CHAPTER III

METHODOLOGIES

3.1 Availability of Data

3.1.1 NAV and TNA data

This dataset contains the monthly and weekly Net Asset Value or NAV per unit and Total Net Asset value or TNA of Thai public equity funds existing from June 2000 to August 2004. The data is courtesy of The Association of Investment Companies (AIMC). The NAVs per unit is used for calculating monthly net returns of funds and standard deviations of weekly net returns of funds. The basic statistics of this dataset are discussed in a later chapter.

3.1.2 Fund flow data

This dataset contains the monthly inflow, outflow, and net flows of every equity fund under the scope of my study from June 2000 to August 2004. The data is courtesy of The Securities and Exchange Commission (SEC) and is downloadable from its website.

3.1.3 Expense ratio data

This dataset is available but must be manually procured from the database at The Securities and Exchange Commission (SEC). The data is annualized in the form of mutual funds annual reports. Monthly data is calculated by pro-rata of each month's TNAs. The SEC holds data on all public equity funds dating from present back to before June 2000 which is the beginning of the time span that would be covered in this study.

3.1.4 Fund companies shareholding/management structure

Obtained by observing each individual mutual fund company. Used to determine whether a mutual fund management company is an affiliate of a commercial bank or not.

3.1.5 Other data

Stock market returns obtained from The Stock Exchange of Thailand (SET) and from Thomson Datastream. Risk free rate (I used the Bank of Thailand's 14-day repurchase or REPO rate) obtained from the table of statistics, Bank of Thailand. Other related data obtained from reliable data sources as SET, SEC, AIMC, Bank of Thailand, Thomson Datastream, and Reuters.

3.2 Hypotheses

Hypothesis 1 Funds with superior returns track record can attract investors better than other funds in the following year.

Hypothesis 2 Funds with low expense ratio attracts customers better than funds with high expense ratios.

Hypothesis 3 A Fund Company that is an affiliate of a bank has an advantage in attracting customers better than other funds by using their bank's customer base.

Hypothesis 4 The level of inflow/outflows deteriorates the fund's performance in the following year.

Hypothesis 5 Following the flow of money creates abnormal returns in investing in funds.

Hypothesis 6 The level of gross flows impact fund performance

Hypothesis 7 Investors have timing skills, investing and divesting in funds at the right time.

Hypothesis 8 Market returns are positively correlated with aggregate flows into funds

3.3 Methodologies

3.3.1 Relationships between fund flows and fund characteristics : Sirri and Tufano (1998)

Use reference of Sirri and Tufano (1998)'s analysis but remove fund objective since our scope already limits to non-specific equity funds.

$$FLOW_{i,t} = \alpha_i + \beta_{\text{Return}} \text{Return}_{i,t-1} + \beta_{Riskiness} Riskiness_{i,t-1} + \beta_{Expenses} Expenses_{i,t-1} + \beta_{LogTNA} LogTNA_{i,t-1} + e_{it}$$

--- (8)

Where FLOW i,t represents the net percentage growth in fund i in period t. Return $_{i,t-1}$ represents net return on NAV from period t-1. Riskiness $_{i,t-1}$ represents the standard deviations of monthly net returns . LogTNA $_{i,t-1}$ is the size of fund in the previous period as a control , reflecting the fact that an equal dollar flow will have a larger percentage impact on smaller funds.

This provides the observation for several relationships.

3.3.1.1 Relationship to fund returns

This is to test whether the positive returns in the previous period exhibits in significant positive flows for the following period. It is to observe whether investors make use of previous fund return information and are more likely to buy funds that show positive return and sell funds that show negative return. The basic model is to test the raw returns of the previous period t-1.

Then test whether investors are sophisticated as to choose funds in invest based on previous year's alpha from CAPM 1-factor model, Fama-French 3-factor model, and Carhart 4-factor model. Use the same model (8) but replace $\beta_{\text{Return}} \text{Return}_{i,t-1}$ with the respective alpha, namely $\beta_{\alpha CAPM} \alpha CAPM_{i,t-1}$ for the CAPM 1-factor model, $\beta_{\alpha FF} \alpha FF_{i,t-1}$ for the Fama-French 3-factor model, and $\beta_{\alpha Carhart} \alpha Carhart_{i,t-1}$ for the Carhart 4-factor model. Also try raw returns with further period lags of t-2 and t-3 to test whether investor reaction is based on a longer observation timeframe.

3.3.1.2 Relationship to fund expense ratio

One important characteristic of each mutual fund is the difference in management fees or other fees such as trustee fees between different funds. This hypothesis questions the assumption on investor behavior whether an investor's

decision to invest or rather not to invest in a mutual fund would get impacted from the fund's expense ratio or the fees that the funds charge from investors. An investor might prefer funds with low expense ratio as they do not anticipate superior performance in higher expense funds and would rather save cost resulting in higher returns in a lower expense fund. Or an investor might prefer funds with high expense ratio from the belief that a fund that charges higher fees is managed by a higher skilled manager which the superior performance delivered would well outweigh higher fees.

3.3.1.3 Relationship to fund size

The characteristic of size examines whether investors prefer to invest in funds with large asset under management or small asset under management. The size is measured by the fund's beginning Total Net Assets (TNA) for each period. The logarithmic of the TNA is used for the regression.

3.3.1.4 Relationship to fund riskiness

The smoothness or riskiness of returns is another variable that investors could use as a criteria in selecting funds. Under the CAPM model, a risk averse investor would seek for the less risky fund while obtaining the same return, or would require a higher return for a more risky investment. This would test whether investors in equity funds also disprefer risk.

3.3.1.5 Relationship to returns of funds under management of the fund company

Then there is the question whether investors consider funds as each individual fund or as a whole family of funds, as in a company that manages mutual funds. Investors might recognize that one company has good reputation as a good performing fund and would be willing to invest in other funds under the same company as well. The investor might focus less on each individual fund's past performance but rather on the total past performance of all funds managed by the company. Examine this question by

tracking whether Funds Companies with superior returns track record can attract investors better than other Fund Companies in the following year.

From model (8), replace net returns on each single fund with net returns combined for all funds of a fund company. There are two ways of defining a fund company's net returns. One is by weighting the performance of all funds managed by that company equally. Two is by weighting by value of asset under management of each fund within the company.

3.3.2 Relationship between fund flow and portfolios of fund return

Another way of looking at it instead of straight regression in model (8) is by dividing returns into decile portfolios. 10 Portfolios of funds are created by grouping funds by each fund's return for the previous month into decile rankings. A comparison between the top decile portfolio and the bottom decile portfolio is conducted, recalibrating monthly according to previous returns, to see whether funds that attract top money flow outperformed funds with bottom money flows.

3.3.3 Commercial banks attracting flows

Among the fourteen mutual fund management companies with equity funds within the scope of this study, seven are affiliates of local commercial banks. The objective of this is to examine whether mutual fund customers are bank customers getting referral to invest in equity funds as an alternative to fixed deposits in the current low interest rate situation. Banks would introduce their customers to a mutual fund company that is their affiliate rather than to other funds. Some banks even operate as a selling agent to their affiliate's funds.

A dummy variable of BANK is used in dividing fund companies into companies affiliated with commercial banks and companies which are not.

$$FLOW_{i,t} = \alpha_i + \beta_{Bank} BANK + \beta_{\mathrm{Re}turn} \mathrm{Re}turn_{i,t-1} + \beta_{Riskiness} Riskiness_{i,t-1} + \beta_{Expenses} Expenses_{i,t-1} + \beta_{LogTNA} LogTNA_{i,t-1} + e_{it}$$

--- (9)

3.3.4 Relationships between fund returns and fund flow characteristics

Turn to the other side of equation (8), whether a fund which in the past year has attracted a superior characteristics of flows would generate superior net returns when compared to other funds.

3.3.4.1 Relationships to net flows

The fund manager cannot remain idle as the flow of cash forces the manager to make a move in adjusting the portfolio. Superior net returns caused by inflows can be a result of managers further investing the new money in their favorite stocks. It is like investing on momentum strategy. Inferior net returns from outflows are explained by the same basis, having to sell their better performing stocks to pay for the redemptions. The size effect also come into play as inflows cause the size of the fund to grow larger.

$$\mathrm{Re}turn_{i,t} = \alpha_i + \beta_{FLOW} FLOW_{i,t-1} + \beta_{Riskiness} Riskiness_{i,t-1} + \beta_{Expenses} Expenses_{i,t-1} + \beta_{LogTNA} LogTNA_{i,t-1} + e_{it}$$

---- (10)

First test with raw fund returns as the return variable. Then test against a return benckmark to obtian excess return over benchmark by using raw return less market return as the return variable

3.3.4.2 Relationships to gross flows

When mutual fund investors order inflow or outflow to funds, the fund manager must adjust his portfolio to optimize the cash level. There are costs involved which would be passed on to flow-creating investors in the form of load fees. The magnitude of load fees varies in each fund. If load fees are considered substantial, this could create abnormal returns for other long-term fund unit holders who would benefit from load fees flowing into the funds TNA. However, if load fees are too low the other fund holders might have their wealth extracted by the more active fund unit traders which each additional flow would lower the returns for the long-term buy and hold unit holders.

$$\mathrm{Re}turn_{i,t} = \alpha_i + \beta_{GrossFlow} GrossFlow_{i,t} + \beta_{FLOW} FLOW_{i,t-1} + \beta_{Riskiness} Riskiness_{i,t-1} + \beta_{Expenses} Expenses_{i,t-1} + \beta_{LogTNA} LogTNA_{i,t-1} + e_{it} \quad \text{---- (11)}$$

Where $GrossFlow_{i,t}$ represents the gross flows (inflows + outflows) in fund i in period t. $Return_{i,t-1}$ represents net return on NAV from period t-1

3.3.5 Performance of New Money Portfolios

This study uses three different methods in estimating performance of new money portfolios.

3.3.5.1 Estimated by Simple Grouping Method

The simple approach is to create a zero investment portfolio by holding long position in funds with FLOW in the top decile and holding a short position in funds with FLOW in the bottom decile. 10 Portfolios of funds are created by grouping funds by each fund's money flow into decile rankings. Specifically I calculate:

$$^{1}\text{Return}_{t} = \text{Return (top FLOW)}_{t-1} - \text{Return (bottom FLOW)}_{t-1} \quad \text{---(12)}$$

and measure whether this zero investment portfolio has positive returns.

3.3.5.2 Estimated by Portfolio regression method : Zheng (1999)

Zheng (1999)'s Portfolio Regression[2] method compares the returns and risk-adjusted returns of different trading strategies. The following portfolios are constructed

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[1] Since flow data is not available right away at the end of each month, normally data becomes available at a certain time lag after the actual flows take place, I shall test that by learning flow data after certain time lags and following those flows can still make abnormal returns. Replace t-1 with t-n where n = number of months lag time

[2] This approach is free of look-ahead survivorship bias because it does not require that the fund survive for a longer period of time in order to be included in this test. But the drawback is that it does not take into account that portfolio compositions and their risk characteristics are time-varying.

corresponding to investment strategies based on past new money flow (newly invested money) signals. The portfolios are readjusted every 3 months.

Portfolio 1: Equally in all available funds.

Portfolio 2: In all available funds and weighted by funds' current TNA

Portfolio 3: Equally in all available funds with positive new money cash flow.

Portfolio 4: Equally in all available funds with negative new money cash flow.

Portfolio 5: In all available funds with positive new money cash flow and weighted by funds' new money.

Portfolio 6: In all available funds with negative new money cash flow and weighted by funds' new money.

Portfolio 7: Equally in all available funds with above-median new money cashflow

Portfolio 8: Equally in all available funds with below-median new money cashflow

Portfolios 3 through 8 are referred to as new money portfolios. Portfolios 3, 5, and 7 as positive portfolios and portfolios 4, 6, and 8 as negative portfolios. Difference between Portfolios (3 – 4), (5 – 6), and (7 – 8) are the difference between positive and negative portfolios.

For the Portfolio regression approach, calculate a time-series of raw returns for each of the eight portfolios and perform OLS regressions to estimate portfolio factor loadings and the $\alpha_{p,1}$, $\alpha_{p,3}$ measures from the following regressions:

$$R_{pt} - R_{ft} = \alpha_{p,1} + \beta_{p,1}(R_{mt} - R_{ft}) + e_{pt} \quad \text{--- (13)}$$

$$R_{pt} - R_{ft} = \alpha_{p,3} + \beta_{p,3RMRF} RMRF_t + \beta_{p,3SMB} SMB_t + \beta_{p,3HML} HML_t + e_{pt} \quad \text{--- (14)}$$

where R_{pt} = the rate of return of portfolio p in month t, R_{ft} = the risk-free interest rate in month t, R_{mt} = the rate of return of the market in month t, $RMRF_t$ = the excess market return in month t, SMB_t = the rate of return on the mimicking portfolio for the common size factor in stock returns in month t, HML_t = the rate of return on the mimicking

portfolio for the common book-to-market equity factor in stock returns in month *t*, $\alpha_{p,1}$ and $\alpha_{p,3}$ are the abnormal returns of the corresponding factor model. β = factor loadings of the corresponding factors.

3.3.5.3 Estimated by Fund regression method : Gruber (1996)

There is another method, the Fund Regression method, which is able to pick up the fund variations through time yet it suffers from look-ahead survivorship bias. Here, the α is measured individually for each and every fund, then filtered and averaged out according to each portfolios' investment strategies. I construct 8 portfolios corresponding to investment strategies based on past new money flow (newly invested money) signals as I did in the previously mentioned Portfolio regression approach.

$$R_{it} - R_{ft} = \alpha_{i,1} + \beta_{i,1}(R_{mt} - R_{ft}) + e_{it} \quad \text{--- (15)}$$

$$R_{it} - R_{ft} = \alpha_{i,3} + \beta_{i,3RMRF} RMRF_t + \beta_{i,3SMB} SMB_t + \beta_{i,3HML} HML_t + e_{it} \quad \text{--- (16)}$$

where R_{it} = the rate of return of fund *i* in month *t*

To evaluate the performance of the trading strategies, I use the following different measures of returns and risk-adjusted returns.

1. Raw Returns
2. Excess return over the market : $R_{it} - R_{mt}$
3. Abnormal return from the single factor model

$$R_{it} - R_{ft} = \alpha_i^1 + \beta_i^1 (R_{mt} - R_{ft}) + e_{it} \quad \text{--- (17)}$$

4. Abnormal return from the Fama-French factor model

$$R_{it} - R_{ft} = \alpha_i^3 + \beta_{RMRF}^3 RMRF_t + \beta_{SMB}^3 SMB_t + \beta_{HML}^3 HML_t + e_{it} \quad \text{--- (18)}$$

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3.3.6 Aggregate investor timing skill

This takes a look at the aggregate level of all mutual fund investors whether investors in mutual funds are better or worse off trying to time the market when compared to the buy and hold strategy.

Note that the purpose of this experiment is to get a view of aggregate mutual fund investments. In reality, the buy-sell orders come from each different individual and therefore could not be interpreted as timing skill of any individual. Each investor has his/her own different investment horizon and magnitude. Movements in the opposite directions of which are coming from a different individual are also net off of each other. In order to explore individual investor timing skill, one must be able to obtain data on each individual's trading patterns.

3.3.6.1 Buy-Sell vs. Hold observation

This is a simple observation approach that in a given period of time, whether or not aggregate investors are better off with their actual timing of investing and divesting of funds compared with the returns of just holding the fund unit which is equal to the growth in NAV.

From the four years of data available, measure samples of multiple numbers of rolling two-year horizons and the total four-year horizon.

Units of funds outstanding in open-end funds are calculated by TNA/NAV. Monthly net inflow/outflows or shares issued/redeemed can replicate a buy-sell portfolio. Measure whether an active buy-sell strategy to time the market or a hold strategy generates a higher return to investors in mutual funds in the longer run. The buy-sell position represents market timing of aggregate investors as TNA represents the position of investment that aggregate investors have in mutual funds altogether[3].

$$\text{Hold} = \text{Ending NAV} / \text{Beginning NAV} \quad \text{--- (19)}$$

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[3] This represents mutual fund investors at the aggregate level. It is not possible of measuring flow and market timing activities of a particular group of investors from this perspective.

$$\text{Buy-Sell} = \frac{\sum_{t=0}^{n} (TNA_{t+1} - TNA_t - FLOW_t)}{TNA_{t=0}} \quad \text{--- (20)}$$

To test this hypothesis, a comparison is made between the market timing investors using the Buy-Sell strategy and the Hold strategy investor whether the timing investor can earn superior return.

3.3.6.2 Treynor-Mazuy (1966) approach

$$r_{j,t+1} = \alpha_j + \beta_j r_{m,t+1} + \gamma_j r_{m,t+1}^2 + \varepsilon_{j,t+1} \quad \text{---- (21)}$$

Use Treynor-Mazuy (1966)'s model in measuring managers' abilities to predict market moves. Instead of measuring managers who time the stocks, measure investors as a whole who time the managers of funds they invest in.

Where j represent each fund, positive α show that investors have skill in timing the mutual fund market

3.3.7 Indicator to market sentiment

3.3.7.1 Aggregate flows as sentiment indicator

Looking in from the macro perspective of the entire fund community rather than the single fund level, whether net aggregate inflows to mutual funds represent market sentiment? Use the Warther (1995) method to test a correlation of stock market returns and flows into equity mutual funds.

$$Market\,\text{Re}turn_t = \alpha + \beta_{FLOW} FLOW_t + e_t$$

---- (22)

3.3.7.2 Unexpected flows as sentiment indicator

Warther (1995) was able to separate flows into expected and unexpected flows. Expected flows are predicted from the lagging relationship to flows in the previous months. In Warther's test sample, he found relationship of expected flow significant up to the third month lag time. So he used the third Auto-regressive lag, AR(3) time-series lag as expected flows. Unexpected flows are the total flows less expected flows. First test whether the lags show significance which can be used to predict expected flow. If there is no Auto-regressive lag term that can determine expected flow, only a relationship of market returns to total aggregate flow as in equation (22) is testable. But if Auto-regressive lags show that there is expected flow, then separate out a relationship of market returns to unexpected flow as in equation (23).

$$Market\,\mathrm{Re}turn_t = \alpha + \beta_{ExpectedFlow} ExpectedFlow_t + \beta_{UnExpectedFlow} UnExpectedFlow_t + e_t$$

---- (23)