The GARCH Analysis of YU'EBAO Annual Yields

Weiwei Guo[1,a]

[1] Longdong University,Qingyang,Gansu province,745000

[a]Email：gww2008ok@126.com

Key words: GARCH; YU'EBAO; Annual Yields

Abstract. As the important tool of network finance, YU'EBAO has highly financial product yield, liquidity and other advantages compared with bank. But accompanied by such financial products innovation, their earnings also gradually fell back. By Eviews 6.0 ,the paper studies YU'EBAO annual yields from May 30, 2013 to September 5, 2014 , establishes the financial time series of the ARCH model, compares and concludes T – GARCH better fitting of the volatility of its annual yield condition, the paper would help network investors forecast the earnings trend.

The introduction

Financial time series data analysis exists the common rule that the variance of random perturbation terms ut often accompanies the changes and integration of variance of fitting function over time, and which go against classical econometric analysis model of variance for constant. That using such as least squares classical econometric model to predict the future development trend will seriously affect the prediction effect. Therefore, at the beginning of Robert F.Engle proposeing the ARCH model, Bollerslev, Nelson, Zakoizn, Robbins, and so on ,they all further develop the ARCH model to provide some theoretical support for predicting the stock market returns, inflation, foreign currency exchange rate changes.

As a representative of the emerging network products, since early June 2013 on taobao, YU'EBAO has been favored by the majority of network financial investors, the present yields characteristics is from high to low. To help such investors, the article will use the autoregressive conditional heteroscedastic model to empirically analyze the trends of YU'EBAO annual yields.

The empirical analysis and prediction

Data Selection. The article selects the dates of Tianhong increased profits treasure money market funds (funds code: 000198) from May 30, 2013 to September 5, 2014, which statistics 398 precious date annual return of the balance of the observed value. We assume the date annual return is Rt (%), t ∈ [1,398].For reducing the changes of Rt, LOG (Rt) is on behalf of the logarithmic benefits.

The selection of regression equation lags order. For accurately judging estimated parameters of the lag order number, the paper chooses Akaike information criterion (AIC) and the schwarz information criterion (SC) to determine the optimal lag order number, from table 1, the results can be judged by the lag order 6, where AIC and SC is minimal and the lag order number is ideal.

Table 1 The lag order selection based on the regression equation of the AIC and SC

lag	AIC	SC	lag	AIC	SC
One	-5.136760	-5.126725	Five	-6.626635	-6.576078
Two	-6.113170	-6.093062	Six	-6.692236	-6.631451
Three	-6.409332	-6.379113	Seve	-6.692199	-6.621148
Four	-6.554477	-6.514108			

Heteroscedasticity regression equation. According to the choice of the lag order, we create the logarithm regression equation as follows.

LOG(R) = 1.59774*LOG(R(-1)) - 0.41190*LOG(R(-2)) - 0.12641*LOG(R(-3)) +

standard deviation （0.123706） （0.197523） （0.097423）

T statistics （12.91562） （-2.085311） （-1.297563）
0.00774*LOG(R(-4)) - 0.18151*LOG(R(-5)) + 0.11436*LOG(R(-6))
（0.078997） （0.071030） （0.034735）
（0.097991） （-2.555455） （3.292508）
R2=0.996903;A-R2=0.996863;DW=2.011195;
SE=0.008458;LOG LIKELI HOOD =1317.678.

Because LOG (R3), LOG (R4) was not significant in the matter t statistics, the regression results are shown in table 2.

Table 2 the LS regression results rejecting the LOG (R3), LOG (R4)

□	Coefficient	Std. Error	t-Statistic	Prob.
LOG(R(-1))	1.627108	0.113288	14.36264	0.0000
LOG(R(-2))	-0.534181	0.146154	-3.654917	0.0003
LOG(R(-5))	-0.197574	0.068806	-2.871473	0.0043
LOG(R(-6))	0.104659	0.037072	2.823105	0.0050
R-squared	0.99688	Mean dependent var		1.601927
Adjusted R-squared	0.99685	S.D. dependent var		0.151005
S.E. of regression	0.00847	Akaike info criterion		-6.693925
Sum squared resid	0.02785	Schwarz criterion		-6.653402
Log likelihood	1316.01	Hannan-Quinn criter.		-6.677865
Durbin-Watson stat	2.06489			

Although regression R^2 = 0.996876, which represents higher fitting degree; Logarithmic likelihood function value,1317 is bigger, which represents the model is more accurate; DW is 2.064887, which delegates the first-order autocorrelation is non-existent, however, whether the correlation regression equation residual exists higher-order autocorrelation, it is necessary to continue to use the test of residual graphical inspection, the ARCH LM test, Normality test, white inspection, different variance, the results found that there were different variance phenomenon.

Residual figure shows residual volatile concentration areas, namely, behind the large fluctuations, there are a series of more substantial fluctuations, and also, behind the fluctuations of the small, there are a series of small amplitude fluctuations. So, it is refused to residual autocorrelation hypothesis.

ARCH LM test are shown in table 3, the F statistics and P values can be seen that residual error has a serious self-correlation.

Table 3 Heteroskedasticity Test: ARCH

F-statistic	54.27476	Prob. F(1,389)	0.0000
Obs*R-squared	47.87422	Prob. Chi-Square(1)	0.0000

Normality test results show that the characteristic of "rush thick tail" is obvious, the peak Kurtosis is 17.11908, the Skew ness is 1.326976, residual autocorrelation hypothesis should be accepted.

Heteroscedasticity test are shown in table 4, which also reject the hypothesis that there is no residual autocorrelation.

Table 4 Heteroskedasticity Test: the ARCH

F-statistic	79.88697	Prob. F(1,394)	0.0000
Obs*R-squared	66.75693	Prob. Chi-Square(1)	0.0000

White test are shown in table 5, the F statistics and P values also shows that residual has also the correlation.

Table 5 Heteroskedasticity Test: White

F-statistic	6.696896	Prob. F(10,381)	0.0000
Obs*R-squared	58.60190	Prob. Chi-Square(10)	0.0000

Setting up the family of the ARCH model

In conclusion, the paper would establish the family of the ARCH model, and better explain the changes of YU'EBAO annual yield.

Table 6 ARCH models of YU'EBAO annual yield

	T-GARCH	E-GARCH	P-GARCH	C-GARCH	GARCH
LOG(R(-1))	1.621322* (131.8172)	1.635989* (1177.209)	1.621200* (30.23563)	1.711727* (37.15168)	1.584784* （27.11320）
LOG(R(-2))	-0.522333* (-81.00888)	-0.52481* (-148.5291)	-0.483951* (-6.631550)	-0.604920* (-9.784881)	-0.432780* (-5.498790)
LOG(R(-5))	-0.225197* （-16.46302	-0.21944* （-179.662	-0.348616* (-10.89846)	-0.314757* （-11.02986	-0.382255* (-10.98752)
LOG(R(-6))	0.125943* （ 13.88563	0.108532* （34.68991	0.211345* (13.12122)	0.207932* (15.24290)	0.230239* (12.90540)
Variance equation	GARCH = 1.29e-06 + 0.207605*RESID(-1)^2 + 0.479332*RESID(-1)^2*(RESID(-1) <0) - 0.624908*R	LOG(GARCH) = -0.674637 + 0.419581* ABS(RESID(-1)/@SQRT(GARCH(-1))) + 0.960890	@SQRT(GARCH)^1.668662 = 8.40e-06+ 0.288733* ABS(RESID(-1))^1.668662 + 0.754770 *@SQR	Q = 0.000846 + 0.998679*(Q(-1) - 0.000846) + 0.235843* (RESID(-1)^2 - GARCH(-1))	GARCH = 1.64e-06 + 0.311443*RESID(-1)^2 + 0.719843*GARCH(-1)
R^2	0.996863	0.996844	0.996768	0.996735	0.996731
A-R^2	0.996797	0.996795	0.996709	0.996667	0.996680
AIC	-7.490115	-7.379657	-7.424695	-7.465215	-7.430396

SC	-7.398938	-7.308742	-7.343649	-7.374038	-7.359481
DW	2.051289	2.061442	2.055457	2.212806	1.988123

Note: * represents the coefficient parameters, the figures in parentheses represent the T statistic.

According to the outcome of table 6, the results of the five kinds of generalized autoregressive conditional heteroscedastic model to the annual yield changes have an entirely better fitting effect. YU'EBAO annual yields of the logarithm have a relationship that the Significant positive is the first day yields of the logarithm and the previous day yields of the logarithm, and the former two days last week, and the weak positive is relation with the logarithm of the end of last week yields, and the weak inverse relationship also presents two days before and the day last week yields of logarithmic .By comparison, no matter from the run-off coefficient R2, adjustment of determination coefficient R2, or from the Durbin-Watson (DW) value, the Akaike information criterion (AIC), Schwartz information criterion (SC), or the regression equation of Lagrange multiplier residual test, the ARCH residual test and inspection, the residual correlation diagram of white, All of these indicators show the threshold - generalized autoregressive conditional heteroscedastic model can better fit annual yield changes. The model said YUEBAO annual yield of logarithmic today is the day before yesterday 1.621322 times of logarithmic minus two days before yield 0.522333 times that of logarithmic, and minus five days before yields 0.225197 times that of logarithm yield, then plus before 6 logarithm of 0.125943 times. For more accuracy describing T - GARCH model fitting image, the results finally forecast of the draw are shown in figure 1. We can be seen from the diagram, the year yield R will fluctuate around the mean (2, 3) interval, but volatility will gradually shrink.

Conclusion

By comparing the five types of GARCH model, and ultimately we determine T - GARCH model can better reflect the balance of the accuracy of the annual income changes, Income exists the ARCH effect and the leverage effect: when the bad news first appeared, the impact that brings to the conditional variances is 0.479332 times; When there is bad news for two consecutive times, the impact that brings to conditional variances is equivalent to 0.479332-0.624908 = 0.624908 times, and in the long run, the balance YU'EBAO annual yield will eventually stabilize, the reason can be get from the mean equation, The first day income will be approximately equal to 0.999735 times (1.621322-0.522333-0.522333 + 0.125943) earnings before 4th, namely , annual yield close to 1 times the average income, the conclusion is in line with the competition equilibrium theory: any business or investment could not obtain excess profits for a long time, since the competition and market clearing, and finally would obtain the average earnings.

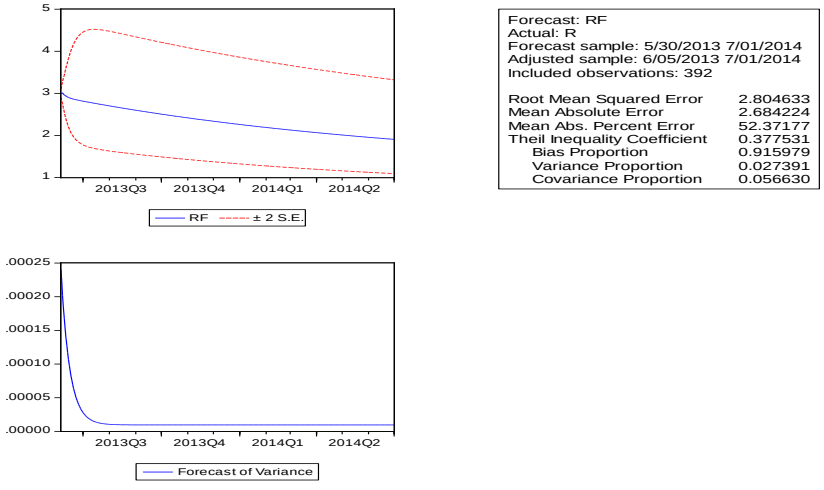

Figure 1 YU'EBAO annual yield forecasting

References

[1] Tiemei Gao. Eviews econometric analysis and modeling example, application [M]. Beijing: tsinghua university press, 2009.

[2] Yi Feng, Lijian Sun. Based on the analysis of GARCH model of foreign exchange rate volatility [J]. Journal of statistics and decision, 2009 (7).