CHAPTER III

RESEARCH METHODOLOGY

Continuously Compounded Rate of Return

The Capital Asset Pricing Model (CAPM) derived by Sharpe, Lintner and Mossin assumes that all investors have horizon periods of identical length. This implies that all trading in the market takes place only at the beginning and end of this horizon period. Clearly this is not realistic as trading in the market takes place almost continuously and investors therefore have different and overlapping horizon periods. Jensen (1969) showed that the CAPM holds for any arbitrary length of time as long as the returns are expressed in terms of the proper compounding interval. This horizon interval is instantaneous ie. the interval is infinitesimally small and that the natural logarithm form of the returns provides a very good approximation of reality.

The equations 3.1, 3.2 and 3.3 shown below for calculating the rates of return are based on this continuously compounded method that was adopted by Jensen (1968).

$$R_{j,t} = \log_e \frac{NA_{j,t} + D_{j,t}}{NA_{j,t-1}} \tag{3.1}$$

$$R_{m,t} = \log_e \frac{I_t + DI_t}{I_{t-1}} \tag{3.2}$$

$$R_{f,t} = \log_e (1 + r_{f,t}) \tag{3.3}$$

where

$R_{j,t}$ = The monthly continuously compounded rate of return of the jth unit trust during the month t

$NA_{j,t}$ = The net asset value for unit trust j at the end of month measured by the managers bid price (repurchase price)

$D_{j,t}$ = Dividend per unit paid by unit trust j during month t

$R_{m,t}$ = The estimated monthly continously compounded rate of return on the market portfolio m for month t

I_t = Level of the KLSE Composite Index (CI) at the end of month t

DI_t = Estimate of dividends received by the market portfolio m in month t (obtained from gross dividend yield records of the KLSE CI and market capitalisation figures) expressed in the same scale as the level of the KLSE CI using the original base value of the CI on 3rd January 1977 of RM4,250,789,182.00

$R_{f,t}$ = The monthly continuously compounded risk free rate of interest for month t

$r_{f,t}$ = The yield to maturity rate of the 90 day Treasury Bill for month t as the proxy for the riskless rate of interest

Measurement of Risk

Two measures of risk are used for the analysis in this study. The first measure is the standard deviation of historical returns as shown in equation 3.4.

$$\sigma_j = \left[\sum_{t=1}^{N} \frac{(R_{j,t} - \overline{R_j})^2}{N - 1} \right]^{0.5} \tag{3.4}$$

where

$R_{j,t}$ = Rate of return of the jth unit trust at time t

$\overline{R_j}$ = Mean of the rate of return for the jth unit trust

N = Number of observations

The second measure of risk is the beta coefficient (β_j) of the unit trust. This is obtained as the slope of the characteristic line (equation 3.5) obtained by regressing the monthly returns of the unit trust with respect to the monthly returns of the market portfolio m.

$$R_{j,t} = \alpha_j + \beta_j R_{m,t} + e_{j,t} \tag{3.5}$$

where

α_j = Regression intercept

β_j = Slope of characteristic line

$R_{j,t}$ = Return on unit trust in month t

$R_{m,t}$ = Return on market portfolio m in month t

$e_{j,t}$ = Regression's unexplained residual return in month t, $E(e_{j,t}) = 0$

Investment Performance Measurement

The investment performance measures to be used for evaluating and ranking the performance of the unit trust funds in this study are the Adjusted Sharpe Index, Treynor Index, Jensen's Alpha and the Adjusted Jensen's Alpha.

Sharpe Index and Adjusted Sharpe Index

The Sharpe Index (SI) is defined in equation 3.6.

$$SI = \frac{\text{Risk Premium}}{\text{Total Risk}} = \frac{\overline{R}_j - \overline{R}_f}{\sigma_j} \tag{3.6}$$

where

$\overline{R}_j$ = Average return of unit trust j

$\overline{R}_f$ = Average riskless rate of return

σ_j = Standard deviation of return of unit trust j

This index measures the risk premium of the portfolio relative to the total risks in the portfolio.

This Sharpe Index was found to be biased by Miller and Gehr (1978). The bias was found to be a function of the number of return intervals (K) in the evaluation period. This biasness was corrected by Jobson and Korkie (1981) using the Adjusted Sharpe Index (ASI) given in equation 3.7.

$$ASI = \frac{SI \times K}{(K + 0.75)} \tag{3.7}$$

Treynor Index

The Treynor Index (TI) is given in equation 3.8.

$$TI = \frac{\text{Risk Premium}}{\text{Systematic Risk}} = \frac{\overline{R_j} - \overline{R_f}}{\beta_j} \tag{3.8}$$

where

β_j = Beta coefficient obtained from the slope of the characteristic line of the unit trust

This performance measure is based on the systematic risk as measured by the portfolio's beta coefficient.

Jensen's Alpha and Adjusted Jensen's Alpha

Jensen restated the original characteristic line of equation 3.5 in risk premium form instead of the return. Equation 3.9 defines the Jensen's characteristic line in risk premium form.

$$R_{j,t} - R_{f,t} = A_j + B_j (R_{m,t} - R_{f,t}) + U_{j,t} \tag{3.9}$$

where

A_j = Jensen's Alpha of unit trust j obtained from the regression intercept

B_j = Regression slope coefficient

$U_{j,t}$ = Residual risk premium for jth unit trust at time t which is unexplained by the regression, $E(U_{j,t}) = 0$.

Jensen's Alpha cannot be used to rank the performance of different asset unless it is risk adjusted by dividing by B_j as defined in equation 3.10.

$$\text{Adjusted Jensen's Alpha } (AA_j) = \frac{A_j}{B_j} \tag{3.10}$$

Degree of Risk Diversification of Unit Trusts

One of the benefits of investing in unit trusts is the reduction of portfolio risk through diversification by holding a large number of securities. The degree of risks diversification of a fund may be measured by the Coefficient of Determination, R^2 of the regression equation 3.5.

A R^2 value of zero indicates that there is no risk diversification and R^2 value of 1.0 indicates perfect risk diversification. The R^2 is theoretically the proportion of the total variance of the returns of a portfolio which is explained by the market portfolio.

Consistency of Performance with Time

It is not unusual for poorly managed unit trust funds to report good performance for one or two years purely based on chance. Only those unit trust which are managed by superior investment managers can expect consistent and good performance in the long run. The consistency of performance is important to investors as they often rely on historical performance measures to make investment decision for the new period.

In this study, the unit trusts are rank annually using the Adjusted Sharpe Index, Treynor Index and the Adjusted Jensen Alpha for the period 1984 to 1993. Thereafter the Spearman Rank Correlation (R_S) is calculated using equation 3.11 for each pair of years. The test of significance of R_S is then carried out using the t statistic given by equation 3.12.

$$R_S = 1 - \frac{6 \Sigma d^2}{n (n^2 - 1)} \qquad (3.11)$$

$$t = \frac{R_S (n - 2)^{0.5}}{(1 - R_S^2)^{0.5}} \quad \text{with } (n\text{-}2) \text{ degrees of freedom} \qquad (3.12)$$

where

d = Difference between rankings of year 1 and year 2

n = Number of paired rankings of years 1 and 2 in the data series

Stability of Systematic Risks (Beta)

To determine if unit trust funds' managers adhere to a certain risk level ie. the stability of beta, the Spearman Rank Correlation Coefficients together with the t statistic is calculated for each pair of years during the period 1984 to 1993. For this purpose equations 3.11 and 3.12 are used.

Objectives of Unit Trust Funds

Unit trust funds can be classified according to the different risk categories that cater for investors with different risk tolerance level. The stated objectives of unit trust funds provide the investor with qualitative guide posts to follow in selecting a fund. These objectives in particular indicate the risk and return that can be expected from a fund and are communicated to the investing public in advertisement, brochures and propectuses.

There are basically six type of fund objectives stated qualitatively by Coates (1978) as shown in Table 3.1 below :

Table 3.1 : Objectives of Unit Trust Funds

Fund Objective	Definition
1. Income Funds	Funds that provide as liberal a current income from investment as possible
2. Balanced Funds	Funds that minimise risk and at the same time retain some possibilities for long term growth and current income
3. Income-Growth Funds	Funds that place slightly more emphasis on current income than on growth
4. Growth-Income Funds	Funds that emphasize growth more than current income
5. Growth Funds	Funds that view income as only a secondary or incidental objective
6. Maximum Capital Gains Funds	Funds that pay low or no dividends and invest in risky stocks

So far a qualitatively treatment has been given for the classification of unit trust funds' objectives. A definition based on empirical findings by McDonald (1974) is given in Table 3.2 below.

Table 3.2 : Relationship between Beta value and Traditional Fund Objectives

Fund's stated Objective	Beta Value
Income	0.55
Balanced	0.68
Income-Growth	0.86
Growth-Income	0.90
Growth	1.01
Maximimum Capital Gains	1.22

One can determine whether investment managers adhere to the fund's stated objectives by comparing the historical beta value of the fund with those defined in Table 3.2 above.

Forecasting Ability of Investment Managers

Following the method used by Jensen (1968), estimates of the systematic risk B_j of the fund can be obtained by regressing the fund's risk premium on the market portfolio's risk premium using equation 3.13.

$$R_{j,t} - R_{f,t} = B_j (R_{m,t} - R_{f,t}) + e_{j,t} \quad (3.13)$$

If the manager is a superior forecaster he will tend to systematically select securities which will realise $e_{j,t} > 0$. Hence his portfolio will earn more than the "normal" risk premium for its level of risk.

Allowance for such forecasting ability can be made by simply not constraining the estimating regression to pass through the origin. That is we allow for the possible existence of a non zero constant in equation 3.13 by using equation 3.14 as the estimating equation.

$$R_{j,t} - R_{f,t} = A_j + B_j (R_{m,t} - R_{f,t}) + U_{j,t} \qquad (3.14)$$

where the new error term $U_{j,t}$ will have $E(U_{j,t}) = 0$.

Thus if the unit trust manager has an ability to forecast security prices, the intercept A_j in equation 3.14 will be positive ($A_j > 0$). This represents the average incremental rate of return on the portfolio per unit time which is due solely to the manager's ability to forecast future security prices. In contrast, a naive buy and hold strategy can be expected to yield a zero intercept ($A_j = 0$). In addition, if the manager is not doing as well as the naive buy and hold strategy, A_j will be negative ($A_j < 0$).

Least square regression of monthly returns for each year provides the dispersion of the sampling distribution of the intercept, A_j. Futhermore the sampling distribution of the estimate, A_j is a Student t distribution with (n-2) degrees of freedom. The test of significance of the forecasting ability of investment managers involved the testing of the following hypothesis :

H_0 : The investment performance of the unit trust equals that of the market portfolio ie. $A_j = 0$.

H_1 : The investment performance of the unit trust is better or worse than that of the market portfolio ie. $A_j > 0$ or $A_j < 0$ respectively.

If the t statistic yield a result that is significant, H_1 is accepted and H_0 is rejected ie. the unit trust has either perform better or worse than the naive buy and hold strategy. On the other hand if the t statistic is not significant, then H_0 is accepted and H_1 is rejected ie. the investment manager has no superior or inferior forecasting ability and he performs as well as the naive buy and hold strategy.

Impact of Fund Characteristic on Investment Performance and Systematic Risks

It is of interest to determine whether the various fund characteristics are associated with investment performance. Some of the fund characteristics to be investigated in this study are :

(i) Age of the funds which is measured by the number of years since commencement (X_1)

(ii) Size of the fund as measured by the net asset value of the fund (X_2)

(iii) Portfolio turnover which is measured as the sum of the proceeds from investment sold and cost of investment purchased (X_3)

(iv) Expense ratio which is the ratio of the management expenses/fees to the net asset value of the fund (X_4)

It is generally believed that older and the more established funds are more experienced in their field of expertise and have more resources than the newer funds in performing security analysis and thus should perform better. This is investigated to determine its effect on investment performance.

The rationale for including the size of the fund as an independent variable, is that it is often reported that smaller size portfolios or funds performs better. The reason given is that there is some loss of investment flexibility associated with very large size funds. The need to purchase portfolio in very large blocks may take a substantial amount of time, so that investment opportunities are lost and even in the short run may drive up the price of the securities involved beyond the level at which they were initially attractive. If the portfolio holdings are sufficient large, the decision to sell may again take substantial time to implement. However a divergent view is that, large funds with substantial assets will spend a smaller portion of its income on security analysis or alternatively by spending the same proportion, a larger fund may obtain more or better analysis than a smaller one. This study attempts to determine which of these effects influence the investment performance on the sample of unit trust.

Portfolio turnover may be expected to affect the investment performance as well. Higher turnover results in higher transaction costs which would tend to lower the return to investors unless the management is able to take better advantage of investment opportunities through more active trading. On the other hand, if higher turnover is primarily motivated by attempts to take advantage of perceived investment opportunities or if the trading activity itself affects the market in a direction favourable to the fund, then portfolio turnover may improve performance. Which of these effects take predominance in the sample of unit trust would have to be determined.

In the case of expense ratio, it is suggested that high management expense ratio would tend to result in somewhat lower returns to unit trust investors unless the funds with such ratios have superior portfolio management. On the other hand, presumably the higher the management advisory fees, the greater the resources which can be devoted to investment research and the larger the remuneration that can be paid to attract superior management personnel. Again which effect is predominant in the sample of unit trust is to be determined.

In this study, each of these independent variables : age, size, portfolio turnover and expense ratio are individually regressed against the investment performance measures such as the Adjusted Sharpe Index (ASI), Treynor Index (TI) and the Jensen's Alpha (α). This is achieved by simple linear regression to see if any significant relationship between the independent variables and the dependent variables could be uncovered. A multiple regression is also performed to see if the investment performance measure is dependent upon the combined effect of the independent variables.

The above procedure is also repeated with the systematic risk measure (β) of the fund as the dependent variables using the same independent variables described above.

The regression analysis is performed using data at the end of the financial year of each funds for the period 1990 to 1993. Please note that due to the unavailability of data only Funds 14 to 21 for the above period is analysed.

Software for Analysis

All mathematical calculations and analysis were performed using the spreadsheet programme Microsoft Excel Version 5.0 However the simple linear and multiple regression analysis described in the last section was performed using the statistical software package SPSS.