

## Based on the empirical research on the gem index E - garch model

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**Abstract:** In this paper, based on the GARCH model, simulation of the gem index trend, the gem closing index of the unit with inspection, Respectively establish a Garch (1, 1) model, T - Garch and E - Garch model, the simulation results for the gem smooth closing index time series, the arch effect, E - Garch model to simulate the best effect.

**Keywords:** Garch model, the gem index, E - Garch model, Item Number.

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### INTRODUCTION

Risks in the process of securities investment, and investors' aim is to maximize returns and reduce their risk. The higher the expected reward, the higher the investors have to bear the risk. So the main purpose of the investors choosing investment is to withstand the risk, the pursuit of the biggest reward; Or under the expected reward, the pursuit of the lowest risk. So investors need some quantitative indicators to help make decisions. Gem is a comprehensive index reflecting the whole gem market index, and reflect the overall price change and trend of chinext stocks, provide investors with a reference of authority. Based on this paper, the GARCH model is used to provide a reference for the analysis of the gem index.

### GARCH Theoretical basis[1-4]

GARCH (p, q) model called generalized ARCH model, is the expansion of the ARCH model, put forward by Bollerslev in 1986. It is a generalization of the ARCH model. If ARCH model is applied to AR model, GARCH model is using ARMA model for volatility modeling, by this method can effectively reduce the number of fluctuations after order, to estimate the effective introduction of the model.

Engel (Engle) in 1982 in the journal of econometrics in a paper autoregressive conditional heteroscedastic model is put forward for the first time, and in 2003 was awarded the Nobel Prize in economics. ARCH model is considered to be the most concentrated reflects the characteristic of variance changes is widely applied to financial data time series analysis model. The main ideas of the ARCH model is: the disturbance of conditional variance depends on the size of its previous value. Model is expressed as, which is an independent identically distributed random variables, obey the mean to 0, the variance of 1 standard normal distribution.

### GARCH model

GARCH (p, q) is as follows:

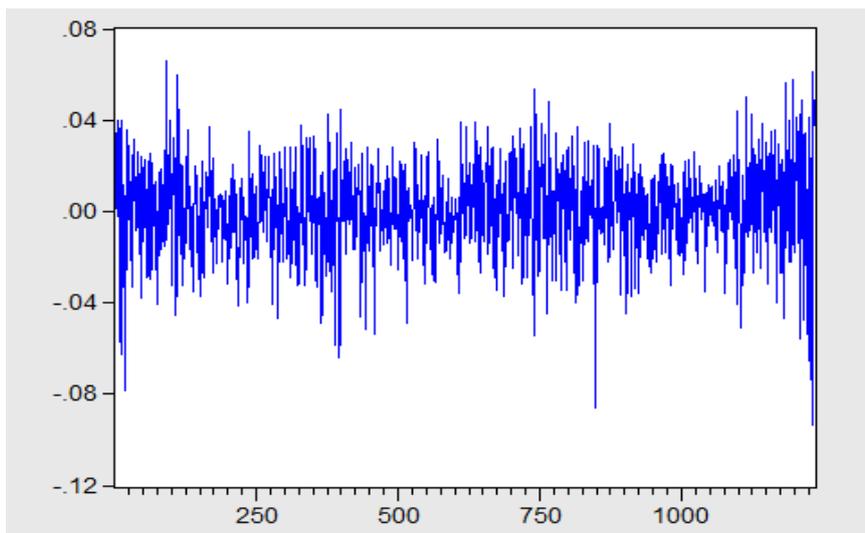
$$a_t = \delta_t \varepsilon_t, \delta_t^2 = \alpha_0 + \sum_{i=1}^p \alpha_i a_{t-i}^2 + \sum_{j=1}^q \beta_j \delta_{t-j}^2 \quad (1)$$

Which is an independent identically distributed random variables, obey the mean to 0, the variance of 1 standard normal distribution.  $\alpha_0 > 0, \alpha_i > 0, \beta_i > 0$ .

### THE EMPIRICAL ANALYSIS

In this paper, the selection of the object of study for the gem's closing price, sample interval for June 1, 2010 - July 1, 2015. Data categories for the day, sample number is 1233. Data processing using the software of Excel and Eviews 6.0 software.

For data preprocessing  $R = \text{LN}X(t) - \text{LN}X(t-1)$ , the logarithmic index, yield,  $x(t)$  for the same day the closing price,  $x(t-1)$  for the previous day's closing price.



**Fig-1: Descriptive time series**

The cluster phenomenon can be seen from the logarithmic exponential daily yield curve. the linear graph clustering phenomenon, namely small fluctuations over a period of time, and in some period. Can be seen in the bar graph sequence mean value is 0.000904, the standard deviation is 0.001840, partial degrees  $-0.443123 < 4.269932 > 0$ , there is left trailing, kurtosis 3 illustrates the sequence rush thick tail. J - statistics of 123.1055 B, P value is 0, refused to sequence is normal distribution hypothesis.

For the results of implementing stationarity test sequence, its T statistic is 25.83908, 1%, 5%, 10% confidence level under the T statistic respectively 3.4355, 2.8637, 2.5680, corresponding to the P value is 0, that smooth sequence. The data from the test results for P value is 0, with significant, so reject the null hypothesis, namely the sequence exists since the correlation.

Regression model is established after the reuse of residual square correlation diagram test the ARCH effect. Inspection results P value is 0, proved that the time sequence sequence correlation to the there is the ARCH effect.

Garch (1, 1) model, T - Garch model, E - Garch model.

**Table-1: The results of model**

	R-squared	AIC	SC	DW	P value
Garch(1,1)	0.0000	-5.0841	-5.0717	1.7826	0.0777
T-Garch	0.0000	-5.0849	-5.0683	1.7826	0.0783
E-Garch	0.0000	-5.0838	-5.0672	1.7826	0.0075

For E-Garch (1,1)residual ARCH effect inspection. Lag order number 1,4,8 .respectively. Under the lag value F statistic are not significant, the model does not exist the ARCH effect. E - Garch model is:

$$\ln \delta_t^2 = -0.132190 + 0.091821 | \varepsilon_t / \sqrt{\delta_{t-1}^2} | + 0.0016 \varepsilon_{t-1} / \sqrt{\delta_{t-1}^2} + 0.992338 * \ln \delta_{t-1}^2$$

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