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The Error Correction Model and Empirical Study of Open-end Fund Scale in China Based on the Season Serial Data

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Abstract: Analyzing on change factors of China open-end funds scale and founding economic model which can explain the size of the fund changing. Analyzing and forecasting changes on China open fund scale can provide decision-making basis for management and risk control of China open-end fund investment which will have very theoretical and realistic significance. This study on the external factors which effects the fund investment flows. Based on season serial data it found the error correction model to analysis the change of fund size by the example of the open-end stock equity mutual funds in China. This model extends the size of sample data. The results shows us there exists a long-term cointegration relationship among the fund scale changing Y, the net growth rate of the final fund share X1 and the percentage of the Shanghai index changing X2. It analyzes the long term equilibrium relationship and short term fluctuate forecast of the fund flows. From the coefficient estimation, we can see that the adjustment effort is large.

Key words: Open-end fund, scale of fund, season serial data, error correction model

INTRODUCTION

As a new type of financial intermediary products, open mode fund meets the investors in dynamic equilibrium requirements between liquidity and profitably by its unique system-subscribe and redeem at any time.

Different from enclosed fund, the scale of open mode fund being constantly changed. Chinese scholars Haile Xu (2005) discussed the macro and micro factors which influencing China open mode fund. Yang and Li (2005) studied the relation between scale of securities investment fund and information content of stock price. Xun and Yu (2006) used panel data regression method to analyze the change of China open mode fund of different categories and single category. She and Deng (2010) and Zhao and Wang (2007) analyzed the correlativity between scale and return of open mode fund. Li (2011) and Zhang and Tan (2013) systematically analyzed on development of Chinese open mode fund.

In the economic analysis, time series data is one of the most common and most important kind of data. But in the construction of the model, there is an implicit assumption of data's steadiness. Another question involved time series is false return. To avoid the above problems, this study used the error correction model to structure the models of the fund size changing. Analyzing on change factors of China open-end funds scale and founding economic model which can explain the size of the fund changing. Analyzing and forecasting changes on China open fund scale can provide decision-making basis for management and risk control of China open-end fund investment which will have very theoretical and realistic significance.

MATERIALS AND METHODS

Simple introduction of the model

Granger representation theorem and error correction model: For whether the relationships between variables can be described by the error correction model, Engle and Granger put forward the famous expression of Granger theorem in 1987: If the variable X and Y have cointegration relation, then the short-term non-equilibrium relationship can be expressed by an error correction model, that is:

$$\Delta y_t = \text{lagged}(\Delta Y, \Delta X) - \lambda.ecm_{t-1} + \mu_t,\ 0<\lambda<1 \qquad (1)$$

Among them, ecm_t is non-equilibrium error term or a long-term equilibrium deviation, λ is the short-term adjustment parameters. To establish the error correction model, we first need cointegration analysis on variables,

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to find the cointegration relationship between variables. And set up short-term model which regard error correction term as an explanatory variable, together with the other variables which can reflect the short-term fluctuation and set up short-term model, that is error correction model.

Unit root test of stability of time series: The definition of stability: If a time series is stable, then its mean value has no relationship with time t and its variance is limited. It doesn't have system change with the pass of t.

Definition of single: If a sequence must conduct d times difference before to be a stable sequence, then this sequence is called d order single .It is recorded as I (d).

In the ADF test, in order to ensure the stochastic disturbance term is white rashness sound, in the right of the DF inspection equation, we add some lag items. So the regression equation of the unit root test is:

$$\Delta x_t = (\rho-1)x_{t-1} + \sum_{i=1}^{p}\theta_i\Delta x_{t-1} + \varepsilon_t \quad (2)$$

This equation is called model 1. If it contains a constant it is model 2:

$$\Delta x_t = \alpha + (\rho-1)x_{t-1} + \sum_{i=1}^{p}\theta_i\Delta x_{t-i} + \varepsilon_t \quad (3)$$

If we add time trend function, then it is model 3:

$$\Delta x_t = \alpha + \beta t + (\rho-1)x_{t-1} + \sum_{i=1}^{p}\theta_i\Delta x_{t-i} + \varepsilon_t \quad (4)$$

When the actual inspection, we begin with model 3 and then model 2, model 1 (check their critical value table), when the inspection refused the null hypothesis, that is the original series does not exist unit root, for stationary series, then the inspection stop.

Cointegration test: If series X_{1t}, X_{2t}, ..., X_{kt} are integrated of d and there exits a vector $\alpha = (\alpha_1, \alpha_2, \alpha_k)$ to make $z_t = ax'_t \sim I(d\text{-}b)$. Among them, b>o, $x_t = (X_{1t}, X_{2t}, ..., X_{kt})$, then the series X_{1t}, X_{2t}, ..., X_{kt} is cointegration with (d, b) order, notes for $x_t \sim CI(d,b)$, α is cointegration vector. This study used the Engle-Granger two-step inspection (Liu, 2004).

RESULTS AND DISCUSSION

Selection and processing of data and variable: Due to the fund involved with more data, in this study only selected the twelve open-end stock fund which was released in 2007. These funds' name are as follows: Wanjia 180 index, Hefeng cycle funds, Jingshun Greatwall preferred stock, Huabao xingye baokang consumer goods, Jiashi finance growth, Jinying component selection, Rongtong blue-chip growth, Hefeng growth fund, Yifangda strategy growth, Yinhe Yinlian steady, Zhaoshang Antai stock.

Because the fund share out bonus can also send a dividend, so it is not suitable to use the fund share as explained variable, where net value of asset fund as explained variables. Select from the second quarter of 2008 to 2012 in the fourth quarter as the interval research range, we get the final fund net value, the weighted average net income, net worth growth, share in this stage and other data but because the data used are so much and not standard, so we has the following treatment: use the fund net value of next period to minus the value of a earlier period, then use the result got to divide the value of a earlier period, then we got the percentage changes of the fund's size as dependent variable, then SSRP and Great wisdom downloaded end of each Shanghai index of historical data from March 1, 2008 to 31 December 2012 and take average according to season.

Use the preliminary multiple linear regression model to analyze and remove the explanatory variables which are not significant and the variables which can cause multicolinearity and the size of the fund percentage changes Y as explanatory variables and the final fund share net growth X1 (scale index), Shanghai index percentage changes X2 (risk index) as explained variables and the above 12 kind open stock fund data as the samples.

Structure and prediction of models: Interaction test. Using Eviews software, we test the steadiness of the three sequence data by ADF test. The results are shown in Table 1.

From Table 1, we know that the percentage of the fund scale changing Y, the net growth rate of the final fund share X_1, the percentage of the Shanghai index changing X_2 are the first single and all the three variables are interaction order with the same order.

Cointegration test: Chose X_1, X_2, the two integrated of 1 series as the explanatory variables, the first single as variable Y as the explained variable to study. And we use the Engle-Granger method to test the cointegration

Table 1: Test results of the sequence stationary test

Variables	Level	First-order difference	Second-order difference
Y	-1.97	-4.458727	-4.640035
X1	-1.97	-3.964144	-4.054026
X2	-1.97	-2.968372	-3.313190

Significant at 5%

relationship. We divided the process into two steps. The first step is to test the variables whether it has the aneuhaploidy with the same order, we has been validated in the first part. The second step is to test the variables whether it has a stable linear combination. According to the idea of from the general to the simple, we established the model:

$$Y_t = \alpha_0+\alpha_1 X1_t+\alpha_3 X2_t+\alpha_4 Y_{t-1}+\alpha_5 X1_{t-1}+\alpha_6 X2_{t-1} \quad (5)$$

Get rid of the not significant variables step by step, we can get the model as:

$$\begin{gathered} Y_t = 0.026X1_t-3.744X2_t+0.408Y_{t-1} \\ (2.63)\ (-3.68)\ (2.13) \\ R^2 = 0.972,\ D.W. = 1.959 \end{gathered} \quad (6)$$

We know that there is not exist autocorrelation according to the D.W value, then each variable coefficient is significantly not zero, the coefficient of determination is 0.972 and the residual is approximately close to white noise. So, we can preliminary think there exists a long-term stable relationship between them. We do unit root test of the residual item, because we should reject for the trend term and constant are not significant and we test that the final results of the model is:

$$\begin{gathered} \Delta ecm_t = -1.077ecm_{t-1} \\ (-4.144) \\ R^2 = 0.586,\ D.W.=1.93 \end{gathered} \quad (7)$$

And the value of the ADF test is -4.144272. It is less than the critical value with the 5% significant level is -1.97. So it shows the residual sequence is stationary sequence, the cointegration relationship among Y, X_1 and X_2 is existed.

Establishment of the error correction model: We let the stationary time series as error correction term, ΔY_t as explained variables, X_1, X_2 and their lagged variable of any order term as explanatory variables. Removing the not significant variables, we built the error correction model and estimate it. The result is:

$$\begin{gathered} \Delta Y_t = 0.025\Delta X1_t-4.045\Delta X2_t-0.637ecm_{t-1} \\ (4.07)\ (-3.77)\ (-2.11) \\ R^2 = 0.719,\ D.W.=1.816 \end{gathered} \quad (8)$$

Forecast of the model: To test the accuracy of the model prediction results, we forecast the fund size for the fourth quarter of 2012. First of all, we take out of the fourth quarter of 2012 from the original data. Then we estimate it again. Because we have tested for the stability and cointegration of the data in the front part of the study , so we only list the regression results for establishing models:

$$\begin{gathered} \Delta Y_t = 0.026\Delta X1_t-4.009\Delta X2_t-0.606ecm_{t-1} \\ (3.45)\ (-3.50)\ (-1.86) \\ R^2 = 0.716,\ D.W. = 1.681 \end{gathered} \quad (9)$$

Using the original data, we can get:

$$\Delta X1_{2012,4} = -38.37$$

$$\Delta X2_{2012,4} = -0.085$$

$$\Delta ecm_{t-1} = (0.026\Delta X1_t-4.009\Delta X2_t-\Delta Y_t)\div 6.606$$

After we generate into the data of the third quarter of 2012, we can get $ecm_{t-1} = -0.716$ Put the Eq. 9 into it, we can get $\Delta Y_{2012,4} = -0.2218$. And the real data of the fourth quarter of 2012 is -0.2418.The relative error of the forecast outcomes is 8.27%.

CONCLUSION

The emergence and development of Chinese open-end fund has been less than 15 years, compared with mutual funds have highly developed countries such as America. Open-ended funds in China either in theoretical research, or in the actual operation are in the primary stage. In the real market, seeking an open-end fund scale which can adapt the macroeconomic factors, dynamically balanced with rate of economic growth and can offer the best returns for investors. Chinese fund scale has already become the theory and empirical question which is urgent need to discuss and study.

Firstly, this study expanded the time span of the sample data and the used data are all the quarter data. Secondly, in a long-term equilibrium and short-term fluctuation two levels, we used error correction model to study the changes of the size of the fund. The results shows us there exists a long-term cointegration relationship among the fund scale changing Y, the net growth rate of the final fund share X1,and the percentage of the Shanghai index changing X2. From the coefficient estimation (-0.6) ,we can see that the adjustment effort is large.

Because Chinese open mode fund start later it caused the sample size to smaller. In some extent it affected the prediction effect of the model. Finally with the expansion of the sample size, the prediction function of the model will be enhanced.

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REFERENCES

Li, L., 2011. China open mode fund flow analysis and change countermeasure. Securities Futures China, 11: 37-38.

Liu, J.P., 2004. Risk Management of open mode fund risk. Economic Science Press, Beijing, China.

She, Y.F. and C. Deng, 2010. Empirical research into the correlation between open-end fund and it return in China. Syst. Eng., 4: 74-78.

Xu, H.L., 2005. On the factors affecting the scale of open-end funds of China. J. Shandong Inst. Bus. Technol., 3: 40-45.

Xun, M.H. and S. Yu, 2006. Econometrical model and empirical study of open-end fund flow in China. J. Harbin Univ. Commerce (Nat. Sci. Edn.), 22: 115-121.

Zhang, Z.Y. and M. Tan, 2013. Study on relationship between stock allocation strategy and performance of open-ended fund. Technol. Econ., 7: 90-95.

Zhao, X.J. and S.H.Y. Wang, 2007. An empirical study on the Chinese equity investment funds' efficiency. Syst. Eng.-Theory Pract., 3: 1-11.