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THE SEARCH OF STRUCTURAL CHANGES IN MUTUAL FUND INDUSTRY-BASED ON THE ARMAX-GJR-GARCH MODEL

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ABSTRACT

This study aims to examine the impacts of a bond fund segregation policy event on Taiwan mutual fund industry. In principle, mutual fund industry is a highly regulated industry. However, bond funds focus on pursuing short-term high returns and increasing their scale by investing in structured products with poor liquidity and those offered to clients and increasing the funds' liquidity risks; this event would significantly affect the development of mutual fund industry. Accordingly, this study examines pre- and post- a bond fund segregation policy, event for verifying the impacts of this event on mutual fund industry changes. The empirical findings of mutual fund industry have significantly changed because of new regulations causing from the event. In particularly, the Bond funds and management fees from the significant relationship into does not have a significant relationship. The mutual fund industry needs to cultivate more professional managers, as well as create more types of mutual funds, and offers a wide range of financial products to meet the needs of different investors, and to strengthen the development of the mutual fund industry.

INTRODUCTION

The Taiwan's industry of mutual fund has boomed since the year 2000. Due to the special features and incentives of bond fund, its scope reaches the peak in May 2004 with the amount of 2.4 trillion NTD. There's reason behind the fast growth of bond fund. In the past, bond fund is an unique product that combines the advantage of monetary fund's high liquidity and higher return rate than saving deposit. In addition, there isn't dividend distribution and taxation. All these factors made it an irresistible product. Nevertheless, as the market's interest rate increase, the over-investment of structure notes and the problems of splitting the notes and manipulating the net value of funds, leads to the Union Security Investment Trust incident in July 12, 2004. This incident made the

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market emphasize more on the issue regarding structure notes. However, bond funds focus on pursuing short-term high returns and increasing their scale by investing in structured products with poor liquidity. The problem arises when bond funds allow clients to redeem and take their proceeds the next day, engendering a liquidity divergence between the bond funds' own assets and those offered to clients and increasing the funds' liquidity risks. In order to avoid risk, Taiwan's Financial Supervisory Commission (FSC) decided to carry out a bond segregation policy before the end of 2006. The system split up bond funds into fixed income bond funds and quasi money market bond funds. This event would affect the development of mutual fund industry. In principle, mutual fund industry is a highly regulated industry.

Most studies in the bond fund literature focus on funds' performances, credit quality, and value at risk (VaR). Some previous research studies such as Blake et al. (1993) used linear and non-linear models to examine bond funds' performances. Elton et al. (1995) first developed and tested the relative pricing models (based on the Arbitrage Pricing Theory, or APT) to explain the expected returns and performance of bond funds. These two research studies concluded that active funds do not outperform passive benchmarks. Only Morey and O'Neal (2006) examined the portfolio credit quality holding and daily return patterns for bond mutual funds. They found that bond funds on average hold significantly more government bonds during disclosure than during non-disclosure. Chen et al. (2010) considered nine common factors and measured the timing ability and performance of bond mutual funds. They concluded that timing ability generates non-linearity in fund returns as a function of common factors, but there are several non-timing-related sources of non-linearity.

As mentioned above, we do not find any study in the literature on structural changes in Mutual Fund Industry. In order to reduce the risk of bond funds, Taiwan's FSC decided to conduct a bond fund segregation policy before the end of 2006. We aim to look into the effectiveness of this segregation policy. Hence, the study empirically investigates the effect of examines pre- and post- a bond fund segregation policy, event for verifying the impacts of this event on mutual fund industry changes.

The remainder of the paper is organized as follows. Section 2 takes a brief review of the ARMAX-GJR-GARCH model. Section 3 provides our empirical results. Section 4 is conclusion and remarks.

BRIEF REVIEW OF MODELS

In our empirical study we employ the main income of the Asset Management Company as manager fees, and the source for the size of the fund. A fund with a year or two of lucky performance will experience an increase in fund size. First, constructed multiple regression analysis model, test the

correlation Company Asset Management fund manager fee income with the main types of mutual funds, as the analysis of the industrial structure model. The multiple regression is:

$$\gamma_i = a_p + b_i \sum_{i=1}^{4} X_i + \varepsilon_{pt},$$
(1)

Where

γ_i = the management fee,

a_p = intercept of the model,

b_i = be estimated regression coefficient,

X_1 = the stock fund,

X_2 = the balance fund,

X_3 = the bond fund,

X_4 = the others type fund,

ε_{pt} = the residuals of the model.

The models for the univariate variables must take into account the characteristics of the variables. Return series have been successfully modeled by ARMAX-GJR-GARCH (1,1) model assuming Gaussian residuals is as follows. [2]

$$\gamma_i = a_p + b_i \sum_{i=1}^{4} X_{,t-1} + \varepsilon_{p,t}, t = 1, 2, \dots T$$
(2a)

$$\varepsilon_{p,t} = \sqrt{h_t} Z_t, Z_t \sim N(0,1)$$
(2b)

$$h_t = \sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1},$$
(2c)

where

$$d_{i,t} = \begin{cases} 1, if & \varepsilon_{p,t} < 0 \\ 0, if & \varepsilon_{p,t} \geq 0 \end{cases}$$
(2d)

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[2] Based on the Log-likelihood test and min: AIC (Akaike information criterion), we set optimal order of ARMAX (1, 0, 0)-GJR-GARCH (1, 1).This specification is able to solve both the autocorrelation and heteroscedasticity and asymmetric problems.

$$(z_{1t}, z_{2t}) \sim C_t(F(z_{1t}), F(z_{2t})) \tag{2e}$$

$z_{i,t} = \varepsilon_{p,t} / \sqrt{h_{i,t}}$ is the conditional distribution of standardized innovations. Here, C was modeled by Normal, student-t, respectively.

EMPIRICAL RESULT ANALYSIS

As described above, this article investigates of Structural Changes in Mutual Fund Industry in Taiwan, and thus the dataset consists of mutual fund issued in Taiwan. For the purpose of comparison, the sample period for the study covers ten years, from January 2001 to June 2010. Table 1 presents a total of mutual fund scale and date of establishment. The data were obtained from the Taiwan Economic Journal (hence TEJ) database. Table-1 reports the descriptive statistics of the manager fee, stock fund, balance fund, bond fund, and other fund. Here, manager fee between NT$637 to NT$ 2,009, and the mean is NT$ 1,193, we can see a great gap of the management Fee, which shows that management fee influenced by variables produce large fluctuations.

As for the Stock fund scale, the value is between NT$ 220,266 to NT$ 938,504, and the mean is NT$ 468,261, that the size of stock funds after the bond funds, the issue of time earlier than bond funds, the Balance fund scale, the value is between NT$ 27,168 to NT$ 218,258, and the mean is NT$ 86,085, and the Bond fund scale, the value is between NT$ 198,782 to NT$ 2,435,934, and the mean is NT$ 1,381,238 ,show that bond funds are the largest types of domestic mutual funds, the other fund scale, the value is between NT$ 3,626 to NT$ 956,231, and the mean is NT$ 141,150. Overall, the size of the mutual funds are very different, in particular, there is a significant deviation between the different types of mutual funds. Possible reason is that the investment trust companies prefer to issue Stock funds and bond funds also implies that investors tend to invest in large-scale mutual funds. In addition, all of the Jarque-Berra (J-B) statistics reject the null hypotheses of normality distribution.

Table-1. Summary statistics of Mutual funds' Scale

	Management fee (NT$ million)	Stock fund scale (NT$ million)	Balance fund scale (NT$ million)	Bond fund scale (NT$ million)	Other fund scale (NT$ million)
Mean	1,193	468,261	86,085	1,381,238	141,150
Std	300	187,413	48,789	503,640	130,691
Max	2,009	938,504	218,258	2,435,934	956,231
Min	637	220,266	27,168	198,782	3,626
Skewness	0.39840	0.799836	0.834673	0.407045	2.10404
Kurtotsis	-0.35166	-0.721532	-0.118263	-1.02145	10.7500
J-B	10.0497***	15.3978***	14.0035***	8.53049***	666.354***

Note: P-value is the probability that the data come from the normal distribution, according to the

Jarque -Berra normality test. *** shows significant at 0.01 level.

In order to test the long-run relationships and avoid the spurious regression among manager fee, stock fund scale, balance fund scale, bond fund scale and other fund scale. Based on the results of the stationary test of variables in Table-2, it is abundantly clear that all the variables have stationary characteristics since the nulls of the unit root are mostly rejected. In other words, all variables were integrated of order one.

Table-2. unit root test results

	Level	P value	Difference	P value
Management fee	-2.00423	0.2852	-3.63189	0.000[***]
Stock fund scale	-1.31945	0.6228	-4.05971	0.000[***]
Balance fund scale	-2.51056	0.1129	-4.35178	0.000[***]
Bond fund scale	0.863936	0.9951	-2.93825	0.000[***]
other types fund scale	-1.74558	0.4059	-10.856	0.000[***]

Table-3 exhibits the estimated coefficients of the ARMAX-GJR-GARCH model results. We apply the ARMAX-GJR-GARCH model above to observe the management fee correlation between the Stock fund scale, balance fund scale, bond fund scale and other types fund scale, respectively. We see stock fund scale and the management fee have a significant positive relationship and the coefficient of the highest, which compared with other types of funds, stock funds are the important factors affect the fund management fee, due to the management fee is the main income of the securities investment trust, so changes in the size of the stock funds, will affect the industrial structure of the fund.

Significant relationship between bond funds and fund management fees, makes us curious, is the largest fund, but the degree of influence does not extend to the stock funds. Inference bond funds there may be structural factors affect the mutual fund industry, we can understand the past ten years due to the era of low interest rates, bond funds for investors keen on investment products. As for balanced funds and management fee is a significant relationship, the impact is less than stock funds and bond funds. We can understand that Taiwan investors may be enthusiastic about the low level of balanced funds, so over the past decade, the size of the balanced funds change to a lesser extent also implied that Taiwan investors in the investment will be emphasis on belonging to the majority of investors choose mutual fund products. In addition, other types of funds are outside the aforementioned three types of fund products, other types of funds and management fees are non-significant relationship.

Therefore, we get an experience, the mutual fund industry in Taiwan, issue of the type of mutual fund seems to be too concentrated, and so resulting in the low selectivity of mutual fund products, highlighting the mutual fund product diversification is an important topic in the mutual fund industry in Taiwan.

Table-3. Estimated coefficients of ARMAX-GJR-GARCH model results

	Coefficient	p-value
Const	-9.8224	0.0000***
Stock fund scale	0.4299	0.0000***
Balance fund scale	0.0663	0.0006**
Bond fund scale	0.2341	0.0000***
other types fund scale	0.0015	0.9968

Notes: The numbers in brackets indicate p-values. *** indicates significance at the 0.01 level.

Table-4 we found that stock funds, balanced funds and other types of funds with management fees are positively related, in addition to the bond fund. For the past ten years, the bond fund is the largest type of mutual fund in Taiwan, but instead presented a negative relationship, we infer that the possible bond funds by the market on the financial events that impact the performance of bond funds in the industrial structure. In addition, bond funds and stock funds are also rendered negative relationship, should reaction performance of investor behavior, investors because the bond funds were on the market force capacity, it will give up the choice of stock funds relative securities investment trust is required in order to meet investor will choose the issuance of bond funds, and reduce the amount of issued stock fund. Via our tracking, we believe that the industrial structure changes may be associated with the event of the outbreak of the domestic sectors that is constantly on the issue of convertible bonds, the solvency of view, accounted for the largest proportion of convertible bonds buyer bond funds, but also by the media to the high-times magnifying glass to view. Then evolved to the Taiwan Financial Supervisory Commission requires December 2005, structured notes held by the domestic bond funds need all the punishment completed, bond funds no longer hold structured notes, bond fund portfolio assets in Simple based as well as bond funds in the current shunt as a "money market fund (Quasi Money Market Fund)" and "fixed-income funds (Real Bond Fund) and international asset management market practice standards".

Table-4. The results of Correlation coefficients

Management fee	Stock fund scale	Balance fund scale	Bond fund scale	other types fund scale	
1.0000	0.8206	0.5333	-0.3084	0.7263	Management fee
	1.0000	0.1600	-0.7084	0.5622	Stock fund scale
		1.0000	0.2252	0.7139	Balance fund scale
			1.0000	-0.1985	Bond fund scale
				1.0000	other types fund scale

Table-5 reports a series of data can often contain a structural break, due to a change in policy or sudden shock to the economy. In order to test for a structural break, we use the Chow test, this is Chow' first test (the second test relates to predictions). The model in effect uses an F-test to determine whether a single regression is more efficient than two separate regressions involving splitting the data into two sub-samples.

We applied Chow test to formally test the structural change of Management fee during the period from January 2001 to June 2010. The results of chow test show that the trend of volatility of Management fee significantly existed structure-break which peak on December 2005. It represents significant at 5% significance level through Chow test on Table-5. Especially bond funds necessary for the segregation policy was completed in December 2005, a great shock result in bond funds, fund changes in the market, because investors fear generated for bond funds lost confidence. Thus a large number of redemption phenomenon, caused some investors hesitate to invest in low-risk products, some investors turn to investment in stock funds or other financial instruments.

Table-5. The results of Chow test

Chow statistics	Breakpoint:2005/12	
		P-value
F(5, 110)	67.7918	0.0000***
F(9, 110)	427.2407	0.0000***

Note: *** denotes significant at the 1% significance level.

Table-6 reports the result of structural changes, we found that the management fees and stock funds and bond funds, has a significant positive relationship between investors keen to invest in two types of mutual funds and accounts for a very large weight. On the contrary, the relationship between the management fee and balanced funds, and other types of funds is limited, to highlight investors always accustomed to investing in fixed type of mutual fund indirectly reflect the securities issued by investment trust mutual fund type monotonicity.

Table-6. Before structural break of ARMAX-GJR-GARCH model results

	Coefficient	p-value
Stock fund scale	0.30851	0.0000***
Balance fund scale	0.08894	0.0000*
Bond fund scale	0.40175	0.0000***
other types fund scale	0.00053	0.42127

Notes: The numbers in brackets indicate p-values. *** and * indicate significance at the 0.01 and 0.10 levels, respectively.

Table-7 reports the results of after the structural change of the mutual funds, non-significant relationship found that the management fee and bond funds, bond funds have become non-mainstream investment products. Past bond funds debt because investment structure, able to provide high income and attract the most investment in a large number of purchase, However, after the outbreak of the credit risk of structured notes, affect the confidence of investors in bond funds, and the FSC in order to protect investors, implementation of the segregation policy, changing the production structure of the mutual fund industry is also an important factor. Investors in the investment selection is very limited circumstances, still choose to invest in stock funds, stock funds have become the changes in the industrial structure, the major mutual fund investment targets. Highlight the mutual fund industry needs more different type of investment fund to investors a

wider choice of investment targets. Implied mutual fund industry is facing changes in the industrial structure, it is necessary to think about investment in product development research, personnel training, etc. to be able to drive the development of the mutual fund industry.

Table-7. After structural break of ARMAX-GJR-GARCH model results

	Coefficient	p-value
Stock fund scale	0.67474	0.0000***
Balance fund scale	0.08524	0.0027*
Bond fund scale	0.02948	0.45866
other types fund scale	0.13089	0.0009**

Notes: The numbers in brackets indicate p-values. ***, ** and * indicate significance at the 0.01, 0.05 and 0.10 levels, respectively.

CONCLUSION AND REMARKS

Through experience, we have found that this decade is an important moment, the changes in the structure of the mutual funds industry tells us that the mutual fund industry has a lot of room to grow. Few mutual fund type selectivity, the mutual fund industry generally issued stock funds, bond funds. The lack of financial management concepts to investors accustomed to focus on investing in mutual funds of the fixed type, there is no concept of diversification of investments, and securities investment trust companies have a responsibility to educate investor's proper investment value. The mutual fund industry needs to train more professional managers to create more types of funds, to provide a broad range of financial products to meet the needs of different investors, and strengthen the development of the mutual fund industry.

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