

An Empirical Analysis of Unit Trust Performance in Singapore

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Abstract

The Singapore government's recent strategic plan to develop the financial sector has placed much emphasis on the fund management industry. In this paper we examine the unit trust performance in Singapore in the 90s. Our results show that fund managers in general performed poorly in security analysis and market timing. However, they performed fairly well in risk-adjusted returns and generally maintained well-diversified portfolios. We find that there is little consistency in the performance ranking of the evaluated portfolios, although there is evidence of repeat performance of some top funds. Our analysis also shows that fund managers could indeed make excess returns above the risk-free rate in the medium- to long-term. Thus, unit trusts can be an ideal investment for small investors seeking sufficient diversification.

Keywords: Fund performance; Jensen measure; Sharpe measure; Treynor-Mazuy measure; Unit trust

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1. Introduction

The extent of unit trusts' penetration and establishment in an economy often mirrors the degree of development of its financial sector.¹ For investors with modest means to participate in the stock market and with relatively low risk tolerance, unit trusts represent a natural investment consideration. The recognition of the increasing dominance and importance of unit trusts as an investment instrument has spurred researchers to devise appropriate techniques to assess portfolio performance. The earlier works by Sharpe (1966), Treynor (1965) and Jensen (1968) represent significant contributions to the evaluation of portfolio performance. Most studies in the modern literature still utilize the theoretical frameworks of these pioneers as the basis of their analysis. Certain advances have been made in various aspects. Grinblatt and Titman (1989a) developed characteristic-based benchmarks to more efficiently mimic the trading environment of the portfolios. Bhattacharya and Pfleiderer (1983) extended Jensen's (1972) theoretical framework to more efficiently capture the market timing abilities of fund managers. Ferson and Schadt (1996) proposed a Conditional Jensen Measure to factor in time-varying economic variables. In addition, Grinblatt and Titman (1989b) proposed an alternative to the Jensen technique, called the Positive Period Weighting Measure, which seeks to assign weights to portfolio returns depending on the market returns of the period.

Empirical studies on the performance of unit trusts in Singapore have been scanty. Notable exceptions are the works by Koh, Koh and Cheng (1990) and Koh, Phoon and Tan (1990). These studies generally found poor ex-post performance of the unit trusts in terms of returns, risk-variance efficiency and the degree of diversification. The poor

¹ Unit trusts are generally called mutual funds in the US market. As the term unit trust is commonly used in the Singapore market, we shall adopt this terminology in this paper.

performance of the unit trusts may itself account for the slow growth in the fund management industry in the 70s and 80s. Today, the fund management industry is still relatively small, although it has seen tremendous growth in the 90s as Singapore strives to become the financial hub of the region.

In this paper we examine the unit trust performance in Singapore in the 90s. The unit trusts considered are restricted only to existing local funds with trading activities in Singapore and/or the Asian region. The scope of the unit trusts considered and the methodology applied extend beyond previous works on the Singapore market. Our objective is to provide an in-depth study of the fund management performance in a period when the industry experienced a healthy growth. The blueprint of the Singapore government's recent strategic plan to develop the financial sector has placed important focus on the fund management industry. Thus, an evaluation of the performance of the industry cannot be over-emphasized.

Our results show that fund managers in general performed poorly in security analysis and market timing. However, they performed fairly well in risk-adjusted returns and generally maintained well-diversified portfolios. We find that there is little consistency in the performance ranking of the evaluated portfolios. However, there is evidence of repeat performance of some top funds, which makes it possible to formulate long-term strategies to make supernormal profits. Our analysis also shows that fund managers could indeed make excess returns above the risk-free rate in the medium- to long-term. Thus, unit trusts can be an ideal investment for small investors seeking sufficient diversification.

The plan of this paper is as follows. In Section 2 we survey the recent developments of the unit trust industry in Singapore and the role it plays in the financial sector of the Singapore economy. The various measures of fund performance used in the

paper are described in Section 3. Section 4 discusses the issues of the compilation of the returns of the portfolios and the selection of benchmarks. The empirical results are summarized in Section 5. The implications of our findings and some issues related to the future development of the fund management industry in Singapore are covered in Section 6. Finally, the conclusions are summed up in Section 7.

2. The Unit Trust Industry in Singapore

In the 90s, Singapore saw rapid expansions in the equity market. In 1999, there were a total of 51 new listings. However, this number pales in comparison to the growth of the fund management industry. The industry saw a 35.6% growth in the number of funds, which went from 191 funds at the end of 1998 to 259 funds at the end of 1999. The number of asset management firms also increased by 20 to 189. With such rates of growth, Singapore may eventually, like the US and Hong Kong, have more unit trusts than stocks listed in its exchange. Yet, the growth was not limited to mere breadth. The total assets in the fund managers' portfolios swelled by 36% in the first half of 1999. This works out, according to the Monetary Authority of Singapore (MAS), to be a massive \$204.1 billion.² Multiplying this figure by the average industry's annual management fee rate of 1.25%, the fund management industry is currently worth an estimated \$2.55 billion in annual income. On the other hand, the current unit trust penetration rate in Singapore is only 3% to 4% of the population. In contrast, the penetration rate in Hong Kong is 5% to 6%, while that in the US is a massive 48%. This indicates the tremendous potential for growth in the fund management industry.

² This amount includes funds managed for clients outside Singapore. All figures quoted in this paper are in Singapore dollar. The current exchange rate is about 1.73 S\$ to 1 US\$.

The MAS and the Government of Singapore Investment Corporation (GIC), the government's largest investment arm, are in the process of releasing a total of \$35 billion public funds over a few years for external fund managers to manage. This massive injection of public funds reflects the government's commitment to open up competition and transparency within the public sector. This provides a strong psychological boost to the public's confidence in fund managers and their investment products. In addition, the Central Provident Fund³ (CPF) Investment Scheme for unit trusts was revamped to increase the number of quality asset managers and products available to CPF members. The end product of this is an increase in CPF-approved unit trusts from 21 in March 1998 to 53 as in the first half of 1999. With Singapore's high savings rates, especially due to the large component contributed to the CPF, the pool of domestic funds available for professional management is set to get even larger.

The government has focused its initial financial liberalization efforts largely on the fund management industry. The industry receives such government support as it is an end user of a wide range of financial products, including foreign exchange, stock broking services, money and capital markets, and legal services in finance. Currently, fund managers are also allowed to trade in derivatives but are restricted mainly for hedging purposes. Several measures have been introduced to reform the brokerage and fund management industry to make them more competitive. Appendix A provides a brief summary of the fee structure and tax regulations of the fund management industry. As the population becomes more affluent and aware of the investment products available, traditional methods of savings, such as bank deposits and insurance, will be slowly

³ The Central Provident Fund is a fully-funded defined contribution (around 30% of income) required of the people working in Singapore.

replaced in part by professional fund management promising higher returns with modest risk exposure.

Many recent studies on the fund performance of the Singapore market suffer from several shortcomings. First, most studies make use of the typical end-of-month trading prices of the portfolios for their evaluation. Though a convenient move, monthly prices may not adequately reflect the price volatility of the market in the 90s, especially during the volatile period of the Asian Crisis. Second, many studies ignore the effects of dividend payments, which may have significant effects on fund performance.⁴ Third, some studies pursue an extensive coverage of almost all the unit trusts available within the evaluation period, including funds that began or ceased to exist within the period. Such an approach compromises on the consistency in the number of observations available and the observation period for each fund, making comparisons between them difficult. In this paper we consider only equity-based funds that exist throughout the evaluation periods. Weekly prices are used for the analysis. In addition, recognizing the diversity of funds available and the importance of selecting an appropriate benchmark, we try to match each fund with an appropriate index according to the declared objectives of the fund. To serve this purpose, we create two new benchmark indices to more effectively mimic the trading characteristics of certain funds. The details are discussed in Section 4.

3. Methodology

We use three different measures to assess portfolio performance, namely, the Sharpe Measure, the Jensen Measure and the Treynor-Mazuy Total Performance

⁴ Test runs of our data showed that the absolute returns of portfolios are significantly higher when dividends are reinvested.

Measure. The first of these measures is a reward-to-variability (mean-standard deviation) evaluation while the other two rely on the beta of the fund, measuring the portfolio's performance as compared to a benchmark.

3.1 Performance Measures

3.1.1 Sharpe Measure

Sharpe (1966) developed the Sharpe Measure S_p as a simple way to evaluate portfolio performance. His idea was to measure the amount of excess return of the portfolio over the risk-free rate in a given period per unit of risk. Sharpe took the standard deviation of the portfolio return as the proxy for risk. Thus,

$$S_p = \frac{r_p - r_f}{s_p}, \quad (1)$$

where r_p is the sample mean return of the portfolio, r_f is the risk-free rate of return for the given evaluation period, and s_p is the sample standard deviation of the portfolio return.

The Sharpe Measure assumes *ex ante* mean-variance efficiency of the market portfolio. Miller and Gehr (1978), however, found that the Sharpe Measure is biased upwards when the sample size is small (less than 12, say) and proposed a correction for this. Subsequently, Jobson and Korkie (1981) suggested a simpler method of correcting for the bias. This is given by:

$$S_p^a = S_p \left(\frac{N}{N + 0.75} \right), \quad (2)$$

where S_p^a is the adjusted Sharpe Measure and N is the number of return observations.

3.1.2 Jensen Measure

Jensen (1968) suggested that within the specification of the Capital Asset Pricing Model (CAPM), the excess return of the portfolio can be written as:

$$R_{pt} = \beta_p^J R_{mt} + \varepsilon_{pt}^J, \quad (3)$$

where R_{pt} and R_{mt} are the excess returns (above the risk-free rate) of the portfolio p and the market portfolio, respectively, in period t , β_p^J is the systematic risk of portfolio p with respect to the market portfolio, and ε_{pt}^J is the error term with an expected value of zero.

Within this framework, a manager with superior stock-picking ability will try to select securities that are expected to yield positive ε_{pt}^J . Thus, there should be an allowance for a non-zero constant to exist in equation (3), which gives us the following equation:

$$R_{pt} = \alpha_p^J + \beta_p^J R_{mt} + \tilde{\varepsilon}_{pt}^J, \quad (4)$$

where β_p^J , R_{pt} and R_{mt} are as defined in equation (3), α_p^J is the true measure of a manager's stock-picking ability and $\tilde{\varepsilon}_{pt}^J$ is the error term with an expected value of zero.

Jensen's performance measure is given by the estimate of the vertical intercept α_p^J in the regression line represented by equation (4). Fama (1972) suggested that a portfolio manager's skill can be partitioned into two distinct components: the forecast of price movements of selected stocks and the forecast of price movements of the whole stock market. The former is known as 'security analysis' or 'stock picking'. The latter is known as 'market timing', which refers to a manager's ability to predict future economic conditions and adjust his portfolio's systematic risk accordingly. It was argued that the Jensen Measure in equation (4) fails to capture the distinction between these two components, which may allow room for biases as the measure ranks portfolio

performance based only on the absolute size of α_p^J . The Treynor-Mazuy Measure attempts to remedy this shortcoming.

3.1.3 Treynor-Mazuy Total Performance Measure

Treynor and Mazuy (1966) argued that if portfolio managers are actively adjusting their portfolios' systematic risk, they will hold larger proportion of the market portfolio when the return on the market is high and a smaller proportion when the return on the market is low. Thus, the portfolio return is not linear but a convex function of the market return. Hence, they suggested adding a quadratic term, namely, the square of the market return in the traditional Jensen Measure in equation (4). Thus, we have the following modified equation:

$$R_{pt} = \alpha_p^{TM} + \beta_{p1}^{TM} R_{mt} + \beta_{p2}^{TM} R_{mt}^2 + \varepsilon_{pt}^{TM}, \quad (5)$$

where α_p^{TM} , β_{p1}^{TM} and ε_{pt}^{TM} are the Treynor-Mazuy (TM) measures defined similarly as the Jensen Measures, and β_{p2}^{TM} is the coefficient that measures the fund manager's response to market conditions. Hence, the Treynor-Mazuy Total Performance Measure is given by:

$$TM = \alpha_p^{TM} + \beta_{p2}^{TM} \sigma_m^2 \quad (6)$$

where σ_m^2 is the variance of the benchmark portfolio return. A large TM score will indicate superior security analysis and market timing ability. In empirical applications, α_p^{TM} and β_{p2}^{TM} in equation (6) are replaced by their least squares estimates.

3.2 Measuring Performance Consistency

3.2.1 The Spearman Rank Correlation

To measure the consistency of the performance of the unit trusts based on various measures, the non-parametric Spearman Rank Correlation Measure r_s is used. r_s is given by:

$$r_s = 1 - \frac{6 \sum \tilde{D}_i^2}{N(N^2 - 1)}, \quad (7)$$

where N is the sample size and \tilde{D}_i is the difference between the rankings of portfolio i using two different measures (or over two different evaluation periods). The null hypothesis that the two measures provide the same ranking (or the performance of the funds is consistent through time) can be tested using the standardized normal test assuming sufficiently large sample.

3.2.2 Simulated Trading Strategies

In addition to the Spearman Rank Correlation test, a series of simulated strategies are applied to the data sets to detect whether certain trading strategies can be applied to achieve *abnormal* profits. The strategies are to select the top 3 or top 5 funds based on either the Sharpe Measure or the absolute returns earned by the top 3 and 5 funds from the last evaluation period. Based on this criterion, an investor is assumed to purchase these funds for the next period. The average excess returns earned on such strategies are then compared with the passive strategy of trading in the Straits Times Index (STI) for the same period. If there is no persistence in portfolio performance, such strategies based on the past performance should not generate any significant excess returns over the market.

4. Data

4.1 Specifications

Given the objective as explained earlier, the unit trusts selected for this study only consist of equity-based funds that deal with stocks traded in Singapore and the Asian

region (including Singapore). This restriction limits the number of funds available for evaluation, but would provide a well-focused comparison of funds that are popular among investors. We compare the funds over three different periods of the 90s, namely, the 10-year period of 1990 through 1999, the 5-year period of 1995 through 1999, and the 3-year period of 1997 through 1999. In the more recent periods, more funds are included in the study due to new additions.

The data for this study consist of weekly price observations taken at the end of the week. There are totally 36 unit trusts,⁵ which include funds managed by six bank's investment arms and eight asset management companies. The entire period of study is from January 5, 1990 to December 24, 1999. There are a maximum of 521 observations for the 10-year period and a minimum of 157 observations for the 3-year period for each fund. The Singapore 1-month inter-bank rate is used as the proxy for the risk-free rate in this study.

The weekly fund prices (ask and bid) were obtained from the Straits Times and the Business Times. Information about the funds' dividend payments and bonus issues was obtained from the funds' prospectus and/or from the respective fund managers through private contacts. The risk-free interest rates were obtained from MAS and all regional benchmark indices, with the exception of the STI, were obtained from the Data Stream. We used the STI rolled back through the evaluation period. This series was obtained from the Business Times. A list of the selected unit trusts and their respective benchmark indices are given in Tables B.1 in Appendix B. Brief descriptions of the selected benchmark indices are given in Table B.2.

To provide proper evaluation of the unit trust performance it is crucial that appropriate indices are selected as benchmarks for comparison. The benchmarks are thus

carefully selected by studying the objectives and Trust Deeds of each fund based on their latest prospectus. Each fund has a benchmark assigned that best matches its trading objectives. In addition, two new base indices are created to more appropriately mimic the trading environment of the funds in question. The two new benchmarks are: (1) the merger of Singapore's STI and Hong Kong's Hang Seng Index (HSI) to form the *STI-HSI* index, and (2) the merger of Singapore's STI and the Kuala Lumpur Composite Index (KLCI) to form the *STI-KLCI* index. The two new indices are calculated as follows:

$$I_t^N = \left(\frac{I_t^A}{I_0^A} \right) 50 + \left(\frac{I_t^B}{I_0^B} \right) 50 \quad (8)$$

where I_t^A and I_t^B are the actual index figures at time t used to construct the new base index I_t^N , and I_0^A and I_0^B are the base-period figures for the two indices taken at the beginning of the evaluation period.⁶

4.2 Calculation of Returns

The portfolio return r_p and the benchmark return r_m are calculated for the evaluation periods. The return of a portfolio is calculated based on equation (9), which incorporates both the bid-ask spread of each fund and the dividend payments. We assume that all dividend payments are reinvested into the portfolio at the mean price P_t^m between the bid and ask prices on the ex-dividend date t^* .⁷ Thus, the portfolio return for the holding period from t to $t+1$ is given by:⁸

⁵ Note that not all funds are covered in the three evaluation periods. See Table A.1 for the details.

⁶ Note that we have adopted an equally weighted scheme for the composite index. We expect the results to be insensitive to this assumption.

⁷ This is also the standard (default) practice of most fund managers in treating dividend payments.

⁸ For the Sharpe Measure, the holding period is the evaluation period of 3, 5 and 10 years. For the regression results (for the Jensen and Treynor-Mazuy Measures) reported in Section 5, holding periods of 13 weeks are used. For the simulated strategies reported in Section 5, the holding period is 1 year. The holding periods are applicable for the calculation in equations (9), (10) and (11).

$$r_p = \frac{P_{t+1}^B \cdot dU_{t+1} - P_t^A}{P_t^A} \quad (9)$$

where P_{t+1}^B is the bid price at time $t+1$, P_t^A is the ask price at time t , and dU_{t+1} is the factor representing dividend reinvestment, which is calculated as follows:

$$dU_{t+1} = \prod \left[\frac{D_{t^*}}{P_{t^*}^m} + 1 \right], \quad (10)$$

where D_{t^*} is the dividend distribution of the portfolio at the ex-dividend date t^* and the product is taken over all ex-dividend dates between time t and $t+1$.

Since all returns are calculated in percentage, bonus issues and stock splits are converted by multiplying the additional issues back into the prices and subsequent dividend payments, starting from the ex-bonus/ex-split dates till the end of the study period.

The calculation of benchmark return requires a different treatment. As there is no bid-ask spread in index trading, the benchmark return is calculated based on an artificial 2% discount (transaction cost or commission) over the “selling” price as given in equation (11). The dividends, however, are ignored from the calculation, since indices are typically reported without income. Thus,

$$r_m = \frac{0.98I_{t+1} - I_t}{I_t}, \quad (11)$$

where I_t and I_{t+1} are the index values at time t and $t+1$, respectively. The weekly observations of the Singapore 1-month inter-bank rate are first converted into effective rates r_w and then compounded weekly over the period of evaluation to obtain r_f . Thus,

$$r_f = \prod (1 + r_w) - 1, \quad (12)$$

where the product is taken over all weeks in the evaluation period.

To capture the portfolio return standard deviation, weekly returns based on the mean of the bid-ask prices are used. The value is then multiplied by the square root of the number of weekly observations within the evaluation period. Thus, the raw Sharpe Measure (see equation (1)) is calculated as follows:

$$S_p = \frac{r_p - r_f}{s_w^p \cdot \sqrt{N}}, \quad (13)$$

where s_w^p is the sample standard deviation of the weekly returns of the portfolio and N is the number of weekly observations in the evaluation period.

Since the minimum sample size taken for the Sharpe Measure is 52 (1 year) in this study, the correction for the sample bias mentioned in equation (2) is trivial and should not have a significant effect on the ranking of the portfolios. As such, the proposed correction is ignored in this study.

We end this section by pointing out that the steps taken to maintain the same number of observations for each fund in the evaluation period does come with a price. Since funds that no longer exist at the end of the study period are left out of the evaluation, the selected data set will be subject to a survivorship bias. However, there are various reasons as to why a particular fund ceases to exist in a particular period. Apart from poor performance, other reasons include change in promotion strategies, low financial resources, adverse political climate and corporate takeovers. In view of the various complications surrounding funds that do not “survive”, it will be intractable to correct for such a bias without introducing more problems to the study. As such, we shall ignore the issue of survivorship bias in this study.

5. Empirical Results

5.1 Performance Evaluation

5.1.1 Mean-Variance Analysis of Portfolio Performance

The mean-variance evaluation of portfolios is conducted based on the Sharpe Measure (or Sharpe Ratio). This measure is calculated based on a passive buy-and-hold strategy of the portfolios over the evaluation periods. The results are then compared against a passive index trading of the STI. The results are summarized in Table 1.

Though the 10-year evaluation period saw an encouraging correlation between portfolio risk and return, the correlation appears to be weak during the Asian Crisis. In the 3-year evaluation period, the correlation between risk and return of the portfolios registered a mere 0.211. However, it is interesting to note that all funds evaluated during the 10-year period outperformed the corresponding risk-free rate. This supports most fund managers' claim that a unit trust is a medium- to long-term (5 to 10 years or more) investment product designed to earn more income than that of bank deposits. The results of the Sharpe Measure also suggest that portfolio managers, on average, are able to outperform the market and actively adjust their portfolios' risk exposure.

5.1.2 Beta-Based Portfolio Performance

We now evaluate the portfolios' performance based on beta. This is done using the portfolios' absolute score of the intercept α_p^J (the Jensen Measure) in the linear regression given in equation (4), and the *TM* score (the Treynor-Mazuy Total Performance Measure) of the quadratic regression given in equation (6). These scores are ranked and compared with the results obtained in the previous subsection. Both regressions are based on a 13-week holding period of the portfolios' excess returns over their respective benchmark (as listed in Table A.1) returns. The results are presented in

Table 2, Panels (a), (b) and (c) for the 10-year, 5-year and 3-year evaluation periods, respectively.

From Table 2 we can see that the results are somewhat disappointing. There are no significant positive scores of fund performance against their respective benchmark portfolios in all three evaluation periods. Though the two beta regressions generated fairly similar rankings, their results differ significantly from the Sharpe Measure. This, however, should not cause too much concern as the Sharpe Measure is based on the total risk whereas the other two measures are based on beta.⁹

Nonetheless, it is possible to identify some consistent performers among the three evaluation techniques. The Singapore Progress Fund ranks among the worst performers in all three measures during all three evaluation periods. This is disappointing as the fund belongs to the first and hence longest established fund management company in Singapore (since 1963), namely, the Singapore Unit Trust. Experience of the firm was clearly not an asset for the fund's performance.

The Citi Asia Infrastructure Fund and the Nikko Oriental Growth Fund, which are only evaluated during the 3-year period, rank among the bottom five in all three measures. In comparison, the Deutsche Premier Select Trust ranks among the bottom five in the three measures during the 5-year evaluation period. On the other hand, there are also consistent top performers. The Savers Trust Fund ranks among the top three and the top four funds in all three measures during the 10-year and 5-year period, respectively. Also, the United Regional Growth Fund ranks fourth in all three measures during the 3-year period.

⁹ As pointed out by the referee, incorporating funds that have ceased to exist would likely show more funds with significantly negative Jensen Measures.

The poor overall performance of the fund managers, however, is in contrast to the findings in the last subsection, where fund managers are found to perform fairly well in risk-adjusted returns. However, one must recognize that in a bear market, it is difficult to pick ‘winners’ among the numerous ‘losers’, especially considering the contagion effect of the Asian Crisis. The positive risk-return results in Section 5.1.1 might be credited to the fund managers’ ability to adjust the portfolios’ market exposure. This ability is clearly put to the test during the volatile periods of the crisis.

5.2 Performance Consistency

5.2.1 Results of the Spearman Rank Correlation Test

At this point, there is still little knowledge about the consistency in the performance of the portfolios over time and the results based on different performance measures. To this end, non-parametric tests based on the Spearman rank correlation (as described in 3.2.1) are performed. Tables 3 and 4 display the results of these tests.

Table 3 summarizes the results of the Spearman rank correlation coefficient of two consecutive non-overlapping three-year evaluation periods throughout the 90s. It can be seen that there is very weak correlation in the portfolios’ ranking over time. None of the pairs of evaluation periods have a correlation score significant at the 5% level. As such, the null hypothesis that there is no correlation over time for the performance of the funds cannot be rejected.

Table 4 summarizes the Spearman rank correlation on the different performance measures over the three-, five-, and ten-year evaluation periods as reported in Table 2. As expected, the Jensen and Treynor-Mazuy measures are highly correlated. In contrast, for the Treynor-Mazur and Sharpe comparison and the Jensen and Sharpe comparison, significant correlation is found only in the three-year evaluation period.

5.2.2 Results of Simulated Strategies based on Past Performance

As mentioned in Section 3.2.2, a series of simulated strategies are tested based on the results of the portfolios' Sharpe scores in Section 5.1.1 and their absolute returns to examine the existence of "hot hands" in the industry. In the first week of each period, an investor is assumed to purchase the top 3 (or top 5) funds based on the information of the funds' performance in the previous period. The funds are then sold in the first week of the next period and at the same time the top 3 (or top 5) performers for that period are purchased and held till the first week of the subsequent period and so on.

These strategies are repeated five times consecutively using annual holding periods beginning from 1995. These five separate returns from the annual trading are then added up to give a 5-year strategy return. The average returns of the funds are then compared with the passive strategy of holding the STI throughout. The results are presented in Table 5.

From Table 5 it appears that "hot hands" do exist in the fund management industry over the 5-year period of study when the strategy based on selecting the top three funds is applied.¹⁰ Based on past performance, an investor can make supernormal profits over and above the STI by purchasing the top 3 performing funds in the previous period. The strategy based on selecting the top five funds, however, is not successful. Above all, the strategies showed that an investor could make abnormal profits based on just the absolute returns of the evaluated portfolios, which is a very crude measure of investment performance.¹¹

¹⁰ As one might have noticed, the annual returns of the top 3 funds based on either the Sharpe scores or the absolute returns are the same. This is so because they consist of the same funds (though their ranking among the top 3 positions may differ).

¹¹ Note, however, that the strategy only works on average in the 5-year period. The results are different if the returns are compared annually.

5.3 Diversification of Portfolios

Koh, Koh and Cheng (1990) found that the unit trusts in Singapore were generally poorly diversified. Though the actual benchmarks selected were not displayed in their paper, their results showed that the R-squared statistic of the 19 unit trusts evaluated had a mean of just 0.25, with a maximum of 0.47. They concluded that investors were better off buying stocks across the board themselves. However, our study, which was set in the 90s, displayed a very different picture. The coefficient of determination (R-squared) of our evaluated portfolios registers a mean above 0.80. This shows substantial improvements in the diversification of the unit trusts in the last decade.

6. Implications of Results and Further Discussions

We have adopted an unconditional approach to fund evaluation. The characteristics of the funds are assumed to be unchanged throughout the evaluation period. There is appeal in using a conditional approach as adopted by Ferson and Schadt (1996), which takes account of changing economic conditions. The success of the conditional approach, however, depends on the construction of a factor model. Given the relatively short evaluation period we have used in this study, an unconditional approach may circumvent the difficulty of a reliable factor model.

At present, firms such as Standard & Poor's and Standard Chartered Investment Services conduct performance analysis of unit trusts in Singapore and bestow annual awards honoring top performers. However, their selected benchmarks and evaluation methodology are usually undisclosed. Fund managers tend to advertise the awards they receive for their performance in a particular year. However, our study demonstrates that yearly analysis may not be a very good indicator of future performance. Furthermore, the

performance comparison may differ significantly depending on the selected evaluation methodology and the selected benchmarks for the portfolios.

The top performer on a particular year might not perform as well (within top 5) in the next. Examples in our study are the Savers Enhanced Trust Fund and the Schroder Singapore Trust. The former ranked second by the Sharpe Measure in 1997 but fell to twenty-second in 1998, while the latter ranked thirty-third in 1997 but made its way up to the first spot in 1998. Nonetheless, our results show that some funds do manage to repeat their performance. Based on the Sharpe Measure, the CMG F S Singapore Growth Fund performed consistently above average, year-on-year, while the Singapore Progress Fund performed consistently below average, year-on-year. Furthermore, the results on the simulated strategies demonstrate that past performance could be utilized to formulate profitable long-term investment strategies.

The poor performance of the fund managers can be in part explained by the lack of talent in the industry. Singapore does have a reasonable number of Chartered Financial Analysts (CFA). However, over a fifth of these CFAs are hired by the GIC, while the rest mainly work under broker-dealer investment banking (which offers very competitive pay). There are only a few CFAs in the local fund management industry holding positions of importance. The lack of talent in the industry does in part account for its poor performance.

Due to its unique properties, investment advisors are actively recommending unit trusts to be included as part of their clients' investment mix. Furthermore, there is also an explosive growth in insurance-linked unit trusts in recent years,¹² where agents use its properties to plan long-term investment packages along with their life insurance policies.

¹² Ten years ago, insurance-linked unit trusts were unheard of in Singapore. Now, they account for 21.6% of the total unit trusts available.

Unit trusts are likely to play a dominant role here as an investment option in the near future. Thus, in light of the performance-reward imbalances in the fund management industry, perhaps more funds should introduce performance fees as partial substitutes for the management fees they charge. This is especially relevant to funds that incorporate a Regular Savings Plan (RSP) for their investors. Under such a plan, an investor will continue his/her periodic contributions to the fund unless otherwise stated. With long-term savings purpose in mind, investors' demand for the fund is unlikely to change due to poor performance of the fund manager for a particular year. This may result in complacency of the management. If performance fees are introduced, investors will have a built-in system to check the managers' performance. However, for this to work, there are necessary details to be ironed out. Foremost, there must be an agreed form of assessment of fund performance. Mandatory reporting standards and performance should be considered to keep investors adequately informed.

7. Concluding Remarks

In view of the phenomenal growth in the fund management industry in the 90s this study seeks to obtain evidence of unit trust performance. Our results show that fund managers in general performed poorly in security analysis and market timing. However, they performed fairly well in risk-adjusted returns and generally maintained well-diversified portfolios. We find that there is evidence of repeat performance of some top funds, which makes it possible to formulate long-term strategies to make supernormal profits. Our analysis also shows that fund managers can indeed make excess returns above the risk-free rate in the medium- to long-term. Thus, unit trusts could be an ideal investment for small investors seeking sufficient diversification.

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Table 1: Summary of the Sharpe Measure Analysis

Evaluation Period	Total no. of Funds	No. of Funds that outperformed the Risk Free Rate	No. of Funds that outperformed the STI in		Correlation between risk and return
			Absolute returns	Sharpe Measure	
10-year	11	11 (100%)	6 (55%)	7 (64%)	0.790
5-year	22	15 (68%)	13 (59%)	15 (68%)	0.296
3-year	36	22 (61%)	17 (47%)	21 (58%)	0.211

Table 2: Performance Comparison Based on Beta and Total Risk**Panel (a): Ten-Year Evaluation Period, 1990 – 1999**

Unit Trusts	Jensen Alpha	Rank	TM Score	Rank	Sharpe Ratio	Rank
Shenton Thrift Fund	0.0143	1	0.0143	1	0.60	10
Savers Trust Fund	-0.0126	2	-0.0127	2	1.97	3
CMG F S Asia Pacific Growth Fund	-0.0145	3	-0.0145	3	1.97	2
CMG F S Singapore Growth Fund	-0.0153	4	-0.0153	4	3.34	1
Savers Capital Fund	-0.0161	5	-0.0161	5	1.01	6
Unifund	-0.0178	6	-0.0179	6	1.55	5
Union Singapore Fund	-0.0211	7	-0.0214	7	0.77	7
Union Investment Fund	-0.0225*	8	-0.0227	8	1.65	4
The Savings Fund	-0.0412*	9	-0.0411	9	0.62	9
Singapore Equity Fund	-0.0434*	10	-0.0433	10	0.67	8
Singapore Progress Fund	-0.0475*	11	-0.0474	11	0.17	11
Average Score	-0.0220		-0.0216		1.30	

Note: Asterisk denotes significance at the 5% level.

Panel (b): Five-Year Evaluation Period, 1995 – 1999

Unit Trusts	Jensen Alpha	Rank	TM Score	Rank	Sharpe Ratio	Rank
Keppel Asia Blue Chip Fund	0.0242	1	0.0254	1	0.25	12
Shenton Thrift Fund	0.0174	2	0.0174	2	0.35	8
Savers AsPac Recovery Fund	-0.0103	3	-0.0102	3	-0.01	16
Savers Trust Fund	-0.0106	4	-0.0113	5	0.96	2
Schroder Singapore Trust	-0.0120	5	-0.0109	4	0.96	3
Schroder Asian Growth Fund	-0.0136	6	-0.0133	6	0.48	6
Deutsche Asia Premier Trust	-0.015	7	-0.0155	8	0.80	4
CMG F S Singapore Growth Fund	-0.0150	8	-0.0153	7	1.30	1
Savers Capital Fund	-0.0184	9	-0.0182	9	0.22	13
CMG F S Asia Pacific Growth Fund	-0.0208	10	-0.0215	12	-0.14	19
United Asia Fund	-0.0210*	11	-0.0210	10	0.32	10
Shenton Asia Pacific Fund	-0.0218	12	-0.0213	11	-0.30	22
United Growth Fund	-0.0234*	13	-0.0230	13	0.33	9
Union Singapore Fund	-0.0274	14	-0.0282	14	0.03	15
Union Investment Fund	-0.0277	15	-0.0285	15	0.62	5
Shenton Twin City Fund	-0.0314	16	-0.0316	16	0.39	7
Unifund	-0.0334	17	-0.0341	17	-0.27	21
Singapore Equity Fund	-0.0377	18	-0.0380	19	0.32	11
Union East Asian Fund	-0.0381*	19	-0.0378	18	0.03	14
The Savings Fund	-0.0421*	20	-0.0417	20	-0.06	17
Deutsche Premier Select Trust	-0.0443*	21	-0.0458	21	-0.19	20
Singapore Progress Fund	-0.0461*	22	-0.0464	22	-0.08	18
Average Score	-0.0213		-0.0214		0.29	

Note: Asterisk denotes significance at the 5% level.

Panel (c): Three-Year Evaluation Period, 1997 – 1999

Unit Trusts	Jensen Alpha	Rank	TM Score	Rank	Sharpe Ratio	Rank
Five Arrows Asian Enterprise Trust	0.0333	1	0.0237	3	0.59	13
Keppel Asia Blue Chip Fund	0.0272	2	0.0297	1	0.40	17
Shenton Thrift Fund	0.0252	3	0.0241	2	0.60	12
United Regional Growth Fund	0.0166	4	0.0145	4	1.21	4
Govett Asia Pacific Growth Fund	0.0126	5	0.0077	6	0.63	11
Singapore Equity Fund	0.0098	6	0.0104	5	1.6	1
Savers Trust Fund	0.0009	7	-0.0025	8	1.24	3
United Apec Equity Fund	0.0005	8	-0.0028	9	1.46	2
Schroder Singapore Trust	0.0001	9	0.0023	7	1.14	5
Keppel South East Asia Fund	-0.0047	10	-0.0031	11	0.79	9
Savers Enhanced Trust Fund	-0.0052	11	-0.0061	12	0.48	16
Keppel Singapore/Malaysia Fund	-0.0061	12	-0.0029	10	0.68	10
Union Enhanced Fund	-0.0107	13	-0.0150	16	1.05	6
Schroder Asian Growth Fund	-0.0110	14	-0.0102	13	0.22	20
Deutsche Asia Premier Trust	-0.0112	15	-0.0131	14	0.53	15
CMG F S Singapore Growth Fund	-0.0134	16	-0.0150	17	0.79	8
Savers Asia Infrastructure Fund	-0.0147	17	-0.0147	15	0.00	23
United Growth Fund	-0.0161	18	-0.0155	18	0.53	14
United Asia Fund	-0.0167	19	-0.0171	20	0.20	21
Savers AsPac Recovery Fund	-0.0178	20	-0.0165	19	-0.10	26
CMG F S Asia Pacific Growth Fund	-0.0218	21	-0.0233	23	-0.23	29
Union Investment Fund	-0.0220	22	-0.0254	24	0.88	7
Savers Capital Fund	-0.0221	23	-0.0211	21	-0.12	27
Shenton Global Opportunities Fund	-0.0242	24	-0.0268	25	-0.49	32
Union Singapore Fund	-0.0247	25	-0.0280	26	0.24	18
Keppel Asia Fund	-0.0277	26	-0.0215	22	-0.24	31
Shenton Asia Pacific Fund	-0.0320	27	-0.0295	27	-0.54	34
Union East Asian Fund	-0.0324	28	-0.0319	28	0.13	22
Shenton Twin City Fund	-0.0343	29	-0.0347	29	-0.13	28
Singapore Equity Fund	-0.0360	30	-0.0378	30	0.23	19
Unifund	-0.0400	31	-0.0421	32	-0.52	33
Nikko Oriental Growth Fund	-0.0420*	32	-0.0417	31	-0.64	35
The Savings Fund	-0.0442	33	-0.0426	33	-0.07	25
Deutsche Premier Select Trust	-0.0454*	34	-0.0503	34	-0.05	24
Singapore Progress Fund	-0.0526	35	-0.0529	35	-0.24	30
Citi Asia Infrastructure Fund	-0.0556*	36	-0.0574	36	-0.93	36
Average Score	-0.0160		-0.0164		0.31	

Note: Asterisk denotes significance at the 5% level.

Table 3: Spearman Rank Correlation on the Sharpe Measure

Evaluation Period	Correlation
90-92 vs. 93-95	0.2818
91-93 vs. 94-96	0.1818
92-94 vs. 95-97	0.3636
93-95 vs. 96-98	0.2364
94-96 vs. 97-99	-0.3818

Notes: None of the correlation is significant at the 5% level.

Table 4: Spearman Rank Correlation on Different Performance Measures

	Jensen vs. TM	TM vs. Sharpe	Jensen vs. Sharpe
10-year period	1.0000*	0.4818	0.4818
5-year period	0.9932*	0.4952	0.4896
3-year period	0.9910*	0.7524*	0.7810*

Note: Asterisk denotes significance at the 5% level.

Table 5: Simulated Average Return versus Return of the Buy-and-Hold Strategy

Holding Period	Buy Top 3 Performing Funds Based on		STI Returns	Buy Top 5 Performing Funds Based on		STI Returns
	Sharpe Ratio Scores	Absolute Returns		Sharpe Ratio Scores	Absolute Returns	
1995	-0.0524	-0.0524	0.0134	-0.0387	-0.0489	0.0134
1996	0.0745	0.0745	0.0054	0.0448	0.0158	0.0054
1997	-0.3295	-0.3295	-0.2636	-0.3141	-0.3141	-0.2636
1998	-0.0964	-0.0964	-0.0764	-0.1223	-0.1148	-0.0764
1999	0.8581	0.8581	0.7215	0.7862	0.7999	0.7215
Total	0.4543	0.4543	0.4003	0.3559	0.3379	0.4003

Appendix A

Fee Structure and Tax Regulations of the Fund Management Industry in Singapore

Commission

As of October 1, 2000 broking houses are allowed to set their own commission rates. For the time relevant to our study, commission rates were set at 1%. The clearing fees charged by the Stock Exchange of Singapore is 0.05%. Both the clearing and brokerage fees are subject to 3% GST (goods and services tax).

Sales Charges

By law, the cap on sales or preliminary charges is 5% of the value of the investment. Local fund managers charge different rates, depending on the investment size, nature of the portfolio's investment and the promotional periods. However, preliminary rates usually average around 4 - 5%.

Fees Payable by Fund to Manager & Trustee

Unit trusts in Singapore charge a relatively high management fee compared to their foreign counterparts. By law, the maximum fee chargeable is 1.25 - 1.5%, depending on the type of fund involved. In practice, many local fund managers in the selected portfolios charge the maximum rate of 1.25 - 1.5%. The management fee is inclusive of the fees payable to the trustee. Currently, an industrial average of 0.1% is payable to the trustee, subject to a minimum of \$20,000 and a maximum of 0.15%.

Taxation

With respect to the fund, the following incomes are exempt from tax: (1) gains on sale of securities, (2) interest income (other than interest for which Singapore tax has been deducted at source by the payer), and (3) dividends derived from outside Singapore and received in Singapore. The gross amount of Singapore dividends and interest subject to Singapore withholding tax is taxable in the fund but credit is available for the tax deducted at source resulting in no further tax liability for the fund.

With respect to unit holders, no tax is withheld on distributions made. Distribution out of the above income to unit holders who are qualified as non-residents is free from further Singapore tax.

Appendix B

Table B.1: List of Unit Trusts and Their Selected Benchmark Indices

Firms: Unit Trusts	Launch Date	Period of Study			Benchmark Indices
		97-99	95-99	90-99	
AIB Govet (Asia)					
• Govett Asia Pacific Growth Fund	22-Nov-95	✓			MSCI AC Asia Pacific
Aberdeen Asset Management Asia					
• Singapore Equity Fund ^S (Singapore Growth Fund)	22-Oct-96	✓			Straits Times Index
Citibank Global Asset Management					
• Citi Asia Infrastructure Fund	13-Dec-94	✓			MSCI AC Far East ex Japan
CMG First State Singapore					
• CMG F S Asia Pacific Growth Fund	10-Oct-84	✓	✓	✓	MSCI AC Asia Pacific ex Japan
• CMG F S Singapore Growth Fund ^S	10-Oct-84	✓	✓	✓	Straits Times Index
DBS Asset Management					
• Shenton Asia Pacific Fund ^S	14-Aug-92	✓	✓		MSCI AC Asia Pacific ex Japan
• Shenton Thrift Fund ^S	13-Aug-87	✓	✓	✓	Straits Times Index
• Shenton Global Opportunities Fund ^S (Shenton Asian Opportunities Fund)	13-Nov-96	✓			MSCI AC Asia Pacific
• Shenton Twin City Fund	01-Mar-93	✓	✓		<i>STI-HS</i>
Keppel Investment Management					
Keppel Singapore/Malaysia Fund (Tat Lee Cash Value Fund)	09-Jan-96	✓			<i>STI-KLCI</i>
• Keppel South East Asia Fund ^S (Tat Lee Basic Value Fund)	09-Jan-96	✓			BT Singapore Regional Index
• Keppel Asia Fund ^S (Orientrust Fund)	11-Mar-96	✓			MSCI AC Far East free
• Keppel Asia Blue Chip Fund ^S (Enhance Fund)	25-Jul-94	✓	✓		MSCI AC Asia Pacific ex Japan
Deutsche Asset Management (Morgan Grenfell Investment Management)					
• Deutsche Asia Premier Trust ^S	01-Oct-94	✓	✓		MSCI AC Far East ex Japan
• Deutsche Premier Select Trust ^S (Deutsche Singapore Premier Trust)	30-Nov-93	✓	✓		Straits Times Index
Nikko Capital Management					
• Nikko Oriental Growth Fund	10-Oct-95	✓			MSCI AC Asia ex Japan Free
OCBC Asset Management					
• Savers AsPac Recovery Fund	18-Feb-93	✓	✓		MSCI AC Asia Pacific ex Japan
• Savers Capital Fund	27-Apr-87	✓	✓	✓	<i>STI-KLCI</i>
• Savers Enhanced Trust Fund ^S	19-Apr-95	✓			MSCI AC Asia Pacific ex Japan
• Savers Trust Fund ^S	28-Feb-89	✓	✓	✓	Straits Times Index
• Savers Asia Infrastructure Fund	28-Mar-96	✓			MSCI AC Far East ex Japan
OUB Asset Management					
• Union East Asian Fund	31-Mar-87	✓	✓		MSCI AC Far East ex Japan
• Union Singapore Fund	17-Apr-80	✓	✓	✓	Straits Times Index
• Union Investment Fund ^S	01-Jun-89	✓	✓	✓	Straits Times Index
• Union Enhanced Fund ^S	18-Jul-95	✓			Straits Times Index

Rothschild Asset Management					
• Five Arrows Asian Enterprise Trust ^{\$}	22-Aug-95	✓			MSCI Far East Small Cap
Schroder Investment Management					
• Schroder Asian Growth Fund (Schroder South East Asia Fund)	08-May-91	✓	✓		MSCI AC Asia ex Japan Free
• Schroder Singapore Trust ^{\$}	01-Feb-93	✓	✓		Straits Times Index
Singapore Unit Trusts					
• Singapore Progress Fund	16-Mar-70	✓	✓	✓	Straits Times Index
• Singapore Equity Fund	12-Feb-79	✓	✓	✓	Straits Times Index
• The Savings Fund	07-Jul-65	✓	✓	✓	Straits Times Index
UOB Asset Management					
• United Apec Equity Fund	01-Nov-95	✓			MSCI AC Asia Pacific
• United Asia Fund ^{\$}	01-Apr-92	✓	✓		MSCI AC Far East ex Japan
• Unifund	01-Jun-86	✓	✓	✓	<i>STI-KLCI</i>
• United Regional Growth Fund ^{\$}	01-Mar-95	✓			BT Singapore Regional Index
• United Growth Fund ^{\$}	01-Mar-90	✓	✓		Straits Times Index
TOTAL		36	22	11	

Notes:

- 1) The term in parentheses refers to the name for which the fund was formerly known.
- 2) \$ represents CPF-approved unit trusts.
- 3) *STI-KLCI* and *STI-HS* represent, respectively, the composite indices based on the Straits Times Index and the Kuala Lumpur Composite Index, and the Straits Times Index and the Hang Seng Index. See equation (8) in the text for the formula used in the computation of these composite indices.

TABLE B.2: List of Selected Benchmark Indices and Their Description

Benchmark Indices	Index Description
Straits Times Index	A value-weighted index of 55 stocks traded on the Stock Exchange of Singapore.
BT Singapore Regional Index	A market value-weighted index of 34 SES-listed stocks with substantial exposure to the region.
Hang Seng Index	A barometer of the Hong Kong stock market.
Kuala Lumpur Composite Index	A broad-based capitalization-weighted index designed to measure the performance of the Kuala Lumpur Stock Exchange.
MSCI AC Asia Pacific	An index tracking the performance of stocks traded in 15 countries in the Asia Pacific Region.
MSCI AC Asia Pacific ex Japan	Same composition as MSCI AC Asia Pacific excluding Japan.
MSCI AC Asia ex Japan Free	An index tracking the performance of stocks traded in 11 countries in Asia excluding Japan.
MSCI AC Far East ex Japan	An index tracking the performance of stocks traded in 9 countries in the Far East region excluding Japan
MSCI AC Far East Free	An index tracking the performance of stocks traded in 11 countries in Asia.
MSCI Far East Small Cap	An index for monitoring the performance of the small companies' universe of securities in the Far East region.