PERSISTENCE TOURNAMENT AND LIQUIDITY TIMING ABILITY: EVIDENCE FROM BANK AFFILIATED ASSET MANAGEMENT COMPANY

BY

MR. WORAPHON WATTANATORN

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY (BUSINESS ADMINISTRATION)
FACULTY OF COMMERCE AND ACCOUNTANCY
THAMMASAT UNIVERSITY
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ENTITLED

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was approved as partial fulfillment of the requirements for
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ABSTRACT

This dissertation examine two important issues in mutual fund industry. The first issue is about the risk-taking behavior in mutual fund tournament. The study begins with the improvement of the model in order to capture the risk-taking behavior of mutual funds in four AEC markets; namely, Indonesia, Malaysia, Singapore, and Thailand. I find the different level of tournament behavior within these four markets. Additionally, as the mutual funds can be classified by the bank-mutual fund relationship, I improve the model to demonstrate the different risk-taking behavior between two groups of funds. I find the effect of this bank-mutual fund relationship on the risk-taking behavior of mutual funds by showing that bank-related funds expose more to risk-taking behavior in mutual fund tournament than non-bank-related funds. Also, this study further scrutinizes the persistence of this risk-taking behavior of mutual funds in different market states using a Thai mutual fund sample. Furthermore, this study analyzes the effect of bank-mutual fund relationship on risk-taking behavior in mutual fund tournament in different market states. The result supports the tournament hypothesis among bank-related funds regardless the market states.

The second issues is the mutual fund performance. I improves the traditional timing model by introducing liquidity timing. As the return in emerging markets are non-normal, I further improve the model and coskewness factor to match the higher moment required for emerging market study. In order to find the liquidity timing ability, I test the model with the sample of Thai mutual funds. The performance of mutual funds is analyzed at cross-sectional and portfolio level. The finding suggest the liquidity timing ability exist in Thai mutual industry. Furthermore, this dissertation further analyzes the different liquidity timing between Bank-related funds and non-bank-related funds.

Keywords: Mutual fund tournament, risk-taking behavior, Bank-related funds, Bank affiliated funds, Timing ability, Liquidity timing, higher moment, coskewness

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Doing a Ph.D. is significantly tough and long journey for me. It likes I had been walked through the darkness tunnel for an aged. I never see the light until I approached the end of the tunnel. At the very last step of this journey with the light at the end, I have realized that this journey giving me variety of experiences. I had been faced the good times and hard times. Finally, it was an incredibly one of the journey in my life. Without a group of these special person, I could not pass though that hard times. I would like to acknowledgement to these whom I indebt to and person who always share me, support me in both good time and hard times, and even encourage me in every situation.

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Mr. Woraphon Wattanatorn

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CHAPTER 1
INTRODUCTION

1.1 Motivation

In the 21st century, the global mutual fund industry has expanded dramatically. Its asset under management (AUM) is 11,654 billion USD in 2001. Over the last fifteen years, the world's AUM impressively expanded to 31,382 billion USD by the end of 2014. The growth came from both newly-established funds and existing funds. The number of funds increased from 52,849 funds to 79,669 funds during the same period. This reveals the popularity of mutual funds as an alternative investment. However, there are two main issues in mutual fund studies. The first one is the mutual fund performance and the second one is the tournament behavior in mutual funds.

One mechanism that drives mutual funds and creates their value is the asset management company (AMC). The AMC as fund management firms is responsible for optimizing the allocation of a pool of invested money according to the fund's objective. In return the AMC charges investors a management fee and other expenses. These fees are charged as a percentage of the AUM.

On the other hand, rational investors aim to maximize their utility functions by maximizing investment returns. As a consequence, investors who invest in actively-managed funds expect a required net risk-adjusted return at least on par to that of index funds. Therefore, the performance of actively-managed mutual funds is an important issue for investors (Ippolito 1992).

There are two traditional abilities of fund managers that can create superior fund's performance. The first ability is selectivity. This superior ability is an ability of fund managers to manage idiosyncratic risks. To measure selectivity, Jensen (1968) offers a model to capture fund's alpha which is called Jensen's alpha (Jensen 1968). Another superior ability is market timing. It is the ability of fund managers to time the market return. The first market timing ability measurement models are purposed by (Treynor and Mazuy 1966). Furthermore, market volatility has been discovered as another market risk. Busse (1999) finds that market volatility is more persistent than market return. Hence, he documents that mutual funds have an ability to time market volatility (Busse 1999). However, prior literature reveals mixed evidence of the selectivity and timing ability of funds (Henriksson and Merton 1981, Jensen 1968, Treynor and Mazuy 1966, Chang and Lewellen 1984, Kon 1983, Malkiel 1995, Kon and Jen 1979).

Not only market return and market volatility are found to be systematic risks, but also liquidity risks have been found to be priced as an important risk factor. Substantial research has documented both the theoretical and empirical results of the positive relationship between this liquidity risk factor and stock return (Ľuboš Pástor and Robert F. Stambaugh 2003, Acharya and Pedersen 2005, Amihud 2002, Holmström and Tirole 2001, Amihud and Mendelson 1986).

For mutual funds, liquidity is also important. This is because fund managers need to manage portfolio liquidity in order to meet daily investors' redemptions. For example, funds are faced with large unexpected redemptions in a bear market. Furthermore, liquidity is discovered to be more persistent than return. Hence, it is possible that mutual fund managers have superior skill to forecast market liquidity to manage this unexpected redemption. A liquidity timing model is firstly introduced in 2013 (Cao, Simin, and Wang 2013). Their results are based on US sample during 1970 – 2009. According to my knowledge, there are only three studies on market liquidity timing. Moreover, these studies document evidence that is only found in the US market. (Bodson, Cavenaile, and Sougné 2013, Karstanje et al. 2013).

This dissertation extends this liquidity timing within the context of an emerging market. There are two important characteristics of emerging markets. Emerging markets are known as the high risk, and high expected return markets. Moreover, the returns in emerging markets are non-normally distributed (Chunhachinda et al. 1997, Kon 1984, Kraus and Litzenberger 1976, Mills 1995, Peiró 1999). Hence, both characteristics called for the question of the result found in developed markets.

Additionally, since the returns in emerging markets are violating the normality distribution, the higher moment is an important risk factor. In this dissertation, I purpose the liquidity timing model with the higher moment factor in order to demonstrate the results in the emerging market context.

The second issue is based on the tournament behavior in the mutual fund industry. The relationship between investors and the mutual fund is similar to the relationship between principal and agency. Where investors are the principal and the mutual fund is the agency. As a fund management firm, the mutual fund is responsible for optimal allocation of the pool of investment. Furthermore, its allocations should be consistent with the funds' objectives. In return, the mutual fund charges fee from investors. These fees can be classified into two types of fee. The first type is transaction fees, which are for example front-end fees, back-end fees, and switching-fees. Mutual funds charge these to investors as a percentage of the transaction. The second type is management fees. These fees include management fees, custodial expenses, legal expenses, accounting expenses, transfer agent expenses, and other administrative expenses. These management fees are charged as a percentage of the AUM. However, the mutual fund as a firm also aims to maximize its revenues and profits. As a consequence, a conflict of interest arises. This is because investors expect the mutual fund to maximize the return on its investments. On the other hand, the mutual fund aims to maximize its revenue from fees. It can simply increase revenue from fees in two ways. First, it can maximize its revenue by optimally charging fees to investors. Another way is to maximize the AUM by attractive new investment flow. It can actually do the first but it will lose the competitive advantage to other lower fees funds.

However, since there is a positive relationship between past performance and new investment flow, the mutual fund can simply maximize its revenue in the second way. This positive relationship between past performance and new investment fund flow means that high-performance funds can attract new investment flow. Additionally, this relationship is found to be convex, where convexity means that the higher performance funds attract positive investment flow while poor performance funds are not penalized at an equivalent amount (Patel, Zeckhauser, and Hendricks 1994, Ippolito 1992, Sirri and Tufano 1998). Based on this asymmetric fund flow sensitivity, mutual fund has an incentive to take more risk to boost its performance and hence increase its expected revenue, which is a percentage of the AUM (Chevalier and Ellison 1995). Brown, Harrow, and Stark (1996), hereafter "BHS," documented tournament behavior in the mutual fund industry (Brown, Harlow, and Starks 1996). They find that interim poor-performance funds, which is called "loser funds," and interim high-performance funds, which are called "winner funds," behave differently. Furthermore, they find that the asymmetric effect of convexity in the fund flow and performance relationship motivates the interim loser funds to take more risk to enhance their performance by the year's end. On the other hand, the interim winner funds allocate conservatively to lower their portfolio risk, for example by indexing, in order to secure their top position. Many findings support the result of BHS (Koski and Pontiff 1999, Taylor 2003, Goriaev, Nijman, and Werker 2005, Acker and Duck 2006, Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009, Chevalier and Ellison 1995, Brown, Harlow, and Starks 1996). However, the results are not universally accepted. Alternatively, the strategic behavior hypothesis is based on the winner fund perspective. The strategic behavior predicts that the winner funds adjust the portfolios' risk more than the loser funds do in the second half of the year in order to either maintain or boost performance (Qiu 2003, Benson, Faff, and Nowland 2007, Hallahan, Faff, and Benson 2008, Jans and Otten 2008, Hallahan and Faff 2009).

Although there are a number of studies on mutual fund performance and the mutual fund tournament, there is little research on the effect of the bank-mutual fund relationship on both issues. Hence, this study aims to extend the knowledge of mutual fund performance and mutual fund tournament by further analyzing the relationship between bank and mutual fund. This relationship significantly impacts mutual fund tournament behavior and performance.

There are two hypotheses related to this bank-mutual fund relationship. The first one is the information advantage hypothesis. According to this hypothesis, the bank-related (BR) funds have superior information and hence they utilize this superior information to create value for the mutual funds under their management. Banks can share information obtained from other activities with mutual funds. As a consequence, BR funds gain information advantages in several ways. First, they can obtain information at a cheaper cost compared with non-bank-related (NBR) funds. Second, they can access the unpublished information available only at banks; lending information (Massa and Rehman 2008, Mehran and Stulz 2007, Hao and Yan 2012, Berzins, Liu, and Trzcinka 2013). Third, BR funds have the privileged benefit of receiving the IPO allocation to boost their portfolio performance when their parent bank is an underwriter (Ritter and Zhang 2007).

In addition to the information advantage, BR funds provide lower searching costs than NBR funds. Since the information availability of mutual funds affect the investment decisions of investors in that the higher searching cost negatively affects fund flows (Sirri and Tufano 1998), BR funds benefit from this lower searching cost in that both individual investors and institution investors have normal business activities with the bank in terms of both deposits and loans. As a result, the investors can access BR fund information inexpensively (Frye 2001). Furthermore, Nathaphan and Chunhachinda (2012) demonstrate that BR funds introduce higher growth from new investment flow compared with NBR funds (Nathaphan and Chunhachinda 2012).

On the other hand, the conflict of interest hypothesis argues that banks may affect their investment constraints and hence the investment outcomes. For example, a bank may encourage the BR funds to support their client's stock IPO in order to win a future contract in another line of the bank business—underwriting, seasonal equity offerings, and mergers, for example (Hao and Yan 2012, Mehran and Stulz 2007). Furthermore, the BR funds improperly allocate the portfolio toward the parent client stock and hence lose the diversification benefit (Hao and Yan 2012).

As a consequence, I conjecture that there should be different mutual fund performance,—liquidity timing ability—and a different level of tournament behavior between both types of funds. According to the present author's knowledge, there is no study of both liquidity timing and the tournament effect taking the bank-mutual fund relationship into account. In order fill this literature gap, the different liquidity timing ability and risk-taking behavior between BR funds and NBR funds are documented in this study.

1.2 Background

The mutual fund is a pool of money from investors used to invest according to the fund's objective. Mutual funds are broadly classified as opened-end and closed-end funds. A closed-end fund is a mutual fund that is issued a specific number of shares and a specific investment period at the beginning of the fund raising. Investors can redeem their unit of investment at the date specified in the fund prospectus. On the other hand, an opened-end fund is more flexible than the closed-end fund. An opened-end fund has no specific investment period. Investors can redeem their unit of investment daily.

Mutual funds have become the choice of investment. Their popularity as an alternative investment has expanded overtime, since mutual funds offer a number of benefit to investors. First, mutual funds offer a cheap, well-diversified portfolio. This is because mutual funds provide lower transaction costs than individual investors since mutual funds have a larger trade volume than individual investors. As a consequence, mutual funds earn transaction cost discounts (Chordia 1996). To invest in mutual funds, investors can invest in well-diversified portfolios at a cheaper price than investing themselves. Second, mutual funds are managed by professional investment managers that have superior skills. More specifically, these professional fund managers offer at least two investment skills to investors; namely, stock selection and market timing. As a result, without investment experience, investors can use mutual funds as a vehicle for their investment to maximize their wealth, and hence their utility functions. Third, mutual funds provide a self-liquidating benefit to investors in that investors can buy and sell shares of funds at net asset value (NAV) on a daily basis. Last but not least, mutual fund industry is highly regulated. Furthermore, mutual funds are set in all equity structure. Consequently, investors lessen the bankruptcy risk.

Although nowadays opened-end funds are more popular than closed-end funds, the very first mutual fund is a closed-end fund in Belgium set up in the 19th century. The Société Générale de Belgique is founded in 1822 by King William of the Netherlands. This fund allows investors to earn interest from government loans. A year later in the US, the Massachusetts hospital life insurance Company is founded in

1823 with an initial capital of 500 USD. This fund is invested in many kinds of contacts according to the investors' objectives. The first mutual fund in the UK is the London financial association established in 1863. This company allocates its investment to provide capital for industry and infrastructure construction, including roads, railroads, and canals.

[Figure 1.1]

Figure 1.1 displays the global mutual fund industry growth since 2001. The world portfolio's AUM rise from 11,654 billion USD in 2001 to 31,381 billion USD by the end of 2014. This notable growth is contributed to by both newly-established funds and existing funds. The number of funds rise at a slower rate than the AUM growth rate. The number of funds rise from 52,849 funds to 76,200 funds during the same period.

[Figure 1.2]

Although mutual funds can be classified into opened-end funds and closed-end funds, the mutual fund industry is dominated by opened-end funds globally. Figure 1.2 shows the AUM of mutual funds by fund types. This figure reveals that opened-end funds hold more than 99% of the industry's AUM. Additionally, the AUM of opened-end funds significantly expand overtime. AUM increased from about 11,514 billion USD in 2001 to 31,098 billion USD by the end of 2014. The remaining 1% of the industry's AUM is shared by closed-end funds.

Not only do opened-end funds hold more AUM than closed-end funds do, but also opened-end funds have a larger number of funds available than closed-end funds. Opened-end funds share more than 99% of the number of funds available in this industry. There are 52,849 funds available in 2000. Among these, 51,210 funds are opened-end funds. The number of funds also increases with the mutual fund industry expansion. At the end of 2014, there are 79,669 funds: 79,070 funds are opened-end and 599 funds are closed-end.

Like the world mutual fund industry, the mutual fund industry in Asia expands significantly during the same period. The Asia mutual fund industry holds 1,039 Billion USD as its AUM. Its investment expands at about 3.5 times to 3,646 Billion USD by the end of 2014.

Broadly, mutual funds can be classified by their investment objectives. There are four broad fund categories: including equity funds, bond funds, balance funds, and other funds. Figure 1.3 reveals that the equity fund is the major type of mutual fund. Equity funds share the market at about 44% of the global portfolio. Like the world portfolio, equity funds dominate in three markets— the US, Europe, and Asia-Pacific. More specifically, in 2014, equity funds account for 48% and 45% of the industry's AUM in the US and Asia-Pacific respectively. Although the size of the equity mutual funds in Asia-Pacific is substantially small compared with those in the US, the equity mutual is a significant factor in the mutual fund industry growth as in the US mutual fund industry.

[Figure 1.3]

Although there are numbers of mutual fund studies, most of those focus mainly on the developed markets. The study of emerging markets has important contributions; they have recently illustrated significant growth in terms of economics and global market share (Kearney 2012). Emerging markets differ from developed markets in many ways. First of all, they are characterized by a high average sample return and high volatility of return. Second, emerging markets have less correlation with developed markets. Third, the high returns in emerging markets have been found to be predictable (Bekaert and Harvey 1997). Finally, unlike developed markets, emerging markets exhibit a high serial correlation of returns resulting from inefficient information and insider trading. In addition, the returns are found to exhibit skewness and excess kurtosis (Bekaert and Harvey 1997, 2002, Harvey 1995).

According to the above characteristics of emerging markets, they can be seen as a suitable environment to study mutual fund performance and tournament behavior in these markets. Although prior studies focus on the issues of mutual fund tournament and mutual fund performance, only a few studies focus on the effect of the bank-mutual fund relationship regarding both issues.

In order to strengthen the findings in the literature, I further improve a model to capture the effect of the bank-mutual fund relationship on mutual funds tournament and mutual fund performance in the context of emerging markets. Specifically, in this dissertation, I focus on: the effect of bank-mutual fund relationship on risk-taking behavior in mutual fund tournament: evidence from the

Asian Economic Community (AEC), the persistent risk-taking behavior of bank-related funds: evidence from Thailand, and mutual fund performance—liquidity timing using the higher moment framework.

I limit the study to the AEC and Thailand for several reasons. The AEC nations have illustrated significant economic growth during last decades, and the AEC nations have demonstrated higher average economic growth than world economic growth. On average, the AEC nations' GDP grew at 5.32% per year compared with the world GDP, which grew at 2.71% per year. As a result, the AEC nations' GDP expand from 0.60 trillion USD to 2.31 trillion USD in 2012. This made the AEC economics share 3.14% of the world GDP in 2012 compared with 1.8% in 2000.

In this study, the sample includes four of the largest economics in the AEC; namely, Indonesia, Malaysia, Singapore, and Thailand. By 2012, these four economics accounted for 79.01% of AEC's economies. Second, studying in this region allows this study to compare the results for both emerging economics—Indonesia, Malaysia, and Thailand, and developed economies—Singapore. However, due to the availability of data in emerging market studies, I further study the persistence of risk-taking behavior and mutual fund performance using data on Thailand. This is because Thailand has the biggest number of equity funds among the others.

1.3 Objective and contribution

The main objective of this dissertation is to further examine the mutual fund performance—liquidity timing ability, and tournament behavior issues in the emerging market context. The study begins with the improvement of the model in order to capture the risk-taking behavior of mutual funds in four AEC markets; namely, Indonesia, Malaysia, Singapore, and Thailand. Additionally, as the mutual funds can be classified by the bank-mutual fund relationship, this dissertation examines the effect of this bank-mutual fund relationship on the risk-taking behavior of mutual funds. Also, this study further scrutinizes the persistence of this risk-taking behavior of mutual funds in different market states using a Thai mutual fund sample.

Regarding the mutual fund performance issue, this study revisits the liquidity timing model and further improves the model to suit the higher moment framework. More specifically, this study improves the liquidity timing model by match the non-normality feature of the emerging market. As a result, the study takes the higher moment represented by coskewness risk factor into account. In order to find the superior liquidity timing ability, the performance of mutual funds is analyzed at cross-sectional and portfolio level using the Thai mutual fund sample. Furthermore, this dissertation further analyzes the different liquidity timing between BR funds and NBR funds.

The contribution of this dissertation can be summarized into ten folds. First, the results demonstrate different levels of tournament behavior in AEC markets. The findings show that each market possesses a unique fund flow pattern. Hence, each depicts a different level of tournament behavior. Second, the tournament behavior is documented for the Thai market, specifically in August, while the other countries have less evidence of tournament behavior. The results show that the winner funds are lowering their portfolios risk in the second part of the year. Third, this study also provides evidence confirming the existence of the mean reversion property of fund volatility in Indonesia, Malaysia, Singapore, and Thai markets. Fourth, the bank-mutual relationship stimulates BR funds exhibit greater risk shifting than NBR funds in Thailand. Fifth, for Thailand, the results show that tournament behavior exists in two of the three assessment periods for the BR funds but not for the NBR funds. Controlling for specific fund characteristics, this dissertation documents evidence of the tournament behavior in Thai mutual fund industry, which is a highly regulated industry.

Sixth, the results reveal that the market condition positively affects the risk-taking behavior of mutual funds. Seventh, the results demonstrate evidence showing that not only does the bank-mutual fund relationship affect tournament behavior, but also the persistence of the tournament behavior of mutual funds. The results found here shows that tournament behavior persistently exists regardless of the market state among BR funds. Eighth, according to the present author’s knowledge, this dissertation is the first to study the liquidity timing of mutual funds outside the US market. Furthermore, the evidence of liquidity timing is documented in this study. This dissertation also documents the different liquidity timing among BR funds and NBR funds. Ninth, this study purposes the higher moment model in order to strengthen the findings in the non-normality environment. I find the result of liquidity timing hold when the higher moment is being analyst. Tenth, I find high and low performance portfolio have different effect of the coskewness.

1.4 Structure of dissertation

Chapter 2 of this dissertation focuses on the risk-taking behavior issue. The findings are based on the regression approach suggested by Kemp, Ruenzi and Thiele (2009) in order to examine the risk-taking behavior (Kempf, Ruenzi, and Thiele 2009). In order to analyze the risk-taking behavior of the winner and loser funds, the sample is divided into three equal portfolios: winner, middle, and loser. I first rank the interim performance by percentile. Then I allocate each fund to one of three portfolios; namely portfolio1 (loser), portfolio2 (middle), and portfolio3 (winner), according to fund's interim ranking. Additionally, this study improves the model in order to study the effect of the bank-mutual fund relationship on the risk-taking behavior of mutual funds. The bivariate dummy variable of BR funds and NBR funds are added to the model. Specifically, this chapter discusses the "Bank-related asset management firm and risk-taking in the mutual fund tournament: evidence from Asean Economic Community.

In Chapter 3, this dissertation explores the idea that tournament behavior persistently exists in the Thai mutual fund industry. Although in Chapter 2, the tournament behavior is documented in the Thai market, the persistent risk-taking behavior in tournament study remains a puzzle. Some prior research found that tournament behavior exists but changes with market condition (Acker and Duck 2006, Kempf, Ruenzi, and Thiele 2009, KO and HA 2011, Ramiah et al. 2012). Therefore, this chapter purposes two different methods in order to make the findings more robust; namely, the portfolio sorting method and the regression method. The results revealed here support the notion that both the market state and the bank-mutual fund relationship affect the risk-taking behavior in the mutual fund tournament. To be more specific, this chapter discusses "the persistent risk-taking behavior of bank-related funds: Evidence from Thailand"

Chapter 4 of this dissertation discusses the mutual fund performance evaluation issue. This chapter extends the literature of recent models on liquidity timing (Cao et al. 2013, Cao, Simin, and Wang 2013). The results are based on the mutual funds in Thailand. This study improves the model by introducing the coskewness risk factor. The results are robust under the higher moment framework. Furthermore, the results also demonstrate different liquidity timing between BR funds and NBR funds.

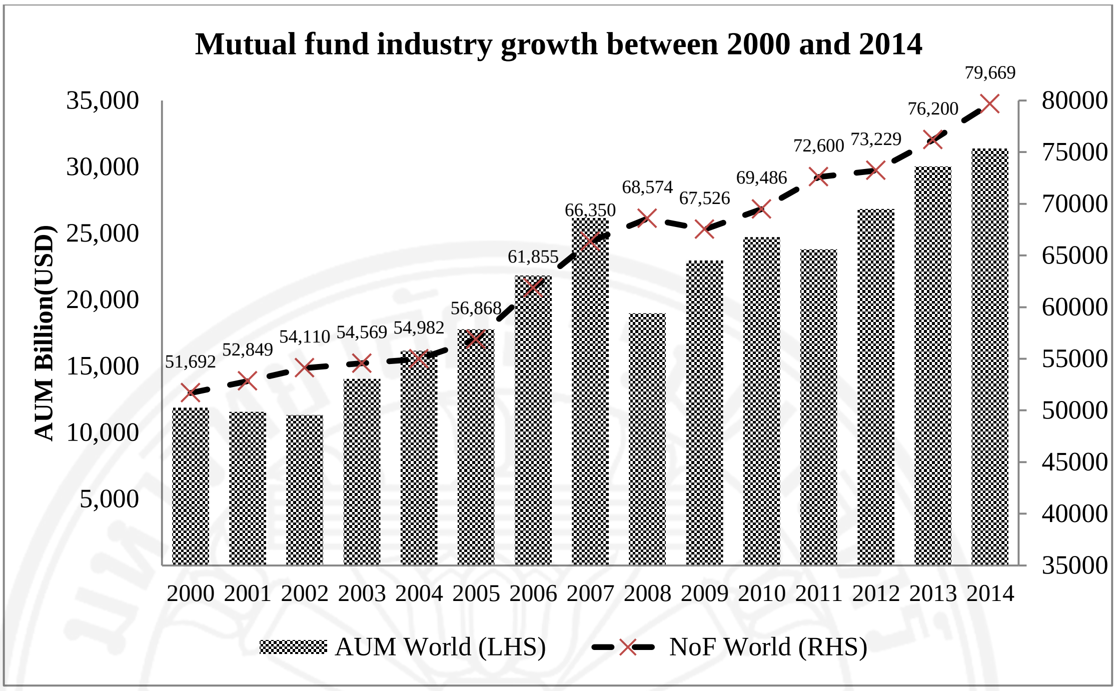

Figure 1.1: Mutual fund industry growth between 2000 and 2014

(Source: ICI)

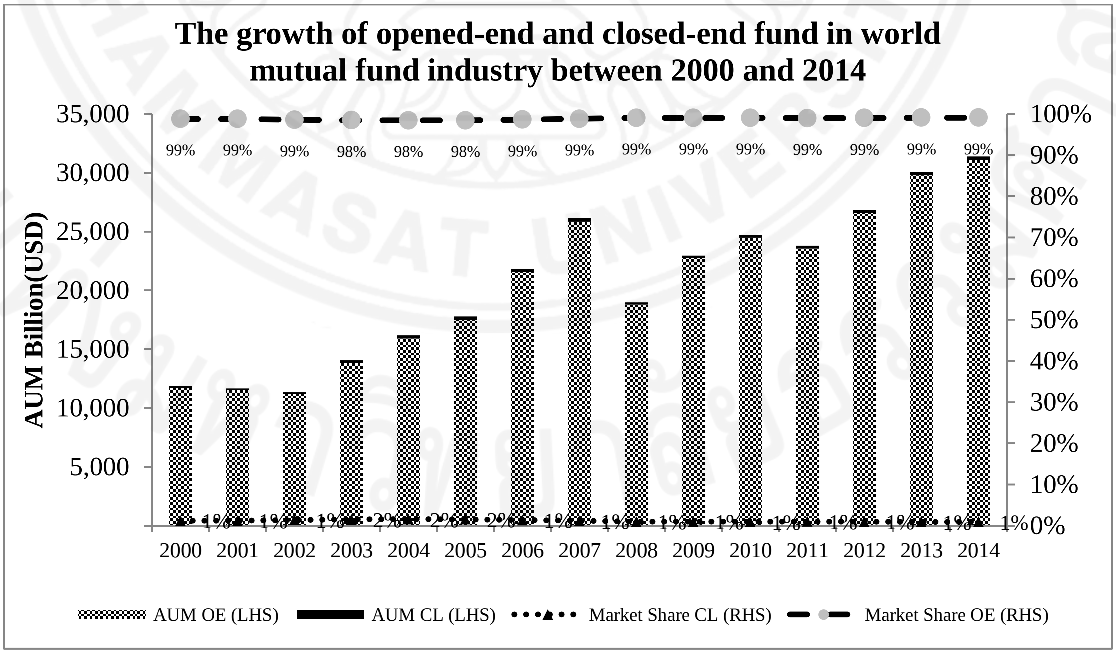

Figure 1.2: The growth of opened-end and closed-end fund in world mutual fund industry between 2000 and 2014

(Source: ICI)

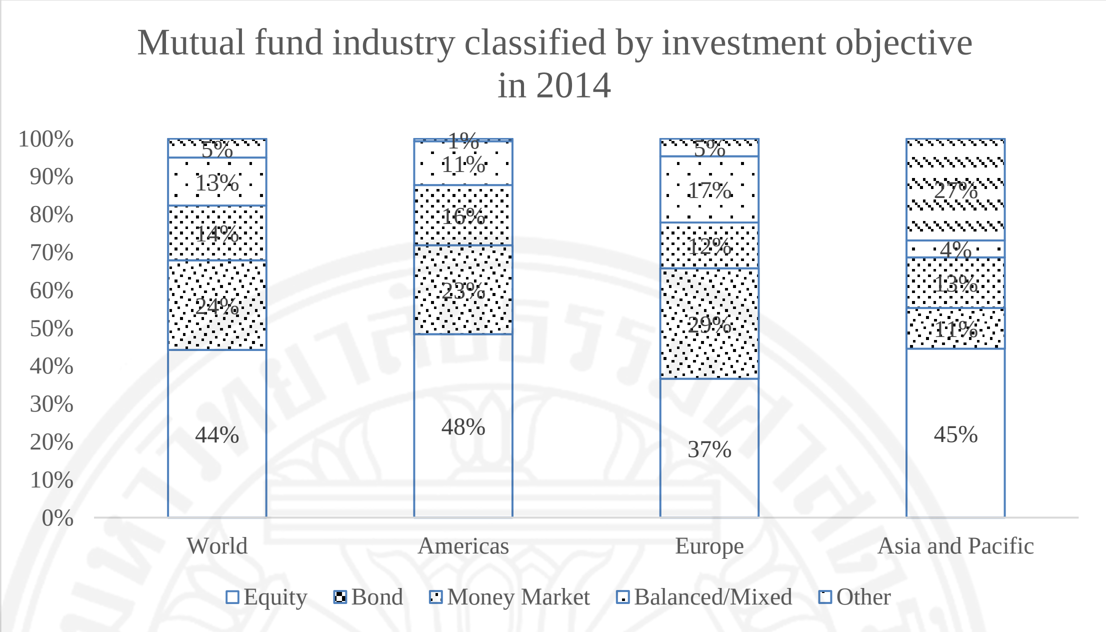

Figure 1.3: Mutual fund industry classified by investment objective in 2014.

(Source: ICI)

CHAPTER 2

BANK-RELATED ASSET MANAGEMENT FIRM AND RISK TAKING IN THE MUTUAL FUND TOURNAMENT: EVIDENCE FROM ASEAN ECONOMIC COMMUNITY

2.1 Introduction

There are two schools of thought explaining the risk-taking behavior in the mutual fund industry; namely, the tournament behavior hypothesis and the strategic behavior hypothesis. The first theory postulates that interim loser funds are more volatile than winner funds during the second half of the year because loser funds want to be among the top performing funds by the year's end in order to earn a new investment flow (Koski and Pontiff 1999, Taylor 2003, Goriaev, Nijman, and Werker 2005, Acker and Duck 2006, Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009, Chevalier and Ellison 1995, Brown, Harlow, and Starks 1996). Alternatively, the second hypothesis is strategic behavior hypothesis. This hypothesis predicts that winner funds adjust their portfolios' risk more than loser funds do during the second half of the year in order to either maintain or boost performance (Qiu 2003, Benson, Faff, and Nowland 2007, Hallahan, Faff, and Benson 2008, Jans and Otten 2008, Hallahan and Faff 2009).

Nathaphan and Chunhachinda (2012) hint that mutual fund can be classified into BR fund and NBR fund according to bank-mutual fund relationship, BR funds introduce higher growth from new investment flows compared to NBR funds. They show that both types behave significantly differently. In addition, the tournament hypothesis shows that the winner funds have incentive to reduce risk in order to secure their position in the mutual fund tournament in the second part of the year. The loser funds have incentive to take more risk in order to capture the higher performance in the second part of the year. Therefore, in this study, I classify the mutual funds into BR and NBR funds according to their bank-mutual fund relationship. In addition, BR funds and NBR funds possess different portfolio allocations due to different information advantages and styles (Massa and Rehman

2008, Hao and Yan 2012). However, none of the previous studies focus on the effect of the bank-mutual fund relationship on risk-taking behavior. In order to fill this literature gap, this dissertation documents the different risk-taking behavior between BR funds and NBR funds. I find that this bank-mutual fund relationship affects risk-taking behavior of loser funds; that is, the BR loser funds increase the funds' volatility more than that of the NBR loser funds.

Most of the previous research is conducted in developed markets, but a few reports from emerging economies can be found. The study of emerging markets would have important contributions to the literature since emerging markets illustrate significant growth. Also, their rapid rate of growth has led to an increase in their share of the global market (Kearney 2012). Emerging markets differ from developed markets in many aspects. First, emerging markets have higher average sample returns and volatility than developed markets. Additionally, these higher returns have been found to have high serial correlation and are also found to be predictable (Bekaert and Harvey 1997, Harvey 1995). The high serial correlation is the result of inefficient information Therefore, this difference raises more concern over the results found in developed countries' markets (Huij and Post 2011).

This chapter investigates the risk-taking behavior of mutual funds in four AEC countries; namely Indonesia, Malaysia, Singapore, and Thailand over the period of 2008-2013[1]. The overall results are consistent with the tournament hypothesis. Given the convex relationship between new investment fund-flows and past performances shown in (Chevalier and Ellison 1995, Ferreira et al. 2012, Sirri and Tufano 1998), I further analyze whether the bank-mutual fund relationship affects the risk-taking behavior of mutual funds in the annual tournament setting. In sum, the mutual funds adjusts its portfolio risks in response to a new investment fund-flow, leading to more fees for mutual funds.

I further improve the model in order to capture evidence of the risk-taking behavior and it effect of bank-mutual fund relationship. The panel-corrected standard error regression is employed to reveal the behavior of the winner funds and the loser funds. I contribute to prior literature in the development of the mutual fund

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[1] The sample data are accounted for 79.01% of AEC economic size at the end of 2012. I obtain the GDP data from ASEAN statistical yearbook.

industry, and corporate finance as follows. First, the results demonstrate different levels of tournament behavior in AEC markets. I find that each market possessed a unique fund flow pattern, leading to a different level of the tournament behavior. Second, tournament behavior is found in Thailand, specifically in August, while other countries show less evidence of tournament behavior. I notice that the winner funds are lowering their portfolio risk in the latter part of the year. This study also provides evidence confirming the existence of mean reversion property of fund volatility in all markets. Last, the BR funds are exposed to greater risk shifting compared with NBR funds. Moreover, for Thailand, I find tournament behavior among BR funds in two of three assessment periods but not for the NBR funds. Controlling for specific fund characteristics, I conclude that the tournament effect existed in Thai market.

The remainder of this paper is organized as follows. Section 2 is a review of the literature and discusses the development of the hypotheses Section 3 describes the data, methodology, and industry overview. Section 4 shows the empirical results and the last section is the conclusion.

2.2 Literature review

2.2.1 Fund flow - performance relationship

Sirri and Tufano (1998) demonstrate that the positive relationship of fund flow and performance is a convex function. However, poor performing funds are not penalized by the same proportion of outflow (Chevalier and Ellison 1995, Sirri and Tufano 1998); thus the convexity differs from market to market. Ferreira et al. (2012) point out that this relationship depends on the level of investors' education, the level of accessibility to information, and the development of financial markets. They also suggest that the convexity is more sensitive in less developed markets (Ferreira et al. 2012). Therefore, the relationship pushes mutual funds to take more risks in order to capture future fund flow, particularly in emerging markets.

2.2.2 Tournament behavior

The tournament behavior model is first developed in 1996 by Brow, Harlow, and Starks (BHS). They implicitly assume that investors observe the mutual fund's year-end ranking and utilized this information for their investment allocation. Therefore, this motivates mutual funds to compete for top positions in the annual tournament. In addition, they find that the asymmetric effect of convexity in the fund flow performance relationship motivates poorly performing funds to increase their portfolio risk to be higher than winner funds in order to enhance their performances by the end of the year. Several pieces of evidence demonstrate the tournament effect in the US sample. The evidence supports the existence of the tournament in that the interim loser funds increase portfolio risk to catch up with the performance while the interim winner funds prefer to lock in their top position, for example, by indexing (Chen and Pennacchi 2009, Chevalier and Ellison 1995, Dass, Massa, and Patgiri 2008, Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009, Schwarz 2012). Some research, however, rejects the tournament hypothesis in the US market. Busse (2001) finds that the tournament behavior exists because of biased estimation (Busse 2001). Others support of the strategic hypothesis in that the winner funds increase their risk more than loser funds (Qiu 2003, Tourani-Rad, Jans, and Otten 2008).

Acker and Duck (2006) provide the first study of tournament behavior outside the US market with a dataset containing UK investment trusts. They find evidence supporting tournament behavior and suggest that it has a positive relationship with market conditions (Acker and Duck 2006). Benson et al. (2007) document that derivatives users behave strategically (Benson, Faff, and Nowland 2007). Their result contradicts Koski and Pontiff's finding. The evidence is also inconclusive outside the US sample, with a study of Australian superannuation funds showing that strategic behavior dominates tournament behavior (Hallahan, Faff, and Benson 2008). Hallanhan and Faff (2009) document tournament behavior in Australian equity funds between 1989 and 2001.

Only a few studies have been conducted in emerging areas. Prior evidence on emerging areas is neither persistent nor conclusive. For example, Ko and Ha (2011) studied Korean equity funds. Their results show that the tournament behavior is not persistent (KO and HA 2011). Ramiah et al. (2012) apply a non-parametric test and document both tournament and strategic behavior in conventional Malaysian funds (Ramiah et al. 2012).

In order to fill the gap, a comparison between four of the largest economies in the AEC will lead to clearer results. This is because emerging and developed markets have different characteristics. Therefore, in this study, the sample can depict the results in both emerging markets and developed market. Furthermore, as the mutual fund in this region can be classified into BR funds and NBR funds, I find that These BR funds and NBR funds have different investment fund flows. In addition, BR funds and NBR funds have different portfolio allocations due to the exploitation of different information. BR funds have an advantage from the privileged information on clients: lending information, for example (Massa and Rehman 2008). Furthermore, BR funds are likely to hold their clients' stocks improperly (Hao and Yan 2012). As a result of improper allocation, BR funds lose portfolio diversification and have greater volatility in the second half of the year. The recent research has documented evidence showing that investment BR funds have lower fund alphas compared with NBR funds. As a result, previous studies document the existence of conflict of interest in investment bank managed funds (Berzins, Liu, and Trzcinka 2013). Finally, the high return and high volatile characteristics of emerging markets demonstrate the importance of diversified portfolios and the influence of the risk-taking behavior by mutual funds.

The tournament effect is tested in the emerging market context through the hypotheses below:

Hypothesis1A: There is a negative relationship between interim performance and the risk adjustment of winner funds.

Hypothesis1B: There is a positive relationship between the interim performance and the risk adjustment of loser funds.

Hypothesis2: BR funds and NBR funds have different effects on risk-taking behavior due to their interim performance.

2.3 Data and methodology

In this study, I obtain data from various sources. Monthly AUM, NAV, total return, net flow, annual reported net expense ratio, and turnover ratio are obtained from the Morningstar Direct database. The risk-free rate and market return are obtained from DataStream.

In order to compare the data in different countries from a meaningful perspective, the investment objectives are classified into categories according to the Morningstar Global Broad Category Group. The initial samples under this study are 1,059 equity opened-end funds. However, I limit the sample to the domestic equity opened-end fund type. Fund of funds, feeder funds, index funds, money-market funds and other international funds are excluded from this study. I also exclude sector funds from three markets—Malaysia, Indonesia, and Thailand. For Singapore, the majority of domestic funds are sector funds. Therefore, the results from the two different types of funds can depict a different picture between flexible and restricted funds. Further, according to Ramiah et al. (2012), the Islamic funds make investment decisions under Shariah law and thus there is no evidence of a tournament in this type of fund. Therefore, I exclude the Islamic type of funds from the sample. I obtained a list of commercial bank from BankScope. I manually matched the bank's name and the AMC's name. Additionally, I use information on each fund's website to cross check the relationship with the bank.

Finally, in this study, the samples include of all domestic equity opened-end mutual funds in four countries; namely Indonesia, Malaysia, Singapore, and Thailand. The total number of observations is 1,813 fund-year-observations, which consist of 460 funds by the end of 2013. This represents about 79% of initial sample.

Table 2.1 shows the sample descriptive statistics and Pearson's correlation matrix by country. Panel A shows the sample descriptive statistics. By the end of 2013, Indonesia has the largest AUM follow by Singapore, Malaysia, and Thailand. Among these four countries, Thailand has the largest number of equity opened-end funds of 215 by the end of 2013 while Singapore has the lowest number of funds in the same category—59 funds. Malaysian funds have the longest average fund age at almost twice the Indonesian funds. Among the AEC countries, Thai funds show top performance, followed by Indonesia, Malaysia, and Singapore. For fund volatility, Indonesian and Thailand have 6.7% and 5.99% of the standard deviation, which reflects the characteristic of the emerging market environment. Malaysian funds display lower fund volatility. Moreover, Malaysian funds have higher entry and exit fees than any other three markets. This shows that the Malaysian funds have the highest switching cost among the samples. Indonesian funds are found to have the highest average management fee at 2.5% per annum while the others have approximately 1.4% per annum.

Panel B shows the Pearson's correlation matrix by country. Three of four markets— Indonesia, Malaysia, and Thailand, have negatively significant correlation between interim performance and risk-taking behavior. Although I cannot find this correlation between interim performance and risk-taking behavior for Singapore, I find the preserved negative sign. In all markets, the risk-taking behavior has positive correlation with segment volatility change but has negative correlation with interim volatility change. I find the negative correlation between fund size and fund age with risk-taking behavior in only Thailand. I find insignificant correlation between risk-taking behavior and management fee in all country.

Mutual funds can be classified into BR funds and NBR funds. Thailand is the only country in samples in which the BR funds dominated the NBR funds. According to table 2.2, Thailand, Singapore, and Indonesia are the markets where the mature funds stayed in the top performance portfolio while Malaysian funds are outperformed by younger funds. NBR funds are older than BR funds in Thailand, Singapore, and Malaysia. Only for the Indonesian market are the BR funds older than NBR funds.

2.3.1 Fund flow - performance relationship

Fund flows are defined as the total new asset of fund excess that of reinvestment rate. Therefore, I followed the calculating fund flow method suggested by Sirri and Tufuno (1998), Chevalier and Ellision (1995) and Ferreira et al. (2012).

$$FLOW_{i,t} = \frac{AUM_{i,t} - AUM_{i,t-1} * (1 + R_{i,t})}{AUM_{i,t-1}}, \quad (1)$$

$FLOW_{i,t}$ is the end period new asset flow to the fund, while $AUM_{i,t}$ is the AUM in the end of t period and $AUM_{i,t-1}$ is AUM at the end of t-1 period. $R_{i,t}$ is the fund return of period t. Figure 1 displays that the funds in Indonesia, Malaysia, and Thailand have a positive in flow in last quarter of the year while Singapore does not experience fund flow fluctuation. An analysis of Thailand clearly depicts the positive fund flows in the last quarter of the year because of tax-incentives (Nathaphan and Chunhachinda 2012).

2.3.2 Empirical model

In order to extent the analysis of tournament hypothesis, a panel corrected standard error technique analysis is applied. As discussed by BSH, fund managers revise their investment strategies after the information in second quarter are revealed. I allow the ranking period to vary between July and September. This means that I allow the funds to fully observe the industry's interim performance and allow time to reallocate their investment strategies based on the interim ranking information. Extending the assessment of these three periods may detect different tournament behavior.

$$Ret_{iMy} = \left[(1 + r_{i1y})(1 + r_{i2y}) \ldots\ldots (1 + r_{iMy})\right] - 1 \quad (2)$$

Ret_{iMy} is the interim return on funds during first M month of fund ith in year y. r_{iMy} is the total return of fund ith on month M of year y. If tournament behavior exists, loser funds will increase their risk more than winner funds in the second half of the year.

In order to further analyze the effect of bank-mutual fund relationship on risk-taking behavior, I follow prior literature and introduced DB_i as a bivariate dummy variable for BR and NBR funds to the equation (Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009). DB_i is equal to "1" for BR fund and "0" otherwise.

$$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DB_i + \beta_4 \Delta\sigma_{it}^{m} + \beta_5 \sigma_{it}^{1} + \beta_6 lnAge_{it} + \beta_7 lnAUM_{it} + \varepsilon_{it} \quad (3)$$

In order to analyze the risk-taking behavior of winner and loser funds, I divide the samples into three equal portfolios—winner, middle, and loser. I first rank interim performance by percentile. Then I allocate each fund to one of three portfolios; namely portfolio1 (loser), portfolio2, and portfolio3 (winner), according to their interim ranking. The endogenous variable in the model ($\Delta\sigma_{it}$) is the difference between the volatility in first and second half of year for fund ith. The interest exogenous variables are Ret_{it} and DB_i. Ret_{it} is the fund return in each period. According to the tournament hypothesis, the loser portfolios are expected to increase their risk due to interim performance and hence β_2 for losers are expected to be positive. Winners are expected to reduce risk and thus β_2 for winners are expected to be negative. DB_i is introduced to test the different between BR funds and NBR funds according to Hypotehesis2.

The control variable includes $\Delta\sigma_{it}^{m}$, the median change of industry volatility to control the segment volatility change. The funds' volatility is expected to have mean reversion. Therefore, σ_{it}^{1} is introduced to control the mean reversion of volatility (Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009). Age and AUM are introduced as the log form. The younger the fund, the less is the tracking record stand. Hence, the young fund is likely to take more risk.

2.4 Empirical result

In Table 2.3, I apply the panel corrected standard error regression to analyze the model. In order to fully reveal the behaviors of the funds, I perform a regression using three assessment periods. The results in Table 2-4 show the regression results from equation (3).

In panel A, I find less evidence of a tournament. I cannot reject Hypoethesis1A for all countries. All of the winner fund portfolios have negative and insignificant coefficients. However, I can reject Hypoethesis1B for Singapore and Thailand. This shows that the loser funds in both countries participate in risk-taking behavior in order to boost their performance. β_3 is positively significant only for Thailand.

In Panel B, I can reject all of the hypotheses for the Thai market. There is strong evidence of tournament behavior in Thai market, particularly in August. The coefficients for the loser funds are strongly and positively significant ($\beta_{2,1} = 0.000933$) and those of the winner portfolios are strongly negatively significant ($\beta_{2,3} = -0.00204$) at 1% and 5% level respectively. Additionally, the coefficient of $\beta_{3.3}$ for the Thai market is positive and significantly different from zero at the 1%

level. The Singapore funds show evidence that the loser funds increase their portfolio risk ($\beta_{2,1} = 0.000550$) in the latter part of the year. Although I find a preserved negative sign for the winner funds, I cannot reject the null hypothesis that $\beta_{2,3}$ is significantly different from zero in this market. For the Malaysian funds, it is found that the winner funds lower their portfolio volatility but not the loser funds as stated in previous research. Nonetheless, the Indonesia funds have no relationship in this interim period.

In Panel C, I can reject null hypothesis Hypoethesis1A as I find that the winner funds in every country lower their portfolio risk in the second part of the year. I can reject null hypothesis Hypoethesis1A for the winner funds in three countries—Indonesia, Malaysia, and Thailand. Although I cannot reject the null hypothesis for Singapore, the negative sign of $\beta_{2,3}$ is preserved. Moreover, the results for Thailand hold as previous results for $\beta_{3,3}$.

I can reject Hypothesis2 for the Thai market. Although $\beta_{2,3}$ is preserved with a negative sign, I cannot reject the null hypothesis Hypoethesis1A for all countries in this interim period. $\beta_{3.2}$ and $\beta_{3.3}$ are found to be strongly and positively significant for the winner funds in the Thai market. β_4, the segment industry change, is positively significant as expected. The negatively significance of β_5 demonstrating the evidence of the mean reversion of volatility. β_6 is found to be insignificant for all markets in this sample. Controlling for fund size and fund age, I find mixed result among our sample.2

The results from Table 2.3 provide strong evidence of risk taking behavior of the BR funds in the Thai market. Therefore, I further analyzed the tournament effect in Thailand. I separated the mutual fund sample in the Thai market into BR funds and NBR funds in order to study the difference between them.

Table 2-4 shows that in the July and August period of the sample from the Thai market, in Panel A, there is evidence of tournament behavior that could reject Hypoethesis1A and Hypoethesis1B for funds in both groups. I find that $\beta_{2.1}$ is

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2 As the fund manager takes more risk to increase their revenue and incentive, I have included the management fee as additional control variable. I then perform following equation;

$$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DB_i + \beta_4 \Delta\sigma_{it}^m + \beta_5 \sigma_{it}^1 + \beta_6 lnAge_{it} + \beta_7 lnAUM_{it} + \beta_8 Mgtfee_i + \varepsilon_{it}$$

However, I find the results remain unchanged in all markets and report the results in Appendix A.

positively significant, while $\beta_{2.3}$ is negative and significant. In Panel B, I also reject null hypothesis 1A and Hypoethesis1B for the BR funds, but not for the NBR funds. This evidence supports the existence of tournament behavior in the Thai market, especially in the BR funds. Furthermore, I can reject Hypoethesis1B for the NBR funds. This means that the loser funds in the NBR funds also shift their risk in the latter part of the year to stimulate their fund position. Although I could reject Hypoethesis1A for the winner funds in the NBR funds, the negative sign of $\beta_{2.3}$ is preserved. In Panel C, I can reject Hypoethesis1A but not Hypoethesis1B in either group. This means that winner funds in both groups lower their portfolios risk in order to secure the year-end position.

2.5 Conclusion

After the original paper about tournament behavior by BHS (1996), later studies document that winner (the loser) funds reduce (increase) their portfolio risk in the second half of the year. Contradictory results have also been documented, which rise to an alternative explanation of strategic behavior, whereby winner funds see an opportunity to increase their risk exposure in the second half of the year. Most of those previous studies, however, are conducted in developed markets.

In this study, I compare the tournament effect using regression methods. The results show different levels of tournament behavior in the AEC market. I find that four markets in the AEC have different fund flow patterns leading to different levels of tournament behavior. Second, I find strong evidence of tournament behavior in the Thai mutual fund industry in the August interim period, while other countries show less evidence of tournament behavior. However, I find that the winner funds lower their portfolio risk in the latter part of the year. Further, the results provide evidence confirming the mean reversion property of fund volatility that exists in all markets. Last, I show that the risk-taking behavior of BR funds and NRB funds is different. The BR funds exposed to risk shifting compared with NBR funds in Thailand. Moreover, for Thailand, I find tournament behavior in two of three assessment periods but not for the NBR funds.

Therefore, the higher risk of the BR funds is an issue related to the conflict of interest between investors and the BR funds in that they try to maximize the benefits from fund-flow convexity. A possible explanation is that the portfolio allocation of the BR funds is lost the diversification benefit because their portfolio allocations are driven by an information advantage and these allocations are strictly with such information (Hao and Yan 2012, Massa and Rehman 2008). The more recent research also confirms such a conflict of interest among investment banking-managed funds. Therefore, the results fill the gap in the findings that bank-mutual fund relationship affect risk-taking behavior. The finding shows that BR funds exhibit higher risk-taking behavior compared with NBR funds.

Table 2.1 Sample descriptive statistics and Pearson's correlation matrix by country. In Panel A, the table reports the number of funds, AUM (million USD) and $\overline{AUM}$ at the end of 2013. Fund age, average fund return, Average fund standard deviation, Entry Fee, Exit Fee and Management Fee are the time-series average of yearly cross-sectional between 2008 and 2013. In Panel B, the table reports the Pearson's correlation matrix by country. The p-value is reported in parenthesis.

PANEL A: Basic statistic

Country	Number of Funds			AUM	$\overline{AUM}$	Age	$\overline{Ret}$	$\overline{std}$	Entry	Exit	Mgt.
	Full	BR	NBR			(yrs)			Fee	Fee	Fee
Indonesia	97	21	76	82.64	1.54	5.16	15.42	6.79	1.87	1.04	2.49
Malaysia	89	43	46	76.15	0.51	11.47	9.41	3.22	5.31	2.40	1.48
Singapore	42	13	29	41.26	1.01	7.07	-2.54	4.52	4.47	0.94	1.38
Thailand	215	150	65	55.36	0.16	8.58	15.81	5.99	0.89	0.68	1.40

PANEL B: Correlation Matrix

PANEL B-1: INDO

	$\Delta\sigma_{it}$	Ret_{it}	DB_i	$\Delta\sigma^m_{it}$	σ^1_{it}	$lnAUM_{it}$	$lnAge_{it}$	Mgt_fee_i
$\Delta\sigma_{it}$	1.0000							
Ret_{it}	-0.1045	1.0000						
	(0.0921)							
DB_i	-0.0008	0.0694	1.0000					
	(0.9892)	(0.2620)						
$\Delta\sigma^m_{it}$	0.8318	-0.0706	0.0000	1.0000				
	(0.0000)	(0.2539)	(1.0000)					
σ^1_{it}	-0.6655	0.2163	0.0171	-0.5912	1.0000			
	(0.0000)	(0.0004)	(0.7751)	0.0000				
$lnAUM_{it}$	0.0682	-0.1015	0.0390	0.0484	-0.0887	1.0000		
	(0.4410)	(0.2639)	(0.6254)	(0.5450)	(0.3158)			
$lnAge_{it}$	0.1287	0.3758	0.1174	0.0237	-0.1236	0.3869	1.0000	
	(0.0322)	(0.0000)	(0.0306)	(0.6634)	(0.0391)	(0.0000)		
Mgt_fee_i	-0.0190	-0.2318	-0.1130	-0.0000	-0.0068	-0.1983	-0.3399	1.0000
	(0.7532)	0.0001	0.0099	1.0000	0.9093	0.0134	0.0000	

Table 2.1: (Continue)

PANEL B-2: MAL								
	$\Delta\sigma_{it}$	Ret_{it}	DB_i	$\Delta\sigma^m_{it}$	σ^1_{it}	$lnAUM_{it}$	$lnAge_{it}$	Mgt_fee_i
$\Delta\sigma_{it}$	1.0000							
Ret_{it}	-0.3097	1.0000						
	(0.0000)							
DB_i	-0.0078	-0.0762	1.0000					
	(0.8594)	(0.0809)						
$\Delta\sigma^m_{it}$	0.8677	-0.2911	0.0000	1.0000				
	(0.0000)	(0.0000)	(1.0000)					
σ^1_{it}	-0.4274	0.2990	0.0428	-0.2471	1.0000			
	(0.0000)	(0.0000)	(0.3272)	(0.0000)				
$lnAUM_{it}$	-0.0626	0.0349	0.4277	-0.0700	0.0273	1.0000		
	(0.1648)	(0.4394)	(0.0000)	(0.1161)	(0.5452)			
$lnAge_{it}$	-0.0271	0.1663	-0.0644	-0.0537	0.0318	0.1149	1.0000	
	(0.5374)	(0.0001)	(0.1381)	(0.2160)	(0.4688)	(0.0098)		
Mgt_fee_i	0.0154	0.0258	0.0142	0.0000	0.0254	0.2103	0.3200	1.0000
	(0.7268)	(0.5562)	(0.7220)	(1.0000)	(0.5609)	(0.0000)	(0.0000)	

PANEL B-3: SIN								
	$\Delta\sigma_{it}$	Ret_{it}	DB_i	$\Delta\sigma^m_{it}$	σ^1_{it}	$lnAUM_{it}$	$lnAge_{it}$	Mgt_fee_i
$\Delta\sigma_{it}$	1.0000							
Ret_{it}	-0.1021	1.0000						
	(0.1110)							
DB_i	0.0467	0.0277	1.0000					
	(0.4657)	(0.6622)						
$\Delta\sigma^m_{it}$	0.7339	-0.1167	0.0000	1.0000				
	(0.0000)	(0.0644)	(1.0000)					
σ^1_{it}	-0.3127	0.2213	0.0082	-0.1552	1.0000			
	(0.0000)	(0.0004)	(0.8969)	(0.0135)				
$lnAUM_{it}$	-0.0467	0.0951	0.1955	-0.0773	0.1877	1.0000		
	(0.5348)	(0.2053)	(0.0047)	(0.2670)	(0.0118)			
$lnAge_{it}$	0.0437	0.1948	-0.1103	-0.0113	-0.2657	-0.0752	1.0000	
	(0.5773)	(0.0114)	(0.1059)	(0.8691)	(0.0005)	(0.3808)		
Mgt_fee_i	0.0119	-0.0246	0.3452	0.0000	-0.0094	0.0947	0.1981	1.0000
	(0.8649)	(0.7200)	(0.0000)	(1.0000)	(0.8911)	(0.2073)	(0.0105)	

Table 2.1: (Continue)

PANEL B-4: TH								
	$\Delta\sigma_{it}$	Ret_{it}	DB_i	$\Delta\sigma^m_{it}$	σ^1_{it}	$lnAUM_{it}$	$lnAge_{it}$	Mgt_fee_i
$\Delta\sigma_{it}$	1.0000							
Ret_{it}	-0.3884	1.0000						
	(0.0000)							
DB_i	0.0390	-0.0528	1.0000					
	(0.1972)	(0.0835)						
$\Delta\sigma^m_{it}$	0.9452	-0.3783	0.0000	1.0000				
	(0.0000)	(0.0000)	(1.0000)					
σ^1_{it}	0.2593	0.0973	-0.0534	0.3977	1.0000			
	(0.0000)	(0.0014)	(0.0774)	(0.0000)				
$lnAUM_{it}$	-0.0961	0.0718	0.3466	-0.1052	-0.1473	1.0000		
	(0.0015)	(0.0186)	(0.0000)	(0.0004)	(0.0000)			
$lnAge_{it}$	-0.1624	0.3030	-0.0429	-0.0801	-0.0459	0.1706	1.0000	
	(0.0000)	(0.0000)	(0.1480)	(0.0068)	(0.1295)	(0.0000)		
Mgt_fee_i	-0.0449	0.1814	-0.0448	0.0000	0.1928	-0.0891	0.1497	1.0000
	(0.1383)	(0.0000)	(0.1010)	(1.0000)	(0.0000)	(0.0026)	(0.0000)	

Table 2.2 Interim performance portfolio descriptive statistic.

The interim performance on July (7,5) is used to form the portfolio in each annual tournament. Portfolio1 represents the bottom one-third of the sample, Portfolio3 represents the top one-third of the sample, while portfolio2 represents the middle-performance funds. Mutual funds are classified into BR funds and NBR funds. AGE, AUM, Ret, and Std represent the time-series yearly cross-sectional average of each portfolio.

Country	AGE (year)			AUM (Local currency)			Total return (%)		
	Full	BR	NBR	Full	BR	NBR	Full	BR	NBR
INDO									
Port1	3.77	4.53	3.53	3.49×10^{11}	1.73×10^{11}	3.98×10^{11}	-26.45	-21.16	-27.96
Port2	5.27	5.73	5.26	9.68×10^{11}	1.03×10^{12}	1.05×10^{12}	18.78	-12.91	19.82
Port3	4.26	5.19	3.92	7.24×10^{11}	6.26×10^{11}	6.52×10^{11}	10.76	4.03	13.87
MAL									
Port1	13.13	11.36	14.89	1.39×10^{8}	2.85×10^{8}	4.06×10^{7}	-1.60	-0.42	-3.29
Port2	11.20	11.22	11.08	1.67×10^{8}	2.39×10^{8}	4.51×10^{7}	6.50	3.19	2.40
Port3	10.01	9.22	9.31	1.37×10^{8}	2.28×10^{8}	5.37×10^{7}	14.85	8.49	14.63
SIN									
Port1	5.45	5.01	5.66	4.77×10^{7}	3.35×10^{7}	5.09×10^{7}	-21.31	-30.88	-15.71
Port2	5.30	4.62	5.76	5.56×10^{7}	3.24×10^{7}	6.69×10^{7}	-10.24	-21.23	-4.17
Port3	6.19	5.25	6.69	5.16×10^{7}	3.15×10^{7}	6.26×10^{7}	4.05	-7.65	8.75
TH									
Port1	7.52	7.17	7.55	1.33×10^{9}	1.59×10^{9}	4.64×10^{8}	-5.01	-8.24	4.41
Port2	8.62	8.55	10.17	8.34×10^{8}	1.02×10^{9}	5.81×10^{8}	2.89	-0.43	7.36
Port3	7.91	7.57	8.04	7.77×10^{8}	9.97×10^{8}	4.22×10^{8}	9.55	7.74	14.10

Table 2.2 (Continued)

Country	Standard Deviation (%)			Entry Fee (%)			Exit Fee (%)		
	Full	BR	NBR	Full	BR	NBR	Full	BR	NBR
INDO									
Port1	4.81	5.23	4.70	4.81	5.23	4.70	4.81	5.23	4.70
Port2	4.57	5.11	4.48	4.57	5.11	4.48	4.57	5.11	4.48
Port3	4.87	5.21	4.68	4.87	5.21	4.68	4.87	5.21	4.68
MAL									
Port1	3.35	3.26	3.38	3.35	3.26	3.38	3.35	3.26	3.38
Port2	3.30	3.24	3.11	3.30	3.24	3.11	3.30	3.24	3.11
Port3	3.62	3.56	3.53	3.62	3.56	3.53	3.62	3.56	3.53
SIN									
Port1	4.91	4.45	5.17	4.91	4.45	5.17	4.91	4.45	5.17
Port2	4.36	3.84	4.58	4.36	3.84	4.58	4.36	3.84	4.58
Port3	4.33	3.91	4.49	4.33	3.91	4.49	4.33	3.91	4.49
TH									
Port1	5.49	5.25	6.07	5.49	5.25	6.07	5.49	5.25	6.07
Port2	5.35	5.21	5.50	5.35	5.21	5.50	5.35	5.21	5.50
Port3	5.46	5.42	5.66	5.46	5.42	5.66	5.46	5.42	5.66

Table 2.2 (Continued)

Country	Management Fee(%)		
	Full	BR	NBR
INDO			
Port1	1.57	1.74	1.54
Port2	1.57	1.63	1.57
Port3	1.70	1.73	1.65
MAL			
Port1	1.46	1.44	1.47
Port2	1.45	1.36	1.43
Port3	1.47	1.37	1.49
SIN			
Port1	1.42	1.28	1.51
Port2	1.41	1.29	1.45
Port3	1.42	1.24	1.50
TH			
Port1	1.34	1.38	1.20
Port2	1.27	1.31	1.21
Port3	1.20	1.27	1.08

Table 2.3 Regression approach.

The table report the result obtained by equation (3) on three interim periods. Panel A, B, and C represent the different interim periods from July to September respectively. $\Delta\sigma_{it} = \sigma_{it}^2 - \sigma_{it}^1 = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DB_i + \beta_4 \Delta\sigma_{it}^m + \beta_5 \sigma_{it}^1 + \beta_6 lnAge_{it} + \beta_7 lnAUM_{it} + \varepsilon_{it}$ $\Delta\sigma_{it}$ is the difference between the volatility in first and second halves of year for fund i^{th}. The interest exogenous variables are the Ret_{it}, interim return in each period and DB_i, the bivariate dummy variable for bank and non-bank related funds. DB_i is equal to "1" for BR funds and "0" otherwise. $\Delta\sigma_{it}^m$ is the median of industry standard error change. σ_{it}^1 is fund interim volatility. Age is fund age in log form. The p-values are reported in parenthesis.

	Period (7,5)					
	INDO			MAL		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0000	0.00656***	-0.0076	0.0000	-0.0014	-0.0015
	(0.12)	(0.00)	(0.59)	(0.32)	(0.20)	(0.15)
β_3	0.0006	-0.0016	-0.0082	0.0001	0.0017	0.0013
	(0.89)	(0.78)	(0.26)	(0.95)	(0.31)	(0.50)
β_4	0.694***	1.058***	1.317***	0.779***	0.871***	0.899***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
β_5	-0.592***	-0.531***	0.3490	-0.575***	-0.297***	-0.411***
	(0.00)	(0.00)	(0.73)	(0.00)	(0.00)	(0.00)
β_6	0.00234*	0.003	0.004	0.00256**	-0.00363**	-0.00291*
	(0.07)	(0.17)	(0.59)	(0.01)	(0.01)	(0.06)
β_7	0.0005	-0.0001	0.0016	-0.0002	0.0004	-0.0011
	(0.32)	(0.89)	(0.48)	(0.76)	(0.54)	(0.11)
α_{it}	0.0192	0.0492***	-0.0883*	0.0160	0.0017	0.0294**
	(0.16)	(0.00)	(0.10)	(0.13)	(0.92)	(0.02)
N	43	44	36	167	165	160
Adj-R^2	89.8	89.7	31.2	81.9	83.4	87.0

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.3 (Continued)

	Period (7,5)					
	SIN			THAI		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.000309***	-0.00948**	-0.01	0.000654***	0.0005	-0.0007
	(0.01)	(0.03)	(0.12)	(0.00)	(0.58)	(0.45)
β_3	0.0046	0.0034	0.0042	0.0014	0.00545***	0.00314***
	(0.38)	(0.46)	(0.59)	(0.44)	(0.00)	(0.00)
β_4	0.501***	0.715***	1.144***	1.035***	1.149***	1.110***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
β_5	-0.563***	-0.0091	-0.476**	-0.476***	-0.529***	-0.437***
	(0.00)	(0.96)	(0.01)	(0.00)	(0.00)	(0.00)
β_6	-0.003	-0.001	0.002	-0.001	-0.00519***	-0.00374***
	(0.14)	(0.74)	(0.56)	(0.27)	(0.00)	(0.00)
β_7	0.0000	-0.0024	0.0035	-0.0006	-0.0007	0.0006
	(1.00)	(0.14)	(0.29)	(0.16)	(0.15)	(0.19)
α_{it}	0.0294**	-0.0135	0.0052	0.0472***	0.0560***	0.0173
	(0.04)	(0.76)	(0.91)	(0.00)	(0.00)	(0.16)
N	46	40	38	356	353	365
Adj-R^2	75.1	75.6	78.7	86.3	91.5	93.4

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.3 (Continued)

	Period (8,4)					
	INDO			MAL		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0001	0.0021	-0.0085	-0.0001	-0.00406***	-0.00390***
	(0.34)	(0.34)	(0.23)	(0.58)	(0.00)	(0.00)
β_3	0.0101	0.0013	0.0027	0.0011	-0.0007	0.0000
	(0.14)	(0.75)	(0.68)	(0.56)	(0.66)	(0.99)
β_4	0.930***	0.968***	0.864*	0.867***	0.821***	0.831***
	(0.00)	(0.00)	(0.07)	(0.00)	(0.00)	(0.00)
β_5	-0.337***	-0.283***	0.9360	-0.415***	-0.239***	-0.342***
	(0.00)	(0.01)	(0.35)	(0.00)	(0.00)	(0.00)
β_6	0.00402**	0.0032	0.0027	0.0017	-0.00351**	-0.00492***
	(0.01)	(0.32)	(0.62)	(0.14)	(0.05)	(0.00)
β_7	0.0004	0.0002	-0.0017	0.0003	0.0001	-0.0010
	(0.45)	(0.84)	(0.50)	(0.66)	(0.89)	(0.22)
α_{it}	0.0020	0.0114	-0.0329	0.0033	-0.0131	0.0168
	(0.92)	(0.63)	(0.53)	(0.78)	(0.35)	(0.27)
N	41	46	36	171	163	158
Adj-R^2	88.3	78.4	28.1	79.0	85.7	83.2

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.3 (Continued)

	Period (8,4)					
	SIN			THAI		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.000550**	0.0080	-0.0107	0.000933***	0.0005	-0.00204**
	(0.02)	(0.23)	(0.21)	(0.00)	(0.52)	(0.01)
β_3	0.0009	-0.0040	0.0126	0.0004	0.00396***	0.00232**
	(0.88)	(0.42)	(0.24)	(0.84)	(0.00)	(0.05)
β_4	0.421***	1.011***	1.334***	1.067***	1.082***	1.108***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
β_5	-0.560***	-0.594***	-0.3950	-0.291***	-0.285***	-0.560***
	(0.00)	(0.00)	(0.13)	(0.00)	(0.00)	(0.00)
β_6	-0.0033	-0.00532*	0.0061	0.0010	-0.0007	-0.00252**
	(0.24)	(0.09)	(0.18)	(0.47)	(0.55)	(0.01)
β_7	0.0020	-0.0001	0.0041	-0.0002	0.0002	0.0005
	(0.12)	(0.94)	(0.39)	(0.70)	(0.72)	(0.30)
α_{it}	-0.0018	0.0815*	-0.0184	0.0260**	0.0132	0.0177
	(0.94)	(0.08)	(0.77)	(0.01)	(0.22)	(0.12)
N	44	40	40	356	353	365
Adj-R^2	51.7	73.8	62.1	90.0	91.4	93.8

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.3 (Continued)

	Period (9,3)					
	INDO			MAL		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0002	-0.0061	-0.00790**	0.0000	-0.0006	-0.00583***
	(0.66)	(0.44)	(0.02)	(0.23)	(0.65)	(0.00)
β_3	0.0047	-0.0020	0.0003	0.0006	0.0010	0.0001
	(0.28)	(0.69)	(0.92)	(0.79)	(0.54)	(0.97)
β_4	0.792***	1.060***	1.280***	0.798***	1.075***	0.725***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
β_5	-0.407***	0.4720	-0.3380	-0.420***	-0.0562	-0.425***
	(0.00)	(0.29)	(0.15)	(0.00)	(0.51)	(0.00)
β_6	0.0022	-0.0024	-0.0026	0.00186*	-0.0030	-0.00711***
	(0.27)	(0.68)	(0.28)	(0.09)	(0.10)	(0.00)
β_7	0.0007	-0.0005	0.0010	0.0004	0.0004	0.0003
	(0.26)	(0.67)	(0.47)	(0.63)	(0.48)	(0.76)
α_{it}	-0.0006	-0.0233	-0.0202	0.0021	-0.0001	-0.0067
	(0.98)	(0.74)	(0.46)	(0.89)	(0.99)	(0.71)
N	44	45	34	168	163	161
Adj-R^2	78.6	55.7	63.5	75.1	86.8	79.3

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.3 (Continued)

	Period (9,3)					
	SIN			THAI		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.000911***	-0.0006	-0.0026	0.0005	-0.00252***	-0.00281***
	(0.01)	(0.90)	(0.77)	(0.39)	(0.00)	(0.00)
β_3	0.0031	-0.0014	0.0009	-0.0008	0.00338*	0.00343***
	(0.56)	(0.74)	(0.92)	(0.66)	(0.05)	(0.01)
β_4	0.593***	0.898***	1.248***	1.003***	1.000***	1.012***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
β_5	-0.539***	-0.2250	-0.2880	-0.201***	-0.0808	-0.215***
	(0.00)	(0.28)	(0.29)	(0.00)	(0.29)	(0.00)
β_6	-0.0052	-0.0025	0.00554*	-0.0007	-0.0006	-0.00416***
	(0.11)	(0.50)	(0.10)	(0.58)	(0.69)	(0.00)
β_7	0.0004	0.0010	-0.0033	0.0000	0.0009	0.000953*
	(0.79)	(0.52)	(0.38)	(0.95)	(0.13)	(0.06)
α_{it}	0.0317	-0.0102	0.0762	0.0189**	-0.0202	-0.0066
	(0.22)	(0.83)	(0.15)	(0.05)	(0.12)	(0.57)
N	49	34	41	357	353	364
Adj-R^2	55.9	74.8	65.0	93.5	94.6	95.7

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.4 Risk-shifting behavior between BR funds and NBR funds.

The table report the result obtained by following equation;

$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_4 \Delta\sigma_{it}^{m} + \beta_5 \sigma_{it}^{1} + \beta_6 lnAge_{it} + \beta_7 lnTNA_{it} + \varepsilon_{it}$.

The result are analyzed on three interim periods. Panel A, B, and C represent the different interim periods from July to September respectively.$\Delta\sigma_{it}$ is the difference between the volatility in first and second halves of year for fund i^{th}. The interest exogenous variables are Ret_{it}, is an interim return in each period and DB_i is the bivariate dummy variable for bank-related funds and non-bank-related funds. DB_i is equal to "1" for BR fund and "0" otherwise. $\Delta\sigma_{it}^{m}$, the median of industry standard error change. σ_{it}^{1} is the fund interim volatility. Age is fund age in log form. The p-values are reported in parenthesis.

	Period (7,5)		
	BR		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.000837***	-0.000351	-0.00235*
	(0.00)	(0.79)	(0.06)
$\beta_4 \Delta\sigma_{it}^{m}$	1.020***	1.130***	1.087***
	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^{1}$	-0.529***	-0.517***	-0.483***
	(0.00)	(0.00)	(0.00)
$\beta_6 lnAge_{it}$	-0.000133	-0.00603***	-0.00426***
	(0.91)	(0.01)	(0.00)
$\beta_7 lnTNA_{it}$	-0.000863**	-0.00102	-0.000982**
	(0.04)	(0.12)	(0.03)
α_{it}	0.0550***	0.0645***	0.00999
	(0.00)	(0.00)	(0.48)
N	254	224	239
Adj-R^2	88.9	90.5	93.8

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.4 (Continued)

	Period (7,5)		
	NBR		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.000569*	0.00240*	-0.00282*
	(0.06)	(0.09)	(0.07)
$\beta_4 \Delta\sigma_{it}^m$	1.092***	1.197***	1.161***
	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^1$	-0.437***	-0.594***	-0.312***
	(0.00)	(0.00)	(0.00)
$\beta_6 lnAge_{it}$	-0.00551	-0.00367***	-0.00295*
	(0.18)	(0.01)	(0.07)
$\beta_2 lnTNA_{it}$	-0.000236	-0.0000409	-0.000111
	(0.83)	(0.95)	(0.91)
α_{it}	0.0424**	0.0544***	0.0366
	(0.03)	(0.00)	(0.11)
N	102	129	126
Adj-R^2	82.5	93.6	93.5

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.4 (Continued)

	Period (8,4)		
	BR		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.000793***	0.00167*	-0.00223**
	(0.00)	(0.09)	(0.04)
$\beta_4 \Delta\sigma_{it}^m$	1.044***	1.138***	1.145***
	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^1$	-0.294***	-0.320***	-0.669***
	(0.00)	(0.00)	(0.00)
$\beta_6 lnAge_{it}$	0.00183*	0.00187	-0.00433***
	(0.10)	(0.21)	(0.00)
$\beta_2 lnTNA_{it}$	-0.000444	0.000914	0.000538
	(0.25)	(0.12)	(0.27)
α_{it}	0.0294***	0.00351	0.0285**
	(0.00)	(0.79)	(0.03)
N	250	218	249
Adj-R^2	92.4	92.4	94.0

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.4 (Continued)

	Period (8,4)		
	NBR		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.00180*	-0.00109	-0.00114
	(0.09)	(0.43)	(0.32)
$\beta_4 \Delta\sigma_{it}^{m}$	1.127***	1.012***	1.057***
	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^{1}$	-0.313**	-0.286***	-0.362***
	(0.03)	(0.00)	(0.00)
$\beta_6 lnAge_{it}$	-0.00217	-0.00470***	-0.000166
	(0.62)	(0.01)	(0.93)
$\beta_2 lnTNA_{it}$	0.000319	-0.000929	0.000976
	(0.84)	(0.22)	(0.27)
α_{it}	0.0273	0.0356*	-0.00483
	(0.36)	(0.06)	(0.81)
N	106	135	116
Adj-R^2	86.2	90.3	94.2

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.4 (Continued)

	Period (9,3)		
	BR		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	0.000689	-0.00202**	-0.00313***
	(0.21)	(0.02)	(0.00)
$\beta_4 \Delta\sigma_{it}^m$	0.999***	1.034***	1.046***
	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^1$	-0.295***	-0.0472	-0.304***
	(0.00)	(0.55)	(0.00)
$\beta_6 lnAge_{it}$	-0.000561	0.00217	-0.00334**
	(0.69)	(0.30)	(0.02)
$\beta_2 lnTNA_{it}$	0.000226	0.00136**	0.00144**
	(0.65)	(0.03)	(0.03)
α_{it}	0.0190*	-0.0330**	-0.01
	(0.09)	(0.05)	(0.52)
N	261	223	233
Adj-R^2	93.6	95.2	95.3

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

Table 2.4 (Continued)

	Period (9,3)		
	NBR		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
$\beta_2 Ret_{it}$	-0.000368	-0.00369*	-0.00152**
	(0.77)	(0.07)	(0.03)
$\beta_4 \Delta\sigma_{it}^{m}$	1.025***	0.955***	0.935***
	(0.00)	(0.00)	(0.00)
$\beta_5 \sigma_{it}^{1}$	0.0706	-0.113	0.0295
	(0.50)	(0.46)	(0.63)
$\beta_6 lnAge_{it}$	0.00183	-0.00344	-0.00590***
	(0.53)	(0.13)	(0.00)
$\beta_2 lnTNA_{it}$	-0.00160*	0.00021	0.000867
	(0.09)	(0.82)	(0.23)
α_{it}	0.0251	-0.00396	-0.013
	(0.19)	(0.85)	(0.39)
N	96	130	131
Adj-R^2	94.3	94.0	97.5

*, **, and *** represent significant levels, at 10%, 5%, and 1% respectively.

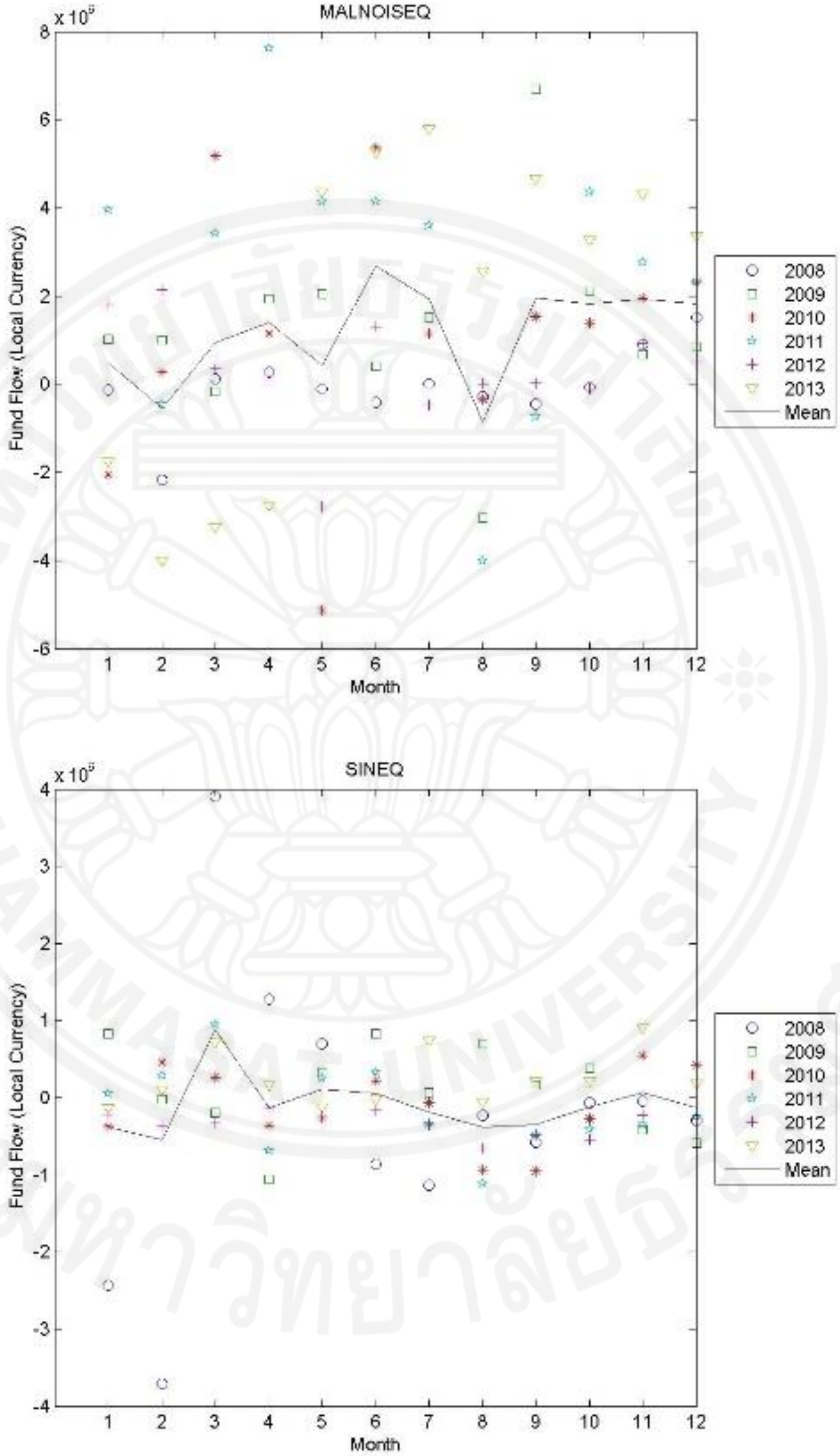

Figure 2.1: Average monthly fund flow during 2008-2013

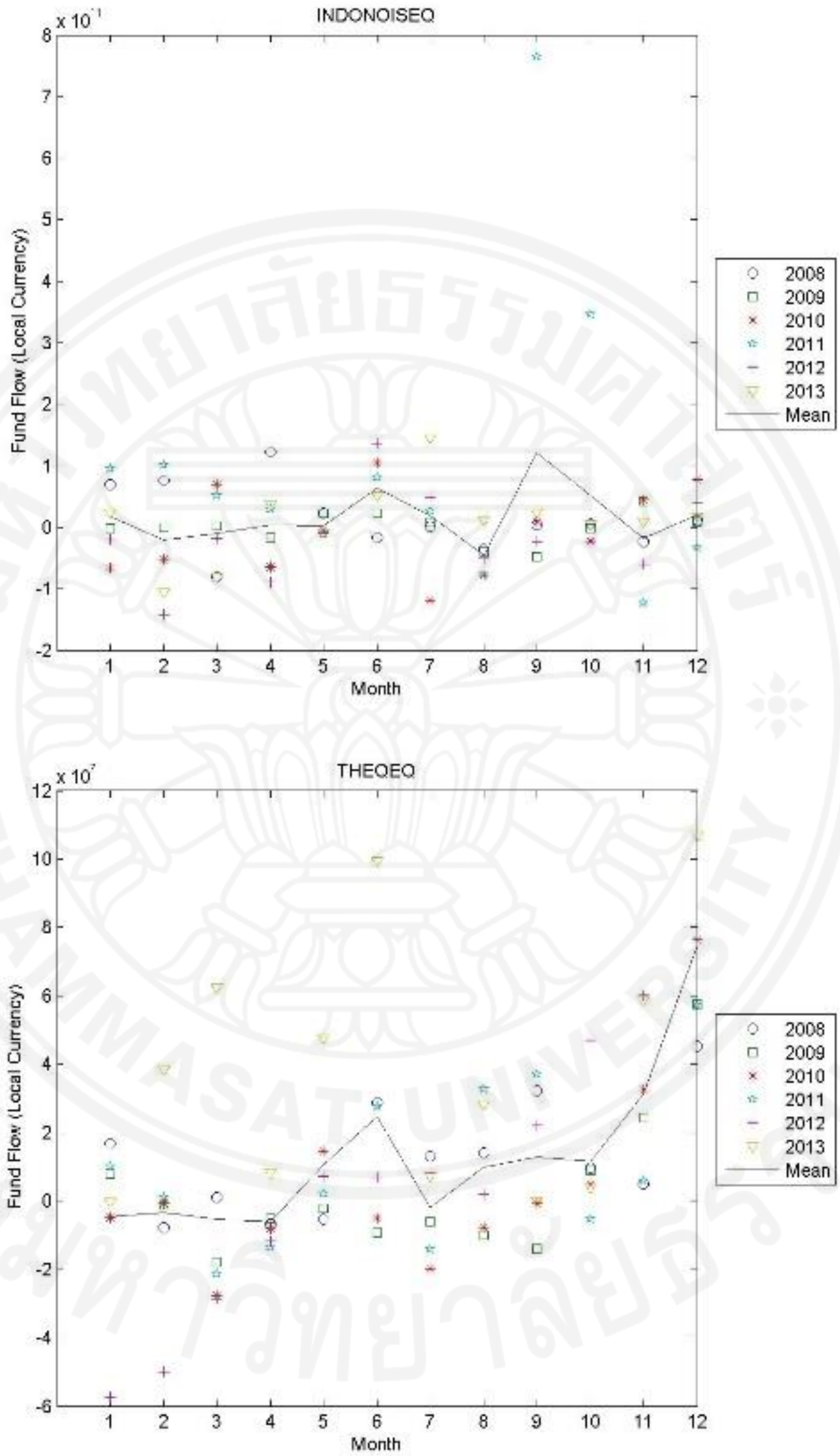

Figure 2.1: (Continued)

CHAPTER 3
PERSISTENT RISK-TAKING BEHAVIOR OF BANK-RELATED FUNDS: EVIDENCE FROM THAILAND

3.1 Introduction

Due to the fact that, in previous chapter, there is tournament behavior found in Thai market where the other markets show weak evidence of tournament behavior (Wattanatorn, Nathaphan, and Padungsaksawasdi 2015). In addition, the data availability on Thai market allows this study to further analyze the persistence of this risk-taking behavior. So, in this chapter, I further analyze the persistence of this risk-taking behavior in the Thai mutual fund industry. It is interesting to understand the tournament behavior of mutual fund. The tournament behavior is grounded on the different investment objectives between investors and mutual funds. The investment objective of investors is to maximize return. Recent literature documents that investors care for past performances and hence allocate their investments based on the funds' historical performances. As a result, there is a positive convex relationship between fund flow and past performance, where convexity means that high performance funds attract positive investment flows while low performance funds are not penalized at an equivalent amount of negative investment flows (Patel, Zeckhauser, and Hendricks 1994, Ippolito 1992, Sirri and Tufano 1998). Given on this asymmetric fund flow sensitivity, mutual funds have an incentive to take more risks to boost their performances and hence increase their expected revenue.

Prior literature offers two schools of thought in explaining the risk-taking behavior of mutual funds. First, tournament behavior hypothesis predicts that an interim loser fund increases its portfolio risk in order to be the top-performing fund by the year's end with an aim to earn new investments (Acker and Duck 2006, Brown, Harlow, and Starks 1996, Chevalier and Ellison 1995, Goriaev, Nijman, and Werker 2005, Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009, Koski and Pontiff 1999). Second, the strategic behavior hypothesis provides an explanation in a different view point, where the winner funds adjust the portfolios' risk more than the loser funds do during the second half of the year in order to either maintain or boost performances (Qiu 2003, Benson, Faff, and Nowland 2007, Hallahan, Faff, and Benson 2008, Jans and Otten 2008, Hallahan and Faff 2009, Taylor 2003).

Though risk-taking behavior studies on different funds' objectives are normal. Not many studies show evidence on bank-mutual fund relationship. With this approach, mutual funds are classified as bank-related (BR) funds and non-bank-related (NBR). Two major explanations on the bank-mutual fund relationship exist.

First, the information advantage hypothesis states that BR funds have superior information and hence they utilize it to create value under their managements. Banks can share information obtained from other activities to the BR funds. Ultimately, the BR funds gain information advantages in several ways as follow. First, they can obtain information at a cheaper cost compared with NBR funds. Second, they are able to access the unpublished information available only at the bank; lending information (Massa and Rehman 2008, Mehran and Stulz 2007, Hao and Yan 2012, Berzins, Liu, and Trzcinka 2013). Third, BR funds have a privileged benefit to receive the IPO allocation to boost their portfolio performance when their parent bank is an underwriter (Ritter and Zhang 2007). In addition to the information advantage, BR funds have lower searching costs than NBR funds. The searching cost affect the investment decisions of investors. Thus, the high searching cost negatively affects the fund flows (Sirri and Tufano 1998). The BR funds have lower searching cost because both individual investors and institutional investors have normal business activities with the bank in terms of both deposits and loans. As a result, the investors can access BR funds information inexpensively (Frye 2001). Furthermore, Nathaphan and Chunhachinda (2012) demonstrate that BR funds show a higher growth from new investment flows.

Second, the conflict of interest hypothesis argues that banks affect their investment constrains and hence the investment outcomes. For example, a bank may encourage the BR funds to support their client's stock IPO in order to win a future contract in another line of the bank businesses—underwriting, seasonal equity offerings, and mergers (Hao and Yan 2012, Mehran and Stulz 2007). Furthermore, the BR funds improperly allocate the funds toward the bank-parent's client stock and hence do not achieve diversification benefit (Hao and Yan 2012).

I define my research objectives as follow. First, I investigate the risk-taking behavior of bank- and non-bank related mutual funds in the yearly tournament, where prior literature lacks evidence in Thai mutual fund sector. I hypothesize that these exists a different level of tournament effect between these two groups.

Second, though studies in mutual funds are intensive, most finding are in developed countries. This study provide additional finding in the developing market, Thailand. Emerging equity markets differ from developed equity markets in many aspects. First, they show a relatively high average return and high return volatility. Second, the return in emerging markets have less return correlations with developed markets. Third, return predictabilities in emerging markets are documented (Bekaert and Harvey 1997). Finally, unlike developed markets, emerging markets exhibit a high serial correlation of returns resulting from inefficient information and insider trading (Bekaert and Harvey 1997, 2002, Harvey 1995).

In order to strengthen the findings in the literature, I further improve the model to capture evidence of tournament behavior in the context of emerging markets. Last, Kempf et al. (2009) suggest that tournament behavior is difference in different market states. This elaborate finding provide an insight to both academicians and practitioners. Due to the fact that there is an evidence of tournament behavior exits in Thai mutual fund industry (Wattanatorn, Nathaphan, and Padungsaksawasdi 2015), I apply both the portfolio-sorting and the regression methods to explore the mutual fund tournament in Thailand from 2000 and 2013.

To sum up, this study contributes to prior literature regarding the development of the mutual fund industry, and corporate finance in the mutual fund industry, as follows. First, I show consistent and persistent results of tournament behavior. The findings document that there is a conflict of interest in the mutual fund industry. Second, the persistence of tournament behavior is observed in all market states. Third, the bank- mutual funds relationship affects risk-taking behavior, where BR funds exhibit tournament behavior persistently regardless to market states.

The remainder of this paper is organized as follows. Section 3.2 is a review of the literature and a discussion of the development of the hypotheses. Section 3.3 describes the data, methodology, and offers an overview of the industry.

Section 3.4 discusses the empirical results and the conclusion is presented in Section 3.5.

3.2 Literature review

3.2.1 Fund flow and performance relationship

The rationale investor wants to take advantage of the best opportunities available for investing in order to maximize their utility function. Therefore, investors allocate more to high-performance funds than poor-performance funds. As a consequence, there is a positive relationship between past performance and the subsequence period of fund flow (Ippolito 1992, Smith 1978). Moreover, this positive relationship is found to be convex, which means that high-performance funds earn new investment inflow while poor-performance funds are not penalized by the same proportion of outflow (Chevalier and Ellison 1995, Sirri and Tufano 1998). Recent research shows that this convexity relationship varies across counties. The convexity of fund flow and past performance is less in more developed countries, more education advance and a more information-transparent market. On the other hand, emerging markets are characterized by less development and less information transparency. Therefore, emerging markets have higher degree of convexity than developed markets. (Ferreira et al. 2012). In addition, the participation costs, including information cost, and analyzing cost, affect the level of fund-flow performance sensitivity. The higher participation cost funds are more sensitive to fund-flow performance than that of low participation cost funds (Huang, Wei, and Yan 2007).

3.2.2 Tournament behavior

Based on the convexity relationship between fund flow and past performance, the interim loser funds have an incentive to take more risk to boost their performance. This is called the tournament behavior hypothesis, which was first developed in 1996 by Brown, Harrow and Stark (1996), hereafter “BHS”. They find that the asymmetric effect of convexity in the fund flow and performance relationship motivates the interim loser funds to take more risk to enhance their performance by the year’s end. On the other hand, the interim winner funds allocate conservatively to lower their portfolio risk, for example by indexing, in order to secure their top position.

Much circumstantial evidence confirms the existence of the tournament effect in the U.S. (Chen and Pennacchi 2009, Chevalier and Ellison 1995, Dass, Massa, and Patgiri 2008, Kempf and Ruenzi 2008, Kempf, Ruenzi, and Thiele 2009, Schwarz 2012). In contrast, some researchers have rejected the tournament hypothesis and support the strategic behavior in that the winner funds increase the portfolio's risk more than loser funds (Qiu 2003, Tourani-Rad, Jans, and Otten 2008, Taylor 2003).

As in the U.S., evidence of tournament study is inconclusive. Acker and Duck (2006) provide the first study of tournament behavior outside the U.S. market, with a dataset containing U.K. investment trusts. They find evidence supporting tournament behavior and then suggest that it has a positive relationship with market conditions. In Australia, there is both evidence of tournament behavior and evidence of strategic behavior. Hallanhan and Faff (2009) find evidence of tournament behavior in a sample of Australian equity funds between 1989 and 2001 (Hallahan and Faff 2009). On the other hand, there are evidence to support strategically behavior in this market (Hallahan, Faff, and Benson 2008, Benson, Faff, and Nowland 2007).

The previous studies are based mainly on developed markets. Although there are important differences between emerging market study and developed markets, only a limited number of studies have been conducted in emerging areas. Further, their results are mixed. Ko and Ha (2011) study Korean equity funds and find that the tournament behavior is not persistent. In Malaysia, Ramiah et al. (2012) study the Malaysian mutual fund industry and find that tournament behavior exists for conventional Malaysian funds. More recent research suggests the existence of tournament behavior in the Thai mutual funds market (Wattanatorn, Nathaphan, and Padungsaksawasdi 2015). Although risk-taking behavior changes with the market's state in that tournament behavior exists in a up market while the strategic behavior exists in a down market (Kempf et al. , 2009), none of three studies above took the effect of the state of the market state into account in their tournament study. Furthermore, I analyze the effect of the bank-mutual fund relationship on the tournament behavior in different market states. In order to fulfill the literature gap, I improve the model to explore this effect by testing the hypotheses below.

Hypothesis1: Market conditions affect the relationship between the interim performance and the risk adjustment of funds.

Furthermore, since there are differences between BR and NBR, I improve the model in order to explore the different tournament behavior among these two groups. In order to address this issue, I propose the hypothesis below:

Hypothesis2: BR and NBR to have a different effect on risk-shifting behavior in different market condition.

3.3 Data and methodology

In this study, the data are collected from various sources. The monthly AUM, net asset value (NAV), total returns, net flow, annual reported net expense ratio, and turnover ratio are obtained from the Morningstar Direct database. The data on market returns and risk-free rate are obtained from Thomson Reuter DATASTREAM. I focus this study on equity funds classified according to the Association of Investment Management Company (AIMC). I exclude international funds, funds of funds, index funds, bond funds, and money market funds. This sample is also free from survival bias, since Morningstar reported all of the available data for both active and inactive funds. Finally, this sample includes 172 equity funds or 1729 fund-year observations by the end of 2013.

In order to classify the BR funds and NBR funds, a list of commercial banks is obtained from BankScope. Even though the database does not provide the match bank-mutual fund relationship, I follow prior literature in order to match the bank-mutual fund relationship manually. The bank's name and the AMC's name are manually matched. Furthermore, the study is cross checked the bank-mutual fund relationship, for example the major shareholder name, by using information from each fund website in order to check the relationship with the bank manually (Berzins, Liu, and Trzcinka 2013, Hao and Yan 2012). In 2014, the study ended up then with

11 BR AMC and 11 NBR AMC respectively. These 11 BR AMCs manage 1,151 BR funds and while 11 NBR AMCs manage 350 NBR funds.

[Table 3.1]

According to Table 3.1, it can be seen that the AUM of funds grew more than the number of funds available in the market. The number of funds in the sample increased from 68 to 172 between 2000 and 2013. AUM impressively grew from 17.78 billion baht to 412.15 billion baht during the same period. As a result, the average size of the AUM expanded to 2.40 billion baht per fund by the end of 2013. Moreover, the fee charged by AMC also increase. I find that the total net expense ratio increased from 1.38% to 1.58% per year.

3.3.1 Why Thailand?

There are two main objectives of this chapter. The first one is to further analyze the persistence of risk-taking behavior in mutual fund tournament in different market condition. Second, this chapter aims to further study the effect of bank-mutual fund relationship on persistence of risk-taking behavior in mutual fund tournament. Few studies focus on the effect of market condition on risk-taking behavior in mutual fund tournament, although there are many documents suggest the existing of tournament behavior. Furthermore, these studies keep their attention only on developed markets (Kempf, Ruenzi, and Thiele 2009, Jans and Otten 2008). However, there are differences between developed markets and emerging markets. Emerging markets are found as less financial development and less information efficient. Furthermore, since the risk-taking behavior in mutual fund tournament is grounded on the fund-flow and performance convexity, the emerging markets have higher degree of fund-flow convexity and higher information cost than developed markets. As a consequence, these differences call for the question whether the finding in developed markets holds in emerging markets. As one of fast growing emerging markets, Thai mutual fund industry is an interesting market to depict both persistence of tournament behavior and the effect of bank-mutual fund relationship of this persistence of tournament behavior for several reasons.

First, Thailand is one of the important emerging markets in the South East Asian region and has exhibited a rapid economic expansion. In addition to the economic growth, the Thai mutual fund industry has expanded impressively by 29% per annum while the world mutual fund portfolio grows approximately 11% per year. Second, there is an evidence of tournament behavior in Thai market (Wattanatorn, Nathaphan, and Padungsaksawasdi 2015). Third, Thai market is dominated by debt financing though bank-loan (Prommin, Jumreornvong, and Jiraporn 2014). Hence, according to the information advantage hypothesis, BR funds gain information benefit in that banks able to share their clients' loan information with their affiliated fund. Therefore, studying the Thai mutual fund industry allows this study to find the different effects of the bank-mutual fund relationship on tournament behavior.

3.3.2 Industry overview

Thai mutual fund industry was formally founded in 1975 by the collaboration between the government of Thailand and the International Finance Corporation, which is one of World Bank subsidiaries. Mutual Fund Public Co., Ltd. was the first AMC in Thailand. This AMC solely operated in this industry between 1975 and 1992. During this period, the company operated 22 funds, including 12 domestic funds and 10 international funds. In 1992, the Security and Exchange Act BE2535 (AD, 1992) was approved by the Thai government. This act allowed the subsidiaries of commercial banks and other financial institutions to operate in the mutual fund industry. As a result, there are 22 AMC in 2014. Among these, there are 11 BR AMC and 11 NBR AMC.

The mutual fund industry in Thailand has expanded significantly. Figure 3.1 shows that the Thai mutual fund's AUM is 86 billion baht in 2000. This AUM is about 1.7% of Thai's GDP and 6.7% of the market capitalization of the Stock Exchange of Thailand (SET). However, the mutual funds industry impressively expands over the last fifteen years. By the end of 2014, the Thai AUM of the mutual fund industry expands to 3,262 billion baht, which accounts for 24% of the GDP and SET.

[Figure 3.1]

The expansion of the mutual fund industry illustrates the increasing popularity of mutual fund investment as an alternative savings channel in the Thai market. Figure 3.2 reveals that deposit savings are the largest proportion of household savings for Thais. However, this popularity of deposit savings has declined. The proportion of deposit savings to the overall household savings has become lower. This deposit savings accounts for 67% of GDP in 2000 and declines to 51% of the GDP in 2014. During the same period, mutual funds increase their size to 24% of the GDP. Life insurance also expands its size to 12% of the GDP. Furthermore, Figure 3.3 shows that the number of mutual fund accounts, and that the number of mutual fund accounts per population increased overtime. Also, the ratio between the numbers of mutual fund accounts to the number of savings accounts increase. This implies that the number of mutual fund accounts, at least, expands faster than the number of savings accounts.

[Figure 3.2]

[Figure 3.3]

3.3.3 Mutual fund classification

3.3.3.1 Opened-end and closed-end fund

Traditionally, mutual funds are broadly classified as opened-end and closed-end funds. A closed-end fund is a mutual funds that are issued a specific number of shares and a specific investment period of funds at the beginning of the fund raising. Investors can redeem their unit of investment at the date specified in the fund prospectus. On the other hand, an opened-end fund is more flexible to closed-end fund. An opened-end fund has no specific investment period. Investors can redeem their unit of investment at the NAV minus the specific fees. Like the others mutual fund markets, the Thai mutual fund industry is dominated by opened-end funds, as revealed in figure 3.4. An opened-end fund holds 90% of the industry AUM in 2014. In terms of the number of funds, opened-end funds are much more available in the market. In the same year, there are 1450 opened-end funds compared to 51 closed-end funds.

[Figure 3.4]

3.3.3.2 Investment policy

Unlike in the U.S., the mutual funds in the Thai market are not classified according to investment style. The AIMC classifies funds into six categories according to fund investment policies: equity funds, fixed income funds, mixed funds, property funds, commodity funds, and miscellaneous funds. Equity funds are mutual funds that have at least 65% of their NAV invested in equity. Fixed-income funds are mutual funds that invest mainly in debt instruments which include corporate bonds, government bonds, and bank deposits. Moreover, fixed income funds that invest in both short-term bonds and long-term bonds. The third category of mutual funds is mixed funds or balance funds. This type of fund invests in both equity and debt. However, they can invest in equity not over than 65% of their NAV. The fourth type of mutual fund is the property fund. This type of fund invests mainly in property, office buildings, factories, and land. The returns from investment are distributed to investors in the form of dividends. The fifth investment policy is the commodities fund. This type of fund invests mainly in commodities product, including the commodities index, energy, metal, and agriculture. The last type of mutual fund is classified as a miscellaneous fund, which does not fall into any of the five categories.

[Figure 3.5]

The mutual fund industry in the Thai market is dominated by fixed income funds and equity funds. Figure 3.5 demonstrates that both types account for more than 80% of market size. The largest fund type is the fixed-income fund. It accounts for more than half of the market share. The second largest fund is the equity fund. This type shares about 20% and 17.5% in 2000 and 2014 respectively.

In terms of the number of funds available, Figure 3.6 displays that all types of funds have grown significantly. Although fixed-income funds have dominated the market overtime in terms of the AUM, equity funds dominate the market in 2000. The number of equity funds increase from 62 to 335 funds between 2000 and 2014. Fixed-income funds showed dramatic increase. Fixed-income funds expand from 18 to 739 between 2000 and 2014. Mixed funds expand about 7 times, and commodity and property funds slightly increase during the same period.

[Figure 3.6]

3.3.3.3 Tax benefit fund

There are two types of taxed benefit mutual funds in the Thai market. The first type of taxed benefit fund is the retirement mutual fund (RMF). The primary purpose of this fund is to encourage a personal savings scheme. Therefore, the investment policies of the RMF vary according to the level of the investor's risk tolerance. The investors can enjoy the taxed benefit by investing in the RMF up to 15% of their annual revenue or 500,000 baht. The RMF is first launched in 2001. In order to support continuous savings, the RMF has minimum continuous investment criteria. RMF investors are required to continuously invest at no less than 5,000 baht (or 3% of the annual revenue, whichever is the lower) for at least 5 consecutive years. Moreover, these investors are allowed to redeem the unit of investment with a tax-benefit when they invest over 5 consecutive years and they are over 55 years of age.

[Figure 3.7]

With the success of the RMF, the Thai government promoted the long-term investment fund (LTF) as an alternative for tax-benefit investment in 2005. The purpose of the LTF is to stabilize the equity market by increasing the proportion of institutional investment in the Thai equity market. The LTF is the equity fund that invests not less than 65% of the AUM in the equities that are listed on the SET. As with the RMF, LTF investors can enjoy a tax benefit by investing in the RMF up to 15% of their annual revenue or 500,000 baht. However, the LTF offers more flexible benefits compared with the RMF. LTF investors are required to invest for at least 5 calendar years. Investors do not need to hold their unit of investment in LTF until they are 55 years of age as with the RMF. LTF investors can redeem the unit of investment twice a year according to date specified in the fund prospectus.

[Table 3.2]

[Table 3.3]

The less restrict investment criteria support the growth of the LTF over the RMF. By the end of 2014, there are 52 LTF funds and 82 RMF funds. However, the AUM of the LTF is almost double that of the RMF. The LTF holds 27.10 billion baht of the AUM while the RMF holds 14.67 billion baht of the AUM. Between 2004 and 2014, the LTF has the impressive cumulative average growth rate of 42.21% while the RMF and mutual fund industry grew at 25.2% and 28.2% respectively.

3.3.4 Mutual fund organization

One benefit that mutual fund investment offers to investors is that this industry is highly regulated. In 1992, the Security Exchange Commission of Thailand (SEC) issued the SEC Act of 1992 (B.E.2535) to regulate the mutual fund industry. As a result, investors are protected by the mechanism of government regulation. In Thailand, there are three major groups of stakeholders in the mutual fund industry.

1. Regulators
2. Fund operators
3. Fund investors

[Figure 3.8]

3.3.4.1 Regulator

There are two main regulators in the Thai mutual fund industry. The SEC as the government agent, is responsible for developing law and regulation. Furthermore, the SEC monitors law enforcement for any inconsistency in the rules and regulations. As a part of the SEC regulations, mutual funds are required to register with the SEC. The registered mutual funds have to provide fund information, including the fund prospectus. This prospectus include the legal fund name, investment fund type, fund objective, fee, and the expense of the fund. Furthermore, mutual funds need to provide information in their financial statements on a monthly basis. In addition, they have to report portfolio holding data semi-annual report, and annual report. The second group is the non-government agent. Every licensed AMC in the Thai mutual fund industry is a member of the AIMC. This organization is responsible for developing a standard of practice, a code of ethics, guideline for fund accounting and reporting, and performance measurement. The AIMC is also responsible for encouraging, and enforcing their members to operate according to the developed code and guidelines.

3.3.4.2 Fund operator

In order to operate funds, the SEC allows only licensed AMC to set up and operate mutual funds. This license is issued by the Ministry of Finance. The primary duty of AMC is to maximize returns to funds investor according to the funds' objective. In order to maximize investor returns, AMC provide high investment skill and highly-experienced fund managers to operate the mutual funds. In returns, the AMC charge the investor a fee.

[Table 3.4]

In the Thai mutual fund industry, AMC can be classified into BR and NBR according to their bank-mutual fund relationship. There are 13 AMC in 2000: 9 BR AMC and 4 NBR AMC. However, the number of AMC expanded to 22 AMC in 2014. Among these, there are 11 BR AMC and 11 NBR AMC. Even though there are the equal number of BR funds and NBR funds, the BR funds dominate the Thai mutual fund market. The BR funds accounts for 94% of the market share in 2000 and 93% of the market share in 2014. The BR funds also dominates the Thai mutual fund industry in terms of number of funds. BR funds has 1,151 funds compared with 350 NBR funds.

[Figure 3.9]

3.3.4.3 Fund investors

Investors are individuals or institutions who invest in mutual fund. Investors hold the right to receive the returns on their and the right to vote (if any). Consistence with the mutual fund industry expansion, the number of personal investment in mutual fund also increases. There are 0.5 million of mutual funds account in 2001. This number expands to 4.5 million account in 2014. During the same period, both ratio of this account to population and deposit saving account rise overtime. This supports the increasing popularity of mutual fund as alternative saving channel.

3.4 Empirical model

In order to make the results more robust, I apply both the portfolio-sorting method and the regression method.

3.4.1 Portfolio sorting method

I start with the portfolio sorting method called contingency table as prior literature (Brown, Harlow, and Starks 1996, Hallahan and Faff 2009, Acker and Duck 2006, Kempf, Ruenzi, and Thiele 2009, KO and HA 2011, Qiu 2003, Ramiah et al. 2012, Schwarz 2012). The prime benefit of the portfolio-sorting method is that it requires fewer assumptions about the sample distribution. In order to identify the interim winner (loser) in each annual tournament, the median of the cross-sectional funds' returns is used as the criterion. The funds that have higher (lower) interim returns than the industry median are classified as winners (losers). I perform three interim assessment periods between June, July, and August. This is because I allow the funds to fully observe the industry's interim performance and also allow them time to reallocate their investment strategies based on the interim ranking information. By analyzing three interim periods, I may observe the different tournament behavior of funds.

$$Ret_{iMt} = [(1 + r_{i1t})(1 + r_{i2t}) \ldots\ldots (1 + r_{iMt})] - 1 \qquad (1)$$

Ret_{iMt} is the interim compounding return of fund ith between the January and assessment period in month Mth of year tth. Fund ith is a winner (loser) in year tth only when its Ret_{iMt} is higher (lower) than the industry median. In order to identify the risk shifting behavior, I use the standard deviation of the fund return during January and assessment period month Mth in each year. $\sigma_{w1}(\sigma_{L1}) and\ \sigma_{w2}(\sigma_{L2})$ are the standard deviations of the winner (loser) funds in the first Mth month and the standard deviation of the winner (loser) funds in the remaining of the year. According to the tournament hypothesis, the winner funds and loser funds adjust their portfolio risk differently. The loser funds are more likely to increase their portfolio risk beyond that of the winner funds.

I quantified the risk-shifting behavior using the risk-adjusted ratio suggested by BHS, as show in Equation (3) below (Brown, Harlow, and Starks 1996).

$$RAR_{it} = \sqrt{\frac{\sum_{m=M+1}^{12}(r_{imt}-\overline{r_{\iota(12-M)t}})^2}{(12-M)-1}} \div \sqrt{\frac{\sum_{m=1}^{M}(r_{imt}-\overline{r_{\iota Mt}})^2}{M-1}} \qquad (2)$$

RAR_{it} is the risk adjusted ratio of fund ith in year tth. According to the tournament hypothesis, Ret_{iMt} and RAR_{it} are independent. Therefore, the samples in each cell of the contingency table should be allocated equally (25% of the sample per cell). In order to further test Hypothesis1, I classify this research sample into both up and down markets. I classify the market state into up (down) in the years in which the interim market returns are positive (negative) (Fabozzi and Francis 1979, Cooper, Gutierrez, and Hameed 2004, Kempf, Ruenzi, and Thiele 2009). During the sample period, there are four years, 2000, 2005, 2007, and 2012, that I identify as down market.

3.4.2 Regression method

To expand on the results of tournament behavior, the regression approach is applied. A panel-corrected standard errors (PCSE) technic is introduced to adjust for potential heteroskedasticity and autocorrelation among fund managers' risk adjustments (Beck and Katz 1995, Kempf, Ruenzi, and Thiele 2009). I follow the prior literature in order to classify interim ranking. In each annual tournament, funds are classified into portfolio1 which is called "loser", portfolio2, and portfolio3 which is called "winner". According to the tournament hypothesis, the winner (loser) funds intent to decrease (increase) their portfolio risk. As the consequence, I may expect the negative (positive) relationship between interim performance and risk-taking behavior. To test these relationships, I follow the prior literature (Kempf, Ruenzi, and Thiele 2009, Wattanatorn, Nathaphan, and Padungsaksawasdi 2015);

$$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DM_{it} + \beta_4 DB_i + \beta_5 \Delta\sigma_{it}^{m} + \beta_6 \sigma_{it}^{1} + \beta_7 lnAUM_{it} + \beta_8 Age_{it} + \varepsilon_{it} \quad (3)$$

The endogenous variable is the different of portfolio's risk between first and second part of the year of funds ith in year t which is $\Delta\sigma_{it}$. The interest exogenous variable is interim performance, Ret_{it}. To test the Hypothesis1, I define DM_t as a dummy variable to identify the market state. DM_t is "1" in market down and "0" otherwise. I define the market down (up) by the lagged return definition (Cooper, Gutierrez, and Hameed 2004, Fabozzi and Francis 1979). However, tournament hypothesis focus to study the risk-taking behavior of mutual funds at interim stage. Therefore, market down (up) is determined in the year that interim market return is negative (positive)(Kempf, Ruenzi, and Thiele 2009). In high volatility environment like market down, there are high employment risk and termination risk, hence there should be less likely for fund to increase portfolio risk. Fund managers will not act in extreme ways when allocating their portfolio. Also, the winner funds further reduce risk to save their position (Chevalier and Ellison 1995, Kempf, Ruenzi, and Thiele 2009).

To further study the impact of the bank-mutual fund relationship, DB_i is "1" for BR and is "0" for NBR. In order to test Hypothesis 2, I should expect the coefficient of DB_i to be non-zero. To robust the results, I introduce a set of control variables which are fund size (lnAUM), fund age (Age), median of industry volatility change ($\Delta\sigma_{it}^{m}$), and interim volatility (σ_{it}^{1}) to capture the effect of fund size, fund age, sector volatility change , and mean reversion of volatility respectively (Koski and Pontiff 1999, Kempf and Ruenzi 2008).

3.5 Empirical result

3.5.1 Portfolio sorting method

Table 3.5 reports the results of the portfolio sorting method. In order to reconfirm that the tournament hypothesis exists, the full sample analysis is employed as in Panel A. In all of the assessment periods of Panel A, I can reject the null hypothesis of tournament behavior at a 1% confidence level. Furthermore, the results show that the loser (winner) funds increase (decrease) their portfolio risk. For example, the distribution of the sample in Panel A, during the August assessment period, show that the loser funds exhibit a high RAR at 27.85% while the winner funds exhibit a low RAR at 27.68%.

[Table 3.5]

Next, I analyze whether the market state affects the risk-taking behavior of mutual funds. I divide this research sample into market up and down according to the interim market return. In Panel B, I apply the portfolio sorting method to the down market sample. I can reject the null hypothesis of the tournament behavior during the July and August assessment period at a 1% confidence level. In Panel C I apply the portfolio soring method to the up market sample, and I can reject the null hypothesis of the tournament behavior in all assessment periods. The results demonstrate that, in July and August assessment periods, the tournament persistently exists in Thai mutual fund industry regardless of the market state. Although the findings contradict the time-variable tournament behavior suggested by previous studies (Jans and Otten 2008), the results are supported by the majority of previous studies (Brown, Harlow, and Starks 1996, KO and HA 2011, Chen and Pennacchi 2009).

3.5.2 Regression method

[Table 3.6]

In this section, I apply the regression method as an alternative approach in order to reveal this study's findings. In Table 3.6, I study three interim assessment periods. In all of the assessment periods, I find that the winner funds lower their portfolio risk. Consistent with prior literature, the β_2 of the winner portfolios are negative and significant during all assessment periods (Brown, Harlow, and Starks 1996, Koski and Pontiff 1999, Benson, Faff, and Nowland 2007, Hu et al. 2011, Kempf, Ruenzi, and Thiele 2009). Furthermore, I can document a positive significant relationship between the interim performance and risk-shifting behavior among the loser funds during the August assessment period. The results are consistent with the prior study of the Thai market (Wattanatorn, Nathaphan, and Padungsaksawasdi 2015). During the August assessment period, I find different risk-shifting behavior in that the winner (loser) portfolio lowers (increases) their portfolio risk by 3.1% (1.9%). In all of the interim assessment periods, I document a positive and significant impact of the market down, the $\beta_3 > 0$, at a 1% confidence level. This means that the high volatility in down market increases the risk-shifting behavior of the mutual funds during all assessment periods by 1-2.5%. I further analyze the impact of the bank-mutual fund relationship. During all of the interim assessment periods, I can reject the β_4, null hypothesis2, at a 1% confidence level for the winner funds. I find the positively significant relationship between the bank-mutual fund and risk-shifting behavior. The results suggest that the BR winner funds are likely to increase their portfolio risk by 0.4% beyond that of the NBR funds. Although I can reject null hypothesis2 and find that the β_4 is positively significant at a 1% confident level for the winner funds, I cannot reject the β_4 of loser funds during any interim assessment period for the loser portfolio. Controlling for fund age and fund size, I find the fund age and fund size cannot explain the risk-taking behavior among Thai mutual funds.[3]

[Table 3.7]

Next, I further explore the risk-taking behavior in different market states. In Table 3.7, the results are consistent with the previous section, I document the tournament behavior during the August assessment period, particularly for the up market. I find a negative (positive) significant relationship between the interim performance and risk-taking behavior for the winner (loser) funds in the up market. This finding is consistent with previous research (Kempf, Ruenzi, and Thiele 2009). In a down market, although the results finds the negative relationship between interim performance and risk-shifting behavior of winner funds, I find a positive insignificant

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[3] As the fund manager takes more risk to increase their revenue and incentive, I have included the management fee as additional control variable. I then perform following equation;
$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DM_{it} + \beta_4 DB_i + \beta_5 \Delta\sigma_{it}^{m} + \beta_6 \sigma_{it}^{1} + \beta_7 lnAUM_{it} + \beta_8 Age_{it} + \beta_8 \mathrm{Mgtfee}_i$
However, I find the results remain unchanged in all markets and report the results in Appendix B.

relationship for the loser funds. Regarding the bank-mutual fund relationship, the results are consistent with the previous section. I find that this relationship affected the risk-shifting behavior for the winner funds. The BR winner funds are likely to increase the portfolio risk compared to the NBR winner funds.

[Table 3.8]

I further analyze the impact of the bank-mutual fund relationship in the tournament framework. In Table 3.8, I divide the funds sample into two groups according to their bank-mutual fund relationship. In Panel A, I perform the regression according to equation (4) on the sample of the BR group. The results here are consistent with the previous section. I document the evidence of tournament behavior during the August assessment period. In Panel B, I cannot to document evidence of tournament behavior. However, in both Panel, the market state is found to be a significant factor in explaining the funds' risk-shifting behavior. All portfolios, the β_3 is found to be positive and significant. I then explore the effect of bank-mutual relationship on risk-taking behavior in different market state.

[Table 3.9]

In Table 3.9, I further analyze the different behavior of the bank-mutual fund relationship and risk-shifting behavior in various market states. This table is divided into two panels. Panel A shows the results for the BR funds and Panel B shows the results for the NBR funds. In each panel, the samples are divided into up and down markets. For the BR panel, the results are consistence with the previous findings. In the August assessment period, the results suggest that tournament behavior exists in the Thai BR funds. However, I find less evidence of tournament behavior in other June, and July assessment periods.

3.6 Conclusion

The original idea of mutual fund tournament behavior suggests that the interim winner (loser) funds lower (increase) their portfolio risk in the second half of the year in order to maintain (boost) their industrial ranking. The strategic behavior are documented as alternative explanation. This strategic behavior suggests that winner funds see an advantage in increasing their risk exposure in the second half of the year. Most of the previous studies, however, are conducted in developed markets.

In this study, I aim to further explore the tournament behavior in Thailand, which is one of the emerging markets. The results are robust using both the portfolio sorting method and regression method. The findings can be summarized as follows. First, I find that tournament behavior persistently exists in the Thai mutual funds market during the August assessment period. Second, the market states positively affect the risk-shifting behavior of the mutual funds. I find that part of mutual funds risk-shifting is driven by the market down states. Third, I document the different tournament behavior between BR and NBR funds. I find strong evidence of tournament behavior among the BR funds. Furthermore, I find that the tournament behavior among the BR funds persisted in both up and down markets. There are two possible explanations for this finding. The first is that BR fund portfolio allocations are driven by the information advantage they obtained from the bank affiliate or client. An alternative explanation is that BR fund portfolio allocations are driven by conflict of interest. BR funds hold strictly to their client stock and thus lose the benefit of diversification and increase their portfolio risk.

Table 3.1 Sample Descriptive statistics and Pearson's correlation matrix.

In Panel A, the table report the sample descriptive statistic between 2000 and 2013. Nof is the number of funds available each year. $\overline{Age}$, $\overline{AUM}, \overline{TOV}$, and $\overline{Fee}$ are reported as the cross-sectional average fund age, asset under management, turnover, and fund annual net expense ratio. AUM is the total asset under management at each year's end. $Med(Ri^1)$, Rm^1, and $Med(\sigma^1)$ are the median for return, market return, and median for return standard deviation between January and August of each year. In Panel B, the table report the Pearson's correlation matrix for August assessment period.

Year	**Nof**	$\overline{Age}$ **(year)**	**AUM (Billion)**	$\overline{AUM}$ **(Billion)**	$\overline{TOV}$ **(Times)**	$\overline{Fee}$ **%**	$Med(Ri^1)$ **%**	Rm^1 **%**	$Med(\sigma^1)$ **%**
2000	68	3.75	17.78	0.26	N/A	N/A	-30.99	-25.55	-2.08%
2001	73	4.42	20.11	0.28	N/A	N/A	13.31	9.75	-0.18%
2002	82	4.83	24.94	0.30	N/A	N/A	3.19	3.52	-1.52%
2003	92	5.20	80.47	0.87	N/A	N/A	23.91	23.35	2.41%
2004	128	4.45	79.51	0.62	N/A	N/A	-11.22	16.73	-1.22%
2005	138	5.06	82.00	0.59	N/A	N/A	1.45	-8.52	-0.16%
2006	145	5.77	84.70	0.58	279.28	1.38	-1.57	10.72	-0.52%
2007	168	5.84	121.38	0.72	346.49	1.41	15.16	25.55	2.88%
2008	170	6.76	98.97	0.58	460.44	1.44	-6.29	9.75	5.45%
2009	169	7.56	157.76	0.93	351.60	1.50	27.39	3.52	-1.46%
2010	170	8.51	226.54	1.33	530.78	1.58	6.61	23.35	-1.80%
2011	170	9.47	253.81	1.49	654.34	1.55	0.56	16.73	2.11%
2012	172	10.26	343.62	2.00	526.88	1.57	14.32	-8.52	-2.42%
2013	172	11.26	412.15	2.40	390.86	1.58	6.23	10.72	0.22%

Table 3.1: (Continue)

PANEL B: Pearson's Correlation matrix								
	$\Delta\sigma_{it}$	Ret_{it}	Ddown_{t}	$\Delta\sigma_{it}^{m}$	σ_{it}^{1}	lnAUM_{it}	lnAge_{it}	$\mathrm{Mgt\_fee}_{i}$
$\Delta\sigma_{it}$	1.0000							
Ret_{it}	-0.5850	1.0000						
	(0.0000)							
Ddown_{t}	0.7143	-0.4706	1.0000					
	(0.0000)	(0.0000)						
$\Delta\sigma_{it}^{m}$	0.7963	-0.5295	0.8783	1.0000				
	(0.0000)	(0.0000)	(0.0000)					
σ_{it}^{1}	0.2207	0.0438	0.1147	0.1369	1.0000			
	(0.0000)	(0.1688)	(0.0003)	(0.0000)				
lnAUM_{it}	-0.0849	0.0007	-0.1066	-0.1078	-0.1989	1.0000		
	(0.0078)	(0.9826)	(0.0007)	(0.0006)	(0.0000)			
lnAge_{it}	-0.1602	0.0625	-0.1820	-0.1588	0.1378	-0.0302	1.0000	
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.3507)		
$\mathrm{Mgt\_fee}_{i}$	-0.0052	0.0472	0.0000	0.0000	0.1260	-0.1664	0.0317	1.0000
	(0.8699)	(0.1326)	(1.0000)	(1.0000)	(0.0001)	(0.0000)	(0.2983)	

Table 3.2 Summary of tax benefit funds.

	LTF	RMF
Fund objective	To improve equity market stabilization	To encourage personal savings for retirement purposes
Investment policy	1) Only equity investment policy 2) LTF funds invest more than 65% of AUM in SET.	Various investment policies
Criteria for tax-benefit	1) Invest before 2016 2) Hold for at least 5 calendar years	1) Continuous investment at minimum of 5,000 baht (or 3% of income, whichever is lower) 2) Redeem after the age of 55 years
Tax-benefit	1) Up to 15% income tax credit 2) (Maximum 500,000 Baht) 3) Exemption from capital gains tax	1) If criteria for tax-benefit 1) and 2) are met, the investors benefit: 1.1) Up to 15% income tax benefit (Maximum 500,000 Baht). 1.2) Exemption from capital gains tax. 2) If only criterion 1) is met, the investors benefit: 2.1) Exemption from capital gains tax
Dividend policy	1) Dividend policy depends on fund's annual profit. 1.1) Dividend cannot excess of 30% of cumulative profit. 1.2) Dividend cannot excess annual net profit. 1.3) Dividend is 3.1) or 3.2) which is lower. 1) Investors are subjected to 10% withholding tax.	1) No dividend policy

Table 3.3 Tax benefit funds in Thai market between 2004 and 2014.

The table compares the AUM and number of funds between general funds and tax benefit funds.

	2004	2014
Asset under management (AUM)		
- RMF	12,383,517,034	146,758,349,421
- LTF	5,633,941,678	271,023,458,203
- Mutual fund industry	211,162,280,370	3,262,041,437,884
Number of Funds		
- RMF	58	82
- LTF	22	53
- Mutual fund industry	251	310

Table 3.4 Mutual funds classified by bank-mutual fund relationship.

The tables reports the growth of BR and NBR between 2000 and 2014.

	2000	2014
Number of funds		
BR funds	67	1,151
NBR funds	28	350
Asset under management (AUM)		
BR funds	80,883,429,758	3,031,361,259,871
NBR funds	5,460,587,888	230,680,178,013
Market share by AUM		
BR funds	94%	93%
NBR funds	6%	7%
Number of Asset Management Companies		
BR AMCs	9	11
NBR AMCs	4	11

Table 3.5 Portfolio sorting method results.

RTN is the interim performance as in equation (1). Funds are classified as "HIGH" ("LOW") RTN if RTN is higher (lower) than the industry median. RAR is the risk adjusted ratio as in equation (2). Funds are classified as "HIGH" ("LOW") RAR if the funds' RAR is higher (lower) than the industry median.

Panel A: Full Sample (Years 2000-2013)							
Interim		LOW RTN		HIGH RTN			
Period	Obs	LOW	HIGH	LOW	HIGH	Chi2	P-value
Month		RAR	RAR	RAR	RAR		
6,6	1729	23.51	26.81	26.69	22.99	8.4844	0.004***
7,5	1729	22.35	27.79	27.85	22.01	22.0231	0.000***
8,4	1729	22.52	27.85	27.68	21.95	21.1371	0.000***
Panel B: Market down							
Interim		LOW RTN		HIGH RTN			
Period	Obs	LOW	HIGH	LOW	HIGH	Chi2	P-value
Month		RAR	RAR	RAR	RAR		
6,6	214	23.83	25.7	26.64	23.83	0.4656	0.495
7,5	214	19.16	30.37	31.31	19.16	11.6755	0.001***
8,4	214	18.22	30.84	32.24	18.69	14.641	0.000***
Panel C: Market up							
Interim		LOW RTN		HIGH RTN			
Period	Obs	LOW	HIGH	LOW	HIGH	Chi2	P-value
Month		RAR	RAR	RAR	RAR		
6,6	1513	23.46	26.97	26.7	22.87	8.1504	0.004***
7,5	1513	22.8	27.43	27.36	22.41	13.9011	0.000***
8,4	1513	23.13	27.43	27.03	22.41	12.0573	0.001***

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.6 Regression approach results.

This table reports the regression approach according to equation (3).

$$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DM_{it} + \beta_4 DB_i + \beta_5 \Delta\sigma_{it}^m + \beta_6 \sigma_{it}^1 + +\beta_7 lnAUM_{it} + \beta_8 Age_{it} + \varepsilon_{it}$$

The endogenous variable is change in portfolio risk, $\Delta\sigma_{it}$. The independent variables are $rank_{it}$, which is the interim performance classified into three portfolios: Portfolio1 (loser), portfolio2, Portfolio3 (winner). DM_t is the market DOWN dummy. DM_t equals "1" in the DOWN market and 0 otherwise. DB_i equals "1" if the funds are BR funds and "0" otherwise. $\Delta\sigma_{it}^m$ is segment volatility change. σ_{it}^1 is the funds' volatility for the first half of the year. Ln(AUM) is the funds' size, and Age is the funds age.

	M6			M7		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.00184	-0.00548	-0.0128*	0.00409	-0.00313	-0.0199**
	(0.807)	(0.366)	(0.088)	(0.583)	(0.625)	(0.014)
β_3	0.0130***	0.000327	0.0104***	0.0161***	0.000971	0.0190***
	(0.000)	(0.907)	(0.001)	(0.000)	(0.724)	(0.000)
β_4	-0.000542	0.000225	0.00439***	-0.00115	0.00300**	0.00520***
	(0.726)	(0.882)	(0.006)	(0.448)	(0.039)	(0.001)
β_5	0.683***	0.926***	0.759***	0.717***	0.969***	0.697***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	-0.135***	-0.0529	0.0113	-0.0761**	-0.0383	0.0165
	(0.000)	(0.199)	(0.721)	(0.014)	(0.374)	(0.585)
β_7	0.000243	0.000408	-0.000857	0.000249	-0.000061	0.000128
	(0.592)	(0.486)	(0.107)	(0.556)	(0.912)	(0.800)
β_8	0.000615	0.000878	-0.000810	0.0000308	-0.000349	0.000484
	(0.520)	(0.300)	(0.411)	(0.976)	(0.658)	(0.583)
α	0.00197	-0.00520	0.0238**	0.000196	0.00462	0.00756
	(0.832)	(0.676)	(0.040)	(0.982)	(0.703)	(0.532)
N	485	494	500	483	498	498
Adj-R^2	65.1	79.7	57.0	68.9	79.4	47.1

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.6 (Continued)

	M8		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0194**	-0.00874	-0.0317***
	(0.012)	(0.138)	(0.000)
β_3	0.0200***	0.00880***	0.0253***
	(0.000)	(0.004)	(0.000)
β_4	0.00105	-0.000234	0.00421**
	(0.507)	(0.871)	(0.010)
β_5	0.719***	1.069***	0.778***
	(0.000)	(0.000)	(0.000)
β_6	-0.0159	0.0225	0.0703**
	(0.619)	(0.585)	(0.033)
β_7	0.000191	0.000761	-0.00000519
	(0.655)	(0.191)	(0.993)
β_8	0.00130	0.000137	0.000804
	(0.155)	(0.874)	(0.438)
α	-0.00722	-0.0103	0.0182
	(0.405)	(0.394)	(0.179)
N	475	505	499
Adj-R^2	73.8	81.2	48.0

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.7 Tournament behavior in various market states.

This table analyzes the tournament behavior in various market states as follows: $\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_4 DB_i + \beta_5 \Delta\sigma_{it}^m + \beta_6 \sigma_{it}^1 + +\beta_7 lnAUM_{it} + \beta_8 Age_{it} + \varepsilon_{it}$

The endogenous variable is change in portfolio risk, $\Delta\sigma_{it}$. The independent variables are Ret_{it} which are Portfolio1 (loser), portfolio2, Portfolio3 (winner). DM_t is the market DOWN dummy. DM_t equals "1" in the DOWN market and 0 otherwise. DB_i equals "1" if the funds are in the BR group and "0" otherwise. $\Delta\sigma_{it}^m$ is segment volatility change. σ_{it}^1 is the funds' volatility for the first half of the year. Ln(AUM) is the funds' size, and Age is the funds' age. The sample is divided into market down period and up period. Ddown is the market down period analysis. Dup is the market up period analysis.

	M6					
	Ddown			Dup		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0200	0.0179	-0.0420	-0.00408	-0.0116**	-0.00514
	(0.543)	(0.426)	(0.207)	(0.556)	(0.032)	(0.455)
β_4	-0.00427	-0.00607	0.0216***	0.000476	0.00106	0.00288**
	(0.597)	(0.183)	(0.000)	(0.732)	(0.423)	(0.046)
β_5	1.006***	1.478***	0.622***	0.653***	0.891***	0.761***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	0.421**	0.637***	0.579***	-0.170***	-0.123***	-0.0814***
	(0.038)	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)
β_7	0.00311	0.00247	-0.00184	-0.0000563	-0.0000115	-0.000125
	(0.137)	(0.174)	(0.336)	(0.891)	(0.982)	(0.791)
β_8	0.00451	0.000341	-0.00356	-0.000591	-0.000404	-0.000695
	(0.229)	(0.889)	(0.304)	(0.491)	(0.592)	(0.433)
α	-0.0951**	-0.119***	0.0382	0.0110	0.0114	-0.000660
	(0.023)	(0.001)	(0.464)	(0.198)	(0.280)	(0.949)
N	64	61	63	421	433	437
Adj-R^2	56.5	75.2	71.3	53.4	76.9	59.4

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.7 (continued)

	M7					
	Ddown			Dup		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.0381	-0.00478	-0.0410	0.0151**	-0.00283	-0.00836
	(0.194)	(0.781)	(0.200)	(0.036)	(0.662)	(0.289)
β_4	-0.00479	0.0000666	0.0167***	0.000234	0.00367**	0.00322**
	(0.443)	(0.987)	(0.002)	(0.867)	(0.011)	(0.026)
β_5	1.177***	1.230***	0.424***	0.603***	0.927***	0.766***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	0.295*	0.541***	0.401***	-0.0887***	-0.0940**	-0.0593*
	(0.092)	(0.000)	(0.001)	(0.003)	(0.012)	(0.050)
β_7	0.00301*	0.00415**	-0.000903	-0.000153	-0.000577	0.000659
	(0.051)	(0.015)	(0.599)	(0.693)	(0.269)	(0.144)
β_8	-0.000306	0.00115	0.000394	-0.000705	-0.00143**	0.000325
	(0.917)	(0.613)	(0.896)	(0.479)	(0.046)	(0.671)
α	-0.0753**	-0.127***	0.0226	0.00707	0.0189*	-0.00737
	(0.020)	(0.001)	(0.647)	(0.376)	(0.089)	(0.505)
N	64	63	61	419	435	437
Adj-R^2	70.6	82.6	56.0	40.5	66.2	52.3

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.7 (continued)

	M8					
	Ddown			Dup		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0305	-0.0327	-0.0726*	0.0153**	-0.00633	-0.0156**
	(0.375)	(0.145)	(0.010)	(0.027)	(0.259)	(0.023)
β_4	-0.00151	-0.00679	0.0155**	0.00195	0.000866	0.00197*
	(0.835)	(0.153)	(0.024)	(0.165)	(0.534)	(0.98)
β_5	1.129***	1.405***	0.575***	0.507***	1.027***	0.896***
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)
β_6	0.347*	0.729***	0.494***	0.0109	-0.0230	-0.00757
	(0.053)	(0.000)	(0.010)	(0.707)	(0.553)	(0.770)
β_7	0.00245	0.00414*	-0.00139	-0.000165	0.000283	0.000538
	(0.212)	(0.071)	(0.560)	(0.646)	(0.613)	(0.241)
β_8	0.00187	0.00174	-0.00316	0.0000325	-0.00124*	0.00100
	(0.526)	(0.517)	(0.392)	(0.968)	(0.096)	(0.225)
α	-0.0804**	-0.137***	0.0542	0.00184	0.00214	-0.00180
	(0.039)	(0.009)	(0.457)	(0.801)	(0.851)	(0.868)
N	65	62	61	410	443	438
Adj-R^2	75.5	81.0	52.9	32.7	69.5	55.9

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.8 Tournament behavior in BR funds and NBR funds.

This table controls for the BR and NBR relationship and shows the regression results as follows:

$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DM_{it} + \beta_5 \Delta\sigma_{it}^{m} + \beta_6 \sigma_{it}^{1} + + \beta_7 lnAUM_{it} + \beta_8 Age_{it} + \varepsilon_{it}$

The endogenous variable is change in portfolio risk, $\Delta\sigma_{it}$. The independent variables are Ret_{it} which are Portfolio1 (loser), portfolio2, Portfolio3 (winner). DM_t is the market DOWN dummy. DM_t equals "1" in the DOWN market and 0 otherwise. DB_i equals "1" if the funds are in the BR group and "0" otherwise. $\Delta\sigma_{it}^{m}$ is segment volatility change. σ_{it}^{1} is the funds' volatility for the first half of the year. Ln(AUM) is the funds' size, and Age is the funds' age.

Panel A : BR funds			
	M6		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.00704	-0.0113	-0.00930
	(0.460)	(0.143)	(0.343)
β_3	0.0109***	-0.000767	0.00942**
	(0.002)	(0.831)	(0.026)
β_5	0.666***	0.911***	0.790***
	(0.000)	(0.000)	(0.000)
β_6	-0.0992***	-0.0359	0.0159
	(0.009)	(0.464)	(0.692)
β_7	0.000623	0.000600	-0.000882
	(0.231)	(0.385)	(0.167)
β_8	0.00128	0.00174	-0.000917
	(0.278)	(0.135)	(0.499)
α	-0.00751	-0.00836	0.0255*
	(0.499)	(0.598)	(0.087)
N	319	335	337
Adj-R^2	62.0	77.3	55.6

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.8 (Continued)

	Panel A : BR funds		
	M7		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.00131	-0.00819	-0.0209**
	(0.883)	(0.336)	(0.044)
β_3	0.0128***	0.000196	0.0176***
	(0.001)	(0.957)	(0.000)
β_5	0.719***	0.993***	0.735***
	(0.000)	(0.000)	(0.000)
β_6	-0.0383	-0.0510	0.0437
	(0.293)	(0.320)	(0.258)
β_7	0.000622	0.000195	0.00000878
	(0.186)	(0.779)	(0.989)
β_8	0.000940	0.000896	0.00118
	(0.451)	(0.404)	(0.294)
α	-0.0102	0.00315	0.0131
	(0.293)	(0.848)	(0.396)
N	330	333	328
Adj-R^2	65.4	77.8	46.6

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.8 (Continued)

	Panel A : BR funds		
	M8		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0263***	-0.00668	-0.0401***
	(0.003)	(0.395)	(0.000)
β_3	0.0165***	0.00979**	0.0252***
	(0.000)	(0.025)	(0.000)
β_5	0.749***	1.057***	0.832***
	(0.000)	(0.000)	(0.000)
β_6	0.00164	0.0361	0.0859**
	(0.965)	(0.473)	(0.037)
β_7	0.000336	0.00114*	0.000152
	(0.496)	(0.090)	(0.823)
β_8	0.00188*	0.00171	0.000961
	(0.092)	(0.156)	(0.486)
α	-0.0117	-0.0226	0.0248
	(0.252)	(0.129)	(0.150)
N	327	331	333
Adj-R^2	73.2	78.0	49.1

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.8 (Continued)

	Panel B: NBR funds		
	M6		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.00201	0.0113	-0.0217*
	(0.867)	(0.251)	(0.056)
β_3	0.0158***	0.000375	0.0137***
	(0.001)	(0.929)	(0.004)
β_5	0.725***	0.976***	0.695***
	(0.000)	(0.000)	(0.000)
β_6	-0.218***	-0.104	-0.000502
	(0.001)	(0.139)	(0.991)
β_7	-0.00106	-0.000752	-0.000660
	(0.210)	(0.406)	(0.472)
β_8	-0.00131	-0.00123	-0.00109
	(0.412)	(0.269)	(0.416)
α	0.0322*	0.0144	0.0288
	(0.070)	(0.434)	(0.133)
N	166	159	163
Adj-R^2	72.0	85.4	58.6

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.8 (Continued)

	Panel B : NBR funds		
	M7		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0137	0.00460	-0.0180
	(0.289)	(0.629)	(0.141)
β_3	0.0233***	0.00131	0.0238***
	(0.000)	(0.733)	(0.000)
β_5	0.695***	0.950***	0.599***
	(0.000)	(0.000)	(0.000)
β_6	-0.169***	-0.00299	-0.0509
	(0.003)	(0.966)	(0.250)
β_7	-0.00112	-0.000839	0.000253
	(0.218)	(0.348)	(0.768)
β_8	-0.00201	-0.00246**	-0.000970
	(0.218)	(0.021)	(0.480)
α	0.0310	0.0176	0.00988
	(0.103)	(0.314)	(0.623)
N	153	165	170
Adj-R^2	76.8	83.9	44.0

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.8 (Continued)

	Panel B : NBR funds		
	M8		
	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.00391	-0.00948	-0.0116
	(0.796)	(0.245)	(0.372)
β_3	0.0316***	0.00808**	0.0270***
	(0.000)	(0.023)	(0.000)
β_5	0.592***	1.107***	0.653***
	(0.000)	(0.000)	(0.000)
β_6	-0.0368	-0.0298	0.0331
	(0.552)	(0.612)	(0.484)
β_7	-0.000673	-0.000603	-0.000472
	(0.458)	(0.561)	(0.675)
β_8	0.0000586	-0.00242**	-0.000253
	(0.969)	(0.034)	(0.851)
α	0.0162	0.0225	0.0147
	(0.392)	(0.278)	(0.575)
N	148	174	166
Adj-R^2	76.8	87.4	42.9

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.9 Tournament behavior in BR funds and NBR funds in different market states.

This table analyzes the tournament behavior in the BR and NBR group in different market states as follow:

$$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_5 \Delta\sigma_{it}^{m} + \beta_6 \sigma_{it}^{1} + +\beta_7 lnAUM_{it} + \beta_8 Age_{it} + \varepsilon_{it}$$

The endogenous variable is change in portfolio risk, $\Delta\sigma_{it}$. The independent variables are Ret_{it}, which are Portfolio1 (loser), portfolio2, Portfolio3 (winner). DM_t is the market DOWN dummy. DM_t equals "1" in the DOWN market and 0 otherwise. DB_i equals "1" if the funds are in BR group and "0" otherwise. $\Delta\sigma_{it}^{m}$ is segment volatility change. σ_{it}^{1} is the funds' volatility for the first half of the year. Ln(AUM) is the funds' size, and Age is the funds' age

	M6 : BR					
	Ddown			Dup		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.0224***	0.0111	-0.0625*	-0.00266	-0.0104	-0.00610
	(0.008)	(0.683)	(0.087)	(0.132)	(0.210)	(0.548)
β_5	1.009***	1.270***	0.0334	0.777***	0.949***	0.830***
	(0.000)	(0.000)	(0.578)	(0.000)	(0.000)	(0.000)
β_6	-0.473***	0.577***	-0.460***	-0.0591***	-0.122***	-0.0316
	(0.000)	(0.001)	(0.001)	(0.004)	(0.005)	(0.430)
β_7	0.000686	0.00298	-0.00129	0.000342	-0.000238	0.000706
	(0.689)	(0.186)	(0.319)	(0.274)	(0.713)	(0.177)
β_8	0.00139	0.00195	0.00138	-0.0000806	-0.000555	0.000716
	(0.586)	(0.530)	(0.671)	(0.897)	(0.561)	(0.435)
α	-0.0412	-0.118**	0.0834	-0.00130	0.0191	-0.00890
	(0.263)	(0.021)	(0.102)	(0.845)	(0.198)	(0.511)
N	40	40	45	290	293	283
Adj-R^2	64.8	82.3	57.0	52.3	66.4	53.9

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.9 (Continued)

	M7 : BR					
	Ddown			Dup		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.0595*	0.0111	-0.0625*	0.00983	-0.0104	-0.00610
	(0.090)	(0.683)	(0.087)	(0.236)	(0.210)	(0.548)
β_5	1.250***	1.270***	0.0334	0.576***	0.949***	0.830***
	(0.000)	(0.000)	(0.578)	(0.000)	(0.000)	(0.000)
β_6	0.505***	0.577***	0.460***	-0.0569*	-0.122***	-0.0316
	(0.010)	(0.001)	(0.001)	(0.097)	(0.005)	(0.430)
β_7	0.00248	0.00298	-0.00129	0.000246	-0.000238	0.000706
	(0.238)	(0.186)	(0.319)	(0.554)	(0.713)	(0.177)
β_8	0.00100	0.00195	0.00138	0.0000875	-0.000555	0.000716
	(0.823)	(0.530)	(0.671)	(0.942)	(0.561)	(0.435)
α	-0.0857*	-0.118**	0.0834	-0.00238	0.0191	-0.00890
	(0.066)	(0.021)	(0.102)	(0.780)	(0.198)	(0.511)
N	40	40	45	290	293	283
Adj-R^2	81.4	82.3	57.0	38.7	66.4	53.9

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.9 (Continued)

M8 : BR						
	Ddown			Dup		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0580*	-0.0511*	-0.0822*	0.0185**	-0.00337	-0.0204**
	(0.066)	(0.084)	(0.098)	(0.021)	(0.637)	(0.016)
β_5	1.140***	1.705***	0.469*	0.527***	0.970***	1.006***
	(0.000)	(0.000)	(0.093)	(0.000)	(0.000)	(0.000)
β_6	0.415**	0.978***	0.472**	0.0216	-0.00920	0.0169
	(0.014)	(0.000)	(0.047)	(0.519)	(0.844)	(0.597)
β_7	0.00101	-0.000109	-0.0000188	0.0000928	0.000935	0.000527
	(0.666)	(0.964)	(0.993)	(0.821)	(0.146)	(0.327)
β_8	0.00365	0.00353	-0.00347	0.000226	-0.000408	0.00141
	(0.398)	(0.297)	(0.457)	(0.820)	(0.677)	(0.178)
α	-0.0655	-0.0909	0.0578	-0.00270	-0.0138	0.00221
	(0.189)	(0.116)	(0.461)	(0.752)	(0.317)	(0.871)
N	44	36	45	283	295	288
Adj-R^2	82.7	85.2	45.9	35.3	66.8	59.7

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.9 (Continued)

M6 : NBR						
	Ddown			Dup		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0354	-0.0249	-0.0302	0.0254*	0.00998	-0.0137
	(0.120)	(0.121)	(0.269)	(0.054)	(0.344)	(0.255)
β_5	1.070***	1.093***	0.979***	0.691***	0.933***	0.654***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	-0.808***	0.330	0.639***	-0.185***	-0.00941	-0.110**
	(0.000)	(0.304)	(0.000)	(0.001)	(0.894)	(0.012)
β_7	0.00238	0.00482**	-0.00162	-0.00177**	-0.00162*	0.000474
	(0.389)	(0.035)	(0.462)	(0.047)	(0.054)	(0.577)
β_8	-0.000662	0.0000410	-0.00183	-0.00270	-0.00304***	-0.000396
	(0.757)	(0.989)	(0.160)	(0.111)	(0.002)	(0.781)
α	-0.0864	-0.106*	-0.000845	0.0431**	0.0311*	0.00392
	(0.142)	(0.084)	(0.989)	(0.023)	(0.066)	(0.841)
N	24	23	16	129	142	154
Adj-R^2	78.6	87.6	93.7	49.7	68.8	46.1

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.9 (Continued)

	M7 : NBR					
	Ddown			Dup		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.0396	-0.0249	-0.0302	0.0254*	0.00998	-0.0137
	(0.320)	(0.121)	(0.269)	(0.054)	(0.344)	(0.255)
β_5	1.004***	1.093***	0.979***	0.691***	0.933***	0.654***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	-0.571***	0.330	-0.639***	-0.185***	-0.00941	-0.110**
	(0.000)	(0.304)	(0.000)	(0.001)	(0.894)	(0.012)
β_7	-0.00313	0.00482**	-0.00162	-0.00177**	-0.00162*	0.000474
	(0.126)	(0.035)	(0.462)	(0.047)	(0.054)	(0.577)
β_8	-0.00206	0.0000410	-0.00183	-0.00270	-0.00304***	-0.000396
	(0.278)	(0.989)	(0.160)	(0.111)	(0.002)	(0.781)
α	-0.0797*	-0.106*	-0.000845	0.0431**	0.0311*	0.00392
	(0.061)	(0.084)	(0.989)	(0.023)	(0.066)	(0.841)
N	24	23	16	129	142	154
Adj-R^2	78.3	87.6	93.7	49.7	68.8	46.1

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 3.9 (Continued)

M8 : NBR						
	Ddown			Dup		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.0522	-0.000222	-0.0710**	0.00423	-0.00498	-0.00298
	(0.407)	(0.991)	(0.027)	(0.761)	(0.562)	(0.789)
β_5	0.920***	1.103***	0.939***	0.455***	1.162***	0.677***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	-0.194	0.550**	0.664***	-0.0125	-0.0547	-0.0390
	(0.636)	(0.028)	(0.000)	(0.831)	(0.380)	(0.355)
β_7	0.000813	0.00882***	-0.00723***	-0.00143*	-0.00167*	0.000782
	(0.671)	(0.002)	(0.004)	(0.077)	(0.079)	(0.353)
β_8	-0.000935	0.000226	-0.000918	-0.000443	-0.00250**	-0.0000267
	(0.772)	(0.950)	(0.729)	(0.752)	(0.026)	(0.983)
α	0.0186	-0.206***	0.135*	0.0298*	0.0414**	-0.0141
	(0.671)	(0.006)	(0.058)	(0.082)	(0.032)	(0.470)
N	21	26	16	127	148	150
Adj-R^2	52.1	87.2	92.0	27.4	77.0	46.6

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

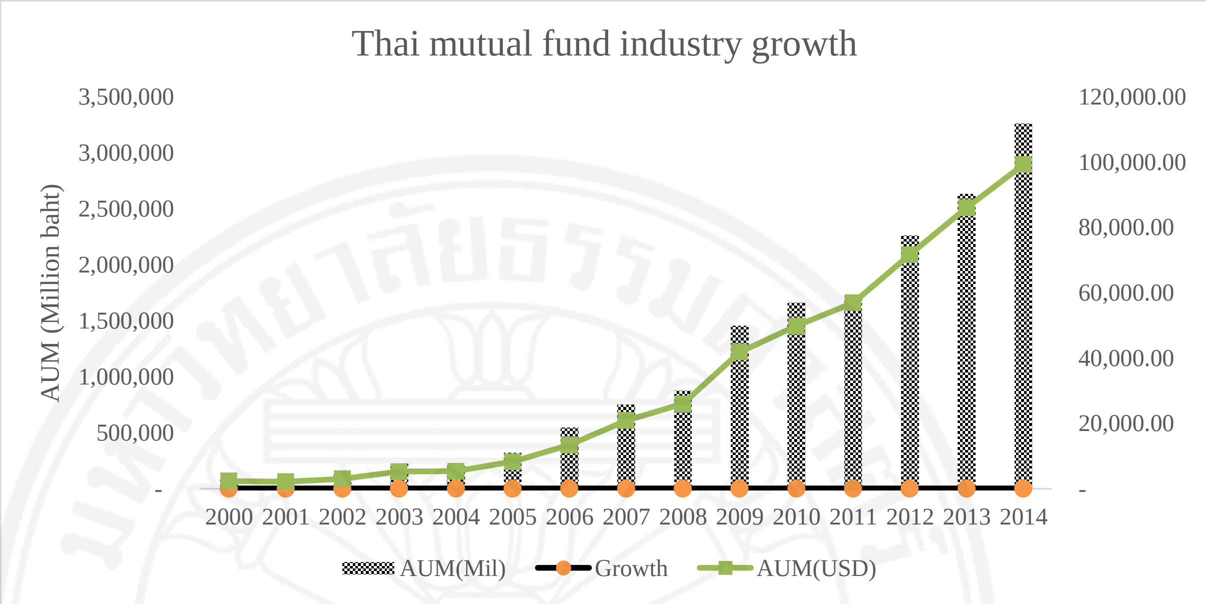

Figure 3.1: Thai mutual fund industry growth.

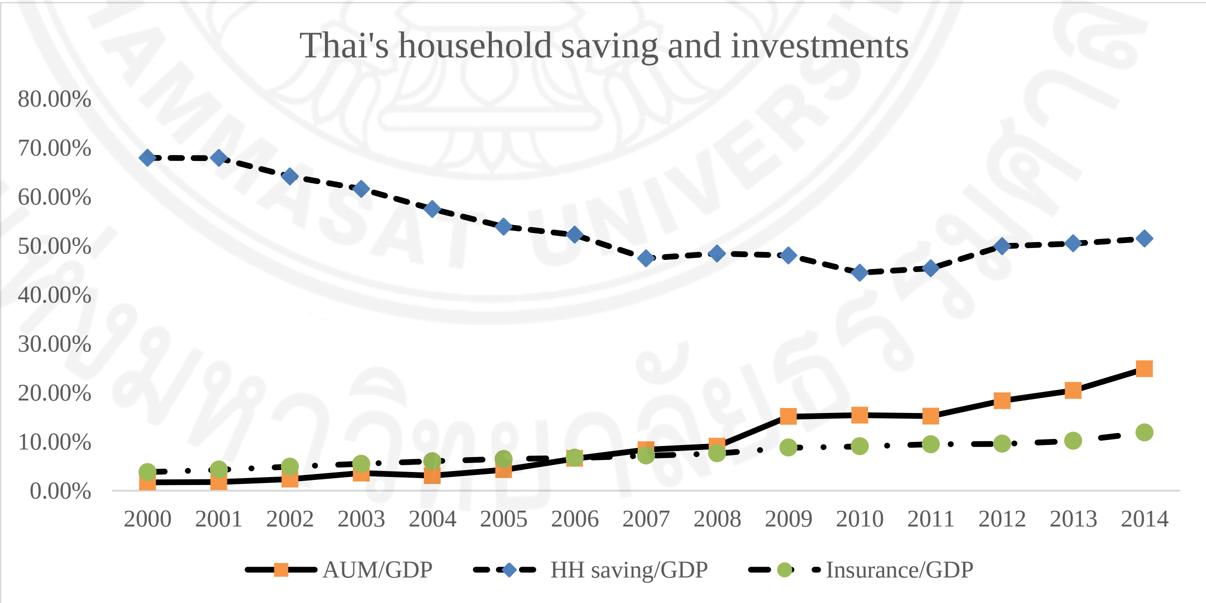

Figure 3.2: Thai’s household saving and investment.

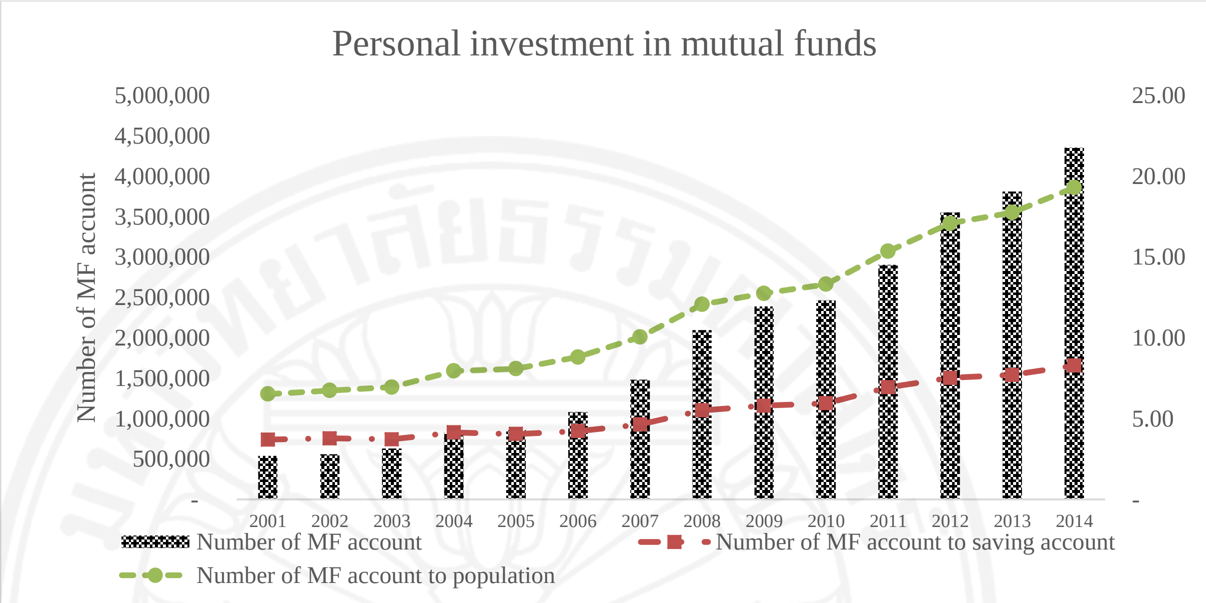

Figure 3.3: Personal investment in mutual funds.

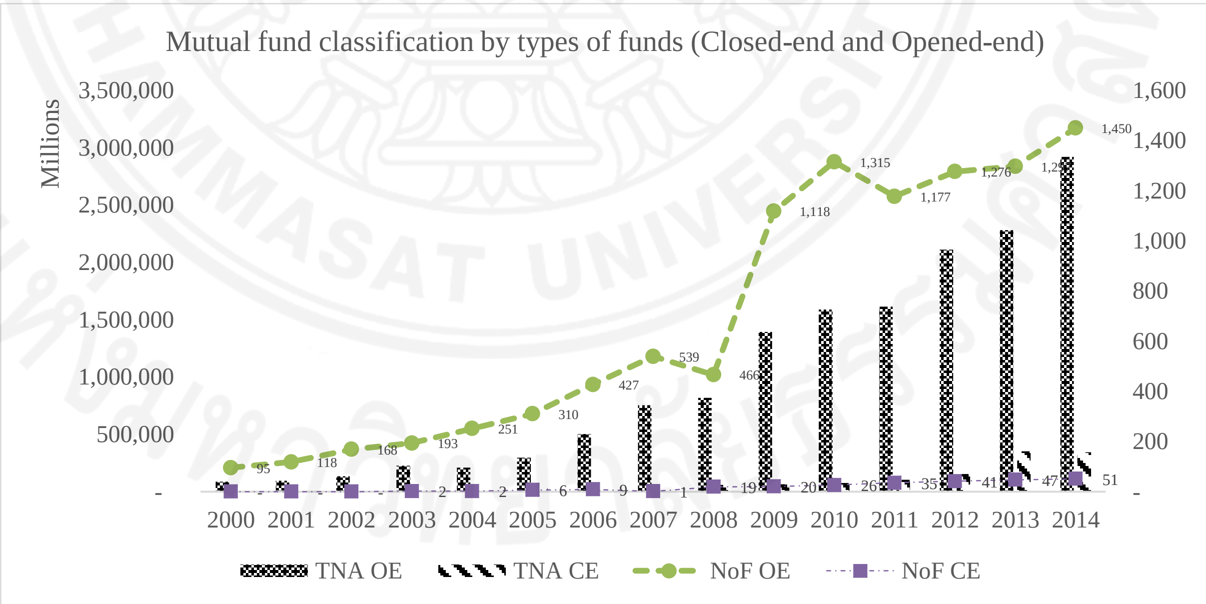

Figure 3.4: Mutual fund industry classified by types of funds.

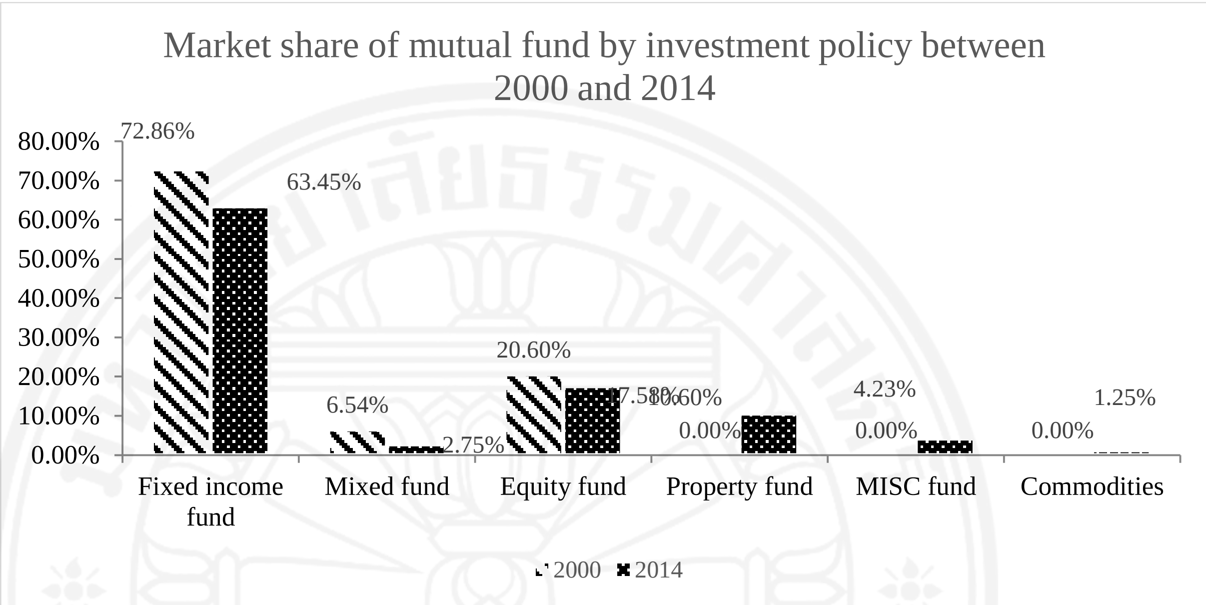

Figure 3.5: Market share of mutual fund by investment policy.

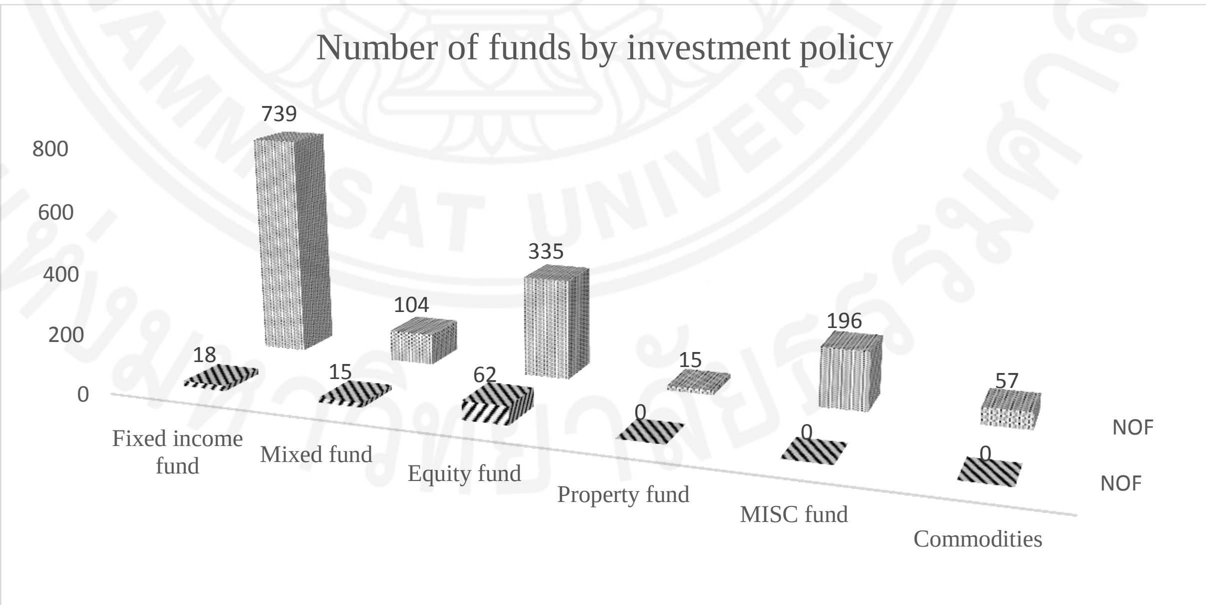

Figure 3.6: The comparison of number of funds by investment policy between 2000 and 2014.

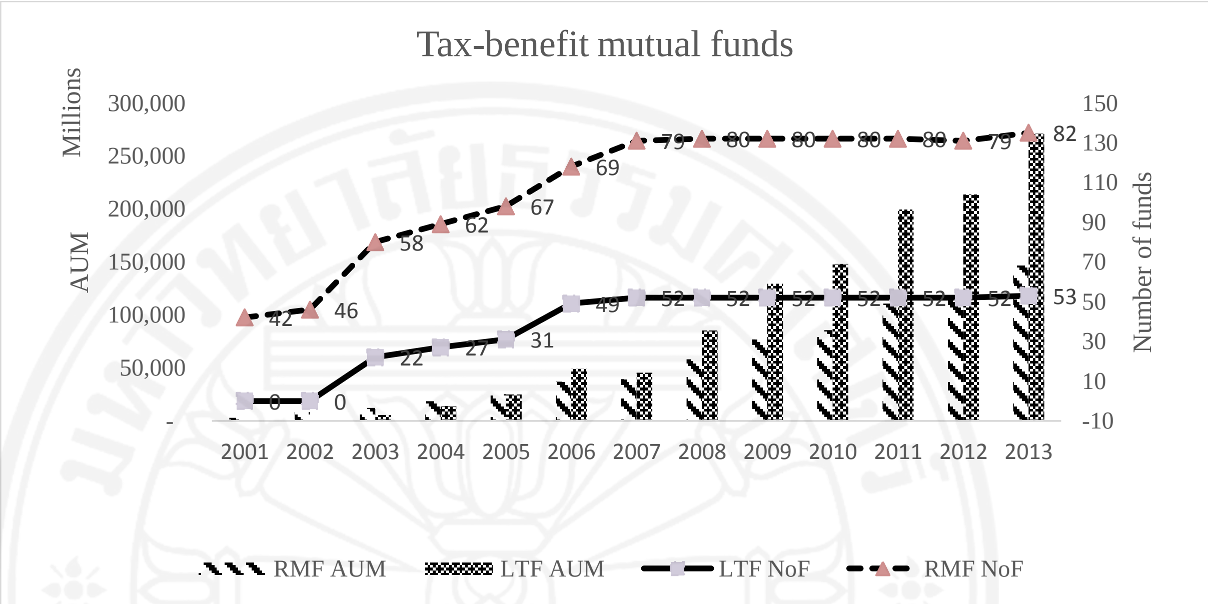

Figure 3.7: Tax benefit mutual funds.

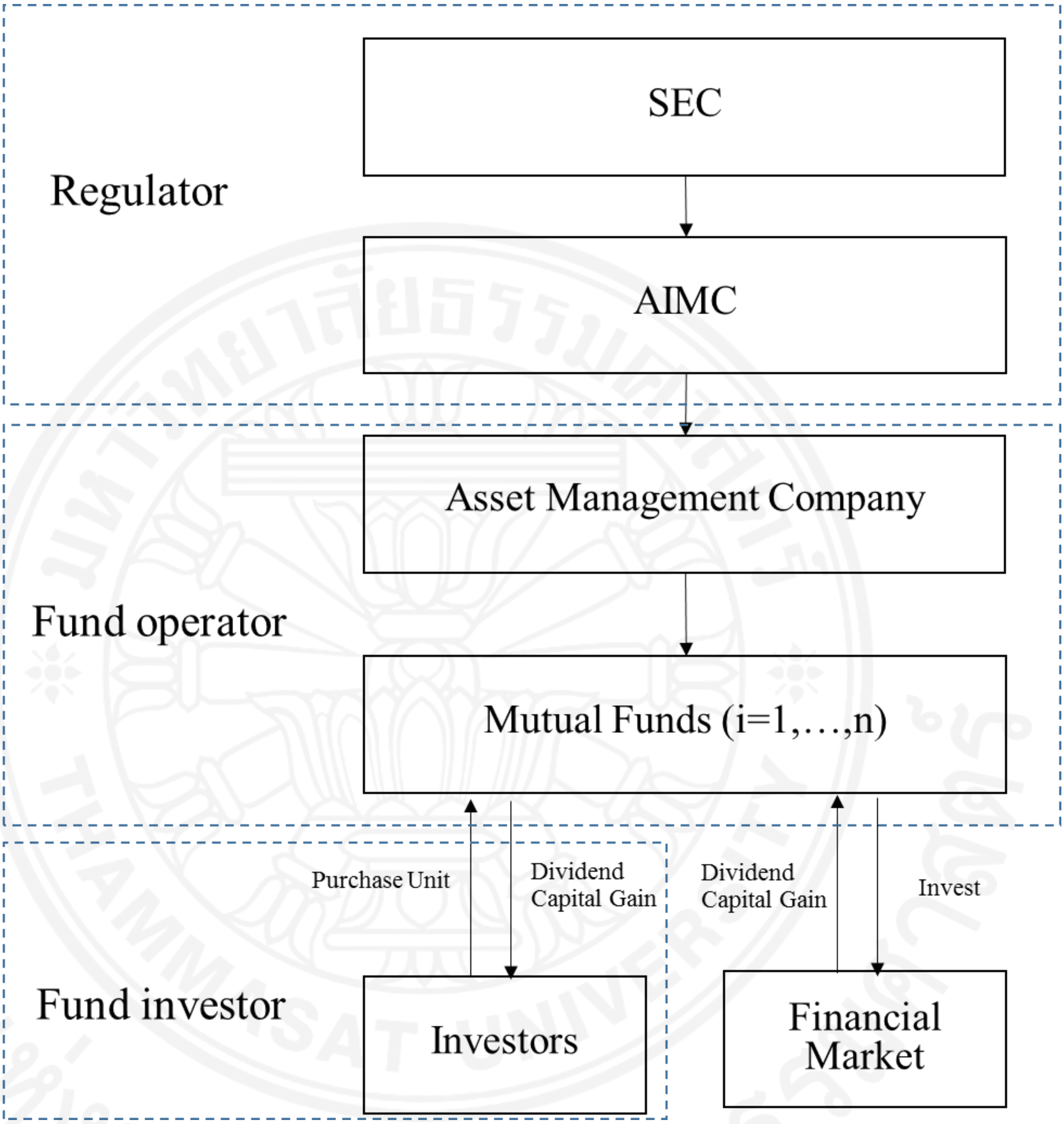

Figure 3.8: Thai mutual fund organization.

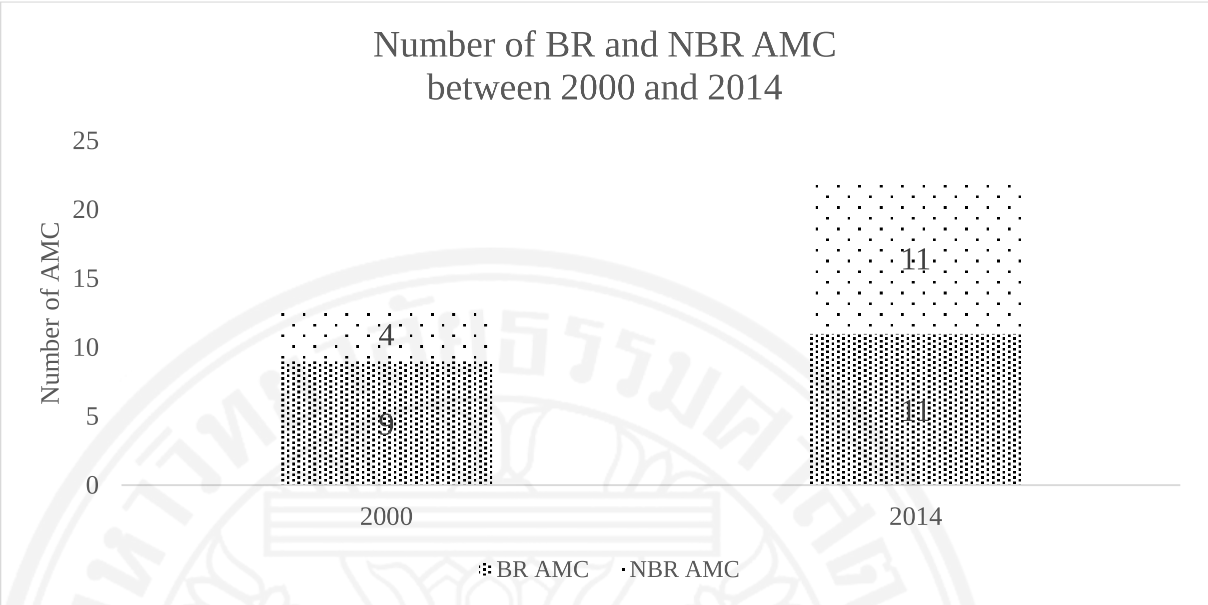

Figure 3.9: The comparison of the number of AMC by bank-mutual fund relationship between 2000 and 2014.

CHAPTER 4
MUTUAL FUND LIQUIDITY TIMING IN A HIGHER MOMENT FRAMEWORK: THE EVIDENCE FROM THAILAND

4.1 Introduction

Traditionally, the performance of mutual funds is classified into two types: stock selectivity and market timing (Jensen 1968, Treynor and Mazuy 1966). Additionally, Busse (1999) finds that market volatility is more persistent than market return. Hence, he documents that mutual funds have the ability to time market volatility. He finds that funds increase (decrease) their exposure to the market during a low (high) market volatility period. Although prior literature suggests that the mutual funds' ability to time market return and market volatility exists, market liquidity has been discovered as an important risk factor (Ľuboš Pástor and Robert F. Stambaugh 2003, Acharya and Pedersen 2005, Amihud 2002, Holmström and Tirole 2001, Amihud and Mendelson 1986).

Not only liquidity is an important risk factor, but this liquidity is also important for mutual funds. This is because fund managers need to manage portfolio liquidity in order to meet daily investor redemption. For example, funds are faced with large unexpected redemptions in a bear market. Furthermore, liquidity has been discovered to be more persistent than return. Cao et al. (2013a and 2013b) document that both hedge funds and mutual funds have the ability to time the market-wide liquidity in that the funds increase (decrease) their exposures to the market during a high (low) liquidity period.

Although there are numbers of studies on traditional mutual funds' performance, there are few studies of mutual fund liquidity timing ability (Bodson, Cavenaile, and Sougné 2013, Karstanje et al. 2013). None of the prior literature has studied liquidity timing in emerging markets, even though liquidity risk has been found to be more important in emerging markets (Brown, Rhee, and Zhang 2008, Hearn 2010, Lam and Tam 2011). Besides, there are different market characteristics between developed and emerging markets. In addition to the importance of liquidity risk in an emerging market, the higher moment is also an important risk factor in emerging market study. This is because the return distribution in emerging markets has been discovered to be non-normally distributed (Adcock and Shutes 2005, Bae, Lim, and Wei 2006, Bekaert et al. 1998, Bekaert and Harvey 2002, Canela and Collazo 2007, Galagedera and Brooks 2007)

In order to fulfill the literature gap, in this study, I study the market liquidity timing of mutual funds in the emerging market under the higher moment framework, focusing on the Thai mutual fund industry. The study is motivated by several reasons. First, I focus this study on the emerging market because the studies of emerging markets have important contributions. Recently research has shown that emerging markets illustrate significant growth in terms of both economics and the proportion of savings. Also, the rapid rate of growth has led to an increase in the share of the global market (Kearney 2012).

Second, although in emerging markets liquidity risk has been found to be an important risk factor and is found to have a higher risk premium than in developed markets (Brown, Rhee, and Zhang 2008, Hearn 2010, Lam and Tam 2011), there is no evidence of liquidity timing ability as in the U.S. market. Therefore, according to my knowledge, this study provides the first evidence of liquidity timing ability exist outside the U.S.

Third, the return distributions in emerging markets are found to be non-normally distributed. Therefore, the higher moment model is required in this environment. Additionally, emerging markets are characterized by higher risk and higher expected return. Consequently, the higher moment is more appropriate for measuring risk in this environment than using the mean and variance approach (Samuelson 1970).

Fourth, prior knowledge has shown inconclusive results in the timing ability of mutual fund managers. Many articles have suggested that fund managers do not have either market timing ability or stock selectivity (Chang and Lewellen 1984, Kon and Jen 1979). However, some studies have documented the evidence that mutual fund manager have both market timing ability and stock selectivity (Kon 1983). However, the returns in the emerging market are found to be more predictable. Therefore, it is more likely that the high-performance fund can time the market return and create abnormal performance. I further improve the model to allow funds to time the market based on the information of market return and market liquidity.

Although there are numbers of studies on mutual fund performance, few researchers have studied the effect of bank-mutual fund relationship regarding their performance. This relationship has an important and significant impact on mutual funds. In Chapter 2 and Chapter 3, I document the different tournament behavior between BR funds and NBR funds in Thai mutual fund market. Also, BR funds and NBR funds have different information and constraint to manage their portfolios (Berzins, Liu, and Trzcinka 2013, Hao and Yan 2012, Massa and Rehman 2008, Mehran and Stulz 2007). Furthermore, BR funds have more investment flow and hence more liquidity compared with NBR funds. This is because BR funds have lower searching cost, and BR funds have attract more new investment flow compared with NBR funds (Nathaphan and Chunhachinda 2012, Sirri and Tufano 1998).

According to these difference between BR and NBR funds, I conjecture that there should be different liquidity-timing ability between both types of funds. According to my knowledge, no study of liquidity timing has taken the effect of bank-mutual fund relationship.

In order to fill this literature gap, I empirically test my model with the Thai mutual fund industry. I focus this study on the Thai market because the Thai mutual fund industry expands impressively at about 27% per annum. The Thai mutual fund's asset under management (AUM) is 86 billion baht in 2000. This is about 1.7% of the Thai GDP and 6.7% of market capitalization of the Stock Exchange of Thailand (SET). However, the mutual fund industry has successfully expand over last fifteen years. By the end of 2014, Thailand's AUM for the mutual fund industry expands to 3,262 billion baht. This AUM accounts for 24% of the GDP and SET. According to my knowledge, this study is the first study of the liquidity timing outside the U.S. Furthermore, I improve the model to match the higher moment environment. In sum, I document the first evidence of liquidity timing outside the U.S. Furthermore, the model is more robust in the higher moment environment because of its introduction of the coskewness risk factor. As a consequence, the results show that the high (low) performance funds have a positive (negative) liquidity timing ability. Also, I further observe that the bank-mutual fund relationship affects the mutual fund's ability to time market-wide liquidity.

The remainder of this paper is organized according to six sections as follows: section 4.2 and section 4.3 discuss the liquidity measure and higher moment factor respectively. Section 4.4 describes the data. Section 4.5 discusses the research methodology, section 4.6 presents the empirical results, and the last section presents the conclusion.

4.2 Liquidity measure in the emerging market

Previous study of the relationship of the bid-ask spread and asset pricing reveals that market-observed expected returns are an increasing and concave function of the spread (Amihud and Mendelson 1986). Following this study, numerous studies suggest that liquidity may be an additional relevant factor that explains stock returns after the Fama-French three-factor model. Additionally, the importance of liquidity as a risk factor is well documented in both developed and emerging markets. In developed markets, there is evidence to support the positive relationship between liquidity risk and expected returns (Acharya and Pedersen 2005, Amihud 2002, Pastor and Stambaugh 2003).

To measure the liquidity risk, prior literature has suggested that emerging markets have lower liquidity than developed markets which support the importance of liquidity as a risk factor (Brown, Rhee, and Zhang 2008, Hearn 2010, Lam and Tam 2011, Jun, Marathe, and Shawky 2003). Moreover, the local liquidity risk factor is discovered to be more important than local market risks (Bekaert, Harvey, and Lundblad 2007). Furthermore, emerging markets have fewer numbers of trading assets, lower trading volume, and a high number of zero returns. Because of these differences, the liquidity measure provides different results in emerging markets. Lesmond (2005) studied the liquidity risk factor in 31 emerging markets using low frequency liquidity measures. He finds that the Amihud illiquidity measure (Amihud) and the zero measurement (zero) are best performing when uses to compare the within-country liquidity (Lesmond 2005). Moreover, the evidence from the emerging markets has shown that the Zero is more highly correlated with bid-ask spread (Bekaert, Harvey, and Lundblad 2007). Furthermore, as with the roll effective spread, the zero is found to be robust for cross-country comparison. However, several subsequent studies support Lesmond's (2005) view—that the Amihud measure is the best performing among the low frequency liquidity measures (Bekaert, Harvey, and Lundblad 2007, Kang and Zhang 2014, Lesmond 2005). Unlike the tradition liquidity timing literature, the findings are not based on Pastor and Stambaugh's (2003) liquidity measure, as suggested by Cao et al. (2013a and 2013b). Pastor and Stambaugh's liquidity measure may not be suitable to measure liquidity in emerging markets because in emerging markets, there is a high number of zero return days. Further, according to Pastor and Stambaugh's liquidity measure equation, the liquidity parameter are multiplied by the volume which are signed by the stock returns in excess of market return. However, the sign of returns is well defined for positive and negative stock excess return but zero returns. Hence, Pastor and Stambaugh's liquidity measure may be a good proxy for liquidity in the high liquid market as in the U.S since the zero return days are uncommon (Pastor and Stambaugh 2003). However, as suggested by prior research, the emerging markets, on the other hand, demonstrate evidence of zero return and hence lead to improper estimation.

As a result, in this study, I apply four liquidity measures. The primary liquidity measure is the Amihud. The Amihud measure can be estimated as follows:

$$ILLQUID_t^i = \frac{1}{D_{i,t}} \sum_{d=1}^{D_{i,t}} \frac{\left|R_{td}^i\right|}{V_{td}^i}, \tag{1}$$

Where R_{td}^i is the return of stock ith on day d in month t. V_{td}^i is the trading volume in million baht of stock ith on day d in month t. The Amihud is expected to be high in a less liquid market and to be negative in a liquid market. Hence, for simplicity, the interpretation of the results is inverse to its sign.

The second liquidity measure is the Adjusted-illiquidity (Adj-illiquidity). As Kang and Zhang (2014)'s suggestion, the Amihud is an undefined under zero trading volume day. Further, zero trading volume days are found to have a high correlation with the bid-ask spread. As a result, Kang and Zhang (2014) suggest Adj-illiquidity as an alternative liquidity measure in emerging markets. The Adj-illiquidity measure is calculated as follows:

$$AdjILLIQ_{i,m} = \left[ln\left(\frac{1}{N_{i,m}} \sum_{t=1}^{N_{t,m}} \frac{|r_{i,t}|}{Vol_{i,t}}\right)\right] \times \left(1 + Zerovol_{i,m}\right) \tag{2}$$

$$Zerovol_{i,m} = \frac{number\ of\ day\ with\ zero\ trading\ volume\ in\ month\ m}{number\ of\ trading\ day\ in\ month\ m} \quad (3)$$

The third liquidity measurement is the zero, which is the number of days with zero returns over the number of trading days in a particular month. The zero measures the asset liquidity in terms of adverse selection. Further, in a less liquidity environment there is are high transaction costs. As a result, the assets with high transaction costs are highly likely to have no price change or zero return (Lesmond, Ogden, and Trzcinka 1999).

$$zeros_{i,t} = \frac{number\ of\ days\ with\ zero\ return}{T} \quad (4)$$

Where $zeros_{i,t}$ is the Zero measure for stock ith in time period t. The higher number of zero depicts the illiquidity in the market. For simplicity, the interpretation of the results is inverse to its sign.

The last liquidity measure is the Roll's effective spread suggested by Roll (1984).

$$Roll's\ Effective\ spread_j = 2\sqrt{-cov_j}, \quad (5)$$

The $-cov_j$ is the first order serial covariance of price change between period t and t-1. Since Roll (1984) implicitly assumes systematic information, the Roll is a spread that is driven by transaction costs (Roll 1984). As a result, the higher spread leads to higher transaction costs and hence less liquidity. In order to interpret an effective spread, I inversely interpreted the results.

4.3 Higher moment risk factor

There is much empirical evidence suggesting that individual security and portfolio returns are not normally distributed (Arditti 1971, Simkowitz and Beedles 1978). Consequently, the normality assumption is rejected, and hence the higher moment cannot be ignored. Furthermore, the positive third moment is also an important property of risk aversion. The positive first moment and the negative second moment properties imply the sufficient condition for positive skewness preference for risk averse investors. As a result, skewness is found to be an important factor in explaining security and portfolio returns (Jean 1971, 1973, Kraus and Litzenberger 1976).

Prior literature supports the importance of the higher moment as a risk factor in developed markets. The negative relationship between positive skewness and expected stock return is widely documented (Chunhachinda et al. 1997, Kon 1984, Kraus and Litzenberger 1976, Mills 1995, Peiró 1999).

However, the higher moment has been found to be more important for emerging market study. This is because there are important characteristics which differ between emerging markets and developed markets. There are noticeable asymmetries in the emerging market, including an incomplete market structure, political and economic uncertainties, weak regularities, and low-quality auditing systems. This strongly supports the idea that emerging markets are more risky and thus investors required higher expect returns (Kearney 2012). As a result of this large markets risk, the higher moment is more appropriate for measuring risk (Samuelson 1970). Therefore, the first two moments are not sufficient to characterize the financial risk in emerging markets.

Further, emerging markets are more likely to experience structural change, for example, regulatory changes, financial market liberalization, political crises, and other shocks. As a result from the change, the market return is found to be non-normally distributed. Several document the evidences to reject the normal distribution in return and to support the skewness in return (Adcock and Shutes 2005, Bae, Lim, and Wei 2006, Bekaert et al. 1998, Bekaert and Harvey 2002, Canela and Collazo 2007, Galagedera and Brooks 2007).

Although this study aims to study mutual funds, which by definition represent a well-diversified portfolio, Sarnat (1972) documents that the higher moment is priced as a risk factor. Hence, there is the strong preference for positive skewness among mutual fund investors (Sarnat, 1972). Furthermore, Harvey and Siddique (2000) document that if the asset returns have non diversifiable skewness, called coskewness, the expected returns of that stock must be rewarded for it. Much evidence also supports their view and has documented the positive relationship between the coskewness risk factor and expected stock return (Doan, Lin, and Zurbruegg 2010, Harvey et al. 2004, Harvey and Siddique 2000, Kostakis, Muhammad, and Siganos 2012, Moreno and Rodríguez 2009, Smith 2006). Therefore, the effect of skewness risk is introduced in this study represented by the negative coskewness risk premium (Harvey and Siddique, 2000, Moreno and Rodríguez, 2009). The coskewness factor is constructed as follows (Harvey and Siddique 2000, Moreno and Rodríguez 2009):

$$S_i = \frac{E(\varepsilon_{i,t+1}\varepsilon^2_{m,t+1})}{\sqrt{E(\varepsilon^2_{i,t+1})}E(\varepsilon^2_{m,t+1})} \quad (6)$$

$\varepsilon^2_{i,t+1}$ is the residuals from the regression of stock ith return on market excess return[4]. $\varepsilon^2_{m,t+1}$ is the market residuals between the market excess return and its mean. In each month, I formed S^-which is 30% of most skewness stocks. The negative coskewness excess return (CSK) is formed according to the difference between S^- and r_f.

4.4 Data

In this study I obtain data from various sources. The monthly AUM, net asset value (NAV), total return, net flow, annual reported net expense ratio, and turnover ratio are obtained from the Morningstar Direct database. Stock price, risk-free rate, and market return are obtained from DataStream. The classification of mutual funds followed the Associate of Investment Management Company (AIMC). I exclude international funds, funds of funds, index funds, trigger funds, bond funds, and money market funds. The sample is also free from survival bias, since Morningstar reports all available data for both active and inactive funds. Finally, this research's sample has on average 161 funds with the funds' age at about 6.46 year per fund. 221 equity funds by the end of 2014.

In order to classify the BR funds and NBR funds, a list of commercial banks is obtained from BankScope. Even though the database does not provide the match bank-mutual fund relationship, I follow prior literature in order to match the bank-mutual fund relationship manually. The Asset Management Companies (AMC) names are used as a proxy to specify the relationship between the bank and mutual

[4] We followed Harvey and Siddique (2000). $\varepsilon_{t+1} = r_{t+1} - a_{t+1} - \beta_{t+1}(r_{m,t+1})$

funds. The funds are classified as BR funds when their AMC has a relationship with the bank. Therefore, I manually match the banks' name and the AMCs' name. Further, the study is cross checked by using information from each fund's website in order to cross check the relationship with the bank manually (Berzins, Liu, and Trzcinka 2013, Hao and Yan 2012). I then have 11 and 11 BR AMC and NBR AMC in 2014 respectively.

4.5 Methodology

A model that captures the liquidity timing is first introduced by Cao et al. (2013a). In this study, I apply the liquidity model suggested by Cao et al. (2013a). They followed the timing literature by expanding market beta. By applying a Taylor series expansion, the market beta can be explained as a linear relationship with market liquidity timing in excess of its time series average.

$$\beta_{mp} = \beta_{0mp} + \gamma_{mt}(L_{mt} - \overline{L_m}), \qquad (7)$$

Where β_{mp} is the total market beta. β_{0mp} is systematic market risk, and γ_{mt}, is the systematic liquidity risk. L_{mt} is the market liquidity at month t and $\overline{L_m}$ is the time series mean of market liquidity risk. In this study, I follow Cao et al. (2013a,b), who suggest using the rolling mean of the previous 60 months as the proxy for the liquidity time series average. In order to measure the liquidity timing, the liquidity timing factor is included in the standard Cahart Four factor model as follows:

$$r_{pt} = \alpha_p + \beta_{mp} rm_t + \beta_{2p} SMB_t + \beta_{3p} HML_t + \beta_{4p} MOM_t + \varepsilon_{p,t}, \qquad (8)$$

r_{pt} is the pth portfolio return, and rm_t is the market portfolio return in excess of a 1 year government bond. SMB and HML are the mimic portfolio. SMB, HML, and MOM are the mimic portfolio returns that capture the different effects of big stock and small stocks, value, and momentum respectively (Carhart 1997, Fama and French 1992, Fama and French 1993). Adding the liquidity timing factor into the four factor model yielded:

$$r_{pt} = \alpha_p + \beta_{0mp} rm_t + \beta_{2p} SMB_t + \beta_{3p} HML_t + \beta_{4p} MOM_t + \gamma_{mt}(L_{mt} - \overline{L_m}) rm_t + \varepsilon_{p,t}, \qquad (9)$$

The γ_{mt} measures the liquidity timing of the portfolio. Therefore, if the γ_{mt} is positive, this illustrates that the funds have the ability to foreseen market liquidity. As a result, they increase (decrease) the funds' exposure to the market in high (low) market liquidity. On the other hand, if γ_{mt} is negative, it means that the funds wrongly forecast the market liquidity. As a result, they increase (decrease) the funds' exposure to the market in low (high) market liquidity.

In order to determine whether the liquidity timing and traditional market timing yield different skills, I control for the market timing coefficient. I construct a market timing model according to Treynor and Mazuy (1966):

$$r_{pt} = \alpha_p + \beta_{0mp} rm_t + \beta_{mkt} {r_{mt}}^2 + \varepsilon_{p,t}, \tag{10}$$

In order to match the model with the higher moment environment in emerging study, I introduced the CSK as in equation (6). As a result, the liquidity timing model in the higher moment framework can be shown as follows:

$$\begin{aligned} r_{pt} = {} & \alpha_p + \beta_{0mp} rm_t + \beta_{2p} SMB_t + \beta_{3p} HML_t + \beta_{4p} MOM_t \\ & + \beta_{5p} \text{the } CSK_t + \beta_{mkt} {r_{mt}}^2 + \gamma_{mt}(L_{mt} - \overline{L_m}) + \varepsilon_{p,t} \end{aligned} \tag{11}$$

4.6 Empirical result

[Table 4.1]

[Table 4.2]

Table 4.1 presents the sample descriptive statistics. The sample has on average 161 funds with the funds' age at about 6.46 year per fund. The data from Table 4.2 shows that during the analysis period, the monthly average return of the equity mutual funds perform lower than the overall stock market returns. SMB, HML, MOM, the CSK and all liquidities are positive as expected.

[Table 4.3]

[Table 4.4]

The correlations in Table 4.3 shows that the mutual funds' excess return strongly correlated with the explanatory variables, which are market return, SMB, HML, but not for MOM and the CSK. Although Table 4.3 reports the significant correlations between each of explanatory variable, in an unreported table, I measure this correlation with the VIF index and find no evidence of a multi-collinearity problem. Additionally, all of the liquidity measures that I used are illiquidity measures. Table 4.4 shows that all of the liquidity measurements have a positive significant correlation with each other. Furthermore, the Amihud and the Adj-illiquidity have the highest positive significant correlation among others.

4.6.1 Test of liquidity timing

[Table 4.5]

I start the test by revisiting the traditional liquidity timing model. Table 4.5 reports the regression of the liquidity model in equation (9). The t-statistic for all coefficients is calculated using the Newey-West heteroscedasticity and autocorrelation (Newey and West 1987). The results showed strong evidence to support market liquidity timing in the Thai mutual funds industry. Three of four liquidity measures suggest positive liquidity timing ability. All three—the Amihud, the Adj-illiquidity, and the Roll’s effective spread—have a positive significant relationship with mutual fund excess returns. The model demonstrates good explanatory power to explain mutual fund excess returns. The model average Adjusted-R2 is about 97%, which is high.

Next, I further explore liquidity timing ability at the portfolio level. I form decile portfolios based a lag of 12-month returns and rebalance these ten portfolios on a monthly basis. Then I apply the regression of the liquidity model in equation (9) again and report the results in Table 4.6. The results are divided into four panels.

[Table 4.6]

In Panel A, the Adj-illiquidity is applied as a proxy for liquidity. The results show that the top (bottom) portfolio has positive (negative) significant liquidity timing. This means that the top performance portfolio times the market exposure by increasing (decreasing) market exposure in high (low) market liquidity. However, the bottom portfolio increases (decreases) market exposure in low (high). Besides the liquidity timing ability, the top performance portfolio show positive selectivity. The top performance portfolio has a positive significant alpha while the low performance portfolio shows the negatively significant alpha. The top-bottom portfolio reconfirm that the Top performance portfolio provide both selectivity and liquidity timing by having positively significant for both alpha and liquidity timing coefficient.

The results in Panel B and C, where the Amihud and Roll's effective spread are applied as the liquidity proxy, show similar results to those of Panel A. The bottom portfolio has negative liquidity timing while the top portfolio has positive liquidity timing.

In Panel D, I apply the zero as a proxy for the liquidity measure. I find less evidence of liquidity timing in this panel. Even though the negative (positive) liquidity timing is preserved for the bottom (top) portfolio, I find negative significant liquidity timing only for portfolio 4.

4.6.2 Test of liquidity timing in a higher moment framework

In this section, I test the model according to equation (11). I introduce the higher moment model in order to capture the liquidity timing. To different the liquidity timing and market timing, I allow funds to time the market based on the market return according the Treynor and Mazuy (1966).

The results from Table 4.7 demonstrate that on average mutual funds have liquidity timing ability. The results show that three of four liquidity measurements support the positive significant liquidity timing of mutual funds. Further, the mutual funds also are seen to have market timing ability. The coefficient of the market timings is positive. This means that mutual funds utilize the information on both market return and market liquidity to adjust their market exposure. Furthermore, the CSK has a negative relationship with mutual fund returns. The average Adjusted-R2 slightly increases compared with the previous model.

[Table 4.7]

[Table 4.8]

Table 4.8 shows the portfolio-based results. I find that the top (bottom) portfolios have positive (no) liquidity timing ability. I further show under the higher moment framework that the two top (bottom) portfolios are found to have a negative (positive) relationship with the CSK. The top and bottom portfolios also have different selectivity and market timing ability. The top portfolio funds have both positive selectivity and market timing ability.

The results in Panel A show that portfolio 2 and portfolio 9, which represent the low and high performance portfolio, have a negative (positive) relationship with the CSK. Further, the results for the liquidity timing ability and market timing ability are consistent with the previous sections. The liquidity timing is positive (negative) and significant for the top (bottom) portfolios. Furthermore, I find that the top (bottom) portfolio has a positive (negative) market timing ability.

The results in Panel B, C, and D show that the extreme portfolio represented by the two top (bottom) portfolios has a positive (negative) relationship with the CSK. The results for the liquidity timing still held. This means that the top (bottom) mutual funds display a positive (negative) significant liquidity timing ability under the higher moment framework.

4.6.3 Test of liquidity timing: robustness check

[Table 4.9]

In this section, I check the results' robustness. I demean the liquidity time series' mean by the different number of lags. In the previous section, I use the mean of lagged 60 months as a proxy for the time series mean. In this section, I use the lagged return of 48 months and increments of 3 months to 60 months. The results are the same as in the previous section, as shown in Table 4.9. However, in order to conserve space, I report only the results from the lagged 48 months. This implies that the liquidity timing variables are not affected by the time-series demean.

4.6.4 Test of liquidity timing: bank-mutual fund relationship

I further explore whether the liquidity timing between the BR funds and NBR funds is different. Therefore, I form portfolios based on the relationship between bank and mutual funds. The sample is classified into BR funds and NBR funds. Table 4.10 reports the different levels of liquidity timing between both groups. Table 4.10 is divided into three panels. A full sample analysis is shown in Panel A of Table 4.7.

[Table 4.10]

Panel B and C show the results for the BR funds and NBR funds respectively. On average, both BR funds and NBR funds show negative selectivity but positive market timing ability. Additionally, both BR and NBR funds show a negative relationship between portfolio returns and the CSK. However, they have clear different liquidity timing ability. In Panel B, the results show that two of four liquidity measurements suggest positive liquidity timing. On the other hand, in Panel C, I cannot provide the evidence of liquidity timing ability among the NBR funds.

4.7 Conclusion

In this study, I study the liquidity timing ability of mutual funds in a higher moment framework. This study contributes to the prior literature in several ways. First, this is the first study that documents the liquidity timing ability of mutual funds outside the U.S. The evidence suggests that mutual funds change their portfolio exposure to the market according to the market liquidity. Second, since this study is conducted in a less liquid market, I apply appropriate measures to match the specific sample. I use four low-frequency liquidity measures, which are found to robust in emerging market study. The results demonstrate that the high (low) performance portfolios show positive (negative) liquidity timing ability. The results hold for three of the liquidity measures.

Third, the model is improved to match the emerging market environments by introducing the coskewness risk factor. The results hold when the higher moment framework is being analyzed. High (low) performance portfolios have a negative (positive) relationship with the coskewness risk factor. The results indicate that low performance portfolios earn risk premiums from holding negative skewness assets, while the higher performance portfolios prefer risk free returns to bearing negative skewness returns.

I further analyze the difference between the BR funds and NBR funds. The results show that the BR funds have liquidity timing ability, while I cannot document evidence for the NBR funds. I did a robustness check as to whether the liquidity timing variables were affected by time series demean process and found the results to be unchanged.

Table 4.1 Sample averages of cross-sectional descriptive statistics during 2000 and 2014.

NoF reports the numbers of fund. (Age), $\overline{AUM}$ and $\overline{Fee}$ report the cross-sectional average fund age, assets under management, and the fund annual net expense ratio respectively. σ_i is the average of return standard deviation.

Sample	$\overline{R\iota}$	Med(R_i)	σ_i	$\overline{AUM}$	$\overline{Fee}$	Age(yr)	NoF
Full	-0.00365	-0.00288	0.03285	695,612,222	1.7141	6.46	161.87
BR	-0.00330	-0.00270	0.02650	842,094,118	1.7604	6.36	108.27
NBR	-0.00250	-0.00070	0.02570	399,249,016	1.6265	6.68	53.60

Table 4.2 The cross-sectional monthly average descriptive statistics for the variables in this analysis between Dec. 1999 and May 2015.

R_i and R_m are the return of mutual funds and market return in excess of 1 year government bonds. SMB, HML, and MOM are the mimic portfolio returns accounts for size, value, and momentum respectively. The CSK is the coskewness mimic portfolio returns. The liquidity measurements in this analysis are Amihud illiquidity, Roll, zero, and Adjusted-Illiquidity. Since all of the liquidity measures are illiquidity, I multiplied by negative 1 for convenience.

	Mean	Median	STD
R_i	-0.0030	-0.0021	0.0326
R_m	0.0063	0.0137	0.0709
SMB	0.0058	0.0055	0.1031
HML	0.0019	-0.0022	0.1299
MOM	0.0601	0.0582	0.0115
CSK	0.0029	0.0000	0.0324
Amihud	0.8339	0.4811	1.0477
Roll	8.2592	7.3159	3.0348
Zero	0.2564	0.2613	0.0431
AdjILLIQ	0.6344	0.7338	0.8300

Table 4.3 Pearson Correlation matrix for the variable used.

	R_i	R_m	SMB	HML	MOM	CSK
R_i	1.00					
R_m	0.97***	1.00				
SMB	0.63***	0.56***	1.00			
HML	0.37***	0.35***	0.78***	1.00		
MOM	-0.05	-0.06	0.13**	0.15***	1.00	
CSK	-0.01	0.03	-0.03	0.14**	0.00	1.00

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.4 The Pearson Correlation matrix for liquidity measurements.

	Amihud	Roll	Zero	AdjILLIQ
Amihud	1.000			
Roll	0.300***	1.000		
Zero	0.139**	0.146***	1.000	
AdjILLIQ	0.844***	0.213***	0.300***	1.000

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.5 Test of liquidity timing.

The table reports regression result from equation (9). r_{pt}, and R_{mt} are the return of mutual funds and market return in excess of 1 year government bond. SMB, HML, and MOM is the mimics portfolio return accounts for size, value and momentum respectively. L_{mt} is liquidity measurements in this analysis are Amihud illiquidity, Roll, zero, and Adjusted-Illiquidity respectively. $\overline{L_m}$ is time series mean of liquidity measure.

$$r_{pt} = \alpha_p + \beta_{0mp} rm_t + \beta_{2p} SMB_t + \beta_{3p} HML_t + \beta_{4p} MOM_t + \gamma_{mt}(L_{mt} - \overline{L_m}) rm_t + \varepsilon_{p,t}$$

	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	γ_{mt}	Adj-R^2 (%)
Adj-illiquidity	-0.001	0.669***	0.6989***	-0.3094**	0.0558	0.0472***	97.88
	(0.7578)	(0.0000)	(0.0042)	(0.0346)	(0.3223)	(0.0005)	
Amihud	-0.0012	0.6804***	0.6368***	-0.3039**	0.062	0.0282***	97.85
	(0.6983)	(0.0000)	(0.0090)	(0.0394)	(0.2538)	(0.0029)	
Roll	0.0008	0.6463***	0.4347**	-0.2186	0.02	0.0152***	98.08
	(0.7700)	(0.0000)	(0.0426)	(0.1062)	(0.6760)	(0.0000)	
Zero	0.0019	0.6805***	0.6886***	-0.3957**	0.0097	-0.1192	97.35
	(0.5251)	(0.0000)	(0.0087)	(0.0177)	(0.8518)	(0.7252)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.6 Test of liquidity timing at portfolio level.

The table reports regression result from equation (9). r_{pt}, and R_{mt} are the return of mutual funds and market return in excess of 1 year government bond. SMB, HML, and MOM is the mimics portfolio return accounts for size, value and momentum respectively. L_{mt} is liquidity measurements in this analysis are Amihud illiquidity, Roll, zero, and Adjusted-Illiquidity respectively. $\overline{L_m}$ is time series mean of liquidity measure.

$$r_{pt} = \alpha_p + \beta_{0mp} rm_t + \beta_{2p} SMB_t + \beta_{3p} HML_t + \beta_{4p} MOM_t + \gamma_{mt}(L_{mt} - \overline{L_m}) rm_t + \varepsilon_{p,t}$$

Panel A: Adjusted Illiquidity measure

Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	γ_{mt}	Adj-R^2 (%)
1	-0.0263***	0.5088***	-0.2845	0.1866	0.3392**	-0.2295***	81.77
	(0.0054)	(0.0000)	(0.5680)	(0.5245)	(0.0402)	(0.0000)	
2	-0.0234**	0.4398***	-0.3465	0.1349	0.3657**	-0.2803***	82.58
	(0.0208)	(0.0000)	(0.4797)	(0.5982)	(0.0346)	(0.0000)	
3	-0.0168*	0.563***	0.5812	-0.2896	0.3118*	-0.1429***	86.48
	(0.0811)	(0.0000)	(0.1580)	(0.1935)	(0.0592)	(0.0000)	
4	-0.0129**	0.7625***	0.8615***	-0.3791**	0.2453**	0.0128	96.10
	(0.0413)	(0.0000)	(0.0069)	(0.0232)	(0.0249)	(0.5439)	
5	-0.0093*	0.8108***	0.9785***	-0.3684*	0.204**	0.0724***	96.40
	(0.0916)	(0.0000)	(0.0012)	(0.0535)	(0.0380)	(0.0002)	
6	-0.0038	0.8374***	1.0123***	-0.4269*	0.1028	0.0817***	96.22
	(0.5251)	(0.0000)	(0.0013)	(0.0605)	(0.3278)	(0.0000)	
7	0.0064	0.8152***	1.1081**	-0.5279	-0.0353	0.0859***	93.34
	(0.4222)	(0.0000)	(0.0153)	(0.1079)	(0.8035)	(0.0004)	
8	0.0195*	0.7568***	1.3559**	-0.5666	-0.2523	0.1407***	90.09
	(0.0534)	(0.0000)	(0.0152)	(0.1320)	(0.1427)	(0.0000)	
9	0.0253**	0.6007***	0.9668	-0.4251	-0.3383*	0.3708***	84.38
	(0.0323)	(0.0000)	(0.1146)	(0.2089)	(0.0815)	(0.0000)	
10	0.0313***	0.5891***	0.7805	-0.4346	-0.382**	0.3597***	82.34
	(0.0035)	(0.0000)	(0.2038)	(0.2712)	(0.0379)	(0.0000)	
10-1	0.0576***	0.0803	1.065	-0.6212	-0.7211**	0.5892***	66.21
	(0.0012)	(0.2378)	(0.2465)	(0.2477)	(0.0197)	(0.0000)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.6 (Continued)

Panel B: Amihud Illiquidity measure							
Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	γ_{mt}	Adj-R^2 (%)
1	-0.0265**	0.462***	-0.0211	0.204	0.3282*	-0.1257***	79.23
	(0.0118)	(0.0000)	(0.9656)	(0.4908)	(0.0814)	(0.0000)	
2	-0.0228**	0.3764***	0.0034	0.1238	0.3386*	-0.1618***	80.20
	(0.0357)	(0.0000)	(0.9945)	(0.6033)	(0.0772)	(0.0000)	
3	-0.0162	0.5282***	0.7709*	-0.3083	0.2924*	-0.0858***	86.26
	(0.1075)	(0.0000)	(0.0645)	(0.1451)	(0.0972)	(0.0000)	
4	-0.0131**	0.7666***	0.8403***	-0.3726**	0.2491**	0.0089	96.10
	(0.0356)	(0.0000)	(0.0065)	(0.0244)	(0.0201)	(0.5279)	
5	-0.0096*	0.8287***	0.8812***	-0.3576*	0.2144**	0.0438***	96.37
	(0.0676)	(0.0000)	(0.0017)	(0.0510)	(0.0222)	(0.0013)	
6	-0.004	0.8563***	0.9085***	-0.4216*	0.1116	0.0477***	96.12
	(0.4858)	(0.0000)	(0.0036)	(0.0612)	(0.2732)	(0.0000)	
7	0.0067	0.8306***	1.0191**	-0.5454	-0.0358	0.0443**	93.00
	(0.4059)	(0.0000)	(0.0376)	(0.1096)	(0.8057)	(0.0179)	
8	0.0193*	0.7878***	1.184**	-0.5653	-0.2405	0.0801***	89.62
	(0.0574)	(0.0000)	(0.0421)	(0.1351)	(0.1711)	(0.0000)	
9	0.0242**	0.6864***	0.4962	-0.4015	-0.2986	0.2164***	81.42
	(0.0479)	(0.0000)	(0.4480)	(0.2310)	(0.1585)	(0.0000)	
10	0.0298***	0.6753***	0.3099	-0.3955	-0.3365*	0.214***	80.52
	(0.0086)	(0.0000)	(0.6380)	(0.3272)	(0.0996)	(0.0000)	
10-1	-0.0265**	0.462***	-0.0211	0.204	0.3282*	-0.1257***	79.23
	(0.0044)	(0.0133)	(0.7330)	(0.2858)	(0.0638)	(0.0000)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.6 (Continued)

Panel C: Roll effective spread							
Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	γ_{mt}	Adj-R^2 (%)
1	-0.0366***	0.5925***	0.3819	0.1501	0.5235***	-0.0425***	74.94
	(0.0009)	(0.0000)	(0.5067)	(0.6411)	(0.0094)	(0.0000)	
2	-0.0356***	0.5478***	0.6014	0.0025	0.5886**	-0.0588***	73.90
	(0.0047)	(0.0000)	(0.3068)	(0.9922)	(0.0110)	(0.0000)	
3	-0.023**	0.6179***	1.0596**	-0.354	0.4254**	-0.0297***	84.37
	(0.0192)	(0.0000)	(0.0232)	(0.1205)	(0.0152)	(0.0001)	
4	-0.0127**	0.7522***	0.6929***	-0.291*	0.2373**	0.0091**	96.26
	(0.0488)	(0.0000)	(0.0064)	(0.0618)	(0.0332)	(0.0231)	
5	-0.0065	0.7763***	0.5781**	-0.2323	0.1491*	0.0231***	96.68
	(0.1714)	(0.0000)	(0.0130)	(0.1793)	(0.0732)	(0.0000)	
6	-0.0004	0.8031***	0.6712**	-0.3458	0.0389	0.0204***	96.04
	(0.9412)	(0.0000)	(0.0239)	(0.1099)	(0.6599)	(0.0000)	
7	0.0096	0.7742***	0.6325	-0.366	-0.1004	0.0275***	93.72
	(0.1403)	(0.0000)	(0.1558)	(0.1913)	(0.3866)	(0.0000)	
8	0.0252***	0.6951***	0.7047	-0.3851	-0.3612***	0.0385***	90.01
	(0.0025)	(0.0000)	(0.2292)	(0.2426)	(0.0094)	(0.0000)	
9	0.0411***	0.4532***	-0.3975	-0.1775	-0.6312**	0.0834***	74.09
	(0.0027)	(0.0000)	(0.6196)	(0.6642)	(0.0104)	(0.0000)	
10	0.0466***	0.4458***	-0.5468	-0.1918	-0.666**	0.0811***	72.42
	(0.0022)	(0.0000)	(0.5036)	(0.6852)	(0.0161)	(0.0000)	
10-1	0.0832***	-0.1467**	-0.9288	-0.3419	-1.1895***	0.1236***	41.30
	(0.0006)	(0.0275)	(0.4574)	(0.6101)	(0.0075)	(0.0000)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.6 (Continued)

Panel D: Zero							
Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	γ_{mt}	Adj-R^2 (%)
1	-0.036***	0.7739***	-0.8952	0.8798*	0.4839**	-1.2064	70.04
	(0.0022)	(0.0003)	(0.2918)	(0.0839)	(0.0259)	(0.2272)	
2	-0.0358***	0.7188***	-1.0001	0.9432*	0.5536**	-1.224	62.94
	(0.0065)	(0.0035)	(0.2420)	(0.0615)	(0.0229)	(0.2675)	
3	-0.0205*	0.9159***	-0.1852	0.3022	0.3553*	-1.7953***	83.02
	(0.0534)	(0.0000)	(0.6753)	(0.3287)	(0.0596)	(0.0062)	
4	-0.0112*	0.8359***	0.7143***	-0.3426**	0.2154*	-0.4228	96.12
	(0.0962)	(0.0000)	(0.0074)	(0.0430)	(0.0644)	(0.2806)	
5	-0.0049	0.8297***	0.9602**	-0.4996**	0.1329	-0.1896	95.57
	(0.3391)	(0.0000)	(0.0173)	(0.0454)	(0.1334)	(0.6684)	
6	0.0005	0.8084***	1.0952**	-0.6179**	0.035	0.0657	95.21
	(0.9237)	(0.0000)	(0.0104)	(0.0275)	(0.7137)	(0.8904)	
7	0.0113*	0.817***	1.1287**	-0.7011**	-0.1145	-0.1108	92.20
	(0.0792)	(0.0000)	(0.0185)	(0.0392)	(0.3357)	(0.8874)	
8	0.0263***	0.6575***	1.6002**	-0.9375**	-0.3567**	0.3881	86.74
	(0.0017)	(0.0001)	(0.0172)	(0.0309)	(0.0157)	(0.6714)	
9	0.0418***	0.2347	1.8252	-1.4917**	-0.5875**	1.6024	55.20
	(0.0043)	(0.4221)	(0.1055)	(0.0311)	(0.0283)	(0.2572)	
10	0.0469***	0.21	1.6625	-1.4897**	-0.6177**	1.688	54.09
	(0.0047)	(0.4074)	(0.1208)	(0.0335)	(0.0410)	(0.1795)	
10-1	0.0829***	-0.5639	2.5576	-2.3695**	-1.1016**	2.8943	10.33
	(0.0017)	(0.2007)	(0.1461)	(0.0315)	(0.0239)	(0.1650)	

. *, **, *and* *** *represent significant levels: 10%, 5%, and 1% respectively.*

Table 4.7 The test of liquidity timing in a higher moment framework.

The result reports regression result from equation (11). r_{pt}, and R_{mt} are the return of mutual funds and market return in excess of 1 year government bond. SMB, HML, and MOM is the mimics portfolio return accounts for size, value and momentum respectively. CSK is coskewness risk factor. L_{mt} is liquidity measurements in this analysis are Amihud illiquidity, Roll, zero, and Adjusted-Illiquidity respectively. $\overline{L_m}$ is time series mean of liquidity measure.

$$r_{pt} = \alpha_p + \beta_{0mp} rm_t + \beta_{2p} SMB_t + \beta_{3p} HML_t + \beta_{4p} MOM_t + \beta_{5p} CSK_t + \beta_{mkt} {r_{mt}}^2 + \gamma_{mt}(L_{mt} - \overline{L_m}) rm_t + \varepsilon_{p,t}$$

	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
Adj-	-0.002	0.7112***	0.4365**	-0.2091	0.0155	-0.0909*	0.3082***	0.0185**	98.17
illiquidity	(0.4676)	(0.0000)	(0.0328)	(0.1085)	(0.7111)	(0.0540)	(0.0000)	(0.0227)	
Amihud	-0.0021	0.7168***	0.4064**	-0.2024	0.0189	-0.0915*	0.312***	0.0118**	98.18
	(0.4202)	(0.0000)	(0.0485)	(0.1215)	(0.6449)	(0.0508)	(0.0000)	(0.0168)	
Roll	-0.0013	0.6945***	0.3678*	-0.1887	0.0058	-0.0924*	0.2491**	0.0067*	98.16
	(0.6233)	(0.0000)	(0.0769)	(0.1498)	(0.8877)	(0.0565)	(0.0124)	(0.0951)	
Zero	-0.0015	0.7132***	0.3912**	-0.2156*	-0.0034	-0.1076**	0.387***	0.0324	98.12
	(0.5905)	(0.0000)	(0.0197)	(0.0561)	(0.9416)	(0.0259)	(0.0000)	(0.8853)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.8 Test of liquidity timing at portfolio level in higher moment framework. The result reports regression result from equation (11). r_{pt} and R_{mt} are the return of mutual funds and market return in excess of 1 year government bond. SMB, HML, and MOM is the mimics portfolio return accounts for size, value and momentum respectively. CSK is coskewness risk factor. L_{mt} is liquidity measurements in this analysis are Amihud illiquidity, Roll, zero, and Adjusted-Illiquidity respectively. $\overline{L_m}$ is time series mean of liquidity measure.

$$r_{pt} = \alpha_p + \beta_{0mp} rm_t + \beta_{2p} SMB_t + \beta_{3p} HML_t + \beta_{4p} MOM_t + \beta_{5p} CSK_t + \beta_{mkt} {r_{mt}}^2 + \gamma_{mt}(L_{mt} - \overline{L_m}) rm_t + \varepsilon_{p,t}$$

Panel A: Adjusted-Illiquidity measure

Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
1	-0.020**	0.473***	-0.140	0.083	0.343*	0.225	-0.108	-0.217***	81.66
	(0.0479)	(0.0000)	(0.7542)	(0.7621)	(0.0573)	(0.1087)	(0.6084)	(0.0000)	
2	-0.017	0.400***	-0.177	0.019	0.372**	0.246*	-0.132	-0.266***	82.56
	(0.1111)	(0.0000)	(0.6493)	(0.9339)	(0.0438)	(0.0690)	(0.6166)	(0.0000)	
3	-0.019*	0.587***	0.458	-0.224	0.299*	-0.108	0.121	-0.154***	86.32
	(0.0520)	(0.0000)	(0.1796)	(0.2593)	(0.0858)	(0.4425)	(0.4831)	(0.0000)	
4	-0.013**	0.819***	0.503**	-0.246	0.188*	-0.110	0.425***	-0.026	96.47
	(0.0227)	(0.0000)	(0.0476)	(0.1027)	(0.0542)	(0.1964)	(0.0000)	(0.1174)	
5	-0.011**	0.867***	0.639**	-0.232	0.154**	-0.141	0.389***	0.035**	96.69
	(0.0224)	(0.0000)	(0.0105)	(0.1670)	(0.0391)	(0.1136)	(0.0001)	(0.0362)	
6	-0.005	0.884***	0.728***	-0.310	0.062	-0.126	0.322***	0.051***	96.39
	(0.2375)	(0.0000)	(0.0083)	(0.1146)	(0.4955)	(0.1258)	(0.0012)	(0.0004)	
7	0.004	0.887***	0.658	-0.358	-0.105	-0.148	0.530***	0.036	93.84
	(0.4589)	(0.0000)	(0.1028)	(0.2222)	(0.3659)	(0.2187)	(0.0007)	(0.1661)	
8	0.014	0.851***	0.809*	-0.331	-0.326**	-0.284**	0.608***	0.083**	90.90
	(0.1151)	(0.0000)	(0.0851)	(0.3054)	(0.0345)	(0.0261)	(0.0061)	(0.0257)	
9	0.020*	0.681***	0.505	-0.223	-0.399**	-0.253*	0.508*	0.322***	85.00
	(0.0755)	(0.0000)	(0.3368)	(0.4588)	(0.0462)	(0.0680)	(0.0671)	(0.0000)	
10	0.027**	0.655***	0.407	-0.267	-0.43**	-0.219	0.406*	0.320***	82.65
	(0.0111)	(0.0000)	(0.4891)	(0.4848)	(0.0118)	(0.1287)	(0.0853)	(0.0000)	
10-1	0.048***	0.685	1.000	-0.338	-0.773**	-0.444*	0.261	0.538***	66.61
	(0.0085)	(0.0242)	(0.5220)	(0.4884)	(0.0109)	(0.0503)	(0.2030)	(0.0000)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.8 (Continued)

Panel B : Amihud Illiquidity measure									
Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
1	-0.020*	0.402***	0.285	0.027	0.368*	0.279*	-0.353	-0.106***	79.52
	(0.0672)	(0.0000)	(0.5655)	(0.9218)	(0.0559)	(0.0813)	(0.1049)	(0.0001)	
2	-0.016	0.315***	0.314	-0.058	0.377*	0.294**	-0.354	-0.142***	80.60
	(0.1389)	(0.0000)	(0.4924)	(0.7897)	(0.0526)	(0.0300)	(0.1353)	(0.0000)	
3	-0.018*	0.539***	0.734*	-0.272	0.293*	-0.087	0.021	-0.087***	86.06
	(0.0631)	(0.0000)	(0.0683)	(0.1744)	(0.0949)	(0.5242)	(0.8895)	(0.0000)	
4	-0.013**	0.810***	0.559**	-0.251*	0.195**	-0.100	0.384***	-0.011	96.43
	(0.0207)	(0.0000)	(0.0353)	(0.0963)	(0.0422)	(0.2416)	(0.0004)	(0.3515)	
5	-0.011**	0.877***	0.581**	-0.219	0.160**	-0.142	0.397***	0.022**	96.71
	(0.0156)	(0.0000)	(0.0129)	(0.1806)	(0.0236)	(0.1035)	(0.0001)	(0.0436)	
6	-0.005	0.901***	0.636**	-0.295	0.063	-0.133*	0.357***	0.028***	96.36
	(0.2015)	(0.0000)	(0.0227)	(0.1350)	(0.4577)	(0.0970)	(0.0000)	(0.0000)	
7	0.005	0.900***	0.574	-0.352	-0.120	-0.165	0.606***	0.012	93.75
	(0.4258)	(0.0000)	(0.1740)	(0.2376)	(0.3039)	(0.1803)	(0.0001)	(0.4438)	
8	0.014	0.877***	0.654	-0.308	-0.329**	-0.299**	0.682***	0.043*	90.75
	(0.1179)	(0.0000)	(0.1879)	(0.3438)	(0.0349)	(0.0191)	(0.0010)	(0.0506)	
9	0.019*	0.782***	-0.081	-0.127	-0.398*	-0.304**	0.753***	0.176***	83.11
	(0.0967)	(0.0000)	(0.8972)	(0.6854)	(0.0549)	(0.0388)	(0.0013)	(0.0000)	
10	0.025**	0.755***	-0.163	-0.167	-0.417**	-0.261*	0.612***	0.181***	81.58
	(0.0187)	(0.0000)	(0.8090)	(0.6689)	(0.0218)	(0.0726)	(0.0066)	(0.0000)	
10-1	0.046**	0.304***	1.000	-0.338	-0.785**	-0.540**	0.966**	0.287***	61.35
	(0.0178)	(0.0001)	(0.6558)	(0.7120)	(0.0168)	(0.0374)	(0.0146)	(0.0000)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.8 (Continued)

Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
Panel C: Roll effective spread									
1	-0.027**	0.473***	0.569	0.020	0.541**	0.376*	-0.514	-0.024	75.32
	(0.0357)	(0.0001)	(0.3164)	(0.9475)	(0.0115)	(0.0555)	(0.4341)	(0.3144)	
2	-0.025*	0.481***	0.729	-0.131	0.579***	0.375**	-0.171	-0.052*	74.04
	(0.0522)	(0.0007)	(0.1952)	(0.6027)	(0.0086)	(0.0215)	(0.8347)	(0.0977)	
3	-0.024**	0.663***	1.000**	-0.338	0.407**	-0.053	0.261	-0.038*	84.22
	(0.0160)	(0.0000)	(0.0323)	(0.1172)	(0.0179)	(0.6859)	(0.5967)	(0.0570)	
4	-0.014**	0.828***	0.594**	-0.261*	0.209**	-0.097	0.425**	-0.005	96.41
	(0.0180)	(0.0000)	(0.0244)	(0.0828)	(0.0328)	(0.2700)	(0.0294)	(0.5149)	
5	-0.01**	0.826***	0.502**	-0.185	0.139*	-0.138	0.228	0.015**	96.71
	(0.0437)	(0.0000)	(0.0245)	(0.2538)	(0.0613)	(0.1071)	(0.1318)	(0.0154)	
6	-0.0042	0.882***	0.560*	-0.293	0.016	-0.160*	0.402**	0.006	96.17
	(0.3632)	(0.0000)	(0.0536)	(0.1472)	(0.8374)	(0.0569)	(0.0432)	(0.3734)	
7	0.0061	0.853***	0.522	-0.317	-0.123	-0.150	0.410	0.013	93.82
	(0.3194)	(0.0000)	(0.2222)	(0.2518)	(0.2842)	(0.1788)	(0.2423)	(0.3539)	
8	0.0173**	0.817***	0.5223	-0.277	-0.387***	-0.318**	0.576	0.018	90.40
	(0.0469)	(0.0000)	(0.3264)	(0.3787)	(0.0053)	(0.0132)	(0.2092)	(0.3239)	
9	0.0308**	0.578***	-0.5957	-0.0377	-0.649***	-0.406**	0.532	0.064*	74.51
	(0.0350)	(0.0006)	(0.4394)	(0.9261)	(0.0072)	(0.0404)	(0.5746)	(0.0691)	
10	0.037**	0.534***	-0.697	-0.066	-0.670***	-0.359*	0.328	0.069**	72.50
	(0.0184)	(0.0013)	(0.3922)	(0.8885)	(0.0073)	(0.0588)	(0.7189)	(0.0363)	
10-1	0.064**	0.663	1.000	-0.338	-1.212***	-0.736**	0.261	0.094*	42.24
	(0.0161)	(0.8243)	(0.3063)	(0.8955)	(0.0047)	(0.0398)	(0.5840)	(0.0915)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.8 (Continued)

Panel D: Zero									
Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
1	-0.024*	0.670***	-0.035	0.347	0.517**	0.367*	-1.080***	-1.600*	75.80
	(0.0585)	(0.0010)	(0.9563)	(0.3906)	(0.0214)	(0.0681)	(0.0000)	(0.0781)	
2	-0.022	0.595***	0.037	0.303	0.595**	0.431**	-1.312***	-1.709*	72.48
	(0.1177)	(0.0082)	(0.9393)	(0.3634)	(0.0237)	(0.0345)	(0.0000)	(0.0813)	
3	-0.021*	0.905***	0.186	0.115	0.385**	-0.051	-0.609***	-2.130***	84.68
	(0.0501)	(0.0000)	(0.5665)	(0.6312)	(0.0456)	(0.7290)	(0.0021)	(0.0009)	
4	-0.014**	0.863***	0.476**	-0.196	0.205*	-0.097	0.301***	-0.310	96.42
	(0.0243)	(0.0000)	(0.0265)	(0.1685)	(0.0542)	(0.2500)	(0.0001)	(0.3261)	
5	-0.010**	0.880***	0.533**	-0.236	0.115	-0.176**	0.540***	0.010	96.56
	(0.0314)	(0.0000)	(0.0312)	(0.1554)	(0.1230)	(0.0419)	(0.0000)	(0.9740)	
6	-0.004	0.857***	0.668**	-0.357*	0.017	-0.164**	0.548***	0.275	96.16
	(0.3035)	(0.0000)	(0.0281)	(0.0899)	(0.8336)	(0.0416)	(0.0000)	(0.4553)	
7	0.005	0.872***	0.604*	-0.386	-0.138	-0.176	0.690***	0.166	93.72
	(0.3583)	(0.0000)	(0.0603)	(0.1415)	(0.1827)	(0.1341)	(0.0000)	(0.7702)	
8	0.016*	0.751***	0.817**	-0.453	-0.38***	-0.332**	0.985***	0.748	90.33
	(0.0697)	(0.0000)	(0.0463)	(0.1240)	(0.0036)	(0.0121)	(0.0000)	(0.2639)	
9	0.026	0.384	0.360	-0.619*	-0.656**	-0.462**	1.951***	2.40**	73.00
	(0.1133)	(0.1168)	(0.4922)	(0.0992)	(0.0362)	(0.0451)	(0.0000)	(0.0325)	
10	0.033*	0.349*	0.283	-0.670	-0.683**	-0.424*	1.844***	2.449**	70.46
	(0.0700)	(0.0898)	(0.5857)	(0.1058)	(0.0429)	(0.0605)	(0.0000)	(0.0133)	
10-1	0.057**	0.663	1.000	-1.018	-1.201**	-0.791**	2.925***	4.049**	41.05
	(0.0473)	(0.3936)	(0.7350)	(0.1303)	(0.0228)	(0.0430)	(0.0000)	(0.0173)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.9 Robustness test.

This table report $\overline{L_m}$ at LAG48 and the result of liquidity timing at portfolio level in higher moment framework. r_{pt} , and R_{mt} are the return of mutual funds and market return in excess of 1 year government bond. SMB, HML, and MOM is the mimics portfolio return accounts for size, value and momentum respectively. CSK is coskewness risk factor. L_{mt} is liquidity measurements in this analysis are Amihud illiquidity, Roll, zero, and Adjusted-Illiquidity respectively. $\overline{L_m}$ is time series mean of liquidity measure.

$$r_{pt} = \alpha_p + \beta_{0mp} rm_t + \beta_{2p} SMB_t + \beta_{3p} HML_t + \beta_{4p} MOM_t + \beta_{5p} CSK_t + \beta_{mkt} {r_{mt}}^2 + \gamma_{mt} (L_{mt} - \overline{L_m}) rm_t + \varepsilon_{p,t}$$

Panel A :Adj-Illiquidity measure

Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
1	-0.020**	0.511***	-0.140	0.083	0.343*	0.225	-0.108	-0.217***	81.66
	(0.0479)	(0.0000)	(0.7542)	(0.7621)	(0.0573)	(0.1087)	(0.6084)	(0.0000)	
2	-0.017	0.445***	-0.177	0.019	0.372**	0.246*	-0.132	-0.266***	82.56
	(0.1111)	(0.0000)	(0.6493)	(0.9339)	(0.0438)	(0.0690)	(0.6166)	(0.0000)	
3	-0.019*	0.613***	0.458	-0.224	0.299*	-0.108	0.121	-0.154***	86.32
	(0.0520)	(0.0000)	(0.1796)	(0.2593)	(0.0858)	(0.4425)	(0.4831)	(0.0000)	
4	-0.013**	0.823***	0.503**	-0.246	0.188*	-0.110	0.425***	-0.026	96.47
	(0.0227)	(0.0000)	(0.0476)	(0.1027)	(0.0542)	(0.1964)	(0.0000)	(0.1174)	
5	-0.011**	0.860***	0.639**	-0.232	0.154**	-0.141	0.389***	0.035**	96.69
	(0.0224)	(0.0000)	(0.0105)	(0.1670)	(0.0391)	(0.1136)	(0.0001)	(0.0362)	
6	-0.005	0.876***	0.728***	-0.310	0.062	-0.126	0.322***	0.051***	96.39
	(0.2375)	(0.0000)	(0.0083)	(0.1146)	(0.4955)	(0.1258)	(0.0012)	(0.0004)	
7	0.004	0.880***	0.658	-0.358	-0.105	-0.148	0.530***	0.036	93.84
	(0.4589)	(0.0000)	(0.1028)	(0.2222)	(0.3659)	(0.2187)	(0.0007)	(0.1661)	
8	0.014	0.836***	0.809*	-0.331	-0.326**	-0.284**	0.608***	0.083**	90.90
	(0.1151)	(0.0000)	(0.0851)	(0.3054)	(0.0345)	(0.0261)	(0.0061)	(0.0257)	
9	0.020*	0.626***	0.505	-0.223	-0.399**	-0.253*	0.508*	0.322***	85.00
	(0.0755)	(0.0000)	(0.3368)	(0.4588)	(0.0462)	(0.0680)	(0.0671)	(0.0000)	
10	0.027**	0.600***	0.407	-0.267	-0.43**	-0.219	0.406*	0.320***	82.65
	(0.0111)	(0.0000)	(0.4891)	(0.4848)	(0.0118)	(0.1287)	(0.0853)	(0.0000)	
10-1	0.048***	0.685	1.000	-0.338	-0.773**	-0.444*	0.261	0.538***	66.61
	(0.0085)	(0.2717)	(0.5220)	(0.4884)	(0.0109)	(0.0503)	(0.2030)	(0.0000)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.9 (Continued)

Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
Panel B: Amihud Illiquidity measure									
1	-0.020*	0.420***	0.285	0.027	0.368*	0.279*	-0.353	-0.106***	79.52
	(0.0672)	(0.0000)	(0.5655)	(0.9218)	(0.0559)	(0.0813)	(0.1049)	(0.0001)	
2	-0.016	0.339***	0.314	-0.058	0.377*	0.294**	-0.354	-0.142***	80.60
	(0.1389)	(0.0000)	(0.4924)	(0.7897)	(0.0526)	(0.0300)	(0.1353)	(0.0000)	
3	-0.018*	0.553***	0.734*	-0.272	0.293*	-0.087	0.021	-0.087***	86.06
	(0.0631)	(0.0000)	(0.0683)	(0.1744)	(0.0949)	(0.5242)	(0.8895)	(0.0000)	
4	-0.013**	0.812***	0.559**	-0.251*	0.195**	-0.100	0.384***	-0.011	96.43
	(0.0207)	(0.0000)	(0.0353)	(0.0963)	(0.0422)	(0.2416)	(0.0004)	(0.3515)	
5	-0.011**	0.873***	0.581**	-0.219	0.160**	-0.142	0.397***	0.022**	96.71
	(0.0156)	(0.0000)	(0.0129)	(0.1806)	(0.0236)	(0.1035)	(0.0001)	(0.0436)	
6	-0.005	0.896***	0.636**	-0.295	0.063	-0.133*	0.357***	0.028***	96.36
	(0.2015)	(0.0000)	(0.0227)	(0.1350)	(0.4577)	(0.0970)	(0.0000)	(0.0000)	
7	0.005	0.898***	0.574	-0.352	-0.120	-0.165	0.606***	0.012	93.75
	(0.4258)	(0.0000)	(0.1740)	(0.2376)	(0.3039)	(0.1803)	(0.0001)	(0.4438)	
8	0.014	0.870***	0.654	-0.308	-0.329**	-0.299**	0.682***	0.043*	90.75
	(0.1179)	(0.0000)	(0.1879)	(0.3438)	(0.0349)	(0.0191)	(0.0010)	(0.0506)	
9	0.019*	0.753***	-0.081	-0.127	-0.398*	-0.304**	0.753***	0.176***	83.11
	(0.0967)	(0.0000)	(0.8972)	(0.6854)	(0.0549)	(0.0388)	(0.0013)	(0.0000)	
10	0.025**	0.724***	-0.163	-0.167	-0.417**	-0.261*	0.612***	0.181***	81.58
	(0.0187)	(0.0000)	(0.8090)	(0.6689)	(0.0218)	(0.0726)	(0.0066)	(0.0000)	
10-1	0.046**	0.304***	1.000	-0.338	-0.785**	-0.540**	0.966**	0.287***	61.35
	(0.0085)	(0.2717)	(0.5220)	(0.4884)	(0.0109)	(0.0503)	(0.2030)	(0.0000)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.9 (Continued)

Panel C: Roll effective spread

Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
1	-0.027**	0.486***	0.569	0.020	0.541**	0.376*	-0.514	-0.024	75.32
	(0.0357)	(0.0003)	(0.3164)	(0.9475)	(0.0115)	(0.0555)	(0.4341)	(0.3144)	
2	-0.025*	0.510***	0.729	-0.131	0.579***	0.375**	-0.171	-0.052*	74.04
	(0.0522)	(0.0012)	(0.1952)	(0.6027)	(0.0086)	(0.0215)	(0.8347)	(0.0977)	
3	-0.024**	0.685***	1.000**	-0.338	0.407**	-0.053	0.261	-0.038*	84.22
	(0.0160)	(0.0000)	(0.0323)	(0.1172)	(0.0179)	(0.6859)	(0.5967)	(0.0570)	
4	-0.014**	0.831***	0.594**	-0.261*	0.209**	-0.097	0.425**	-0.005	96.41
	(0.0180)	(0.0000)	(0.0244)	(0.0828)	(0.0328)	(0.2700)	(0.0294)	(0.5149)	
5	-0.01**	0.817***	0.502**	-0.185	0.139*	-0.138	0.228	0.015**	96.71
	(0.0437)	(0.0000)	(0.0245)	(0.2538)	(0.0613)	(0.1071)	(0.1318)	(0.0154)	
6	-0.004	0.878***	0.560*	-0.293	0.016	-0.160*	0.402**	0.006	96.17
	(0.3632)	(0.0000)	(0.0536)	(0.1472)	(0.8374)	(0.0569)	(0.0432)	(0.3734)	
7	0.006	0.846***	0.522	-0.317	-0.123	-0.150	0.410	0.013	93.82
	(0.3194)	(0.0000)	(0.2222)	(0.2518)	(0.2842)	(0.1788)	(0.2423)	(0.3539)	
8	0.017**	0.80***	0.522	-0.277	-0.387***	-0.318**	0.576	0.018	90.40
	(0.0469)	(0.0000)	(0.3264)	(0.3787)	(0.0053)	(0.0132)	(0.2092)	(0.3239)	
9	0.030**	0.542***	-0.595	-0.037	-0.649***	-0.406**	0.532	0.064*	74.51
	(0.0350)	(0.0034)	(0.4394)	(0.9261)	(0.0072)	(0.0404)	(0.5746)	(0.0691)	
10	0.037**	0.496***	-0.697	-0.066	-0.670***	-0.359*	0.328	0.069**	72.50
	(0.0184)	(0.0063)	(0.3922)	(0.8885)	(0.0073)	(0.0588)	(0.7189)	(0.0363)	
10-1	-0.027**	0.486***	0.569	0.020	0.541**	0.376*	-0.514	-0.024	75.32
	(0.0161)	(0.9748)	(0.3063)	(0.8955)	(0.0047)	(0.0398)	(0.5840)	(0.0915)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.9 (Continued)

Panel D: Zero									
Port No	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
1	-0.024*	0.667***	-0.035	0.347	0.517**	0.367*	-1.080***	-1.600*	75.80
	(0.0585)	(0.0010)	(0.9563)	(0.3906)	(0.0214)	(0.0681)	(0.0000)	(0.0781)	
2	-0.022	0.592***	0.0376	0.303	0.595**	0.431**	-1.312***	-1.709*	72.48
	(0.1177)	(0.0080)	(0.9393)	(0.3634)	(0.0237)	(0.0345)	(0.0000)	(0.0813)	
3	-0.021*	0.901***	0.186	0.115	0.385**	-0.051	-0.609***	-2.130***	84.68
	(0.0501)	(0.0000)	(0.5665)	(0.6312)	(0.0456)	(0.7290)	(0.0021)	(0.0009)	
4	-0.014**	0.863***	0.476**	-0.196	0.205*	-0.097	0.301***	-0.310	96.42
	(0.0243)	(0.0000)	(0.0265)	(0.1685)	(0.0542)	(0.2500)	(0.0001)	(0.3261)	
5	-0.010**	0.880***	0.533**	-0.236	0.115	-0.176**	0.540***	0.010	96.56
	(0.0314)	(0.0000)	(0.0312)	(0.1554)	(0.1230)	(0.0419)	(0.0000)	(0.9740)	
6	-0.004	0.857***	0.668**	-0.357*	0.017	-0.164**	0.548***	0.275	96.16
	(0.3035)	(0.0000)	(0.0281)	(0.0899)	(0.8336)	(0.0416)	(0.0000)	(0.4553)	
7	0.005	0.872***	0.604*	-0.386	-0.138	-0.176	0.690***	0.166	93.72
	(0.3583)	(0.0000)	(0.0603)	(0.1415)	(0.1827)	(0.1341)	(0.0000)	(0.7702)	
8	0.016*	0.752***	0.817**	-0.453	-0.387***	-0.332**	0.985***	0.748	90.33
	(0.0697)	(0.0000)	(0.0463)	(0.1240)	(0.0036)	(0.0121)	(0.0000)	(0.2639)	
9	0.026	0.388	0.360	-0.619*	-0.656**	-0.462**	1.951***	2.40**	73.00
	(0.1133)	(0.1103)	(0.4922)	(0.0992)	(0.0362)	(0.0451)	(0.0000)	(0.0325)	
10	0.033*	0.353*	0.283	-0.670	-0.683**	-0.424*	1.844***	2.449**	70.4
	(0.0700)	(0.0837)	(0.5857)	(0.1058)	(0.0429)	(0.0605)	(0.0000)	(0.0133)	
10-1	-0.024*	0.667***	-0.035	0.347	0.517**	0.367*	-1.080***	-1.600*	75.80
	(0.0473)	(0.4005)	(0.7350)	(0.1303)	(0.0228)	(0.0430)	(0.0000)	(0.0173)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.10 The test of different liquidity timing between BR funds and NBR funds. The result reports regression result from equation (12). r_{pt}, and R_{mt} are the return of mutual funds and market return in excess of 1 year government bond. SMB, HML, and MOM is the mimics portfolio return accounts for size, value and momentum respectively. CSK is coskewness risk factor. L_{mt} is liquidity measurements in this analysis are Amihud illiquidity, Roll, zero, and Adjusted-Illiquidity respectively. $\overline{L_m}$ is time series mean of liquidity measure.

$$r_{pt} = \alpha_p + \beta_{0mp} rm_t + \beta_{2p} SMB_t + \beta_{3p} HML_t + \beta_{4p} MOM_t + \beta_{5p} CSK_t + \beta_{mkt} {r_{mt}}^2 + \gamma_{mt}(L_{mt} - \overline{L_m}) rm_t + \varepsilon_{p,t}$$

Panel A: Full sample									
	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
Adj-illiquidity	-0.002	0.7112***	0.4365**	-0.2091	0.0155	-0.0909*	0.3082***	0.0185**	98.17
	(0.4676)	(0.0000)	(0.0328)	(0.1085)	(0.7111)	(0.0540)	(0.0000)	(0.0227)	
Amihud	-0.0021	0.7168***	0.4064**	-0.2024	0.0189	-0.0915*	0.312***	0.0118**	98.18
	(0.4202)	(0.0000)	(0.0485)	(0.1215)	(0.6449)	(0.0508)	(0.0000)	(0.0168)	
Roll	-0.0013	0.6945***	0.3678*	-0.1887	0.0058	-0.0924*	0.2491**	0.0067*	98.16
	(0.6233)	(0.0000)	(0.0769)	(0.1498)	(0.8877)	(0.0565)	(0.0124)	(0.0951)	
Zero	-0.0015	0.7132***	0.3912**	-0.2156*	-0.0034	-0.1076**	0.387***	0.0324	98.12
	(0.5905)	(0.0000)	(0.0197)	(0.0561)	(0.9416)	(0.0259)	(0.0000)	(0.8853)	

Panel B: BR funds									
	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
Adj-illiquidity	-0.0152***	0.6963***	0.4966***	-0.2534**	0.0351	-0.2038***	0.2679***	0.0188***	98.07
	(0.0000)	(0.0000)	(0.0068)	(0.0377)	(0.3921)	(0.0001)	(0.0000)	(0.0098)	
Amihud	-0.0153***	0.7021***	0.4629**	-0.2477**	0.0356	-0.2065***	0.2807***	0.0105***	98.06
	(0.0000)	(0.0000)	(0.0119)	(0.0430)	(0.3757)	(0.0001)	(0.0000)	(0.0077)	
Roll	-0.0146***	0.684***	0.4294**	-0.2371*	0.0233	-0.2085***	0.2345**	0.0055	98.04
	(0.0000)	(0.0000)	(0.0210)	(0.0526)	(0.5492)	(0.0001)	(0.0163)	(0.1603)	
Zero	-0.0147***	0.7062***	0.4351***	-0.2532**	0.0142	-0.2227***	0.346***	-0.0118	98.01
	(0.0000)	(0.0000)	(0.0061)	(0.0225)	(0.7438)	(0.0000)	(0.0000)	(0.9532)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table 4.10 (Continued)

Panel C: NBR funds									
	α_p	β_{0mp}	β_{2p}	β_{3p}	β_{4p}	β_{5p}	β_{mkt}	γ_{mt}	Adj-R^2 (%)
Adj-	-0.011***	0.7603***	0.265	-0.102	-0.0181	-0.1469***	0.3973***	0.0107	97.71
illiquidity	(0.0018)	(0.0000)	(0.3237)	(0.5394)	(0.7368)	(0.0060)	(0.0000)	(0.3629)	
Amihud	0.0113***	0.763***	0.254	-0.0962	-0.0107	-0.143***	0.382***	0.0095	97.73
	(0.0011)	(0.0000)	(0.3488)	(0.5632)	(0.8374)	(0.0066)	(0.0000)	(0.2108)	
Roll	0.0106***	0.741***	0.2208	-0.0816	-0.0195	-0.1411***	0.3093**	0.0065	97.73
	(0.0034)	(0.0000)	(0.4168)	(0.6251)	(0.7266)	(0.0096)	(0.0101)	(0.1926)	
Zero	0.0108***	0.7524***	0.2565	-0.1134	-0.027	-0.1543***	0.4445***	0.0688	97.69
	(0.0033)	(0.0000)	(0.2313)	(0.4149)	(0.6559)	(0.0036)	(0.0000)	(0.8020)	

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

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APPENDICES

APPENDIX A

Alternative model for chapter2

Table A-1 Alternative model with management fee.

The table compare the result from Table 2-3 with alternative model with management fee. Panel A, B, and C represent the different interim periods from July to September respectively follow alternative model with management fee;

$$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DB_i + \beta_4 \Delta\sigma_{it}^{m} + \beta_5 \sigma_{it}^{1} + \beta_6 lnAge_{it} + \beta_7 lnAUM_{it} + \beta_8 Mgtfee_i + \varepsilon_{it}$$

	Period (8,4): MAL					
	Equation (2-3)			Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.0001	-0.00406***	-0.00390***	-0.000196	-0.00409***	-0.00368***
	(0.58)	(0.00)	(0.00)	(0.491)	(0.000)	(0.001)
β_3	0.0011	-0.0007	0.0000	0.00120	-0.000682	0.00000877
	(0.56)	(0.66)	(0.99)	(0.522)	(0.675)	(0.996)
β_4	0.867***	0.821***	0.831***	0.862***	0.818***	0.834***
	(0.00)	(0.00)	(0.00)	(0.000)	(0.000)	(0.000)
β_5	-0.415***	-0.239***	-0.342***	-0.419***	-0.244***	-0.344***
	(0.00)	(0.00)	(0.00)	(0.000)	(0.001)	(0.000)
β_6	0.0017	-0.00351**	-0.00492***	0.00205	-0.00370**	-0.00552***
	(0.14)	(0.05)	(0.00)	(0.104)	(0.035)	(0.001)
β_7	0.0003	0.0001	-0.0010	0.000395	0.000115	-0.00117
	(0.66)	(0.89)	(0.22)	(0.558)	(0.843)	(0.193)
β_8				-0.000584	0.00127*	0.000494
				(0.303)	(0.053)	(0.363)
α_{it}	0.0033	-0.0131	0.0168	0.00293	-0.0205	0.0189
	(0.78)	(0.35)	(0.27)	(0.811)	(0.147)	(0.242)
N	171	163	158	169	163	158
Adj-R^2	79.0	85.7	83.2	79.0	86.0	83.3

Table A-1 (Continued)

Period (8,4): SIN						
	Equation (2-3)			Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.000550**	0.0080	-0.0107	0.000701*	0.00666	-0.0250
	(0.02)	(0.23)	(0.21)	(0.084)	(0.325)	(0.052)
β_3	0.0009	-0.0040	0.0126	-0.0242	-0.0102	0.0425
	(0.88)	(0.42)	(0.24)	(0.491)	(0.194)	(0.102)
β_4	0.421***	1.011***	1.334***	0.384***	0.958***	1.666***
	(0.00)	(0.00)	(0.00)	(0.000)	(0.000)	(0.000)
β_5	-0.560***	-0.594***	-0.3950	-0.563***	-0.585***	-0.924**
	(0.00)	(0.00)	(0.13)	(0.003)	(0.004)	(0.013)
β_6	-0.0033	-0.00532*	0.0061	-0.00108	-0.00588*	0.0120*
	(0.24)	(0.09)	(0.18)	(0.792)	(0.057)	(0.064)
β_7	0.0020	-0.0001	0.0041	0.00670	0.000551	0.0138**
	(0.12)	(0.94)	(0.39)	(0.300)	(0.730)	(0.044)
β_8				0.00503	0.00264	-0.00581
				(0.573)	(0.178)	(0.143)
α_{it}	-0.0018	0.0815*	-0.0184	-0.0872	0.0553*	-0.0987
	(0.94)	(0.08)	(0.77)	(0.485)	(0.09)	(0.433)
N	44	40	40	33	40	26
Adj-R^2	51.7	73.8	62.1	50.7	73.5	76.4

Table A-1 (Continued)

Period (8,4): TH						
	Equation (2-3)			Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.000933***	0.0005	-0.00204**	0.000913***	0.000553	-0.00205**
	(0.00)	(0.52)	(0.01)	(0.001)	(0.502)	(0.012)
β_3	0.0004	0.00396***	0.00232**	0.000368	0.00388***	0.00231*
	(0.84)	(0.00)	(0.05)	(0.839)	(0.005)	(0.051)
β_4	1.067***	1.082***	1.108***	1.066***	1.082***	1.108***
	(0.00)	(0.00)	(0.00)	(0.000)	(0.000)	(0.000)
β_5	-0.291***	-0.285***	-0.560***	-0.288***	-0.281***	-0.563***
	(0.00)	(0.00)	(0.00)	(0.000)	(0.000)	(0.000)
β_6	0.0010	-0.0007	-0.00252**	0.000986	-0.000674	-0.00256**
	(0.47)	(0.55)	(0.01)	(0.478)	(0.590)	(0.013)
β_7	-0.0002	0.0002	0.0005	-0.000199	0.000186	0.000501
	(0.70)	(0.72)	(0.30)	(0.703)	(0.699)	(0.272)
β_8				-0.000681	-0.000273	0.000102
				(0.466)	(0.611)	(0.823)
α_{it}	0.0260**	0.0132	0.0177	0.0261**	0.0129	0.0175
	(0.01)	(0.22)	(0.12)	(0.014)	(0.234)	(0.116)
N	356	353	365	356	353	365
Adj-R^2	90.0	91.4	93.8	90.0	91.4	93.8

Table A-2 Alternative model with management fee.

The table compare the result from Table 2-4 with alternative model with management fee. Panel A, B, and C represent the different interim periods from July to September respectively follow alternative model with management fee;

$$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_4 \Delta\sigma_{it}^{m} + \beta_5 \sigma_{it}^{1} + \beta_6 lnAge_{it} + \beta_7 lnAUM_{it} + \beta_8 Mgtfee_i + \varepsilon_{it}$$

Period (8,4): TH BR						
	Equation (2-3)			Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.000793***	0.00167*	-0.00223**	0.000753***	0.00165*	-0.00223**
	(0.00)	(0.09)	(0.04)	(0.00)	(0.08)	(0.03)
β_4	1.044***	1.138***	1.145***	1.042***	1.138***	1.149***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
β_5	-0.294***	-0.320***	-0.669***	-0.290***	-0.324***	-0.698***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
β_6	0.00183*	0.00187	-0.00433***	0.00177	0.00183	-0.00469***
	(0.10)	(0.21)	(0.00)	(0.11)	(0.22)	(0.00)
β_7	-0.000444	0.000914	0.000538	-0.000462	0.000892	0.000553
	(0.25)	(0.12)	(0.27)	(0.23)	(0.12)	(0.25)
β_8				-0.000809	0.000204	0.000917*
				(0.44)	(0.71)	(0.05)
α_{it}	0.0294***	0.00351	0.0285**	0.0298***	0.00398	0.0296**
	(0.00)	(0.79)	(0.03)	(0.00)	(0.76)	(0.02)
N	250	218	249	250	218	249
Adj-R^2	92.4	92.4	94.0	92.4	92.4	94.1

Table A-2: (Continue)

Period (8,4): TH NBR						
	Equation (2-3)			Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.00180*	-0.00109	-0.00114	0.00193*	-0.000964	-0.00115
	(0.09)	(0.43)	(0.32)	(0.07)	(0.48)	(0.31)
β_4	1.127***	1.012***	1.057***	1.132***	1.013***	1.056***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
β_5	-0.313**	-0.286***	-0.362***	-0.315**	-0.274***	-0.372***
	(0.03)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)
β_6	-0.00217	-0.00470***	-0.000166	-0.00227	-0.00438**	0.000121
	(0.62)	(0.01)	(0.93)	(0.60)	(0.01)	(0.94)
β_7	0.000319	-0.000929	0.000976	0.000405	-0.000945	0.000677
	(0.84)	(0.22)	(0.27)	(0.80)	(0.21)	(0.42)
β_8				-0.00176	-0.00140	-0.000559
				(0.33)	(0.19)	(0.47)
α_{it}	0.0273	0.0356*	-0.00483	0.0274	0.0367**	0.00148
	(0.36)	(0.06)	(0.81)	(0.35)	(0.04)	(0.93)
N	106	135	116	106	135	116
Adj-R^2	86.2	90.3	94.2	86.3	90.4	94.3

APPENDIX B

Alternative model for chapter3

Table B-1 Alternative model with management fee.

The table compare the result from Table 3-6 with alternative model with management fee on August assessment period;

$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_3 DM_{it} + \beta_4 DB_i + \beta_5 \Delta\sigma_{it}^{m} + \beta_6 \sigma_{it}^{1} + +\beta_7 lnAUM_{it} + \beta_8 Age_{it} + \beta_8 Mgtfee_i + \varepsilon_{it}$

	M8					
	Equation (3-3)			Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0194**	-0.00874	-0.0317***	0.0192**	-0.00873	-0.0316***
	(0.012)	(0.138)	(0.000)	(0.013)	(0.138)	(0.000)
β_3	0.0200***	0.00880***	0.0253***	0.0199***	0.00880***	0.0253***
	(0.000)	(0.004)	(0.000)	(0.000)	(0.004)	(0.000)
β_4	0.00105	-0.000234	0.00421**	0.000679	-0.000219	0.00412**
	(0.507)	(0.871)	(0.010)	(0.666)	(0.880)	(0.014)
β_5	0.719***	1.069***	0.778***	0.719***	1.069***	0.778***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	-0.0159	0.0225	0.0703**	-0.0117	0.0224	0.0708**
	(0.619)	(0.585)	(0.033)	(0.713)	(0.591)	(0.032)
β_7	0.000191	0.000761	-0.00000519	0.000102	0.000760	-0.0000191
	(0.655)	(0.191)	(0.993)	(0.815)	(0.192)	(0.973)
β_8	0.00130	0.000137	0.000804	0.00150	0.000136	0.000843
	(0.155)	(0.874)	(0.438)	(0.110)	(0.875)	(0.429)
β_9				-0.00164	0.0000663	-0.000344
				(0.239)	(0.956)	(0.798)
α	-0.00722	-0.0103	0.0182	-0.00467	-0.0103	0.0187
	(0.405)	(0.394)	(0.179)	(0.599)	(0.392)	(0.174)
N	475	505	499	475	505	499
Adj-R^2	73.8	81.2	48.0	73.8	81.2	48.0

Table B-2 Alternative model with management fee.

The table compare the result from Table 3-7 with alternative model with management fee on August assessment period;

$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_4 DB_i + \beta_5 \Delta\sigma_{it}^m + \beta_6 \sigma_{it}^1 + +\beta_7 lnAUM_{it} + \beta_8 Age_{it} + \beta_8 Mgtfee_i + \varepsilon_{it}$

	M8					
	Ddown Equation (3-3)			Ddown Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0305	-0.0327	-0.0726*	0.0307	-0.0368	-0.0692
	(0.375)	(0.145)	(0.010)	(0.373)	(0.113)	(0.115)
β_4	-0.00151	-0.00679	0.0155**	-0.00116	-0.00782	0.0136*
	(0.835)	(0.153)	(0.024)	(0.875)	(0.102)	(0.059)
β_5	1.129***	1.405***	0.575***	1.132***	1.408***	0.584***
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.002)
β_6	0.347*	0.729***	0.494***	0.351**	0.739***	0.523***
	(0.053)	(0.000)	(0.010)	(0.049)	(0.000)	(0.004)
β_7	0.00245	0.00414*	-0.00139	0.00250	0.00419*	-0.00139
	(0.212)	(0.071)	(0.560)	(0.205)	(0.071)	(0.552)
β_8	0.00187	0.00174	-0.00316	0.00165	0.00141	-0.00299
	(0.526)	(0.517)	(0.392)	(0.557)	(0.599)	(0.421)
β_9				0.00137	-0.00362	-0.00427
				(0.739)	(0.201)	(0.224)
α	-0.0804**	-0.137***	0.0542	-0.0827**	-0.133**	0.0536
	(0.039)	(0.009)	(0.457)	(0.035)	(0.011)	(0.438)
N	65	62	61	65	62	61
Adj-R^2	75.5	81.0	52.9	75.5	81.3	53.5

*, **, and *** represent significant levels: 10%, 5%, and 1% respectively.

Table B-2 (Continued)

	M8					
	Dup Equation (4)			Dup Equation (4’)		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0153**	-0.00633	-0.0156**	0.0150**	-0.00634	-0.0156**
	(0.027)	(0.259)	(0.023)	(0.029)	(0.259)	(0.023)
β_4	0.00195	0.000866	0.00197*	0.00157	0.00106	0.00195
	(0.165)	(0.534)	(0.98)	(0.242)	(0.440)	(0.182)
β_5	0.507***	1.027***	0.896***	0.508***	1.026***	0.896***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	0.0109	-0.0230	-0.00757	0.0155	-0.0255	-0.00748
	(0.707)	(0.553)	(0.770)	(0.591)	(0.511)	(0.773)
β_7	-0.000165	0.000283	0.000538	-0.000257	0.000274	0.000534
	(0.646)	(0.613)	(0.241)	(0.491)	(0.625)	(0.249)
β_8	0.0000325	-0.00124*	0.00100	0.000231	-0.00128*	0.00101
	(0.968)	(0.096)	(0.225)	(0.788)	(0.087)	(0.243)
β_9				-0.00164	0.000875	-0.0000975
				(0.261)	(0.472)	(0.936)
α	0.00184	0.00214	-0.00180	0.00445	0.00187	-0.00167
	(0.801)	(0.851)	(0.868)	(0.559)	(0.869)	(0.878)
N	410	443	438	410	443	438
Adj-R^2	32.7	69.5	55.9	33.0	69.5	55.9

Table B-2 Alternative model with management fee.

The table compare the result from Table 3-9 with alternative model with management fee on August assessment period;

$$\Delta\sigma_{it} = \alpha_{it} + \beta_2 Ret_{it} + \beta_4 DB_i + \beta_5 \Delta\sigma_{it}^{m} + \beta_6 \sigma_{it}^{1} + + \beta_7 lnAUM_{it} + \beta_8 Age_{it} + \beta_8 Mgtfee_i + \varepsilon_{it}$$

	Panel A: BR funds					
	M8					
	Ddown Equation (3-3)			Ddown Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0580*	-0.0511*	-0.0822*	0.0623**	-0.0591*	-0.0723**
	(0.066)	(0.084)	(0.098)	(0.048)	(0.051)	-0.082
β_5	1.140***	1.705***	0.469*	1.151***	1.725***	0.472*
	(0.000)	(0.000)	(0.093)	(0.000)	(0.000)	(0.090)
β_6	0.415**	0.978***	0.472**	0.429***	1.007***	0.512**
	(0.014)	(0.000)	(0.047)	(0.009)	(0.000)	(0.020)
β_7	0.00101	-0.000109	-0.0000188	0.00119	-0.000407	-0.000689
	(0.666)	(0.964)	(0.993)	(0.625)	(0.860)	(0.766)
β_8	0.00365	0.00353	-0.00347	0.00248	0.00383	-0.00247
	(0.398)	(0.297)	(0.457)	(0.561)	(0.238)	(0.610)
β_9				0.00506	-0.00961*	-0.00756
				(0.253)	(0.092)	(0.183)
α	-0.0655	-0.0909	0.0578	-0.0723	-0.0795	0.0640
	(0.189)	(0.116)	(0.461)	(0.160)	(0.146)	(0.384)
N	44	36	45	44	36	45
Adj-R^2	82.7	85.2	45.9	83.0	85.9	49.8

Table B-2 (Continued)

	Panel A: BR funds					
	M8					
	Ddown Equation (3-3)			Ddown Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.0185**	-0.00337	-0.0204**	0.0180**	-0.00297	-0.0206**
	(0.021)	(0.637)	(0.016)	(0.023)	(0.681)	(0.015)
β_5	0.527***	0.970***	1.006***	0.530***	0.969***	1.007***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	0.0216	-0.00920	0.0169	0.0256	-0.0186	0.0173
	(0.519)	(0.844)	(0.597)	(0.452)	(0.691)	(0.587)
β_7	0.0000928	0.000935	0.000527	-0.0000647	0.000991	0.000712
	(0.821)	(0.146)	(0.327)	(0.883)	(0.118)	(0.205)
β_8	0.000226	-0.000408	0.00141	0.000566	-0.000350	0.000899
	(0.820)	(0.677)	(0.178)	(0.594)	(0.719)	(0.473)
β_9				-0.00215	0.00240*	0.00237
				(0.200)	(0.079)	(0.257)
α	-0.00270	-0.0138	0.00221	0.000907	-0.0160	-0.00174
	(0.752)	(0.317)	(0.871)	(0.921)	(0.234)	(0.899)
N	283	295	288	283	295	288
Adj-R^2	35.3	66.8	59.7	35.7	67.1	60.0

Table B-2 (Continued)

	Panel B: NBR funds					
	M8					
	Ddown Equation (3-3)			Ddown Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	-0.0522	-0.000222	-0.0710**	-0.0482	-0.00841	-0.0661*
	(0.407)	(0.991)	(0.027)	(0.471)	(0.697)	(0.076)
β_5	0.920***	1.103***	0.939***	0.918***	1.110***	0.954***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	-0.194	0.550**	0.664***	-0.181	0.552**	0.704***
	(0.636)	(0.028)	(0.000)	(0.653)	(0.015)	(0.002)
β_7	0.000813	0.00882***	-0.00723***	0.000876	0.00906***	-0.00671**
	(0.671)	(0.002)	(0.004)	(0.650)	(0.001)	(0.018)
β_8	-0.000935	0.000226	-0.000918	-0.000694	-0.00132	-0.00106
	(0.772)	(0.950)	(0.729)	(0.824)	(0.634)	(0.701)
β_9				-0.00320	-0.00496	-0.000816
				(0.678)	(0.137)	(0.790)
α	0.0186	-0.206***	0.135*	0.0183	-0.201***	0.120
	(0.671)	(0.006)	(0.058)	(0.682)	(0.004)	(0.151)
N	21	26	16	21	26	16
Adj-R^2	52.1	87.2	92.0	52.3	88.8	92.0

Table B-2 (Continued)

	Ddown Equation (3-3)			Ddown Alternative model		
	Port1	Port2	Port3	Port1	Port2	Port3
	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$	$\Delta\sigma_{it}$
β_2	0.00423	-0.00498	-0.00298	0.00427	-0.00500	-0.00223
	(0.761)	(0.562)	(0.789)	(0.760)	(0.559)	(0.838)
β_5	0.455***	1.162***	0.677***	0.453***	1.162***	0.677***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
β_6	-0.0125	-0.0547	-0.0390	-0.00763	-0.0547	-0.0296
	(0.831)	(0.380)	(0.355)	(0.890)	(0.380)	(0.491)
β_7	-0.00143*	-0.00167*	0.000782	-0.00141*	-0.00168*	0.000849
	(0.077)	(0.079)	(0.353)	(0.079)	(0.071)	(0.310)
β_8	-0.000443	-0.00250**	-0.0000267	-0.000392	-0.00251**	-0.000106
	(0.752)	(0.026)	(0.983)	(0.789)	(0.026)	(0.932)
β_9				-0.000816	0.0000943	-0.00188
				(0.723)	(0.959)	(0.181)
α	0.0298*	0.0414**	-0.0141	0.0300*	0.0416**	-0.0146
	(0.082)	(0.032)	(0.470)	(0.081)	(0.028)	(0.451)
N	127	148	150	127	148	150
Adj-R^2	27.4	77.0	46.6	27.5	77.0	47.3

BIOGRAPHY

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Work Position	Engineer PTT PLC.
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Publications

Wattanatorn, W., S. Nathaphan, and C. Padungsaksawasdi. 2015. "Bank-related asset management firm and risk taking in mutual fund tournament: Evidence from Asean economic community." Journal of Applied Economic Sciences 10 (2):279-292

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