Examination of Volatility Timing Ability on Chinese Open-end Equity Mutual Funds

by

Yuliang Zhao

A research project submitted in partial fulfillment of the requirements for the degree of Master of Finance

Saint Mary's University

Written for MFIN 6692.0 under the direction of
Dr. Francis Boabang

Approved: Dr. Francis Boabang
Faculty Advisor

Approved: Dr. Francis Boabang
MFIN Director

Date: August 31, 2012

Acknowledgements

I would like to thank Dr. Francis Boabang for all his help and advice in completing this project. I would also like to thank the MFIN alumni for responding to my inquiries and agreeing to the use of their admission data. I would also like to thanks my friend Fan Wang for providing me with help on the data collection. Lastly, I would like to express my appreciation to my family for their support, encouragement, and especially their patience.

Abstract

Examination of Volatility Timing Ability on Chinese Open-end Equity Mutual Funds

by

Yuliang Zhao
August 17, 2012

The purpose of this study is to examine whether there is a significant empirical evidence to confirm the existence of the volatility timing ability on Chinese open-end equity mutual fund managers. Daily data are collected through the Bloomberg terminals and the website of Hexun over the period June 1, 2006 to June 1, 2012. The final sample includes 62 open-end equity mutual funds, Shanghai-Shenzhen CSI 300 Index, and the interest rate of one-year government bond. We applied TM and HM model by adding one volatility timing variable to examine the volatility timing ability of Chinese mutual fund managers. The results of this study confirm there is significant evidence to support the Chinese open-end equity mutual funds have the volatility timing ability. This implies that fund managers can reduce the market exposure of the fund assets allocation when the market volatility is increasing. We found that excess fund return and the market volatility are negatively correlated; second, there is evidence of market timing ability of Chinese open-end equity mutual funds managers, but their market timing ability is poor; third, the Chinese open-end equity funds outperform the market but only with very small extent.

Table of Contents

Appendix 1: List of Tables and Figures

Chapter 1

Introduction

> "The idea that a bell rings to signal when investors should get into or out of the stock market is simply not credible. After nearly fifty years in this business, I do not know of anybody who has done it successfully and consistently. I don't even know anybody who knows anybody who has done it successfully and consistently. Yet market timing appears to be increasingly embraced by mutual fund investors and the professional managers of fund portfolios alike." - John C. Bogle (1999)

Market timing is becoming an important indicator to evaluate the performance of fund managers. It means that many of the fund managers attempt to time the movement in each of the markets which are considered for investment. The market timing skill indicates the managers' ability to dynamically allocate the capital among different classes of investments, where to move out of the risky market (equity market) and reinvest in safe market (bond market or money market) if the fund managers forecast that the market is going to fall; or to move into the risky market from the safe market if fund managers forecast the market is going to rise. The question of whether the fund managers have superior market-timing skills has been debated since 1966 (Treynor and Mazuy, 1966, Jensen, 1972, Merton and Henriksson, 1981, Chang and Lewellen, 1984, and Graham and Harvey, 1996). All the results show that the market timing ability of the fund managers is not significant. However, in 1999, Jeffrey A. Busse carried out a new study on market timing ability, volatility timing. Unlike the traditional research on forecasting the market movement, volatility timing focused on forecasting the future volatility of the investment portfolio and adjusted the portfolio risk in accord with the corresponding movement. The volatility timing is a kind of trading strategy which focuses on the market volatility. Investors can use the market volatility as a signal to move in or out of the market; for example, investors should move out of the risky market when market volatility is high. This paper, I will focus on whether or not Chinese open-end equity mutual fund managers have the ability to time the market volatility, and answer the question: Do Chinese open-end equity mutual funds change market exposure when market volatility changes?

1.1 Background

Associated with the fast economic growth and development of the stock market, the Chinese mutual fund industry has increased rapidly in the past two decades. More and more investors are interested in mutual funds; this induces not only domestic investors but also foreign investors. The mutual fund has become the most popular investing instrument in China. Therefore, the performance of fund managers has become extremely important for investors. According to most research in the Chinese market, it is impossible to get true information (because of the inefficient market) when you want to invest in a particular fund. The fund managers will promise you that they can obtain more return for you because of their professional market timing ability. Do they really have good market timing skills, especially the ability to time the market volatility? Investors are further perplexed by increasing variety of mutual fund types.

1.2 The History of Chinese Mutual Funds

The first two Chinese close-end funds were established in October, 1991, and this represented the start of the Chinese fund industry. After the Chinese State Council Securities Regulatory Commission published the Interim Regulations on the Securities Investment Funds in December 1997, the fund industry experienced significant growth. The regulations injected new concepts of investment management for the fund industry. After China joined the World Trade Organization (WTO) in 2001, the first open-end fund was set up in September; in 2003 it was increased to more than 50 open-end funds. In 1997, there was only 6.6 billion Yuan in the net asset value of Chinese funds, and on December 31, 2011, the net asset value was increased to 21918.4 billion Yuan. It was increased by 310%. To compare with the U.S. market, the size of Chinese mutual fund industry is still very small and only about one-tenth of the U.S. market; however, it is expected to grow significantly because of the fast growth in the Chinese economy. It has the potential to grow into the largest fund in the world.

1.3 The Classification of Chinese Funds

There are two kinds of funds in the Chinese fund market: open-end funds and closed-end funds.

Open-end funds or mutual funds

In these funds, shares can be sold and repurchased after an initial public offer (accept redemption of shares). As of July 2, 2012, 955 open-end funds have been set up. The type of open-end funds tends to be more diversified. They can be categorized into stock funds, bond funds, currency funds, and mixed funds with different asset allocation strategies.

Closed-end funds

The shares of closed-end funds are initiated through a stock offering to raise funds, and operate like any public firm. The qualification closed-end is used because the fund does not issue or redeem shares after an initial offering. Shareholders of this type of fund can trade their shares on the secondary market. As of July 2, 2012, 114 closed-end funds have been established.

Table 1: Classification of Chinese Funds

	Open-End Fund	Closed-End Fund
Trading Place	Fund management company or bank	Shanghai and Shenzhen Stock Exchange
Fund Size	Not fixed, Minimum size limited	Fixed
Redemption Restriction	Can repurchase or redeem anytime	Not redeemable
Pricing	Net asset value of mutual funds	Supply and Demand of market
Dividend	Cash or reinvestment	Cash
Investment strategy	Must reserve some cash for investors' redemption; pursue high returns	No need to take reserve; long term investment
Information Disclosure	Net asset value must be notified every trading day	Net asset value must be notified at least once a week

Source: from Hexun Website-The leader of Chinese financial network (http://www.hexun.com.cn)

1.4 Purpose and Rationale of the Study

The objective of this study is to examine the volatility timing skills of Chinese open-end equity mutual fund managers through two classical models: the Treynor and Mazuy model (TM model) and the Henriksson and Merton model (HM model). If fund managers have timing ability, they should increase the weight of the investment in a risky portfolio prior to market advances and reduce the risky weight before market declines.

In this paper, the following research questions will be addressed:

1. Do Chinese open-end equity mutual funds change market exposure when market volatility changes?
2. Is there evidence of market timing ability of Chinese open-end equity mutual fund managers? If market timing skills exist, what is the quality of these skills?
3. How is the performance of Chinese open ended equity mutual funds? Do they outperform or underperform the stock markets?

The paper proceeds as follows: Chapter 2 reviews related literature; Chapter 3 describes the methodology and the data selection; Chapter 4 reports and analyzes the empirical results; and finally Chapter 5 concludes and recommends the study.

Chapter 2

Literature Review

There is much research associated with the market timing volatility ability of fund managers in different periods. To examine the market timing volatility, we need to be aware of the market timing model. If you diffuse the market timing model by the structure, it can be categorized into two major parts: the classical Capital Asset Pricing Model (CAPM) and the market timing activities of fund managers. This first section will review the CAPM model; the second section will look at the market timing activities of funds managers; and lastly, the market timing volatility of fund managers will be examined.

2.1 The Capital Asset Pricing Model (CAPM)

The CAPM is a valuation equilibrium model that reflects the relationship between the expected return and the systematic risk of a portfolio.

The CAPM was formally introduced by William Sharpe (1964). Fisher Black, Michael C. Jensen and Myron Scholes (1972) observed the movement of the daily stock price which was collected in the period 1931-1965, and found that the return of portfolios and their beta are linearly related. This empirical study further testified the CAPM theory.

Based on the CAPM, Jack Treynor (1965) created the famous performance measurement model, Treynor ratio, which reflects the excess return of equity portfolio per unit of the systematic risk (β). This model was first introduced in his article *Can Mutual Funds Outguess the Market* (Jack Treynor, 1965). This ratio can be used for evaluating the performance of funds managers by comparing the Treynor ratio of fund (Tf) with the market ratio (Tm). Treynor selected 57 U.S. mutual funds in the period 1953-1962 as his sample. The empirical study showed that there is no significant evidence for managers of mutual funds outperforming the market.

According to Investment and Equity Portfolio Management, the CAPM implied the following: all investors will hold the market portfolio; the market portfolio is on the efficient frontier; the market portfolio is a value-weight index of all securities; the risk premium on the market portfolio will be proportional to the variance of the market portfolio and the investor's typical degree of risk aversion; the risk premium on individual asset is proportional to the risk premium of market and beta of security; and there is a linear relationship between systematic risk and expected return:

$E(R)i = Rf + \beta i \, [E(Rm) - Rf]$

Where, E(R)i = the expect return of the security "i"

Rf = the risk free rate

βi = the systematic risk of the security "i"

E(Rm) =the expected return of the market

2.2 The Market Timing Ability

Evaluation of mutual fund managers starts with a question: "Are mutual fund managers successfully anticipating major turns in the stock market?" (Treynor and Mazuy, 1966). They assume the beta of the fund is not fixed, but it is non-stationary. This type of beta is following a quadratic process which is one of the earliest models designed to test the market timing activities of mutual fund managers (TM Model). In their paper, Treynor and Mazuy use 57 open-end mutual funds which were obtained from *Investment Companies* 1963 by Arthur Wiesenberger Company to test the performance of fund managers. Applying the test to the performance of those 57 funds, they found there was no significant evidence to support the positive market timing ability. Moreover, their study period is from the beginning of 1953 to the end of 1962, and they did not think the result would be different if they used the different time period for the study.

In 1968, Michael C. Jensen derived a risk-adjusted measure of portfolio performance, Jensen's Alpha, to examine the contribution of the forecasting ability of the mutual fund manager to the return of mutual funds. His study was based on the theory of the pricing of capital assets model (CAPM). Jensen stated that the performance of the portfolio managers can be examined in two ways:

1. The ability to successfully forecast the securities' future price to increase the return of the funds, and
2. The ability to minimize the "insurable risk" which was coming with the holders of the portfolio (Jensen, 1968).

In Jensen's paper, his sample included the annual and quarterly returns on the portfolios of 115 open-end mutual funds which were collected from Wiesenberger's *Investment Companies* in the period 1945-1964. From Jensen's research, we found that there was also no significant evidence to support the ability of mutual fund managers to outperform the market.

Fama (1972) proposed a measure of the performance of the market timing ability based on the capital market theory. It made the forecast based on the observation of the expected return. He divided the forecasting skills into two components:

1. Micro-forecasting, which means predicting the movement of a single security's price according to the security market's, and
2. Macro-forecasting, which means predicting the movement of the stock market' price according to the fixed income securities (Fama, 1972).

Henriksson and Merton (1981) introduced a new model (HM Model), which assumed that the beta followed a shift over time (linear trend in beta), referred to as the Dual-beta model. Under this model, the market timing ability is captured by the dummy variable. In their paper, Henriksson and Merton derived a framework to test the market timing ability on both parametric and nonparametric perspectives. The parametric test is applied under the assumption of either CAPM or a multifactor return model if the forecast of manager are non-observable; and the nonparametric test is used without further assumptions about the distribution of security returns when the predictions of the manager are observable (Henriksson and Merton, 1981).

William N. Goetzmann, Jonathan Ingersoll Jr., and Zoran Ivkovic (1999) examined the Henriksson and Merton model by using monthly return and daily return. They selected 558 mutual funds to do the test, and found that the HM measurement was weak if they used the monthly return. Moreover, Bollen and Busse (2001), in their paper *On the Timing Ability of Mutual Fund Managers* (2001), studied the daily return of 230 mutual funds. Based on their research, they found that if they used the monthly return of mutual funds, there is no significant evidence supports the market timing ability. However, if they used the daily return to do the tests of market timing ability, there are more significant evidence to support market timing ability. This research shows that daily tests are more powerful than monthly.

In 2003, Wei Jiang in his paper *A Nonparametric Test of Market Timing* (2003) used not only the TM model and the HM model but also a different benchmark associated with the different mutual funds to test the market timing activities of U.S. mutual fund managers. He selected the data for the period 1980-1999 from Morningstar Principia Pro Plus for Mutual Funds and CRSP Mutual Funds Data, and focused on domestic equity funds. Through the empirical study, he found that there is no evidence to support the superior timing abilities of the mutual fund managers. Moreover, the market timing ability and the fund characteristics are weakly related.

2.3 The Market Timing Volatility

Many studies have tested the market timing ability of fund managers in the past several decades. However, fewer studies have examined the issue: do funds time the market volatility or do funds have the significant volatility timing ability to gain more abnormal returns for the investors? In the article *Volatility Timing in Mutual Funds: Evidence from Daily returns* (Busse, 1999), he stated two reasons why he focused on volatility:

1. The market return is difficult to forecast, but it is easy to predict the market volatility because it persists as follows: large changes are followed by further large changes and periods when small changes are followed by further small changes (Hill, Griffiths, and Lim 2011, p520).

Figure 1: The Persistent Charateristic in U.S. Stock Market-S&P 500 Index

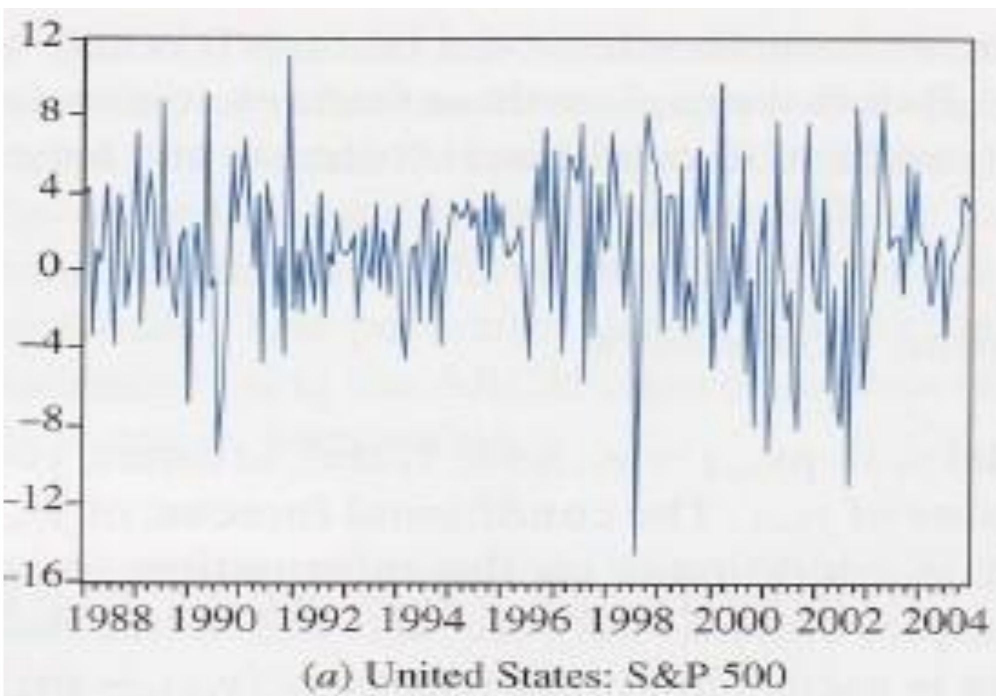
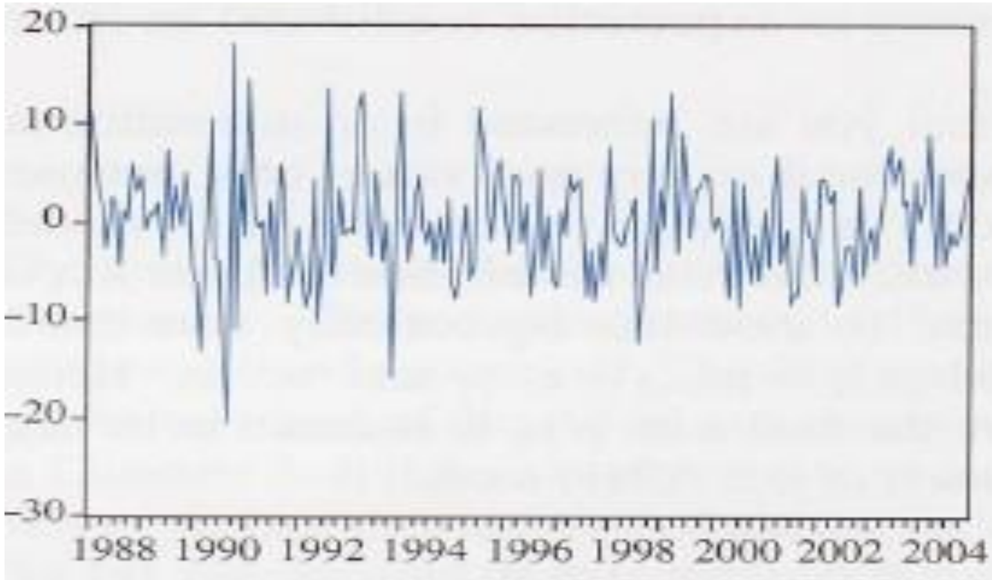


Figure 2: The Persistent Charateristic in Japan Stock Market-TOPIX Index



(c) Japan: TOPIX

2. Most measures of performance are risk adjusted (Busse, 1999).

The significant positive relationship between conditional market returns and conditional market volatility has not been observed from the past empirical studies (French, Schwert, and Stambaugh, 1987). Therefore, fund managers could increase investor's welfare by reducing the market exposure when conditional volatility increases. In Busse's study, he selected 230 domestic equity funds with more than $15 million in total net assets. By using the daily returns, he found that the volatility timing can significantly affect the risk-adjusted return.

Most of the studies show that the standard volatility models cannot explain the researches on volatility timing, and more and more researchers were beginning to doubt the economic values of those models (Fleming, Kirby, and Ostdiek, 2001). Fleming, Kirby, and Ostdiek evaluated the effects of the predictable volatility changes and used a conditional mean-variance to examine the volatility timing ability. Finally, for the same target expected return and volatility, they found that the volatility timing outperforms the unconditionally efficient static portfolios. The result shows that the volatility timing model has economic value to evaluate the performance of fund managers.

Anli Fu, Chaoqun Ma, and Xiaoguang Yang (2005) indicated that the volatility timing skills can be used as a measure of the performance of fund managers. Since China is an emerging market, the stock market is frequently volatile. Furthermore, Ferson and Mo (2012) also stated it is necessary to consider volatility timing behavior to measure the performance of a portfolio manager who may engage in market timing. On one hand, much empirical research shows that the Chinese stock market has the significant clustering phenomenon, and has persistence characteristics (Changfeng Wu, 1999; Fan and Zhang, 2003). On the other hand, the existing empirical studies also did not find there is a reliable positive relationship between the conditional market returns and the volatility. Thus, it is undoubted to evaluate the performance of fund managers from the point of view of volatility timing. In their paper *A Study on Volatility Timing of Investment Funds* (2005), Anli Fu, Chaoqun Ma, and Xiaoguang Yang selected both closed-end funds and open-end funds to do the test. They found the following:

1. The coefficient of volatility timing variable in open-end funds was greater than the one in closed-end funds. This shows that the operation in open-end funds is more active than closed-end funds;

2. The balanced fund and growth fund in closed-end funds didn't show a significant difference. This indicated that there is no effect based on investment style in closed end funds; and

3. The daily return analysis was more powerful than the monthly return analysis. Using the daily return, there is more significant evidence to support market timing volatility.

Giambona and Golec (2008) used Busse's volatility timing model with one more management fee factor to evaluate the volatility timing of mutual funds. They chose the sample from the Center for the Study of Securities Prices (CRSP) which included 3696 equity funds for at least 5 years between 1962 and 2002. Through the empirical study, they found there is a negative relationship between the volatility timing and flow timing are, and the volatility timing improves average excess return, Sharpe ratio, and alpha of the mutual fund.

In April 2012, Wayne Ferson and Haitao Mo developed a model with factor level, volatility timing activities, and security selection skills to measure the performance of U.S. fund managers. They selected the date for the period 1984-2010 from the Center for Research in Security Prices Mutual Fund database, and focused only on active U.S. equity funds. By using the daily return for the empirical study, they found there is no evidence to support the investment ability of U.S. active funds, but they confirmed that funds with low R-square had better performance.

2.4 Summary

From the review of past literature, I found the following features were found:

1. There is no significant empirical evidence to support the market timing ability of fund managers;
2. There is significant evidence to show that volatility timing can be used to evaluate the performance of fund managers;
3. The daily return provides more powerful evidence than the monthly return;
4. The coefficient of volatility timing variable in open-end funds was greater than the one in closed-end funds. This shows that the operation in open-end fund is more active than closed-end funds.

Given these finding, this paper will focus on the daily return to do an empirical research on the performance of Chinese open-end equity mutual funds based on the volatility timing ability.

Chapter 3

Methodology

3.1 Introduction to Research Design

According the definition, volatility timing reflects the ability of funds manager to time the market volatility, and reflects the timing relationship between the coefficient bate and the market volatility. Busse (1999) derived a relationship among the volatility timing, the conditional market return, and the conditional market volatility based on the multi-factor model of market timing as following:

$$\frac{\partial \beta_{jpt}}{\partial \sigma_{j,t+1}} = \frac{1}{\alpha \sigma_{j,t+1}^2} \left[\frac{\partial E_t(R_{j,t+1})}{\partial \sigma_{j,t+1}} - \frac{2E_t(R_{j,t+1})}{\sigma_{j,t+1}} \right] \quad j = 1, \dots, k$$

Where, α is the risk aversion and it is a constant;

β_{jpt} is the coefficient beta of the fund p in time t to the factor j;

$\sigma_{j,t+1}$ is the standard deviation in time t+1 to the factor j;

$R_{j,t+1}$ is the excess return of factor j at time t+1;

$E_t(.)$ is the expected conditional on information available at time t.

If $\partial E_t(R_{j,t+1})/\partial \sigma_{j,t+1} \leq 0$, the sensitivity of fund to the factor j will decrease as the volatility increase. In general, the market volatility has the great influence among all the factors. Thus, when there is a negative relationship between the conditional market return and market volatility, the coefficient of fund beta is going to reduce as the market volatility rising - $\partial \beta_{mpt}/\partial \sigma_{m,t+1} \leq 0$. This represents the volatility timing; for example, when the fund manager predicts the market volatility, then she/he will act to adjust the market exposure of the fund. Busse further proved the existence of the volatility timing ability of the fund; he found that the active fund manager tends to reduce the market exposure of the fund when the market volatility is violent.

Based on the brief understanding, this report is going to apply the Treynor and Mazuy model and Henriksson and Merton model to examine the volatility timing ability of Chinese open-end equity mutual funds.

3.2 Treynor and Mazuy Model (TM Model)

Treynor and Mazuy (1966) derived the following model to test the market timing ability,

$$R_{fund,t} = \alpha_{fund} + \beta_{fund} R_{m,t} + \beta_1 R_{m,t}^2 + \varepsilon_{fund,t} \qquad (3.1.1)$$

Where, in this model, assume beta is following a quadratic process,

The market timing ability is captured by β_1

To further examine the volatility timing ability, we incorporate the effect of market volatility into TM model.

The volatility variable = $R_{m,t}(\sigma_{m,t} - \bar{\sigma}_m)$

Where, $\sigma_{m,t}$= standard deviation of daily market return

$\bar{\sigma}_m$ = average/mean standard deviation of daily market return

Then, the TM Model is as following:

$$R_{fund,t} = \alpha_{fund} + \beta_{fund} R_{m,t} + \beta_1 R_{m,t}^2 + \beta_2 R_{m,t}(\sigma_{m,t} - \bar{\sigma}_m) + \varepsilon_{fund,t} \qquad (3.1.2)$$

Where, $R_{fund,t}$ = *the excess return of fund,*

$R_{m,t}$ = *the excess return of the market,*

α_{fund} = *measurement of the performance of fund manager, outperforms or underperforms the market,*

β_1= *measurement of the market timing ability,*

β_2= *measurement of the volatility timing ability,*

σ = *realized volatility, and*

$\varepsilon_{fund,t}$ = *the error term of the equation.*

The model expects β_2 to be significant if there is volatility timing ability of the funds, and β_1 to be significant if there is a market timing activity.

3.3 Henriksson and Merton Model (HM Model)

Henriksson and Merton (1981) developed a model to test of market timing ability. The difference between the HM model and TM model is that HM model assume a shift in beta as a result of market timing activities, such shift is captured by a dummy variable. The model is as following:

$$R_{fund,t} = \alpha_{fund} + \beta_{fund} R_{m,t} + \beta_1 D_1 R_{m,t} + \varepsilon_{fund,t} \tag{3.2.1}$$

Define D_1 = *Dummy variable*

Where: $D_1 = \begin{cases} 1 & if R_{m,t} > 0 \ \ (market\ performs\ well) \\ 0 & otherwise \end{cases}$

Or

Where: $D_1 = \begin{cases} -1 & if R_{m,t} < 0 \ \ (market\ performs\ poor) \\ 0 & otherwise \end{cases}$

In this model the market timing ability is captured by β_1

If D_1 = 0, then, there is no market timing ability.

$R_{fund,t} = \alpha_{fund} + \beta_{fund} R_{m,t} + \varepsilon_{fund,t}$

If D_1 = 1, then, there is market timing ability

$R_{fund,t} = \alpha_{fund} + (\beta_{fund} + \beta_1) R_{m,t} + \varepsilon_{fund,t}$

To further examine the volatility timing ability, we incorporate the effect of market volatility $R_{m,t}(\sigma_{m,t} - \bar{\sigma}_m)$ into HM model.

The model is as following,

$$R_{fund,t} = \alpha_{fund} + \beta_{fund} R_{m,t} + \beta_1 D_1 R_{m,t} + \beta_2 R_{m,t}(\sigma_{m,t} - \bar{\sigma}_m) + \varepsilon_{fund,t} \quad (3.2.2)$$

Where, α_{fund} = *measurement of the performance of fund manager, outperforms or underperforms the market,*

β_1= *measurement of the market timing ability,*

β_2= *measurement of the volatility timing ability,*

$\varepsilon_{fund,t}$ = *the error term of the equation.*

The model expects β_2 to be significant if there is volatility timing ability of funds, and β_1 to be significant if there is a market timing activity.

3.4 Main Variables Calculations

In this paper, I calculate the fund return by using the common cumulative net growth indicator. It measures the growth of net asset value of per unite investment fund in the specific time period; under the assumption: the fund is not redeemed and all the distribution is reinvested. The formula is as following,

$$r_{fund,t} = \frac{NAV_{fund,t} + D_{fund,t}}{NAV_{fund,t-1}} - 1$$

Where, $NAV_{fund,t}$=*the net asset value of a fund in time t,*

$D_{fund,t}$ = *the distribution of a fund in time t,*

$NAV_{fund,t-1}$= *the net asset value of a fund in time t-1.*

Moreover, the excess return of the fund is calculated as following,

$$R_{fund,t} = r_{fund,t} - r_f$$

Where, r_f = *risk free rate.*

The market return is calculated by the formula,

$$r_{m,t} = \frac{closed\ end\ price_t - closed\ end\ price_{t-1}}{closed\ end\ price_{t-1}};$$

The excess market return $R_{m,t} = r_{m,t} - r_f$

I calculated the 10-days daily market volatility by adopting the estimation method of Andersen (1998) – "Realized Volatility", which is

$$\sigma_{m,t} = \left[\sum_{i=1}^{n_i} (r_{m,t} - \bar{r}_m)^2\right]^{\frac{1}{2}}$$

3.5 Data Selection

To carry out the empirical study, in this paper, I selected 62 Chinese open-end funds, which were issued before 2006 from the website of Hexun (The leader of Chinese financial network, Hexun.com). All these funds are active and focused on domestic equity. For the accurate analysis, I chose the daily net asset value for 6 years' history which from June 2006 to June 2012. The table 3.1 in Appendix 1 shows the 62 open-end mutual funds I selected.

Moreover, there are many types of debt which were issued by the different financial institutions in China such as banks, investment institutions, government, large corporations, and etc. However, we only consider the government bond as the safe debt, so we adopted the annual interest rate of Chinese government bond as the risk free rate. In this paper, I used the mean of the interest rate of one-year Chinese government bond as the risk free rate (Changfeng Wu 1999, Fan and Zhang 2003, Anli Fu, Chaoqun Ma, and Xiaoguang Yang 2005, etc.). The table 3.2 in Appendix 1shows the average risk free rate we will use for the further study.

There are several large indices can be used for the benchmark, such as Shanghai Composite Index, Shenzhen Composite Index, Shanghai-Shenzhen CSI 300 Index, China Securities Index, and etc. In this paper, I will select Shanghai-Shenzhen CSI 300 Index (SHSZ 300) as the market benchmark because of the following several reasons. Firstly, the composite index only can represent the market of the local exchange, it cannot be used as the representation of the whole market in China; secondly, the 62 funds in the sample are listed in both Shanghai and Shenzhen Stock Exchange, thus, the

SHSZ 300 can be used as the relative benchmark; thirdly, either Shanghai or Shenzhen Index cannot fully reflect the truth volatility of Chinese market; lastly, SHSZ 300 Index constitutes about 70% of the total market value of both Shanghai and Shenzhen Stock Exchange, and it was derived as an indicator to observe the trend of the market. Moreover, I collected the daily closed-end prices for the period 2006-2012 from Bloomberg Terminal to calculate the daily market returns.

Chapter 4

Analysis of Results

The Final Sample is designed to study and analyze the market timing activities and volatility timing abilities of the Chinese open-end equity mutual funds. It includes 90272 observations and 16 variables, and it is obtained from the fund sample, the risk free rate sample, and the SHSZ 300 Index sample. The summary statistics of the Final Sample as the following:

Table 4.1 Summary Statistics of the Final Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
id	90272	31.5	17.89563	1	62
fundcd	90272	251088.9	147255.9	1	530001
date	90272				
nav	90272	1.394079	1.06006	0.2623	13.219
cnav	90272	2.866259	0.8431023	0.7334	6.8312
cfundr	90272	0.0005231	0.0134994	-0.5762163	1.394737
rf	90272	0.0000601	0	0.0000601	0.0000601
cefr	90272	0.000463	0.0134994	-0.5762765	1.394677
nfundr	90272	9.91E-06	0.0233382	-0.899047	0.4155272
nefr	90272	-0.0000502	0.0233382	-0.8991072	0.4154671
tb	90272	0.0005864	0.0206391	-0.0924582	0.0933597
tb1	90272	0.0004263	0.0008519	2.88E-10	0.008716
tb2	90272	-0.0000958	0.0043011	-0.0319129	0.0424394
hb	90272	0.0005864	0.0206391	-0.0924582	0.0933597
hb1	90272	0.0078134	0.0118922	0	0.0933597
hb2	90272	-0.0000958	0.0043011	-0.0319129	0.0424394

Each of these variables has total 90272 observations; and the table 2 in Appendix 1shows the definition of these variables. The id represents there are 62 mutual funds. The net assets values of these funds are from 0.2623 to 13.219 Yuan, and the average is 1.06006 Yuan. To compare with the nav, the cnav has the smaller range which is between 0.7334 and 6.8312 Yuan. The cumulative fund returns cfundr has the lowest -5.76% and the highest 1.394%, and we use the cfundr to do our further study because it is more accurate than the net fund returns. Moreover, the volatility variable is tb2 in the TM model and hb2 in the HM model. The tb2 has a lowest value -0.0319129 and highest value 0.0424394; both of them are very small. The hb2 has the same results with tb2.

Based on the model we designed in Chapter 3, I will analyze the results of the Final Sample in three parts: first of all, the results from the TM model; then, the results from the HM model; lastly, the aggregate results from the TM and HM model.

4.1 The Empirical Analysis by Using the TM model

Taking into account the high-frequency characteristics of the volatility timing, we analyze the volatility timing ability of the funds by using the daily data. I used the daily excess returns of the funds and SHSZ 300 Index which are calculated by using the equations in 3.4. The results of the regression by using the equation 3.1.2 as following:

Table 4.2 Results from the TM Model – a brief description of the variables in necessary.

TM Model							
Variable	**tb1**	**s.d.**	**tb2**	**s.d.**	**Constant**	**s.d.**	**R-squared**
id 1	-0.536***	(0.159)	-0.202***	(0.0393)	0.000363**	(0.000151)	0.869
id 2	-0.637***	(0.154)	-0.115***	(0.0379)	0.000472***	(0.000146)	0.849
id 3	-0.396**	(0.156)	-0.145***	(0.0385)	0.000457***	(0.000148)	0.697
id 4	-0.435	(0.942)	-0.0210	(0.232)	0.000844	(0.000893)	0.070
id 5	-0.383***	(0.107)	-0.110***	(0.0264)	0.000390***	(0.000102)	0.638
id 6	-0.256**	(0.123)	-0.126***	(0.0302)	0.000286**	(0.000117)	0.791
id 7	-0.546***	(0.109)	-0.0991***	(0.0270)	0.000357***	(0.000104)	0.815
id 8	-0.821***	(0.178)	-0.194***	(0.0438)	0.000282*	(0.000169)	0.776
id 9	-0.884***	(0.192)	0.111**	(0.0474)	0.000460**	(0.000183)	0.673

id 10	0.0939	(1.233)	-0.407	(0.304)	0.000510	(0.00117)	0.034
id 11	-0.193*	(0.115)	0.0236	(0.0284)	0.000196*	(0.000109)	0.659
id 12	0.0406	(0.227)	-0.231***	(0.0558)	0.000237	(0.000215)	0.810
id 13	-0.516***	(0.115)	-0.150***	(0.0283)	0.000397***	(0.000109)	0.735
id 14	-0.534***	(0.133)	-0.139***	(0.0328)	0.000437***	(0.000126)	0.685
id 15	-0.744***	(0.153)	-0.187***	(0.0377)	0.000329**	(0.000145)	0.851
id 16	-0.665***	(0.157)	-0.218***	(0.0387)	0.000307**	(0.000149)	0.761
id 17	-0.833***	(0.148)	0.0890**	(0.0364)	0.000560***	(0.000140)	0.877
id 18	-0.325***	(0.103)	-0.184***	(0.0253)	0.000171*	(9.74e-05)	0.797
id 19	0.0217	(0.128)	-0.204***	(0.0314)	4.64e-05	(0.000121)	0.680
id 20	-0.554***	(0.148)	-0.113***	(0.0365)	0.000378***	(0.000140)	0.725
id 21	-0.566***	(0.113)	-0.150***	(0.0279)	9.07e-05	(0.000107)	0.838
id 22	-0.515***	(0.137)	-0.0485	(0.0338)	0.000508***	(0.000130)	0.556
id 23	-0.871***	(0.300)	-0.0642	(0.0740)	0.000524*	(0.000285)	0.337
id 24	-0.377	(0.751)	0.136	(0.185)	0.000766	(0.000713)	0.064
id 25	-0.631***	(0.184)	-0.216***	(0.0454)	0.000719***	(0.000175)	0.594
id 26	-0.748***	(0.146)	-0.0692*	(0.0359)	0.000638***	(0.000138)	0.619
id 27	-0.477***	(0.148)	-0.0729**	(0.0365)	0.000207	(0.000141)	0.790
id 28	-0.351***	(0.128)	-0.388***	(0.0314)	0.000435***	(0.000121)	0.842
id 29	-0.388***	(0.112)	-0.194***	(0.0275)	0.000354***	(0.000106)	0.710
id 30	-0.568***	(0.112)	-0.155***	(0.0275)	0.000389***	(0.000106)	0.752
id 31	-0.474***	(0.138)	-0.102***	(0.0340)	0.000430***	(0.000131)	0.742
id 32	-0.547***	(0.131)	-0.0572*	(0.0322)	0.000532***	(0.000124)	0.921
id 33	-0.169	(0.156)	0.193***	(0.0385)	0.000336**	(0.000148)	0.881
id 34	-0.204	(0.135)	-0.0951***	(0.0332)	0.000143	(0.000128)	0.823
id 35	-0.481***	(0.165)	0.301***	(0.0407)	0.000544***	(0.000157)	0.799
id 36	-0.246**	(0.105)	-0.0170	(0.0259)	9.56e-05	(9.99e-05)	0.971
id 37	-0.473***	(0.137)	-0.145***	(0.0339)	0.000515***	(0.000130)	0.686
id 38	-0.671***	(0.120)	-0.0837***	(0.0295)	0.000431***	(0.000114)	0.863
id 39	-0.746***	(0.153)	-0.0178	(0.0376)	0.000436***	(0.000145)	0.898
id 40	-0.272***	(0.104)	-0.0992***	(0.0257)	0.000306***	(9.90e-05)	0.801
id 41	-0.398**	(0.164)	-0.114***	(0.0404)	0.000223	(0.000155)	0.834
id 42	-0.527***	(0.133)	-0.0234	(0.0328)	0.000287**	(0.000126)	0.939
id 43	-0.568***	(0.135)	-0.136***	(0.0332)	0.000469***	(0.000128)	0.741
id 44	0.0558	(0.104)	-0.287***	(0.0256)	9.98e-05	(9.86e-05)	0.855
id 45	-0.416***	(0.152)	-0.112***	(0.0374)	0.000414***	(0.000144)	0.705
id 46	-0.514***	(0.155)	-0.124***	(0.0383)	0.000361**	(0.000148)	0.942
id 47	-0.475***	(0.132)	-0.0278	(0.0325)	0.000240*	(0.000125)	0.839
id 48	-0.497***	(0.105)	-0.138***	(0.0259)	0.000340***	(9.99e-05)	0.822
id 49	-0.510***	(0.0899)	-0.118***	(0.0221)	0.000263***	(8.53e-05)	0.928
id 50	-0.130	(0.131)	-0.0998***	(0.0322)	0.000167	(0.000124)	0.679

id 51	-0.788***	(0.186)	-0.150***	(0.0458)	0.000758***	(0.000176)	0.688
id 52	-0.349**	(0.136)	-0.0618*	(0.0335)	0.000439***	(0.000129)	0.674
id 53	-0.237*	(0.137)	0.0884***	(0.0337)	0.000396***	(0.000130)	0.876
id 54	-0.234*	(0.124)	-0.0728**	(0.0304)	0.000221*	(0.000117)	0.710
id 55	-0.408**	(0.193)	-0.167***	(0.0475)	0.000391**	(0.000183)	0.809
id 56	-0.612***	(0.134)	-0.189***	(0.0331)	0.000202	(0.000127)	0.843
id 57	0.129	(0.184)	0.0333	(0.0453)	-7.78e-05	(0.000174)	0.907
id 58	-0.219	(0.208)	-0.237***	(0.0513)	0.000271	(0.000197)	0.837
id 59	-0.474***	(0.125)	-0.147***	(0.0308)	0.000294**	(0.000118)	0.663
id 60	0.0697	(0.833)	-0.270	(0.205)	0.000426	(0.000790)	0.048
id 61	-0.407***	(0.109)	-0.141***	(0.0268)	0.000359***	(0.000103)	0.736
id 62	-0.611***	(0.145)	0.0937***	(0.0356)	0.000471***	(0.000137)	0.729

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

tb1-market timing coefficient, tb2-volatility timing coefficient

First of all, from the results we can observe that almost all the volatility timing coefficients tb2 of the funds are negative, which represent the poor volatility timing ability. Only 6 volatility timing coefficients of the funds are positive, but they are all statistically insignificant. Based on the t-test, at the 1% level of the significance, 43 of these coefficients are significant; with 5% level of the significance, 4 more of these coefficients are significant; with 10% level of the significance, 3 more of these coefficients are significant. Indeed, more than 90% of the funds have the significant volatility timing coefficients. It indicates that the Chinese open-end equity mutual funds have small but significant volatility timing activities, thus the fund managers can reduce the market exposure when the market volatility is high.

Next, by adding the volatility variable into the TM model, we find that 90% of the market timing coefficients tb1 are negative. Only 6 of these coefficients are positive, but they are all insignificant. Based on the t-test, with 1% level of the significance, 41 of these coefficients are significant; with 5% level of the significance, 6 more of these coefficients are significant; with 10% level of the significance, 3 more of these coefficients are significant. To sum up, most of the funds have the significant market timing ability coefficient. It shows that the Chinese open-end equity mutual funds have the significant market timing activities, but they are poor market timing ability; however, the fund managers have the ability to move the fund from the risky market into the safety market when fund managers forecast the expectation of the market is going to fall.

Moreover, almost all of the constants are positive but with small values. Based on the t-test, about 50% of these values are significant. It indicates that the fund outperforms the market but the value is not significant.

Lastly, most of the R-square of the regression are between 60% and 90%. It indicates that the explanatory variables-the market excess return, the TM market timing variable, and the volatility timing variable can well explain the dependent variables.

4.2 The Empirical Analysis by Using the HM Model

By using the equation 3.2.2-HM model and the daily data, we get the results in Table 6.

<u>Table 4.3 is about here</u>

It has the similar results with the TM model. Almost 85% of the coefficients of the volatility timing hb2 are significant but with the negative value. By using the HM model, we also can observe that the Chinese open-end mutual funds change their market exposure when the market volatility is changed. Furthermore, almost all of the coefficients of the market timing hb1 are negative, and only about 50% of those coefficients are significant. It indicates that the Chinese open-end fund managers have the market timing ability to change the asset allocation when the expectation of the market is going to change, but the market timing ability of the fund managers is poor. The constants also are positive with the small values. Based on the t-test, we find that almost 70% of these constants are significant. It shows that the fund outperforms the market but only with very small extent. Finally, the R-square of the regression is about 60% to 90%, which the independent variables- the market excess return, the HM market timing variable, and the volatility timing variable can well explain the dependent variables.

4.3 The Empirical Analysis by comparing the Aggregate Results of HM and TM Model

We get the aggregate results of the Chinese open-end equity mutual fund by using the TM model-equation 3.1.2 and HM model-equation 3.2.2, as following:

Table 4.4 The aggregate results from TM and HM model

Variable	**b1**		**b2**		**Constant**		**R-squared**
TM model	-0.435***	(0.0386)	-0.103***	-0.0095	0.00037***	(3.67e-05)	0.673
HM model	-0.026***	(0.00464)	-0.106***	-0.0095	0.00038***	(4.79e-05)	0.672

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

From the results, we can observe that the coefficients of the volatility timing b2 and the coefficients of the market timing b1 in both TM and HM model are negative, and they are significant under the level of the significant 1%. However, the coefficient of the market timing in TM model is larger than the HM model, which indicates that the HM model shows the better market timing ability of the funds; the coefficient of the volatility timing ability in HM is larger than the TM model, which indicates that the TM model shows the better volatility timing ability of the funds. Moreover, the constant and R-square in both models are same.

Chapter 5

Conclusions and Recommendations

This research takes 62 domestic open-end equity mutual funds established since June 2006 as the research object, and the sample period is from June 1, 2006 to June 1, 2012. We have conducted an empirical study on volatility timing ability of investment funds in Chinese security markets by improving and adopting the volatility timing model (Busse, 1999). The research shows there is significant evidence to support the Chinese open-end equity mutual funds have the volatility timing ability, which can reduce the market exposure of the fund assets allocation when the market volatility is increasing; and the excess fund return and the market volatility are negatively correlated because of the negative coefficient b2; Secondly, there is evidence of market timing ability of Chinese open-end equity mutual funds managers, but their market timing ability is poor; thirdly, the Chinese open-end equity funds outperforms the market but only with very small extent.

The volatility timing ability of the Chinese open-end funds is relatively weak. The reason mainly lies in lacking of short mechanism in the Chinese fund market which constrains the ability of the fund managers to play within the volatility timing. Meanwhile, the hedge and reinvestment vehicles which can be adopted by the funds are very limited, and even if the fund managers have the correct judgment toward the market volatility, they can rarely make the appropriate adjustments timely. Furthermore, China's stock market has great volatility, low predictability, and frequently changed policy, so that negative impacts are created to a great extent in volatility timing in the fund market.

In addition, the timing activities of the funds are not only the market returns timing, but also the market volatility timing. Therefore, when predicting market trends, fund managers also need to actively respond to the volatility scope of the market. It is especially important to the Chinese volatile and not yet mature market, which is also testified by our empirical results.

The presence of a number of factors affects our empirical results which come from the above model, such as the assumption of the model and the collection of the data.

The above model is built based on the CAPM model, while the validity of the CAPM model has not yet been confirmed. The wrong model choice may lead to improper conclusions. Moreover, CAPM model requires the consistency of benchmark index as market portfolio. However, the shares of the Chinese listed companies are classified into tradable share and non-tradable share, and the non-tradable share accounts 2/3 of the total capital shares in average, which resulting in large distortion of share index calculated by the total share's weighting.

The frequency of sample is too fast. The fund's investment portfolio adjustment requires a certain period of time. Due to the limitations on sample size, this paper adopts daily yield, and this may affect the validity of the result. Furthermore, the trading date of the funds and the trading date of the market are not perfectly corresponding, thus we deduct some of the trading days which may also influence the results.

To further study in this area, you may need to overcome these restrictions and add more factors to eliminated the influence of lacking of short mechanism in the Chinese fund market

References

Bogle, J. C. (1999). *Common Sense on Mutual Funds: New Imperatives for the Intelligent Investor*. John Wiley & Sons.

Bollen, N. P.B. & Busse, J. A. (2001). On the Timing Ability of Mutual Fund Managers. *Journal of Finance, 56*, 1075-1094. doi: June 2001.

Busse, J. A. (1999). Volatility Timing in Mutual Funds: Evidence from Daily Returns. *The Review of Financial Studies*, *12*, 1009-1041. Retrieved from http://rfs.oxfordjournals.org/content/12/5/1009.short

Famma, E. F. (1972). Components of Investment Performance. *The Journal of Finance, 27*,551-567. Retrieved from http://www.jstor.org/discover/10.2307/2978261?uid=3739432&uid=2129&uid=2&uid=70&uid=3737720&uid=4&sid=21101105350561

Fan, Z. & Zhang, S. (2003). Research on the Persistence of Financial Volatility. *Journal Forecasting*, *1*, 33-37

Ferson, W. & Mo, H. (2012). Performance Measurement with Market and Volatility Timing and Selectivity. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2022142

French, K. R., Schwert, G. W., & Stambaugh, R. F. (1987). Expected Stock Returns and Volatility, *Journal of Financial Economics*, *19*, 3-30.

Fu, A., Ma, C., & Yang, X. (2005). A Study on Volatility Timing of Investment Funds. *Contemporary Finance & Economics*, *242*, 53-57.

Giambona, E. & Golec, J. (2008). Mutual Fund Volatility Timing and Management Fees. *Banking & Finance, 33*, 589-599. Retrieved from http://www.sciencedirect.com/science/article/pii/S037842660800294X

Goetzmann, W. N., Jonathan, I. Jr., & Ivkovic, Z. (1999). Monthly measurement of Daily Timers. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=79388

Henriksson, R. D. & Merton, S. C. (1981). On Market Timing and Investment Performance Ⅱ: Statistical Procedures for Evaluating Forecasting Skills. *Journal of Business, 54*, 513-533.

Hill, R. C., Griffiths, W. E., & Lim, G. C. (2011). *Principles of Econometrics* (4th ed.). John Wiley & Sons, Inc.

Jensen, M. C. (1968). The Performance of Mutual Funds in the Period 1945-1964. Journal of Finance, 23, 384-516. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=244153

Jiang, W. (2003). A Nonparametric Test of Market Timing. Journal of Empirical Finance, 10, 399-425. Retrieved from http://www.columbia.edu/~wj2006/market_timing.pdf

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk. Journal of Finance, 19, 425-442. Retrieved from http://www.jstor.org/discover/10.2307/2977928?uid=3739432&uid=2129&uid=2&uid=70&uid=3737720&uid=4&sid=21101105412351

Treynor, J. L. & Mazuy, K. K. (1966). Can Mutual Funds Outguess the Market? *Harvard Business Review*, *44*, 131-136. Retrieved from http://users.business.uconn.edu/jgolec/Treynor-Mazuy.pdf

Appendix 1: List of Tables

Table 1: Classification of Chinese Funds

	Open-End Fund	Closed-End Fund
Trading Place	Fund management company or bank	Shanghai and Shenzhen Stock Exchange
Fund Size	Not fixed, Minimum size limited	Fixed
Redemption Restriction	Can repurchase or redeem anytime	Not redeemable
Pricing	Net asset value of mutual funds	Supply and Demand of market
Dividend	Cash or reinvestment	Cash
Investment strategy	Must reserve some cash for investors' redemption; pursue high returns	No need to take reserve; long term investment
Information Disclosure	Net asset value must be notified every trading day	Net asset value must be notified at least once a week

Table 2: Variable Definitions

Variable	Definition
Fundcd	The fundcd is the trading code which is used to trade within the Exchange in China.
NAV	NAV is the net asset value of the fund. In this paper it represents the daily net asset value of the fund.
CNAV	CNAV is the cumulative net asset value of the fund. In this paper it represents the daily cumulative net asset value of the fund.
Closed_price	The Closed_price is the ending price of SHSZ 300 Index. In this paper we use the daily ending price to calculate the return.
Hist_vol_10d	It is the 10-days daily volatility of SHSZ 300 Index. The daily volatility is calculated by using the previous 10 days market return.
G Bond	It is the one-year government bond which is issued by Chinese government.
nfundr	It represents the net fund return which is calculated by using the NAV.
cfundr	It is the cumulative fund return which is calculated by using the CNAV.
rf	It represents the daily risk free rate of one-year Chinese government bond.
cefr	The cefr is the cumulative excess fund return which is calculated by using the cfundr.
nefr	The nefr is net excess fund return.
tb	It represents the coefficient "b" from the TM Model.
tb1	It represents the coefficient "b1" from the TM Model.
tb2	It represents the coefficient "b2" from the TM Model.
hb	It represents the coefficient "b" from the HM Model.
hb1	It represents the coefficient "b1" from the HM Model.
hb2	It represents the coefficient "b2" from the HM Model.

Table 3.1: Chinese Open-end Equity Mutual Funds Sample

ID	Date	FundCD	Total Asset (CNY)
1	06/01/2012	110002	4198513524
2	06/01/2012	110005	5384796757
3	06/01/2012	121003	4269272265
4	06/01/2012	160505	10714364241
5	06/01/2012	160603	2480790966
6	06/01/2012	161005	4702008310
7	06/01/2012	161706	3483903244
8	06/01/2012	161903	498366249.7
9	06/01/2012	162102	1653854758
10	06/01/2012	162201	1472946382
11	06/01/2012	162203	174456436.4
12	06/01/2012	162204	3811581722
13	06/01/2012	162605	4798844855
14	06/01/2012	162607	6369653354
15	06/01/2012	162703	8135555294
16	06/01/2012	163503	2191567291
17	06/01/2012	163803	6738955754
18	06/01/2012	180003	7422372926
19	06/01/2012	202001	4103718141
20	06/01/2012	210001	1612818111
21	06/01/2012	213002	2201706565
22	06/01/2012	217001	481633059.8
23	06/01/2012	233001	71828094.25
24	06/01/2012	240004	1774051650
25	06/01/2012	240005	4293210679
26	06/01/2012	257010	1693508549
27	06/01/2012	257020	2166257236
28	06/01/2012	288002	3399066151
29	06/01/2012	310308	1396734980
30	06/01/2012	320003	12167664693
31	06/01/2012	360001	8722612715
32	06/01/2012	360005	2159615087
33	06/01/2012	377010	3365512087
34	06/01/2012	460001	6422622102
35	06/01/2012	481001	8722279078
36	06/01/2012	510180	9537843906
37	06/01/2012	519180	5735576071
38	06/01/2012	519300	5529161591

39	06/01/2012	519995	6594582085
40	06/01/2012	000001	9025780332
41	06/01/2012	040001	5415356432
42	06/01/2012	040002	4698986193
43	06/01/2012	050002	9388124949
44	06/01/2012	050004	8127573335
45	06/01/2012	110003	20163848871
46	06/01/2012	159901	19700258000
47	06/01/2012	160106	3122910363
48	06/01/2012	160706	27526129691
49	06/01/2012	161604	14698979547
50	06/01/2012	162202	661084098
51	06/01/2012	200002	1618550796
52	06/01/2012	200006	3852787299
53	06/01/2012	240001	2194652779
54	06/01/2012	260101	1362149284
55	06/01/2012	260104	2199981190
56	06/01/2012	310328	2200000739
57	06/01/2012	510050	19954605055
58	06/01/2012	519001	11348263043
59	06/01/2012	519005	3359440731
60	06/01/2012	519688	5332672112
61	06/01/2012	519997	1921812343
62	06/01/2012	530001	4542605122

Table 3.2: Summary Statistics of the Fund Sample, the Risk Free Rate, and the SHSZ 300 Index

Name	Variable	Obs	Mean	Std. Dev.	Min	Max
110002	NAV	1456	3.561909	0.868862	1.525	5.802
110005	NAV	1456	1.212678	0.352369	0.7185	2.7636
121003	NAV	1456	1.002619	0.288648	0.5725	2.3162
160505	NAV	1456	1.789686	0.381683	1.0444	3.15
160603	NAV	1456	0.953328	0.333288	0.452	2.224
161005	NAV	1456	1.42674	0.273826	0.776	2.2272
161706	NAV	1456	1.336147	0.302565	0.7391	2.3901
161903	NAV	1456	0.92197	0.361265	0.468	1.9572
162102	NAV	1456	1.214411	0.277896	0.6664	1.7893
162201	NAV	1456	1.292904	0.396893	0.6788	2.3246
162203	NAV	1456	0.965436	0.415267	0.4878	2.3087
162204	NAV	1456	4.021268	1.085971	1.4816	6.0774
162605	NAV	1456	1.130653	0.314091	0.663	2.232
162607	NAV	1456	0.953596	0.354884	0.474	2.29
162703	NAV	1456	1.98609	0.460672	0.9798	3.4592
163503	NAV	1456	0.749603	0.374594	0.3524	1.9491
163803	NAV	1456	0.954127	0.379344	0.5463	2.5281
180003	NAV	1456	1.019853	0.236213	0.5743	1.7792
202001	NAV	1456	1.142218	0.315103	0.7246	2.4497
210001	NAV	1456	0.867483	0.339255	0.4495	2.0911
213002	NAV	1456	0.75204	0.351897	0.344	1.788
217001	NAV	1456	0.983403	0.724671	0.3138	3.1712
233001	NAV	1456	0.853942	0.569256	0.3731	2.7608
240004	NAV	1456	1.130345	0.542332	0.5042	2.7429
240005	NAV	1456	1.011198	0.780368	0.4077	4.2105
257010	NAV	1456	1.009025	0.475047	0.516	3.012
257020	NAV	1456	0.985516	0.286541	0.488	2.133
288002	NAV	1456	2.151315	0.424628	1.1611	2.8273
310308	NAV	1456	0.987411	0.225912	0.5751	2.0266
320003	NAV	1456	1.078548	0.260411	0.6074	2.0209
360001	NAV	1456	1.046116	0.396038	0.4833	2.7106
360005	NAV	1456	2.274402	0.70693	0.9589	4.3613
377010	NAV	1456	3.673973	1.273683	1.6645	6.7912
460001	NAV	1456	0.813927	0.387535	0.4157	2.3626
481001	NAV	1456	0.994921	0.938882	0.2623	4.2049
510180	NAV	1456	3.665416	3.669422	0.492	13.219
519180	NAV	1456	0.892621	0.439946	0.3951	2.628

519300	NAV	1456	1.091276	0.348379	0.5504	2.3439
519995	NAV	1456	0.905187	0.401989	0.4653	2.6564
000001	NAV	1456	1.319396	0.316429	0.828	2.359
040001	NAV	1456	1.12728	0.905717	0.492	4.452
040002	NAV	1456	1.448983	1.203299	0.45	4.884
050002	NAV	1456	0.994526	0.399731	0.457	2.493
050004	NAV	1456	1.450277	0.290648	0.9471	2.36
110003	NAV	1456	0.975164	0.399716	0.4952	2.7109
159901	NAV	1456	2.661914	1.530956	0.5441	5.901
160106	NAV	1456	1.625115	0.485959	0.9491	3.1333
160706	NAV	1456	0.922006	0.313252	0.42	2.141
161604	NAV	1456	1.26969	0.293338	0.65	2.116
162202	NAV	1456	1.18872	0.381148	0.5731	2.3223
200002	NAV	1456	1.565592	0.989341	0.6299	5.3557
200006	NAV	1456	0.913511	0.213315	0.4756	1.7187
240001	NAV	1456	1.40826	0.289794	0.8003	2.5836
260101	NAV	1456	1.213062	0.334313	0.6975	2.6148
260104	NAV	1456	3.328793	0.795004	1.647	5.28
310328	NAV	1456	0.914535	0.354875	0.4744	1.8681
510050	NAV	1456	2.203217	0.742007	1.01	4.585
519001	NAV	1456	1.407933	0.419301	0.6472	3.2437
519005	NAV	1456	0.828459	0.326157	0.367	1.86
519688	NAV	1456	1.042466	0.306571	0.6426	2.2423
519997	NAV	1456	0.867135	0.290957	0.4246	1.9624
530001	NAV	1456	0.953563	0.357488	0.4706	1.878
G Bond	rf	7	2.194857	0.873364	0.89	3.42
SHSZ 300	Closed_price	1456	3008.463	968.6037	1224.1	5877.2
SHSZ 300	Hist_vol_10d	1457	30.07195	14.10226	6.477	78.669

Table 4.1: Summary Statistics of the Final Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
id	90272	31.5	17.89563	1	62
fundcd	90272	251088.9	147255.9	1	530001
date	90272				
nav	90272	1.394079	1.06006	0.2623	13.219
cnav	90272	2.866259	0.8431023	0.7334	6.8312
cfundr	90272	0.0005231	0.0134994	-0.5762163	1.394737
rf	90272	0.0000601	0	0.0000601	0.0000601
cefr	90272	0.000463	0.0134994	-0.5762765	1.394677
nfundr	90272	9.91E-06	0.0233382	-0.899047	0.4155272
nefr	90272	-0.0000502	0.0233382	-0.8991072	0.4154671
tb	90272	0.0005864	0.0206391	-0.0924582	0.0933597
tb1	90272	0.0004263	0.0008519	2.88E-10	0.008716
tb2	90272	-0.0000958	0.0043011	-0.0319129	0.0424394
hb	90272	0.0005864	0.0206391	-0.0924582	0.0933597
hb1	90272	0.0078134	0.0118922	0	0.0933597
hb2	90272	-0.0000958	0.0043011	-0.0319129	0.0424394

Table 4.2: Results from the TM Model- a brief description of the variables in necessary

TM Model

Variable	tb1	s.d.	tb2	s.d.	Constant	s.d.	R-squared
id 1	-0.536***	(0.159)	-0.202***	(0.0393)	0.000363**	(0.000151)	0.869
id 2	-0.637***	(0.154)	-0.115***	(0.0379)	0.000472***	(0.000146)	0.849
id 3	-0.396**	(0.156)	-0.145***	(0.0385)	0.000457***	(0.000148)	0.697
id 4	-0.435	(0.942)	-0.0210	(0.232)	0.000844	(0.000893)	0.070
id 5	-0.383***	(0.107)	-0.110***	(0.0264)	0.000390***	(0.000102)	0.638
id 6	-0.256**	(0.123)	-0.126***	(0.0302)	0.000286**	(0.000117)	0.791
id 7	-0.546***	(0.109)	-0.0991***	(0.0270)	0.000357***	(0.000104)	0.815
id 8	-0.821***	(0.178)	-0.194***	(0.0438)	0.000282*	(0.000169)	0.776
id 9	-0.884***	(0.192)	0.111**	(0.0474)	0.000460**	(0.000183)	0.673
id 10	0.0939	(1.233)	-0.407	(0.304)	0.000510	(0.00117)	0.034
id 11	-0.193*	(0.115)	0.0236	(0.0284)	0.000196*	(0.000109)	0.659
id 12	0.0406	(0.227)	-0.231***	(0.0558)	0.000237	(0.000215)	0.810
id 13	-0.516***	(0.115)	-0.150***	(0.0283)	0.000397***	(0.000109)	0.735
id 14	-0.534***	(0.133)	-0.139***	(0.0328)	0.000437***	(0.000126)	0.685
id 15	-0.744***	(0.153)	-0.187***	(0.0377)	0.000329**	(0.000145)	0.851
id 16	-0.665***	(0.157)	-0.218***	(0.0387)	0.000307**	(0.000149)	0.761
id 17	-0.833***	(0.148)	0.0890**	(0.0364)	0.000560***	(0.000140)	0.877
id 18	-0.325***	(0.103)	-0.184***	(0.0253)	0.000171*	(9.74e-05)	0.797
id 19	0.0217	(0.128)	-0.204***	(0.0314)	4.64e-05	(0.000121)	0.680
id 20	-0.554***	(0.148)	-0.113***	(0.0365)	0.000378***	(0.000140)	0.725
id 21	-0.566***	(0.113)	-0.150***	(0.0279)	9.07e-05	(0.000107)	0.838
id 22	-0.515***	(0.137)	-0.0485	(0.0338)	0.000508***	(0.000130)	0.556
id 23	-0.871***	(0.300)	-0.0642	(0.0740)	0.000524*	(0.000285)	0.337
id 24	-0.377	(0.751)	0.136	(0.185)	0.000766	(0.000713)	0.064
id 25	-0.631***	(0.184)	-0.216***	(0.0454)	0.000719***	(0.000175)	0.594
id 26	-0.748***	(0.146)	-0.0692*	(0.0359)	0.000638***	(0.000138)	0.619
id 27	-0.477***	(0.148)	-0.0729**	(0.0365)	0.000207	(0.000141)	0.790
id 28	-0.351***	(0.128)	-0.388***	(0.0314)	0.000435***	(0.000121)	0.842
id 29	-0.388***	(0.112)	-0.194***	(0.0275)	0.000354***	(0.000106)	0.710
id 30	-0.568***	(0.112)	-0.155***	(0.0275)	0.000389***	(0.000106)	0.752
id 31	-0.474***	(0.138)	-0.102***	(0.0340)	0.000430***	(0.000131)	0.742
id 32	-0.547***	(0.131)	-0.0572*	(0.0322)	0.000532***	(0.000124)	0.921
id 33	-0.169	(0.156)	0.193***	(0.0385)	0.000336**	(0.000148)	0.881
id 34	-0.204	(0.135)	-0.0951***	(0.0332)	0.000143	(0.000128)	0.823
id 35	-0.481***	(0.165)	0.301***	(0.0407)	0.000544***	(0.000157)	0.799
id 36	-0.246**	(0.105)	-0.0170	(0.0259)	9.56e-05	(9.99e-05)	0.971
id 37	-0.473***	(0.137)	-0.145***	(0.0339)	0.000515***	(0.000130)	0.686

id 38	-0.671***	(0.120)	-0.0837***	(0.0295)	0.000431***	(0.000114)	0.863
id 39	-0.746***	(0.153)	-0.0178	(0.0376)	0.000436***	(0.000145)	0.898
id 40	-0.272***	(0.104)	-0.0992***	(0.0257)	0.000306***	(9.90e-05)	0.801
id 41	-0.398**	(0.164)	-0.114***	(0.0404)	0.000223	(0.000155)	0.834
id 42	-0.527***	(0.133)	-0.0234	(0.0328)	0.000287**	(0.000126)	0.939
id 43	-0.568***	(0.135)	-0.136***	(0.0332)	0.000469***	(0.000128)	0.741
id 44	0.0558	(0.104)	-0.287***	(0.0256)	9.98e-05	(9.86e-05)	0.855
id 45	-0.416***	(0.152)	-0.112***	(0.0374)	0.000414***	(0.000144)	0.705
id 46	-0.514***	(0.155)	-0.124***	(0.0383)	0.000361**	(0.000148)	0.942
id 47	-0.475***	(0.132)	-0.0278	(0.0325)	0.000240*	(0.000125)	0.839
id 48	-0.497***	(0.105)	-0.138***	(0.0259)	0.000340***	(9.99e-05)	0.822
id 49	-0.510***	(0.0899)	-0.118***	(0.0221)	0.000263***	(8.53e-05)	0.928
id 50	-0.130	(0.131)	-0.0998***	(0.0322)	0.000167	(0.000124)	0.679
id 51	-0.788***	(0.186)	-0.150***	(0.0458)	0.000758***	(0.000176)	0.688
id 52	-0.349**	(0.136)	-0.0618*	(0.0335)	0.000439***	(0.000129)	0.674
id 53	-0.237*	(0.137)	0.0884***	(0.0337)	0.000396***	(0.000130)	0.876
id 54	-0.234*	(0.124)	-0.0728**	(0.0304)	0.000221*	(0.000117)	0.710
id 55	-0.408**	(0.193)	-0.167***	(0.0475)	0.000391**	(0.000183)	0.809
id 56	-0.612***	(0.134)	-0.189***	(0.0331)	0.000202	(0.000127)	0.843
id 57	0.129	(0.184)	0.0333	(0.0453)	-7.78e-05	(0.000174)	0.907
id 58	-0.219	(0.208)	-0.237***	(0.0513)	0.000271	(0.000197)	0.837
id 59	-0.474***	(0.125)	-0.147***	(0.0308)	0.000294**	(0.000118)	0.663
id 60	0.0697	(0.833)	-0.270	(0.205)	0.000426	(0.000790)	0.048
id 61	-0.407***	(0.109)	-0.141***	(0.0268)	0.000359***	(0.000103)	0.736
id 62	-0.611***	(0.145)	0.0937***	(0.0356)	0.000471***	(0.000137)	0.729

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

tb1-market timing coefficient, tb2-volatility timing coefficient

Table 4.3: Results from the HM Model- a brief description of the variables in necessary

HM Model							
Variable	**hb1**	**s.d.**	**hb2**	**s.d.**	**Constant**	**s.d.**	**R-squared**
id 1	-0.0414**	(0.0192)	-0.205***	(0.0393)	0.000444**	(0.000198)	0.868
id 2	-0.0479***	(0.0185)	-0.119***	(0.0380)	0.000559***	(0.000191)	0.848
id 3	0.00339	(0.0188)	-0.148***	(0.0386)	0.000261	(0.000194)	0.696
id 4	-0.0254	(0.113)	-0.0240	(0.232)	0.000848	(0.00117)	0.070
id 5	-0.0239*	(0.0129)	-0.113***	(0.0265)	0.000406***	(0.000133)	0.636
id 6	-0.0203	(0.0147)	-0.128***	(0.0303)	0.000329**	(0.000152)	0.790
id 7	-0.0389***	(0.0132)	-0.103***	(0.0271)	0.000415***	(0.000136)	0.813
id 8	-0.0949***	(0.0213)	-0.199***	(0.0438)	0.000644***	(0.000220)	0.775
id 9	-0.110***	(0.0231)	0.106**	(0.0473)	0.000913***	(0.000238)	0.673
id 10	0.0918	(0.148)	-0.408	(0.304)	-0.000142	(0.00153)	0.034
id 11	-0.0117	(0.0138)	0.0223	(0.0284)	0.000201	(0.000143)	0.659
id 12	0.0201	(0.0272)	-0.231***	(0.0558)	0.000103	(0.000281)	0.811
id 13	-0.0226	(0.0139)	-0.154***	(0.0285)	0.000345**	(0.000143)	0.732
id 14	-0.0196	(0.0161)	-0.143***	(0.0329)	0.000356**	(0.000166)	0.682
id 15	-0.0816***	(0.0184)	-0.191***	(0.0377)	0.000624***	(0.000190)	0.851
id 16	-0.0625***	(0.0189)	-0.222***	(0.0388)	0.000492**	(0.000195)	0.759
id 17	-0.0752***	(0.0178)	0.0835**	(0.0365)	0.000768***	(0.000184)	0.876
id 18	-0.0104	(0.0124)	-0.186***	(0.0254)	0.000109	(0.000128)	0.796
id 19	0.0183	(0.0153)	-0.204***	(0.0314)	-8.27e-05	(0.000158)	0.680
id 20	-0.0502***	(0.0178)	-0.116***	(0.0365)	0.000517***	(0.000184)	0.724
id 21	-0.0549***	(0.0136)	-0.153***	(0.0280)	0.000261*	(0.000141)	0.837
id 22	-0.0167	(0.0165)	-0.0523	(0.0340)	0.000413**	(0.000171)	0.552
id 23	-0.0651*	(0.0361)	-0.0702	(0.0741)	0.000640*	(0.000373)	0.335
id 24	0.00771	(0.0901)	0.133	(0.185)	0.000545	(0.000930)	0.064
id 25	-0.0122	(0.0222)	-0.221***	(0.0456)	0.000539**	(0.000229)	0.591
id 26	-0.0361**	(0.0176)	-0.0745**	(0.0362)	0.000587***	(0.000182)	0.613
id 27	-0.0595***	(0.0178)	-0.0758**	(0.0365)	0.000451**	(0.000184)	0.790
id 28	-0.0278*	(0.0153)	-0.391***	(0.0314)	0.000494***	(0.000158)	0.841
id 29	-0.0243*	(0.0134)	-0.197***	(0.0276)	0.000370***	(0.000139)	0.708
id 30	-0.0432***	(0.0135)	-0.159***	(0.0276)	0.000471***	(0.000139)	0.750
id 31	-0.0146	(0.0166)	-0.106***	(0.0341)	0.000335*	(0.000172)	0.740
id 32	-0.0446***	(0.0157)	-0.0609*	(0.0323)	0.000633***	(0.000162)	0.920
id 33	0.000183	(0.0188)	0.192***	(0.0385)	0.000262	(0.000194)	0.881
id 34	-0.0222	(0.0162)	-0.0964***	(0.0332)	0.000223	(0.000167)	0.823
id 35	-0.0261	(0.0199)	0.297***	(0.0408)	0.000534***	(0.000205)	0.798
id 36	-0.0178	(0.0126)	-0.0187	(0.0259)	0.000124	(0.000131)	0.971
id 37	-0.0132	(0.0166)	-0.148***	(0.0340)	0.000411**	(0.000171)	0.684

id 38	-0.0403***	(0.0145)	-0.0884***	(0.0297)	0.000446***	(0.000149)	0.861
id 39	-0.0656***	(0.0184)	-0.0228	(0.0378)	0.000610***	(0.000190)	0.897
id 40	-0.0204	(0.0125)	-0.101***	(0.0257)	0.000342***	(0.000129)	0.800
id 41	-0.0293	(0.0197)	-0.117***	(0.0404)	0.000272	(0.000203)	0.833
id 42	-0.0542***	(0.0160)	-0.0269	(0.0328)	0.000469***	(0.000165)	0.939
id 43	-0.0194	(0.0163)	-0.140***	(0.0334)	0.000370**	(0.000168)	0.738
id 44	0.0136	(0.0125)	-0.287***	(0.0256)	2.13e-05	(0.000129)	0.856
id 45	0.00277	(0.0182)	-0.116***	(0.0374)	0.000213	(0.000188)	0.703
id 46	-0.0489***	(0.0187)	-0.127***	(0.0383)	0.000508***	(0.000193)	0.942
id 47	-0.0320**	(0.0159)	-0.0311	(0.0326)	0.000276*	(0.000164)	0.838
id 48	-0.0312**	(0.0127)	-0.141***	(0.0261)	0.000361***	(0.000131)	0.820
id 49	-0.0445***	(0.0108)	-0.121***	(0.0222)	0.000379***	(0.000112)	0.928
id 50	-0.0156	(0.0157)	-0.101***	(0.0322)	0.000229	(0.000162)	0.679
id 51	-0.0320	(0.0224)	-0.156***	(0.0460)	0.000660***	(0.000231)	0.684
id 52	-0.00589	(0.0164)	-0.0644*	(0.0336)	0.000333**	(0.000169)	0.673
id 53	-0.0167	(0.0164)	0.0867**	(0.0337)	0.000420**	(0.000170)	0.876
id 54	0.00320	(0.0148)	-0.0746**	(0.0305)	9.59e-05	(0.000153)	0.709
id 55	-0.0447*	(0.0231)	-0.169***	(0.0475)	0.000552**	(0.000239)	0.809
id 56	-0.0587***	(0.0162)	-0.193***	(0.0331)	0.000380**	(0.000167)	0.843
id 57	0.0284	(0.0221)	0.0339	(0.0453)	-0.000237	(0.000228)	0.907
id 58	0.000499	(0.0250)	-0.239***	(0.0513)	0.000173	(0.000258)	0.837
id 59	-0.0292*	(0.0150)	-0.150***	(0.0309)	0.000310**	(0.000155)	0.661
id 60	0.0439	(0.0999)	-0.270	(0.205)	0.000124	(0.00103)	0.048
id 61	-0.0214	(0.0131)	-0.143***	(0.0269)	0.000345**	(0.000135)	0.734
id 62	-0.0321*	(0.0174)	0.0893**	(0.0358)	0.000450**	(0.000180)	0.726

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.4: Aggregate Result from TM and HM Model

Variable	b1		b2		Constant		R-squared
TM model	-0.435***	(0.0386)	-0.103***	-0.0095	0.00037***	(3.67e-05)	0.673
HM model	-0.026***	(0.00464)	-0.106***	-0.0095	0.00038***	(4.79e-05)	0.672

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1