Chapter 3

RESEARCH METHODOLOGY

This chapter discusses the research methodology employed in the study. Chapter consists of five main sections. The first section details research questions and hypotheses. The second describes the data. The third section presents the estimation procedure employed to obtain selectivity and market timing performance parameters. The fourth section lists the statistical testing of hypotheses. and the last section summarizes the chapter.

3.1 Research Questions and Hypotheses

The primary aim of this study to examine whether the Thai equity fund managers are superior stock selectors or market timers and make inferences on fund managers's ability. Three alternative models/measures are used in the estimation of relevant test parameters. Test parameters across these models vary because they are based on differing conceptual framework in attempting to explain fund manager's ability. Therefore it would also be desirable to verify whether the findings of these models are similar or not. A second aim is then designed to examine sensitiveness of selectivity and market timing results to alternative models.

Two research questions relevant to the examination of fund managers' ability are:

Research question 1: Did equity fund managers behave as superior or inferior stock selectors during the period of 1992 - 2004?

Research question 2: Did equity fund managers behave as superior or inferor market timers during the period of 1992 – 2004?

Then the relevant testable null hypotheses (H_0) associated with each of the above two research questions are:

H_{01}: The selectivity performance of equity fund managers is not different from the market during the period 1992 – 2004.

H_{02}: The market timing performance of equity fund managers is not different from the market during the period 1992 – 2004.

Research question related to verifying sensitivity market timing performance of funds to alternative measure performance is

Research question 3: Is the market timing performance of equity funds dependent upon the type of alternative performance models?

Then the relevant testable null hypothesis to the above question is:

H_{03}: The Treynor and Mazuy, and, the Henriksson and Merton measures on market timing performance of Thai equity funds are not correlated.

3.2 Data

3.2.1 Sample of funds

The starting time period chosen in this study is 1992 because the monopolistic nature of the mutual fund industry in Thailand ceased in 1992 and the Thai parliament passed new securities law entitled 'The Securities and Exchange Act B.E. 2535'. In other words it concides with the commencement of some what free capital market in Thailand. Hence the investigation period of this study starts from January 1992 and ends in December 2004. Unlike in previous studies the length of study period is sufficiently long enough to cover a variety of market fluctuations as well as short enough to avoid problems that may subsequently arise from the gradual drift caused by fund modern practices and policies. The sample of funds of this study includes all local Thai equity funds that are identified and classified under the AIMC (The Association of Investment Management Companies)[1].

To reduce survivorship bias, those funds having a record of NAV monthly data, year by year, from 1992 to 2004 were only included in the sample set. Apart from those funds remained alive for the full time period, the ones existed during the study period but got terminated prior to December 2004 are also included in the sample. For example, a fund

[1] Specialist equity funds, equity support funds and equity funds that changed their classification before December 2004; e.g. from an equity fund to flexible fund, are excluded from the sample set. (Flexible funds have a portfolio mix of fixed income instruments, common stocks, and any financial instruments; the mixture of which depend on the fund managers decision)

that existed, say, for the 3-year period January 1996 to December 1998, would be included in the sample (for those years in which it existed). However, 16 funds that have operating life less than 6 months are treated as in-sufficient observation cases and therefore excluded in the analysis. Inclusion of these cases could marginally affect the efficiency parameter estimates.

Required funds return data for the time period from 1992 to 2000 was collected from the study by Satjawathee, George and Jegasothy (2005). Then, the data was updated through December 2004 using funds return information published by the MFC Asset Management Public Company Limited. As noted in Satjawathee et al (2005), fund management companies provided information during 1992 – 2000 and the NAV data of several terminated funds are not available. Hence, some degree of survivorship bias is likely to remain in the sample data. In all, the sample set chosen consists of 92 operating funds and 15 terminated funds[2], making the total to be 107. A list of the 107 Thai equity funds and their histories is presented in Appendix A.

3.2.2 Individual fund returns

In computing fund rates of return (monthly data – the last Friday of each month), it is assumed that all dividend distributions are reinvested on the ex-dividend date. Thus, the monthly rates of return are computed as the change in total value of a fund that contains reinvesting dividend distribution. To smoothen the volatility in the monthly NAV data,

[2] Data of terminated funds for only 15 out of 33 funds are available.

log transformation is used (Pindyck and Rubinfeld, 1998). Hence, returns are expressed as a percentage of beginning-of-month asset values, as follows:

$$R_{jt} = \log\left[\frac{NAV_{jt} + D_{jt}}{NAV_{jt-1}}\right] \qquad (3\text{-}1)$$

where,

R_{jt} = rate of return for fund j in month t,

NAV_{jt} = the net asset value per unit of fund j on the last Friday of month t,

NAV_{jt-1} = the net asset value per unit of fund j on the last Friday of the preceding month, and

D_{jt} = the total of dividend distributions during month t.

3.2.3 Market portfolio return

For the return of market portfolio (benchmark), conventionally, two options exist: market indices or peer group average. Given the track record of the mutual funds in Thailand, market indices seem to be more meaningful. However, the selection of a Thai market benchmark for this study proved to be difficult because there was no publicly-available market index that includes dividend distributions. The Stock Exchange of Thailand (SET) index is the closest proxy that can be used as it comprises the population of equity securities in the Thai stock market and it is available for the entire study period. Further, Thai equity funds invest mainly in stocks comprising the SET Index (at least 65 percent of total assets of the portfolio must be common stocks); and the SET index is widely used as the proxy in recent Thai studies (Kongcharoen, 1992; Bhovichitra, 1996; Mainkumnurd, 1996; Pornchaiya, 2000).

From the SET index, monthly rates of return for the market (benchmark) portfolio are obtained as follows:

$$R_{mt} = \log\left[\frac{SET_t}{SET_{t-1}}\right] \qquad (3\text{-}2)$$

where,

R_{mt} = rate of return for the Thai market portfolio in month t,

SET_t = the SET Index closing value at the last Friday of month t, and

SET_{t-1} = the SET Index closing value at the last Friday of the preceding month

3.2.4 Risk-free estimates

Capital markets investigations of developed countries normally use the Government Bond rate as a proxy for the risk-free rate. This approach is not practicable in this study because the Thai government did not issue new government bonds during the period 1990 - 1998. However, since the deposit rate of commercial banks in Thailand gets a full guarantee from the Thai government, it is effectively risk-free. Hence deposit rates of commercial banks are used as a proxy for the risk-free rate. Further, all prior Thailands' mutual fund performance studies have used deposit rates of commercial banks as a proxy for the risk-free rate (Kongcharoen, 1992; Bhovichitra, 1996; Mainkumnurd, 1996; Pornchaiya, 2000, Satjawathee 2004, Jegasothy, Satjawathee and Tippet 2005, Satjawathee, George and Jegasothy 2005). The risk-free proxy used in this study is 12-month deposit rate of Thai commercial banks published in the Monthly Economic Report by Bank of Thailand. Annual rates are converted into equivalent monthly rates using the following equation:

$$R_{ft} = [1 + ((i_{min\,t} + i_{max\,t}) / 2)]^{1/12} - 1 \quad (3\text{-}3)$$

where,

R_{ft} = average monthly risk-free rate for month t,

$i_{min\,t}$ = minimum 12-month Thai deposit rate in month t, and

$i_{max\,t}$ = maximum 12-month Thai deposit rate in month t

3.3 *Estimable Selectivity and Market Timing Performance Measures*

Rest of the methodological steps adopted in this study are drawn from the selectivity and market timing empirical work conducted by Dellva, Demaskey and Smith (2001). The three popular selectivity and market timing models used in Dellva et.al study (JM, TM, and, HM) are used in this investigation to obtain relevant parameters. The structure of these alternative models and their underlying theoretical underpinnings with respect to the effects and inferences are discussed in section 2.4 of the chapter 2.

3.3.1 Estimational form of alternative models

The structural form of JM, TM and HM models are transformed into estimable form by appending a time indexed error term as follows

a) Jensen Alpha :

$$R_{pt} - R_{ft} = \alpha_p + \beta_p [R_{mt} - R_{ft}] + \varepsilon_{pt}$$

b) Treynor and Marzuy

$$R_{pt} - R_{ft} = \alpha_p + \beta_{1p} [R_{mt} - R_{ft}] + \beta_{2p} [R_{mt} - R_{ft}]^2 + \varepsilon_{pt}$$

c) Henriksson and Merton

$$R_{pt} - R_{ft} = \alpha_p + \beta_{1p} [R_{mt} - R_{ft}] + \beta_{2p} [D (R_{mt} - R_{ft})] + \varepsilon_{pt}$$

where,

$$E(\varepsilon_{pt}) = 0,\ E(\varepsilon_{pt}, \varepsilon_{pt-1}) = 0,\ Var(\varepsilon_{pt}) = \sigma_p^2 \text{ and } \varepsilon_{pt} \sim N(0, \sigma_p^2),\ t = 1, \ldots T$$

Thus in the estimable forms the error term satisfies classical linear regression assumptions.

3.3.2 Estimational procedure

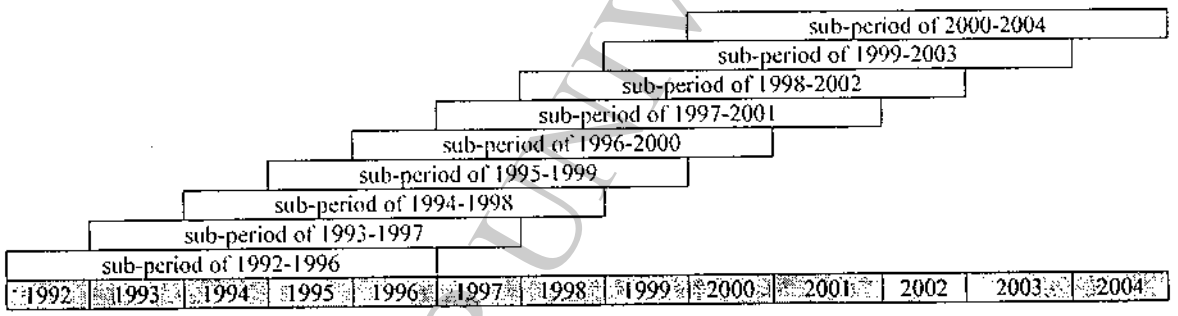
Given the linear structure and assumptions on the error term the estimable models can be estimated with Ordinary Least Square procedure. Estimation of the models is conducted, fund-wise. The intrinsic nature of financial variables is such that many literatures argue the error term of regression models may suffer form spherical disturbances. Therefore the OLS estimation is likely to yield unbiased but inefficient estimates.

To ascertain the presence of spherical disturbances (serial correlation and heteroskedasticity) Durbin Watson and Park test are conducted on the OLS estimates, respectively. If the empirical evidences indicate presence of serial correlation and/or heteroskedasticity, FGLS (Feasible Generalised Least Square) estimation procedure can be adopted to obtain BLUE (Best Linear Unbiased) estimate of the required parameters (Wooldridge, 2003).

Nine sub-periods

To check for stability of results over time, this study not only reports results for the period of 1992 to 2004, but also for various selected sub time periods. The results of nine overlapping of five-year (sub) period beginning in January 1992 and ending in December 2004 is reported to determine whether any particular sub-period stands out over the entire sample period. Similar stability checking procedure also was adopted by Dellva et al (2001). The nine sub-periods can be demonstrated as:

Figure 3.1 Five-year overlapping of the nine sub-periods



3.4 Statistical Testing of Hypotheses

This section discusses the statistical tests relevant to the three hypotheses outlined in section 3.1. First, statistical tests are conducted on the average selectivity (estimates of α_p) and market timing ability (estimates of β_{2p}) with respect to each fund. Inferences are made from the sign of parameter estimates and t-test. Then, to evaluate the significance of the positive ability z-test is conducted on the proportion of superior funds. Finally, to

make inferences on the sensitivity of alternative models on the estimation of selectivity and market timing ability, pair-wise model tests are performed.

3.4.1 Test on fund managerss' ability with respect to individual fund

a) On selectivity performance

To examine whether the Thai fund manager is a superior forecaster or stock picker estimated Jensen, TM and HM Alphas' (intercept term) sign and significane of all three models are verified. This verification is conducted for each fund, seperately. A significant positive value indictes that the fund managers have accurately forecasted stock prices and hence reflect on their superior selective ability and vice versa.

The sign of the estimated Alpha would suggest the direction of selectivity ability while its statistical significance can be evaluated using *t-test*. The significance is evaluated under the following hypotheses

$$H_{01.1}: \alpha_p = 0 \quad \text{Vs} \quad H_{A1.1}: \alpha_p \neq 0.$$

b) On market timing performance

To examine market timing performance, two models are used. These models are improved versions of Jenson alpha model that accomodates a parameter (beta) to represent market timing ability. The first model is *quadratic regression equation* (TM), which was developed by Treynor and Marzuy (1966). This models adds a quadratic term to the

Jensen model (1968) to capture the effect of a fund manager ability to adjust for risk, based on timing the forecast. The behavioural view underlying the quadratic term is that fund managers lower the fund beta when they anticipate a market decline and increase the beta when they expect the market to rise. Alternatively, Henriksson and Merton (1981) modelled the timing behaviour using a *dummy variable regression* (HM). They fitted two linear regression with a dummy variable, one for rise-market periods (i.e., when the fund outperforms risk-free rate) and the other for decline-market periods (i.e., when the fund underperforms risk-free rate).

Although it is obvious that most of punters are keen on examining only the significant positive timing $(\beta_{2p} > 0)$, this study extends to reveal the managers with significant negative timing ability, $(\beta_{2p} < 0)$, as well. The sign of the β_{2p} would indicate the direction of market timing ability while the statistical significance is evaluated using *t-test*. The corresponding hypotheses are:

$$H_{02.1}: \beta_{2p} = 0 \quad \text{Vs} \quad H_{A2.1}: \beta_{2p} \neq 0.$$

3.4.2 Testing the frequency of the funds with superior fund managers' ability

From the results of the t-tests we can classify the funds under two qualtitative outcomes; superior and inferior. As the outcomes follow a binomial distribution, the significance of the superior ability of the fund managers can be inferred using Z-test statistics of proportion (frequency). Denoting the sample population proportion of superior ability as p_s and P, the relevant z-test hypotheses are written as

$$H_{02.2}: p_s = P \quad \text{Vs} \quad H_{A2.2}: p_s > P$$

This test treats the population proportion (P) at 50 percent and proportion significantly exceeding this level of proportion implies that the ability of fund managers has been, in general, superior. This test is conducted on both selectivity ($H_{01.2\text{selectivity}}$) and market timing ($H_{02.2\ \text{market timing}}$) attributes of performance.

3.4.3 Sensitivity of using alternative fund market timing performance models

Sensitivity of using alternative models can be verified either using the average (mean) value of ability coefficient across funds or using a correlation of ability coefficient values. Both these procedures are done as pair-wise model (i and j) comparisons. In the case of selectivity (α_p) pair wise model comparisons are; JM & TM, JM & HM and TM & HM. But for market timing (β_{2p}) pair wise comparison is only conducted between TM and HM as Jenson alpha model does not provide market timing parameter.

a) Using average ability coefficient value

Denote the average of the ability coefficient (ac: α_p or β_{2p}) as μ_{aci} for model i and μ_{acj} for model j. The the relevant twosample t-test hypotheses are

$$H_{03.1}: \mu_{aci} - \mu_{acj} = 0 \quad \text{Vs} \quad H_{A3.1}: \mu_{aci} - \mu_{acj} \neq 0$$

b) Using correlation between ability coefficient values

The correlation relationship measures the linear association between two random variables. In this study managers ability parameter estimates of the two models under investigation are treated as the random variables across the funds. The correlation relationship between the two models can be verifed by obtaining Pearson's correlation coefficient (r_{ij}) and testing this sample test statistics (r_{ij}) for its significance. Assuming the population correlation value for the model i and j as λ_{ij} the relevant hypotheses for the test of significance are:

$$H_{03.2}: \quad \lambda_{ij} = 0$$

$$H_{A3.2}: \quad \lambda_{ij} \neq 0$$

The Pearson's correlation coefficient measures the strength and direction of linear relationship. The values of this coefficient range from -1 to +1, with a value of zero indicating no relationship. A value of -1 indicates perfect negative correlation and a value of +1 indicates perfect positive correlation. The size of r_{ij} infers the magnitude of the strength. Note that the above test assumes that the Pearson's correlation coefficient (r_{ij}) is normally distributed variable. So in order to ascertain test finding the Kolmogorov-Smirnov test can be used to check for normality.

3.5 Summary

The primary aim of this study is to examine the selectivity and market timing performance of Thai equity funds for the period 1992-2004, and the secondary aim is to examine relationship between the market timing measures whether results are sensitive to the timing measures.

JA model is applied to estimate and test the selectivity performance alone while TM and HM models are used to estimate test both the selectivity and market timing performance, of 107 Thai equity funds. The SET Index will be used as a proxy for the market portfolio and the 12-month deposit interest rates of Thai commercial banks will be used as a proxy for the risk-free rate. Equity fund performance will be examined in two categories, the entire 13-year period 1992-2004, and the nine sub-periods of five-year overlapping periods (to check for stability of results over time).