean

1 INTRODUCTION

In financial market, one of the main problems related is the relation between output and share risk. Changes in share output can change shareholders risky expectations and also change in share risk, can effect on shareholders output expectations. So that, the shareholders only accept risky shares for more output and vice versa. In this case one of the problems is share risk modeling. By introducing ARCH and GARCH models by Engle & Robert in 1982, and Bollerslev in 1986, share risk modeling was possible via conditional volatility of share output. By helping GARCH model, the effect of share output on share volatility by Nelson in 1991 was testes and called leverage effect. Many studies have been performed with this model. Khalafalla Ahmed (2012) in article with title Estimation of Exchange Rate Volatility via GARCH Model (Case Study Sudan (1978 – 2009)) the analysis presented.

The purpose of this paper is to estimate volatility in the rate of exchange which is adopted by inconsistent economic policies. GARCH (1, 1) is used for estimating it. The leverage effect is negative which is different from zero in statistical point of view. Results show that there is possibility of concurrent feedback between the rate of exchange and unreliability and also the rate of exchange response to the general level of price-share and current account. Lin & chuang (2011) in article Feedback trading and volatility asymmetry : Differences between the electronics and non-electronics sub-indexes of the Taiwan Stock Exchange, This study considers this hypothesis which says there is feedback in some participants of electronic and non-electronic commerce in sub-criteria of Taiwan securities stock returns. The GJR-GARCH is used in this model that is the result of differences between electronic sub-criteria and non-electronic sub-criteria and also the asymmetry of volatilities. Magnus & Fosu (2006) in article Modeling and Forecasting Volatility of Returns on the Ghana Stock Exchange Using Garch Models, This model considers the Ghana stocks volatility which uses GARCH (1, 1), EGARCH (1, 1) and TGARCH (1, 1) models. The random walk hypothesis on DSI (stock index database) is totally rejected. Nikolay et al (2013) in article with title Heavy-tailed mixture GARCH volatility modeling and Value-at-Risk estimation, the analysis presented. Markus et al (2013) in your article with title Time-varying mixture GARCH models and asymmetric volatility , Alexander et al (2013) with Forecasting VaR using analytic higher moments for GARCH processes , , Xiaodong & Xian (2013) with Modelling natural gas market volatility using GARCH with different distributions , Hou & Suardi (2012) A nonparametric GARCH model of crude oil price return volatility , the analysis presented.

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Nawazish & Mawal Sara (2012) in research with title Time Varying Stock Market Volatility: The Case of an Emerging Market, the analysis presented. In this paper, we examine the volatility patterns in Karachi Stock Exchange using GARCH framework between 2004 and 2012. Based on our finding, we propose that higher order moments of returns should be considered for prudent risk assessment.

Pindyck considered the output volatility on share output in 1984. This was called volatility feedback to design this model, conditional volatility of share output was entered in GARCH`s mean equation. GARCH`S model which have this effects are called GARCH in mean. Now the analysis of volatility feedback whit the help of GARCH in mean is a common test for evaluating of share risk effects on output. There are different practical studies, some of these such as French et al (1987) ; Cample & Henchel (1992) confirmed the positive volatility feedback . It means that output volatility has a positive effect on share output. But some of other researchers like "Turner et al (1989)" and "Glosten et al (1993) , have reported a negative volatility feedback. Abunvari and Motameni in 2007 have considered the possibility of volatility feedback in Tehran share market. In this study, predictable and unpredictable volatility were separated from each other and the effect of each was tested on the output of the whole index of Tehran share market in periods of 1990-2006. The result doesn't confirm the presence of volatility feedback in Tehran share market. In this paper it will be tried to consider volatility feedback of Tehran share market among there group of vehicle, oil and pharmaceutical, separately. For this time series, it has been used the daily index among these three groups in years 2006 to 2010. In continuation used method, in research and the concept of volatility feedback in view of economics will be explain.

2 INTRODUCING RESEARCH METHOD

One of the methods to compute financial assets is to estimate its output volatility. As it was explained above. GARCH methods made it possible to model output volatility. Although, there is discord variance. In this model, conditional variance output of shares is used as risk parameters.

$$\omega Rt = w + \varepsilon t \quad (1)$$

$$\sigma^2 t = \beta 0 + \sum \beta i \varepsilon 2t\text{-}i + \sum \beta j \sigma^2 t\text{-}j + \varepsilon t \quad (2)$$

Above equations show a simple GARCH (i, j). Equation No.1 is called GARCH mean equation. R is financial assets output. W is explanatory variable including width from origin or other endogenous variables that is added to the model if necessary. ε Is the residue of mean equation that is known "News" in economics? If the value is positive the news is good, and if it is negative, the news is bad. The second variance is known as GARCH. δ^2 Is output conditional variance. As it is clear in the second equation, this variance is conditional on news volatility and previous amount of variance itself. In fact, variance equation GARCH, is designed similar to the ARMA and the amount of pause optimization i,j , also via the test of Correlogram Q Statistics for two amount of δ_(i-t)^2 and δ_(j-t)^2 is computable. Coefficient β_i shows the role of good and had news on output volatility that has the same effect as leverage the study of "Mehrara & Abdoli " in 2006 and "Abunvari & Motameni " in 2007 confirmed the existence of this effect in Tehran share market. But for estimating volatility feedback, the effect of output volatility must be tested on the taken test. It means that conditional variance is there in mean equation. These models are said GARCH in mean:

$$\omega Rt = w + y\,\sigma^2 t + \varepsilon t \quad (3)$$

$$\sigma^2 t = \beta 0 + \sum \beta i\, \varepsilon 2t\text{-}I + \sum \beta j\, \sigma^2 t\text{-}j + \varepsilon t \quad (4)$$

According to the equation 4, the coefficient Y shows the output volatility. If the amount of this coefficient is meaningful from the statistical point of view, the existence of volatility feedback is confirmed. If the coefficient Y is positive, by increasing the share risk, the amount of share output also will increase and if Y is negative, by increasing the risk, the amount of share output will decrease. In both cases share output procedure will affect the magnitude of share risk or in other words share output is subject to share volatility feedback. One of the prefaces of using GARCH models being white noise of ε_t in equation mean. ε_t Will be a white noise only in condition that R_t is stationary variable. For the same reason, before using GARCH test, share output will be under augmented dickey fuller test. With the help of this test, the possibility of existence of unit root and the procedure in output variable will be considered.

3 ESTIMATED RESULT OF RESEARCH MODEL

Regarding to the stationary test of share output, the test has been done for the three groups of pharmaceutical, vehicle and oil in Tehran stock exchange. The result of this test has been abridged in table 1:

TABLE 1
UNIT ROOT TEST FOR STOCK RETURN

Variable	t-statistic, ADF	Sig
pharmaceutical	-10.67	0.000
Vehicle	-28.06	0.000
Oil	-24.68	0.000

As it is noticed in above table, the share output of the three groups of pharmaceutical, oil and vehicle is at 5 percent of stationary and hence estimating of GARCH model in each case is possible. GARCH equation was done in mean for estimating volatility feedback like equations 3, 4 for all three groups. The results in table2:

TABLE 2
ESTIMATION OF GARCH MODEL IN MEAN FOR PHARMACEUTICAL

Variable	Coefficient	Standard deviation	z-statistic	Sig
λ	0.595	0.248	2.426	0.015
ω	-0.001	0.000	-2.395	0.016
β_0	0.000	0.001	10.436	0.000
β_1	0.210	0.026	7.964	0.000
β_2	0.438	0.049	8.903	0.000

Output behavior in the group pharmaceutical confirmed the

existence of GARCH (1, 1) model. According to table 2 volatility feedbacks in pharmaceutical Tehran stock exchange in 5 percent level probability is coefficient Y take place when increase in index volatility in pharmaceutical group that share output is going upwards. The following figure shows the process in the pharmaceutical industry:

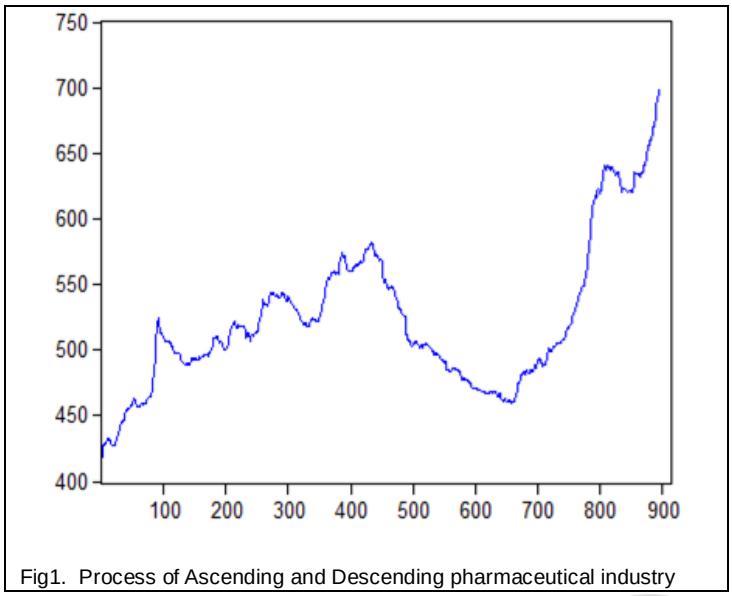

Fig1. Process of Ascending and Descending pharmaceutical industry

Output behavior in group vehicle also confirms existence of GARCH (1, 1) method. Difference is that the output in mean method without the existence of width from origin can maintain the residue stationary equation:

TABLE 3
ESTIMATION OF GARCH MODEL IN MEAN FOR VEHICLE

Variable	Coefficient	Standard deviation	z-statistic	Sig
λ	0.050	0.049	-1.023	0.306
β_0	0.073	0.035	2.052	0.000
β_1	0.073	0.035	2.052	0.041
β_2	0.351	0.129	2.72	0.006

The result of estimating GARCH method in mean vehicle group, the existence of volatility feedback is not confirmed in this group. As it is seen in the table, coefficient is not meaningful in level of 5 percent. The following figure shows the process in the vehicle industry:

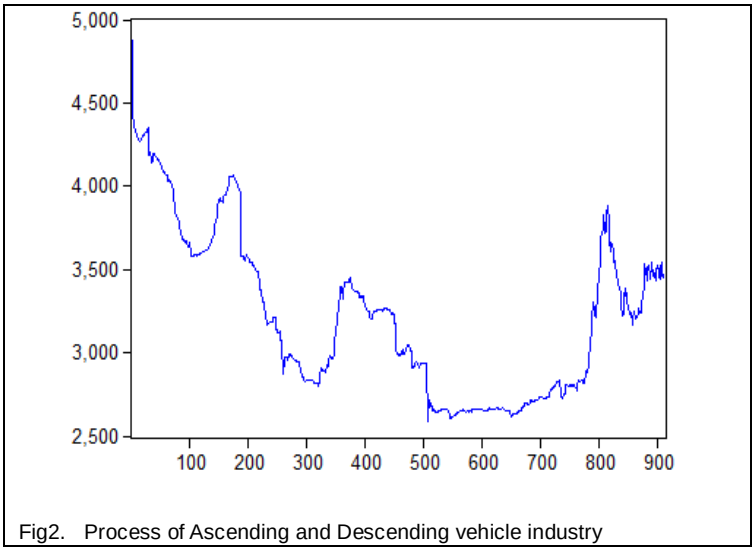

Fig2. Process of Ascending and Descending vehicle industry

On the basis of residue tests of GARCH method of oil industry The GARCH (2, 2) model has been chosen for this group. It means that the variance equation in GARCH method δ_t^2 , ε_t^2 is entered the model with 2 pauses. It is shown in following table.

TABLE 4
ESTIMATION OF GARCH MODEL IN MEAN FOR OIL

Variable	Coefficient	Standard deviation	z-statistic	Sig
λ	-1.660	0.718	-2.309	0.020
ω	0.023	0.010	2.333	0.098
β_0	0.000	0.003	3.398	0.000
$\beta_{i=1}$	0.0011	0.004	2.677	0.007
$\beta_{i=2}$	-0.002	0.006	-0.417	0.676
$\beta_{i=1}$	0.971	0.283	3.434	0.000
$\beta_{i=2}$	0.644	0.120	-6.285	0.000

Coefficient y for the oil group of Tehran stock exchange is obtained -1.66 and it's meaningfully also is not rejected in level of 5 percent. Therefore volatility feedback is there in oil group. So by increasing in risk scope of in oil group leads to decrease share output. The following figure shows the process in the oil industry:

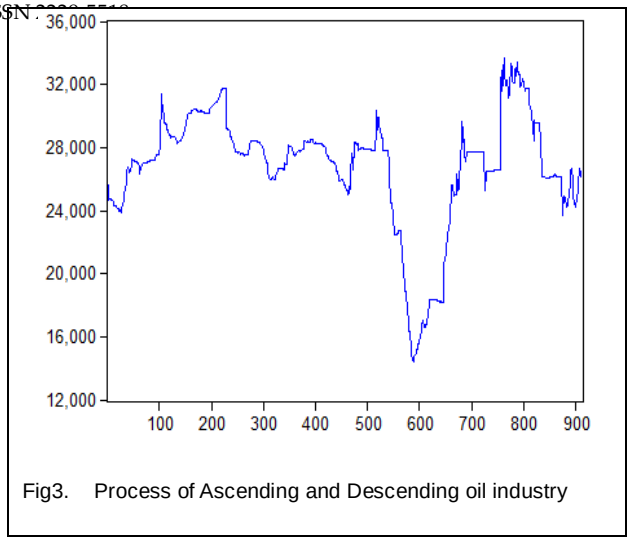

Fig3. Process of Ascending and Descending oil industry

4 Conclusion

In this article the presence possibility of volatility feedback was considered among pharmaceutical, vehicle and oil groups of Tehran share market. The method used in this research, is GARCH in mean. GARCH (1, 1) method has been chosen for pharmaceutical and vehicle group and GARCH (2, 2) was selected for oil industry. The result of unit root test, states the output stationary in all there groups. After estimating GARCH in mean methods, it is marked that volatility feedback doesn't exist in vehicle group. But its existence in two other groups hasn`t been rejected by the method. The amount of coefficient connector of volatility and output shows that positive effect of volatility dominates output, while it is estimated to be negative in oil group

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