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SURVIVORSHIP BIAS IN MUTUAL FUND PERFORMANCE: EVIDENCE IN CANADIAN MUTUAL FUNDS

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Abstract

Survivorship Bias in Mutual Fund Performance: Evidence in Canadian Mutual Funds

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This paper examines the influence of the survivorship bias on performance persistence in Canadian mutual funds. Our sample covers the period of January 1986 till December 1999. Spreads of the survivorship bias on mutual fund returns are gauged by comparing the difference between the sample of surviving funds and the sample of surviving and defunct funds. The comparisons are conducted first only on equity funds, and later on funds in all categories. Contingency tables are used to address the question of performance persistence. Cross Product Ratios (CPR) are obtained for all funds, active and inactive, on an annual basis. Probit models are used to explore the odds of and factors that contribute to the disappearance of funds.

Major findings of this study are as follows. The effects of the survivorship bias on Canadian mutual funds are nontrivial. Persistence of fund performance has been found, while reversals are also observed. The persistence is correlated across managers; this may be due to certain common factors. An examination of fund disappearance in the probit models indicates that funds' return, size, and expense ratios are significant predictors of fund's attrition, while the optional sales charges, whether a fund is affiliated with an insurance company, and how long the fund has been in existence are also significant other factors. These results are consistent with those reported for the US mutual fund industry.

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I dedicate this thesis to my dearest parents, sister, and my friends. It would not have been possible without their supports.

All possible errors are my own.

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I. INTRODUCTION

Mutual fund trading started in the 18th century in Europe, while, in North America, the first mutual fund was offered in Boston in 1924. The first Canadian mutual fund was introduced in 1930's (Stenner and William 1997; p.17). As an outcome of the Darwinian evolution, like in any competitive environment, the mutual fund industry is made up of the fittest funds up to this day. These funds are called "survivors" and statistical data regarding their risk and past performance are observable on a regular basis. The survivors, most likely, are those funds that exhibit stronger performance, or indicate superior characteristics for them to stay in business. Those funds that ceased operations, therefore, are likely to be poor performers that failed to satisfy the needs and niches of the mutual fund market. Since they exit from the industry, statistical data on the defunct funds *should be* available until the time of their exit. However, the data for these funds, when they were survivors, appear to be put aside, neglected, and difficult to access. For example, Carhart (1997) notes that about one third of the total funds in his survivor-free database are not observable in most commercially available data sources.

Measuring the performance of mutual funds, using data only on the surviving funds, may overestimate the success of mutual fund management. This is called the *survivorship bias*. Brown and Goetzmann (1995), Malkiel (1995), and Carhart (1997) showed that the survivorship bias has non-trivial effects on the measurement of rates of return on mutual fund investments. When defunct funds are included in their sample, Brown and Goetzmann (1995) demonstrated a visible reduction in the mutual funds' performance.

Moreover, the conditioning on the surviving history in the empirical analysis might induce a spurious conclusion of success. Elton *et al.* (1992) indicated a 50% higher probability of presence of persistence in survivor-biased samples. If performance persists, investors will tend to make investment decisions by looking at the track records of the fund managers. Nevertheless, funds that do well this year are not guaranteed to be the winners of the next year.

The evidence of performance persistence will be contradictory to the Efficient Markets Hypothesis, which predicts that future performance should not be consistently predictable by observing past records. However, the mutual fund investment practice has assumed the persistence of fund performance. Jensen (1968) reported that no evidence of persistence in mutual fund returns has been found during the period of 1945 to 1964. Contradictory evidence, demonstrating that the mutual fund performance persists, has been cited in recent empirical papers. Brown and Goetzmann (1995), and Malkiel (1995) reported significant positive persistence and reversals. They indicate that persistence is correlated across fund managers. The success is likely due to a common management strategy, possibly dynamic rebalancing or common conditioning upon macroeconomic variables.

Most financial performance studies, similar to other fields in financial research, are conducted using the US data. The Canadian mutual fund industry, up till now, has not received as much attention although its history is almost as long as the history of the US mutual fund industry. Certainly, the effect of the survivorship bias on the Canadian mutual funds' performance has been waiting to be examined. There is not a single study that documented this issue, *in detail*, for the Canadian market[1]. One of the main contributions of this thesis is to document this phenomenon for the Canadian funds and investors. This documentation is important not only for the industry, as the compensation of fund managers depends heavily on the performance of their funds, but also for investors, who use regularly performance analyses in their investment decisions, and for policy makers, as the mutual fund industry has become a very important component of the financial intermediation, influencing the overall efficiency of the Canadian capital markets, and our complex modern financial system. It would be telling to refer to a *Globe and Mail* (February 3, 2000) report on the Canadian mutual funds' performance[2]. It

[1] Jorian and Goetzmann (1999) reported some evidence on the survivorship bias for Canada. However, their work was in relation to the equity premium puzzle and provides evidence with only limited implications for Canadian investors and policy makers.
[2] Gail el Baroudi., (February 3, 2000).

reported that, of the 56 Canadian equity funds with a 15-year record under their belts, not a single one was able to outperform its category average over all 15 years. Just 24 of the 56 funds -- fewer than half -- posted above-average returns for at least eight of the 15 years, or a little more than half the time. We must also note that there exist differences between the Canadian and the US mutual fund industries. The differences lie in macro and micro economic environments, the industrial regulations, and the structure of funds' management costs to the investors. The US economy relies mainly on manufacturing and technology, while Canada's has been heavily based on natural resources. Political risk in Canada is also a macroeconomic factor, distinguishing Canada from the US. These two neighbours also have separate tax systems. All these reasons should lead to different capital market structures.

Our sample consists of monthly data on active and inactive Canadian mutual funds that go back 14 years to January 1986. This unique dataset, largely free from the survivorship bias, allows us to examine the performance of mutual funds, inclusive of the performance of the funds that exited the industry some time ago. This enables us to gauge how severe the survivorship bias is for the Canadian mutual funds industry, and study funds' performance persistence largely controlling for the bias.

Various factors might lead to the disappearance of mutual funds. A fund is usually delisted as a result of termination or being merged into another fund. Therefore, fund disappearance is a result of management decisions, which are presumably based on fund performance, or ultimately on consumer demand. Following Brown and Goetzmann (1995), we first conduct probit models examining the possible factors that may contribute to the funds' disappearance. Second, we examine the funds' disappearance on a year-by-year basis cross-sectionally. Third, departing from Brown and Goetzmann (1995), we formulate an alternative and new probit model to study what factors contribute to the disappearance of funds three years earlier, and two years earlier. Finally, whether a fund's affiliation with an insurance company

influences its survival odds is included in the probit models. This variable appears to be unique to Canada.

We find that expense ratios are highly correlated to the funds' disappearance. The higher the expenses ratios of a fund are, the more likely that it is going to be closed. Funds affiliated with insurance companies have better chances of survival. The probability of survival is also higher for those funds offered on an optional sales charge basis. These results are largely in agreement with those reported for the US mutual funds in various studies.

The rest of this paper will be organized as follows. Literature review on the performance studies of mutual funds and the issue of the survivorship bias in financial studies will be in Section II. Section III describes our database, and the methodology we use in this research is presented in Section IV. Section V examines the performance persistence, while the probit models on fund disappearance are reported in Section VI. Section VII concludes this paper and Section VII proposes some ideas for future research.

II. RELATED LITERATURE

II.1. Performance Studies of Mutual Funds

Portfolio performance has long been an interesting topic to researchers and to the investors. Two relevant questions on the performance of mutual funds have been: 1) do the mutual funds provide consistently excess returns to the investors net of investors' expenses?, and 2) are the winner funds in the previous year going to continue to do well in the next year?

The Efficient Markets Hypothesis implies that the security prices incorporate fast all publicly available information. If information is free, and equally available to everyone, then no differences should be consistently found in the performance of the funds and fund managers. However, if private information were owned by fund managers, then that would lead to the departure from the full-information prices (Grossman and Stiglitz, 1980), and might also lead performance differences.

First generation works on mutual fund performance found that mutual funds do not earn superior returns. In 1960's, a series of papers used mutual fund data and the implications of the then-newly founded Capital Asset Pricing Model (CAPM) to test for the efficiency of the mutual fund market. Studies on measuring the performance of mutual funds have largely been based on using the CAPM. Jensen's α, which measures empirically the deviation of a portfolio from the CAPM's securities market line, and helps one to obtain this portfolio's risk-adjusted returns, has been a standard for measuring fund performance since early 1970's. However, persisting questions pertaining to whether CAPM can be estimated empirically properly has put a cloud over the use of Jensen's α as well (Roll 1977, Fama and French 1992, 1996, Fama 1998) . Thus, one must exercise caution in interpreting the empirical results from any CAPM-based estimations, including Jensen's α.

Sharpe (1966) found that Return-to-Volatility ratios for a sample of 34 funds was lower than the ratio for the Dow Jones Industrial Average portfolio by 3.4% over the years of 1954-

1963. Jensen (1968), using a sample of 115 open-end funds during 1945-1964, reported evidence that mutual fund managers did not appear to have any useful private information as they did not do well enough to recover their investment costs.

Another influential study is again by Jensen (1969), who confirmed Sharpe's (1966) findings that mutual funds did not provide superior performance after deducting all management expenses and brokerage commissions that occurred in the process of trading. Using the same sample as in Jensen (1968), Jensen' (1969) empirical results further indicated that the market was efficient in capturing all currently available information. Fund inefficiencies appeared to be due to the expenses incurred; adding back all management expenses and brokerage commissions made the portfolio returns to be neutral.

Mains (1977) argued that Jensen's results (1969) are somewhat biased downward and obtained corrected results. Mains' reason was that the dividend yields of the funds were assumed to be paid year-end while, in reality, they were normally paid quarterly; in this way, the gains from dividend reinvestments were ignored, potentially biasing performance measurement.

Recent support on the belief that mutual funds do not provide systematically excess returns above and over the market indexes has been found by Grinblatt and Titman (1989b), as well as Connor and Korajczyk (1991). On the contrary, Ippolito's (1989) study used a more recent sample of 143 mutual funds over the period of 1965-1984. He found that risk-adjusted returns in mutual fund investments, net of fees and expenses, except for load charges, were higher than the returns of the index funds. This result appears to be different from the results reported in the earlier studies. Index funds are characterized by passive investment -- low fees and turnover. In contrast, most other mutual funds are actively managed, with management fees averaging to 50 basis points and turnovers[3] averaging to 70% per year (US numbers). The positive α was not sufficiently large enough to recover the load charges, though. On balance, superior results were

[3] Turnover is the lower of annual purchases or sales in the fund during the year divided by average assets (Ippolito 1989, Table IV).

offset by expenses and charges. However, it is also stated in the article that no evidence was found that inferior net returns of the funds were associated with turnover, management fees, or expenses.

Elton *et al.*(1993), after adjusting for the bias that was likely due to holdings of non-S&P assets in the funds, provided contrary result of negative α for the same period as in Ippolito (1989). Thus, Ippolito's conclusions are not found to be robust.

In general, the evidence on the efficiency of mutual fund market is largely from the US, mixed, and evolving.

II.2. Survivorship Bias in Performance of Mutual Funds

II.2.a. Survivorship Bias in Equity Markets and Long-term Studies

Survivorship bias stems from the Darwinian outcome of winnowing out unsuccessful mutual funds. The funds that disappear are, predictably, the least successful funds –ones that failed to attract enough assets to remain viable.

As early as 1970's, some researchers, including Ball and Watson (1972, 1977, 1979), and Salamon and Smith (1979), noted their recognition of the potential effects of the survivorship bias on statistical tests. For example, Ball and Watts (1979) pointed out two biases in the sample selection procedure in their study on firms' earnings: 1) data source in Standard and Poor's tended to include surviving and large firms in its database, and 2) the authors eliminated all firms that did not have complete data for the 20-year period covered in their study. More recently, Brown, Goetzmann and Ross (1995) expressed that most empirical analyses of rates of return in finance are implicitly conditioned on the survivors. This problem lies in virtually all fields of financial studies employing long-term data. The longer the data series is, the stronger the power of the statistical tests should be. Nevertheless, missing to account for the survivorship bias might have nontrivial effects on the issues that the researchers are concerned. As noted in Goetzmann

and Jorion (1995), the simulation of the effects of survivorship on dividend yield regressions suggests that survivorship tends to bias inference in favour of the predictive power of dividend yields on long-horizon returns.

Most of the financial studies have focused on the US and the UK markets. These two markets obviously have the longest historical data and have been the most successful ones. However, the issue of survivor bias may be more severe in other less developed financial markets. Thus, extending research results and conclusions and ensuing investment or policy advice, based only on the US or the UK studies, to other countries, carries potential dangers. In fact, Jorion and Goetzmann (1999) show that, after examining 39 markets from 1921 to 1996, the high equity premium of 4.3% per year in the US market is an exception rather than the rule. Thus, the potential effects of the survivorship bias is not limited to the performance of mutual funds, but may extend to any financial topic, including the equity premium puzzle as demonstrated by Jorion and Goetzmann (1999)[4].

II.2.b. Survivorship Bias in Performance Studies of Mutual Funds

II.2.b.i. Survivorship Bias in the Sample Selection Procedure

The majority of mutual fund performance studies are based on funds that remain in operation till the end of the sample period. Ippolito (1989) based his study on 12 funds that met certain criteria in 1984 and tracked the records of the funds back to 1965. This sample is likely to contain survivor bias as it contains only the surviving funds in 1984. Elton *et al.* (1993) reinterpreted Ippolito (1989) and selected another sample of 12 funds, which met the same criteria at the beginning of 1965, and followed them until 1984. Both studies imposed the survivorship bias since the funds under study were those that survived till the end of the period. In

[4] Siegel (1999) also found that after adjusting for the survivorship bias, the equity premium would be 1.5 to 2.5 percent given transaction cost and diversification.

both studies, the funds that ceased trading in between the 20-year period were excluded from the samples.

More recently, researchers have paid more attention to the issue of the survivorship bias in mutual fund studies. Brown and Goetzmann (1995) constructed a sample with all equity funds, active and inactive, for the years 1976 through 1988. Malkiel (1995) used similar sample from Lipper Analytic Services, covering records of all equity funds that were in existence during a 21-year period from 1971 through 1991. Carhart (1997) includes monthly data on all equity funds from January 1962 to December 1993[5]. About one-third of the total funds (1,892 funds in 16,109 fund years) in Carhart's database had ceased their operations. Therefore, a substantial portion of the mutual fund data is not observable in virtually all commercial databases available to investors.

II.2.b.ii. The Impact of the Survivorship Bias in Performance Studies

It is difficult to sell a mutual fund to the public that has a poor risk-return record. Mutual fund complexes will typically merge the fund into one of the more successful funds in the complex, thereby burying the fund's bad record with it. Lipper Analytical Services Inc. tracks the performance of mutual funds. It reported in 1987 that the average total return of the stock mutual funds, which were in existence between 1985 and 1986, was 15.9%. On the other hand, a recalculation of the average total return from 1985 to 1986 based only on those that were still survivors in 1993 showed a return of 17.4%. This is considerably higher than the *real* average return of 15.9%, and is an outcome of eliminating the statistical data for the disappearing firms from the record books. Thus, an investor, who is studying unknowingly a survivorship-biased historical performance report of mutual funds in 1993, may be given an inflated picture of these funds' past performance.[6]

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[5] On the basis of his Ph.D dissertation submitted to the University of Chicago, Carhart developed a survivor-bias free US Mutual Fund Database, covering monthly data on open-ended mutual funds from January 1, 1962 to December 31, 1997. Detailed description of his database is in Appendix 2.

[6] Robert McGough, (January 7, 1993).

Grinblatt and Titman (1989b) examined one surviving sample and one sample free from the survivorship bias between December 1975 and December 1984. The survivorship bias is calculated as the difference in α between two equally weighted portfolios of funds from the respective samples. They reported that survivorship bias was relatively small in buy-and-hold returns with averages between 0.1% and 0.3% per year for different comparison benchmarks. The survivorship bias was relatively larger for the smaller funds.

Brown and Goetzmann (1995) reported larger spread when the mean returns were scaled by capitalization. The difference between returns of the entire sample with both active and inactive funds, and the return of active funds only, was 0.8% for equally weighted portfolios and 0.2% for value-weighted portfolios. They found that it was easier for the smaller funds to fade away from the market, making the spread wider. Their conclusion was consistent with Grinblatt and Titman's (1989b). Malkiel (1995), who studied the 1982-1991 period, also reported a 1.5% spread due to the survivorship bias in the mean returns of the funds.

Jensen's α for the survivor-biased and -non-biased samples were compared in Elton *et al.* (1996b). While not much difference was found, the smallest funds showed an α twice as negative as the α of the largest portfolio of funds. The results suggested that the small funds were more likely to fail and that the failed funds experienced poor performance compared to the performance of the surviving funds.

Carhart (1997) studied the performance of an equally weighted index of equity funds from January 1962 to December 1993, and found that the use of only surviving funds biased the performance measures upward by about 1% per year. Contrary to Elton *et al.* (1992), Carhart showed that the full survivor-free sample displays the strongest performance persistence, while the survivor-biased sample displays the weakest performance persistence. More research needs to be carried out to sort out the relationship between survivorship bias and performance persistence.

Another important fact that we should pay attention to is that the longer the sample period, the greater is the impact of the survivorship bias on the measurement of fund performance (Carhart 1997; Brown *et al.* 1999).

II.3 Performance Persistence in Mutual Funds

Investors indicate that the performance of the fund should be the primary factor in choosing a fund. Mutual fund managers are likely to provide historical records of the funds in persuading investors to select a fund. Researchers, on the other hand, have been trying to document that the performance measures of mutual funds are correlated between periods. Early studies such as Jensen (1968) rejected the persistence in mutual fund performance. Some others have recently found evidence that certain fund managers have skills in managing their portfolios and that the winners this year may still be the winners next year.

II.3.a. Performance Evaluation

Parametric and nonparametric methods are the usual approaches in performance evaluation. Parametric measurement has been widely used in the literature. One parametric approach refers to a regression of the second period Jensen's α on the first period α. This method requires that the funds in two consecutive periods remain the same. If any significant slope coefficient is found for the first period α, a conclusion will favour the persistence in the mutual fund returns. Elton *et al.* (1993) used this parametric regression on 12 years of data by dividing them into four 3-year sub-samples. The results indicated significant persistence in periods of January 1975-December 1981, and of January 1982-December 1987.

A widely used nonparametric approach in mutual fund performance studies involves the construction of contingence tables to study the presence of repeat performers in consecutive periods. Funds are defined as winners and losers based on a certain benchmark. Chi-square tests,

which examine the independence between winners and losers in consecutive time periods, are reported for each sample. Elton *et al.* (1993) reported contingency table results, which were consistent with their results from the parametric tests. Brown and Goetzmann (1995) obtained Cross Product Ratios for the repeat performers and indicated that performance persisted during the period of 1976-1988. Malkiel (1995) also used this nonparametric test and found strong persistence in the 1970's and relative weak persistence in the 1980's. Nevertheless, we should be cautious in interpreting these results if survivorship bias is present in the sample under study.

The definition of winners and losers concerns the selection of the benchmark. Relative measurement compares the returns of the funds with the median of the fund returns in a certain period. We can also define the winners and losers taking an absolute benchmark such as the performance of the S&P 500 Index, Dow Jones Industrial Average, or TSE 300 Index.

Lehman and Modest (1987) stressed that performance studies were sensitive to the benchmark used in evaluation, and that a benchmark should be able to capture the common factors affecting securities returns. Grinblatt and Titman (1994) also reached a similar conclusion on the sensitivity of choice of benchmark in performance inferences. An efficient benchmark should be chosen with care to secure the evaluation of mutual fund performance.

Different studies have employed single and multiple indexes in evaluating the fund returns. In correcting the excess returns results in Ippolito's (1989) sample due to non-S&P holdings in the funds, Elton *et al.* (1993) considered a non-S&P index and a bond return index to explain the positive α obtained by Ippolito (1989). Ippolito's results contradict the results of Jensen (1969) and other previous studies. Elton *et al.* (1993) stated that the positive α is due to not appropriately accounting for the performance of non-S&P assets. Mutual fund industry has long been using varying benchmarks in evaluating the performance. These benchmarks are chosen according to the risk characteristics of specific funds.

While correcting certain factors that are not captured in a single index, there remains a potential problem with the use of multiple indexes. Measurement of performance through multiple indexes may fail to attribute some elements of good performance to skilled fund management from better sector selection (Elton *et al.*1993, Grinblatt and Titman1989, Lehman and Modest 1987). On the other hand, another line of literature indicates that a single-index model provides an adequate description of portfolio returns, and that the estimation of the returns is reasonably insensitive to the index used. Copeland and Myers (1982) found that performance evaluation was not affected by the choice of performance benchmark. In our study, we compare the average returns of the Canadian mutual funds to the returns of 1) the TSE 300 Index, which is the most popular benchmark in Canada, and 2) to the median fund in a certain year in our sample. These two comparisons, relative and absolute, give us an idea on the sensitivity of the returns data to the different benchmarks used.

Grinblatt and Titman (1993) using portfolio holdings, showed that the growth funds and aggressively managed growth funds earned significantly positive risk-adjusted returns between 1975-1984. However, Grinblatt and Titman's result did not control for the factors of size, and book-to-market ratio, and the momentum effect, which are strategies employed by portfolio managers to successfully time their portfolio weightings.

Daniel *et al.* (1997) improved the idea of constructing characteristics-based benchmarks developed first in Grinblatt and Titman (1993). By fully accounting for the size, book-to-market, and momentum effects, the authors constructed benchmarks from the returns of 125 equity funds and compared portfolio performances of 2500 equity funds which existed in 1975-1994 by the characteristics of selectivity, timing, and average fund style. Daniel *et al.* (1997) found that fund managers realized positive returns, although the returns could not compensate for the fund expenses. The characteristics-based benchmark did a better and more accurate job in matching future realized returns, and in forecasting the cross-sectional patterns of future returns.

II.3.b. Evidences of Performance Persistence

A sample that is truncated by the survivorship bias may exhibit spurious performance persistence. Brown *et al.* (1992) found that when the survivorship bias was present in the data, the probability of a manager, who succeeded in the first period to succeed in the second was greater than 50%. Blake *et al.*(1993) obtained results that indicated that past performance would not determine future performance in a sample of bond funds free from the survivorship bias. Thereafter, Brown *et al.* (1997) also demonstrated that the survivorship bias induced spurious persistence in the performance of mutual funds.

In a most influential study, Jensen (1968) concluded that there was no evidence of persistence during the period of 1945 to 1964 in mutual fund returns. A similar conclusion was reached in Dunn and Theisen (1983) that the probability of selecting an investment manager who would succeed in the next year, as well as in the previous year, was 50-50. Both studies suffered from the survivorship bias. In contrast, positive persistence was found in Grinblatt and Titman (1992) in the risk-adjusted returns of 279 funds that existed from December 1974 to December 1984. Hendrick *et al.* (1993) found that mutual funds that did well in the past would tend to do so in the future. Nevertheless, these studies suffered from the survivorship bias and the look-ahead bias[7].

Using a sample free of survivorship bias, Elton *et al.* (1996a) confirmed the predictive power of past risk-adjusted returns on future performance in both short run and longer run. They also showed that the "hot hands" effect existed in short run returns. Goetzmann and Ibbotson (1994) verified the repeat-winner pattern in 728 open-ended funds over successive one- and two-year intervals for 1976-1988. The repeat-winner phenomenon was presented not only in raw returns, but also in the risk-adjusted returns. The survivorship bias was controlled for in this study because the returns of the surviving funds were compared to the returns of other survivors, rather

[7] Carhart (1997) distinguished these two types of bias. While the survivorship bias is a property of sample selection method, the look-ahead bias is a property of the test methodology that performance measure requires the surviving of the sample for a period of time after the ranking period in order to enter into the portfolio strategy.

than to the returns of an absolute market index, which is known to have persistence bias. Carpenter and Lynch (1999) also provided evidence that the performance of US mutual funds persisted from January 1962 to December 1993.

With a sample of mutual funds between 1975-1984 that is free from the survivorship bias, Grinblatt and Titman (1989b) suggested that the five-year risk-adjusted returns contained some predictive power for subsequent returns, although they did not find any excess returns net of expenses. With a strategy of buying an equally weighted portfolio of last year's best decile of funds, Wermers (1996) showed that the average return on such a portfolio was a 3% higher than the mean return of the average mutual fund. The success of this strategy was strongly related to the presence (or absence) of a momentum effect in the stock returns in a given year. Grinblatt, Titman, and Wermers (1995) also reported that the momentum effect of buying the past winning stocks realized significant positive returns.

Carhart (1997), to the contrary, attributed the persistence in mutual fund performance to the common factors in stock returns and persistence in the expenses and transaction costs of mutual fund investments. He found that the persistence of mutual fund returns only lasted for the next one year, but not thereafter. The "hot hand" and "cold hand' phenomenon, which means that winning and losing mutual funds' returns persist, were documented in Malkiel (1995). Considerable persistence in the 1970's was found, while the persistence was weaker in the 1980's.

Repeat winners are cited in Brown and Goetzmann (1995). Seven (or eight) out of 12 years in the examination period exhibited persistence. They also found reversals in the mutual fund's performance persistence. Malkiel (1995) found reversals in 1987, 1988 and 1990. The positive persistence and reversals reveal that the persistence is correlated across managers, and that the persistence may be due to some common factors in managing the mutual funds.

Gruber (1996) suggested that the persistence in good mutual funds performance confirmed that some funds managers might have superior skills and thereby deliver better fund

performance while, on average, mutual funds underperformed passive benchmarks. Daniel *et al.* (1997) reported that the buy-and-hold returns of all equity mutual funds persisted over 1976-1994. The best funds realized 4.6% per year higher return than the worst funds over the 20-year period. Studies also documented that persistence in mutual fund returns originated from the persistence of poor performance, and that investors were indifferent to extremely poor performers (Hendrick *et al.* 1993, Malkiel 1995, Brown *et al.* 1997).

II.3.c. Expenses and Mutual Funds' Performance

Jensen (1969) suggested that the main reason for the inferior performance for the fund portfolios was the existence of too many and too much expenses. If one added back all expenses, except for brokerage commissions, these portfolios would display average excess return of 0.0009 per year.

Contradictory evidence is cited in Ippolito (1989), who obtained greater than zero risk-adjusted returns for the mutual fund industry, even after accounting for transaction costs and expenses. Blake *et al.* (1993) found that a percentage-point increase in expenses led to a percentage point decrease in the performance for the samples of bond funds. Correspondingly, Carhart (1997) found that for every 100-basis-point increase in expense ratios, annual abnormal returns dropped by about 154 basis points. The coefficients of total expense ratio to the net return of the funds were –3.68 for all surviving funds, and –1.92 for funds with less than 2.5% expense ratio in Malkiel (1995). Higher expense ratios led to lower returns.

Grinblatt and Titman (1989a) suggested that higher abnormal returns would be present when gross returns were used instead of returns net of management fees.

Most of the long-term persistence in mutual fund performance was found to be driven by the persistence in expense ratios (Carhart 1997). The top past-performers appeared to earn back their expenses and transaction costs even though the majority of the mutual funds underperformed the benchmarks by approximately their investment costs. On the other hand,

Elton *et al.* (1996a) found that even after accounting for the impact of expenses, the predictability of past returns on future performance still was present. Expenses accounted for only a part of the differences in performance across funds. Brown and Goetzmann (1995) also indicated that adding back expenses to returns made little difference in the persistence in returns of the growth funds'.

II.4. Canadian Studies on the Performance of Mutual Funds

Canadian evidence of the performance of the mutual funds has not been sufficiently put forward in the literature. FundScope, a mutual fund research company based in Toronto, examined 564 Canadian funds that have been on the market for at least 3 years and found that the funds with the lowest fees were most likely to outperform the market while everything else being equal. The management expense ratios (MER) for Canadian equity funds were reported to be 2.1% per year of a fund's total assets[8].

On the other hand, results in Berkowitz and Kotowitz (1993) showed that fund managers outperformed the market by a percentage that was more than enough to compensate for the management fees and sales charges incurred.

Kryzanowski *et al. (1994)*, using a sample that contained 146 Canadian equity funds for the period from June 30, 1981 to December 31, 1988, found negative Jensen's α for more than 32% of the funds. It was also indicated in the same study that inferences on performance of mutual funds were sensitive to the choice of the benchmark. Their sample, however, suffered from the survivorship bias.

In their study of global stock markets, Jorion and Goetzmann (1999) reported a real return of 3.2% per year for the Canadian market from January 1921 to December 1996. However, their main focus was on associating the survivorship bias to the equity premium puzzle rather than on the performance persistence of the Canadian mutual funds, or on the factors that might

[8] Jonathan Harris, (September 1997).

affect funds' survival odds. Thus, their paper provides only very limited useful information for the investors interested in the Canadian mutual funds.

II.5. Fund Disappearance

Employing a probit model, Brown and Goetzmann (1995) examined the influence of age, relative return, relative size, expense ratio, and other variables, to predict the odds of fund disappearance. Results showed that higher expense ratio led to a higher probability of fund disappearance. Customer response, represented by new money of a certain year, showed weak effect in predicting the exit of a fund from the industry. The lagged returns of the funds, two and three years prior to their disappearance, showed significant predicting power. Carhart (1997) indicated that the defunct funds underperformed for as many as five years prior to disappearance.

Wermers (1997) found that a year's best fund suffered an attrition rate close to that for other funds. Funds that followed a momentum strategy were likely to outperform other funds over the long run, though they would also bear the risk of a short period of poor performance, which might cause these funds to close their operations.

II.6 The Literature and Our Study

Ongoing interest in the performance of mutual funds has led to the extant studies on mutual funds. Our study will be built mainly on those of Brown and Goetzmann (1995), Malkiel (1995), and Brown *et al.* (1992), and provide the first survivorship bias free performance results for the Canadian mutual fund industry in the 1980's and 1990's.

In this study, we developed a database largely controlling for the survivorship bias, and examine the spread of the survivorship bias in the mutual fund data for the period of 1986-1999. We then examine the performance persistence in Canadian mutual funds. The probit models are conducted to detect possible factors that may contribute to the funds' disappearance. However,

due to the time and data constraint, we did not have time left to dig into the risk-adjusted returns of the Canadian mutual funds. We will save this issue for future research.

III. DATA

III.1. Survivorship Bias in Existing Databases

The better informed an investor is, the more tailored the chosen investments can be for his or her circumstances. Information on Canadian mutual funds is available in various sources. The data are essentially for investment purposes though. No Canadian mutual fund database is available for academic research to this date.

Obviously, investors are interested in funds currently in the market place. It appears that data on defunct funds are purged from storage. Thus, generating performance reports based only on data for the survivors will tend to upward bias the successes of the survivors and will give the investors a glorified and misleading portrayal for investing in mutual funds. A fair and accurate portrayal can happen only if the information on the performance of defunct funds is incorporated into such reports.

Malkiel (1995) reveals a little known factor in the behaviour of mutual funds, which may further add to the severity of the survivorship bias in mutual funds, namely, the practice of 'incubator' funds. A fund management complex may start a number of new equity funds with different inhouse managers and wait to see which ones succeed. Suppose after a couple of years, three of the funds generate better than market performance. The fund complex will market the successful funds aggressively, dropping the others and burying their records. The remaining records will only be for those that are survivors. This practice should make the survivorship bias in the mutual fund industry more severe than that in the stock market.

The survivorship bias in the mutual fund performance reports has been noticed by the Canadian fund companies and independent sources that we contacted to obtain data and information for our current study. We elaborate about these sources in our discussions below. An important contribution of this thesis is the construction of a brand-new Canadian mutual fund data file that is free from, to a great extent, the survivorship bias.

III.2. Mutual Fund Information Sources

Information on the Canadian mutual funds is available in fund companies, newspapers, financial services companies, independent databases, or electronic media. Our data file is constructed by merging the original mutual fund databases of *Financial Post DataGroup*, and *Fundata Canada Inc.*. Both sources provide data on a monthly basis.

III.2.a. Active Funds

Financial Post Data Group

The *Financial Post DataGroup* records information on almost all publicly offered open-end mutual funds on a monthly basis. The original *Financial Post* database contains 15 years of Canadian mutual fund data for the period of May 1985 to April 2000. Database covers 3,044 investment funds (active as of April 2000), which include all open-end equity funds, fixed income funds, cash funds, money market funds, balanced funds, and global sector funds. The first fund in the file announced its debut in 1931. Original database consists of two portions: titles file, and data file. Fund data is indexed by Financial Post ID. Financial Post ID is generated based on the first character of the fund name when it was originally added to their database.

The data file lists the total net asset, net asset value per share and record date, dividend distributions (capital and income dividends) information, share balance, and value of investment[9]. Fund name, and other fund specific information, including fund sponsor, fund type[10], fund group, RRSP information, management fee and expense ratio, and the percentage of foreign investment, are detailed in the titles file.

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[9] Value of Investment (VOI):Buy-and-hold value of a fund, where
Share Balance(SHEBAL) = (current dividend * previous SHRBAL) / current NAVPS ÷ previous SHRBAL, and
VOI = Share Balance * NAVPS (current)
Note: If there is no previous data then share balance is 1. Finai value is rounded to four decimals, calculation precision factor is 10.

[10] Please refer to the Investment Funds Standards Committee fund categories (Appendix 1).

We paid special attention to the equity funds for two main reasons: first, all previous studies have been conducted on open-end equity funds, most of which were on the US market; second, the most widely used Canadian benchmark is TSE300 Index, which comprises of 14 groups of equities only.

Fundata Canada Inc.[11]

The *Fundata Canada Inc.* reports market data on Canada's publicly offered open and close-end mutual funds. *Fundata* database covers the period from February 1980 to February 2000. Similar format as that in *Financial Post* database is employed in Fundata dataset. For each fund, we locate comparable data to the *Financial Post* data file, which is indexed by Key (*Fundata* ID), name of the fund, NAVPS (net asset value per share at month end), TNA (month end total net asset), dividend distribution (capital and income dividend), percentage foreign content, and MER (management expense ratio) on a monthly basis. While *Financial Post* dataset only documents the latest available expense ratios, *Fundata* database records the MER ratios of 1992-1999 in more detail with monthly frequency and updates the ratio yearly. This enabled us to study the influence of the expense ratio on the performance of the mutual funds.

Investment Funds Standards Committee (IFSC) mutual fund categories

The Investment Funds Standards Committee (IFSC) was formed in January 1998 by Canada's major mutual fund database and research firms to standardize the classifications of Canadian-Domiciled mutual funds. While mutual fund data providers have different methods of sorting and categorizing mutual funds, confusion and a number of problems can arise due to the different schemes being used. This problem became apparent to us because we used two sources of mutual fund information.

[11] Fundata Canada Inc. kindly provided the mutual fund database for this research.

All mutual funds in the *Financial Post* database are categorized according to the definitions by IFSC (Canadian Investment Fund Standard Committee) (Please refer to Appendix 1 for the Fund category). We matched the funds listed in *Financial Post* database with the fund list, by category, in IFSC (available at www.cifsc.com). Table 1 documents the *Financial Post* database by category.

Table 1 Fund List Sorted by Categories, April 1985—April 2000.

Fund Type	Extant in April 2000	Gone by April 2000	Whole sample	Mortality rate (%)
Balanced	579	56	635	8.82
Equity	**1765**	**209**	**1974**	**10.59**
Cash	196	47	243	19.34
Fixed Income	387	97	484	20.04
Global Sector	117	32	149	21.48
Total	3044	441	3485	12.65

The largest portion of all the funds has been the equity funds; that is 1,964 out a total of 3,485, either active or inactive, in the recent 15-year history. Equity funds have to meet a requirement that a minimum of 50% of total assets and 75% of non-cash assets must be invested in Canadian stocks. Mortality rate reports the percentage of funds that ceased operations sometime between April 1985 and April 2000. Equity fund, among all categories, shows a relatively high percentage of surviving, with a lower mortality rate than that of the full sample.

Alternative data sources

We have approached several other data sources in Canada for mutual fund information. Canadian mutual funds information is available both in paper and computer based forms. Major newspapers, such as the *Globe and Mail*, and the *National Post*, list daily trading data. *Globefund.com* in the *Globe and Mail*, and other mutual fund companies, such as *Southam Inc.*, and *Morningstar Canada* hold their own database. These companies are members of the IFIC.

We contacted some of them and were disappointed to learn that information on all inactive funds is no longer kept in their databases. We were told by *Globefund.com* that information on inactive funds is available in their database but the cost of obtaining the data is *prohibitively* too high. Thus, we did not pursue the *Globefund.com* database in our study.

III.2.b. Inactive Funds

As a database targeting the entire financial industry and investors, *Fundata* dataset does not keep original market data on the defunct funds. Nevertheless, *Fundata* database keeps a record of the names of all the funds, which either existed or presently exist in Canada in the past 20 years. The titles file of the *Fundata* database documents the termination date for each fund that exited from the market.

The original data file in *Financial Post DataGroup* covers active funds only; a survivorship bias thereby exists in the database. Upon special request, *Financial Post DataGroup* retrieved historical information from their old records on the defunct funds in Canada. Thus, our study is the first to re-include the defunct funds into the Canadian mutual fund universe. This unique construction of our virtually survivorship-bias free database allows us to examine the inactive funds and the active funds, and to compare the performance of the surviving funds, to the performance of surviving and non-surviving funds. We also gauge the spread due to the survivorship bias. We note that the newly constructed database may not completely cover all the mutual funds that ever-existed in Canada during the sample period. We are aware that the *Financial Post DataGroup* could not produce to us data on about 100 defunct funds. The completeness of a Canadian mutual fund database that is 100% free from survivorship bias will require further data collection and input. However, our current database is free from the survivorship bias to a great extent as we obtained data on 313 defunct funds out of a total of 441 in the *Financial Post* database.

Financial Post database records inactive fund data till the last month prior the termination date, which is reported in *Fundata* titles file. A numbers of funds, which was reported in *Fundata* database that were offered to be invested in US$, are not included in our study.

Following is a comparison of major features between *Financial Post* and *Fundata* databases:

Table 2 Databases Comparison: Financial Post database and Fundata database

Data source	Financial Post Data Group	Fundata Canada Inc.		
Sample period	May 1985 --- April 2000	Feb. 1980 --- Feb. 2000		
Frequency	Monthly	Monthly		
Open/close end	Open-end	Open-end	Closed-end	Not specified
		4128	40	30
Inactive funds	441	422	4	30
Active funds	3044	3706	36	0
Total number of funds	3485			4198

III.3. Database Development

III.3.a. Matching of Financial Post, Fundata, and IFSC Fund List

In order to standardize the category of our final data file for further research, we match the fund lists in both *Financial Post* and *Fundata* datasets with the fund list by IFSC. Therefore, with any one name in each of these three data sources, we will be able to locate information in the other two datasets in our final database. The merging of datasets involves the matching of funds listed in three sources respectively. Because each data source uses different data sorting method, the only way to match funds in two files is by matching the names of the funds. The matching is done manually due to the variations in recording of the names in individual files.

III.3.b. Merging of Financial Post Database and Fundata Database

Brown and Goetzmann (1995) indicate that expense ratio increases the possibility of disappearance. *Financial Post* expunges all previous expense ratios whenever a new observation is released. The annual historical expense ratios have been listed in the *Fundata* database for the 1992-1999 period. We merge the annual expense ratios in *Fundata* database into the original *Financial Post* dataset, and note that the expense ratios in *Fundata* database are for the active funds only. The expense ratio data for the defunct funds are collected from two places: First, the titles file in the *Financial Post* database reports the last updated expense ratios and the expense ratio date. We match this information with the data file by the date. Second, we tried to collect historical expense ratio information for the defunct funds, and even some active funds, from individual fund companies. This has not been very successful, because even the fund sponsor companies do not keep records on their inactive funds, or declined to release the information. The fact that finding data on the defunct fund is hard makes us to believe strongly that the survivorship bias exists in virtually all Canadian mutual fund databases available.

III.4. Final Sample

III.4.a. Market Indexes

Four Canadian indexes are employed in our study to compare the performance of the mutual funds:

1. TSE300 Composite Total Index: Covering 300 Canadian largest, most liquid traded companies in 14 broad industry groups. Returns are adjusted for dividend distributions.

2. TSE35 Total Index: Made up of 35 of Canada's largest corporations and represents a cross-section of industries. It was designed to closely track the performance of the TSE 300 Composite Index. Returns are adjusted for dividend distributions.

3. CFMRC Equally Weighted Index: The average daily returns for all domestic common equities included in the CFMRC database. Returns used in this index are fully adjusted for distributions.

4. CFMRC Value-Weighted Index: The market value weighted average daily returns for all domestic common equities listed in the CFMRC database. A security's market weight is defined as its market value at the beginning of the current month (shares outstanding times closing price on the last trading day in the previous month) divided by the market value of all securities included in the index (Canadian firms only). Returns used in this index are fully adjusted for distributions.

III.4.b. Risk-free Rate

The risk-free rate is represented by the yield of the 30-day Treasury bill provided by Bank of Canada and is extracted from the CANSIM database.

III.4.c. Mutual Fund Data

Our final sample includes monthly data on all Canadian open-end funds that existed in the period of 1986-1999. Our sample includes both active and inactive funds.

The numbers of funds and the mortality rate by year are reported in Table 3. Full sample covers all funds that existed in each year, both active and inactive funds. Following Brown and Goetzmann (1995) and Malkiel (1995), we omit funds with only partial year's data available, but include every fund that was in existence for the entire year even if it ceased operations at some later point in time. We thereby exclude from our sample the data for the year that the funds merged or were delisted. The sample ranges from 381 in 1986 to 2,239 in 1999. Major jumps in fund numbers have occurred after 1994. The number of funds extant in each year and survive until the end of our sample period is reported in the third column, while the number of funds that ceased operation in one year between 1986 and 1999 is reported in the fourth column under

"Gone by April 2000". Mortality rate of 1986 refers to the percentage of funds in 1986 that ceased operations sometime between 1987 and 1999. As can be noted in the table, the mortality rate is rather high among all years, though naturally the figures decline over time when it gets closer to the final year.

About one-fourth of the total funds in the whole sample had gone by April 2000. Thus, we note that a significant portion of the fund universe is not observable in most commercially available mutual fund data sources.

Table 3 Number of Open-end Mutual Funds by Year, 1986-1999

Year	Whole Sample	Extant in April 2000	Gone by April 2000	Mortality Rate (%)
1986	381	229	152	39.9
1987	454	279	175	38.5
1988	538	350	188	34.9
1989	632	419	213	33.7
1990	694	489	205	29.5
1991	723	535	188	26.0
1992	760	581	179	23.6
1993	822	656	166	20.2
1994	926	764	162	17.5
1995	1226	997	229	18.6
1996	1298	1129	169	13.0
1997	1496	1386	110	7.4
1998	1731	1680	51	2.9
1999	2239	2232	7	0.3

The number of the equity funds per year is reported in Table 4, following the same format as in Table 3. Canadian equity funds experienced gradual increase in numbers over the years, while big jumps are observed in 1998 and 1999. Similar to the result in Table 1, equity funds had a relatively lower rate of disappearance compared to the full sample, especially between 1986-1990. Since the equity price swings are far more severe than the price swings for other assets, the question of why the mortality rates of the equity funds are lower than the

mortality rates of the non-equity funds in our sample arises as an interesting question. We will pursue this question in the future by incorporating the volatility of the equities into our empirical models, and by examining the dynamics of the mortality rates both for equity and non-equity funds in detail.

Table 4 Number of Open-end Equity Funds by Year, 1986-1999

Year	Whole Sample	Extant in April 2000	Gone by April 2000	Mortality Rate (%)
1986	156	116	40	25.61
1987	179	132	47	26.26
1988	215	162	53	24.65
1989	244	182	62	25.41
1990	277	212	65	23.47
1991	295	226	69	23.39
1992	314	247	67	21.34
1993	352	286	66	18.75
1994	415	348	67	16.14
1995	575	469	105	18.26
1996	616	540	76	12.34
1997	732	680	52	7.10
1998	870	844	26	2.99
1999	1147	1144	3	0.26

We compare the mortality rates of Canadian mutual funds to the figures for the US funds, as documented in Malkiel (1995). Mortality rates for the Canadian funds are higher in general. Results are not completely comparable though, since Malkiel's (1995) study was conducted for the period of 1982-1990.

Following Brown and Goetzmann (1995), Table 5 and Table 6 report the annual equally weighted and value-weighted means for the full sample and the equity funds sub-sample. The returns for the TSE300 Total Index, TSE35 Total Index, CFMRC Equally Weighted Index and CFMRC Value-Weighted Index are also reported for comparison purposes.

Annual returns are calculated based on the funds' Value of Investment (VOI)[12]. By using the value of investment, which is the buy-and-hold value of a fund as if it were purchased on the first day it was offered, we incorporate the factor of split and dividend distributions of the funds into the calculation of returns. Since our data file keeps period-end data, the return of this year, r_t, is calculated as follows:

$$r_t = \frac{VOI_t}{VOI_{t-1}} - 1$$

[12] We calculate annual returns differently from that in Brown and Goetzmann (1995). They consider the ratio of change in net asset value per share adjusted to capital gains distribution (ΔNAV_t), and investment income per share at time t, to the previous time period's net asset value per share. The dividend reinvestment is therefore ignored, thereby underestimating the returns.

Table 5 Annual Summary Statistics for Open-end Mutual Funds (%)

	Whole Sample			Extant in April 2000			Gone by April 2000			Benchmark	
Year	EW Mean	VW Mean	STDEV	EW Mean	VW Mean	STDEV	EW Mean	VW Mean	STDEV	TSE300 Total	TSE35 Total
1986	11.86	11.49	(10.07)	12.33	11.80	(10.39)	11.16	10.06	(9.57)	8.95	6.34
1987	2.25	2.65	(9.40)	3.05	2.92	(8.24)	0.98	1.59	(10.90)	5.88	11.29
1988	7.02	10.00	(8.19)	7.85	10.66	(7.74)	5.45	7.44	(8.77)	11.08	11.32
1989	13.96	14.68	(7.73)	14.83	14.84	(6.50)	12.25	13.95	(9.49)	21.37	21.89
1990	-2.30	-4.29	(10.83)	-2.35	-4.78	(10.53)	-2.17	-1.61	(11.56)	-14.80	-11.65
1991	14.32	13.89	(9.66)	14.48	14.30	(8.91)	13.86	11.27	(11.55)	12.02	11.01
1992	6.85	6.27	(8.20)	7.39	6.50	(8.60)	5.10	4.86	(6.44)	-1.43	-3.58
1993	22.18	19.52	(18.74)	23.63	20.15	(19.71)	16.43	14.25	(12.76)	32.55	24.34
1994	-1.41	-1.36	(6.36)	-1.26	-1.22	(6.26)	-2.15	-3.45	(6.77)	-0.18	5.52
1995	12.10	11.79	(10.14)	12.53	11.82	(9.93)	10.21	11.45	(10.83)	14.53	14.72
1996	15.09	14.89	(11.86)	15.72	15.14	(11.59)	10.89	11.12	(12.79)	28.35	30.01
1997	9.32	8.98	(15.44)	9.86	9.02	(14.58)	2.47	5.93	(22.82)	14.98	16.38
1998	5.05	3.40	(16.58)	5.20	3.40	(16.57)	0.10	2.40	(16.29)	-1.58	-0.09
1999	15.79	11.47	(24.96)	15.81	9.90	(24.98)	7.18	19.36	(17.77)	31.71	38.98
Mean	9.43	8.81	(12.01)	9.93	8.89	(11.75)	6.55	7.76	(12.02)	10.13	12.61

*Please refer to Table 3 for the numbers of funds in each category.
* EW and VW mean equally weighted and value-weighted, respectively.

The value-weighted mean is weighted by the capitalization of the fund, that is, the total net assets of the fund at the beginning of the test period.

From the above analysis, we note that the survivorship bias in the estimated annual mutual fund returns is not trivial. Equally and value weighted returns of the defunct funds are lower than those of the whole sample; the surviving funds displayed significant superior performance relative to the whole sample. Similar to the study of Brown and Goetzmann (1995), value weighted averages are lower than the equally weighted averages in general. The mean difference in returns between survivors and the whole sample is 50 basis points per year. Return margins decrease to 8 basis point per year when scaled by capitalization. The small margin in the value-weighted mean implies that larger funds have a higher probability of surviving.

We note that the value-weighted return of the defunct fund in 1999 is 19.36%, while it is 11.47% for the whole sample and 9.90% for the surviving samples. The abnormally high 19.36% annual return for the defunct funds is most likely due to a small number of observations in 1999, only seven out of 2,239 funds. Therefore, the evidence on the year 1999 should be interpreted with extreme caution. The relatively small percentages of defunct funds in the whole sample in year 1997, and 1998, also appear to have led to the relative large differences in the equally weighted means between the defunct funds and the whole sample. The returns of the defunct funds were in the far tail of the return distributions for the whole sample. This phenomenon suggests that the defunct funds are likely to be those that performed poorly in these years.

Both equally weighted and value-weighted means of the whole mutual fund family underperformed the TSE300 Total Index[13]. We use gross returns before deducting management expenses on equity funds to test for these funds' performance against the performance of the market indexes. Although we could not control for equity funds' risk (due to data and time

[13] TSE300 Index is float-weighted. Similar to market-cap-weighted indexes, TSE300 Index takes out both control blocks and non-floating shares - the large long-term holdings of shares by governments, strategic partners, and institutions etc., which are not really publicly traded. TSE300 Index is considered to perform in a similar pattern as a small cap index in the US. In the US, companies with a capitalization of less than $1 billion are now characterized as small caps, but in Canada, $250 million is generally regarded as the limit.

constraints) in our tests, our results indicate that equity funds earned higher average returns than those for the full sample during our sample period. In general, equity funds also display higher volatilities. The differences between the returns of the whole sample and the extant sample are 53 basis points per year when returns are equally weighted, and 27 basis points per year when returns are value weighted. Consistently excluding the non-surviving funds from any performance analysis appears to be significantly overstating the success of the investments in mutual funds. Also note that the value-weighted means of defunct equity funds in 1999 displayed a very high return of 29.26%. This is peculiar to 1999 and should be attributed to the small number of inactive equity funds in that year, which is only three out of 1,147 funds in the whole sample. The results for 1997 and 1998 also should be considered relative to the small portion of inactive funds in the whole sample as the years are getting closer to the end of our sample period.

Table 6 Annual Summary Statistics for Open-end Equity Funds (%)

Year	Whole Sample			Extant in April 2000			Gone by April 2000			Benchmarks		
	EW Mean	VW Mean	STDEV	EW Mean	VW Mean	STDEV	EW Mean	VW Mean	STDEV	TSE300 Total	CFMRC -e	CFMRC -v
1986	14.02	13.03	(12.08)	14.76	13.40	(12.73)	11.87	10.05	(9.81)	8.95	3.77	2.03
1987	0.26	1.40	(9.55)	0.70	1.79	(9.45)	-0.96	-0.86	(9.82)	5.88	3.56	6.23
1988	7.93	11.32	(8.68)	8.32	12.17	(8.98)	6.73	6.86	(7.64)	11.08	1.75	3.61
1989	18.21	16.85	(7.33)	18.27	16.81	(7.34)	18.05	17.08	(7.28)	21.37	-0.90	1.15
1990	-10.74	-12.61	(6.89)	-10.56	-12.54	(7.16)	-11.33	-13.26	(5.95)	-14.80	4.57	3.50
1991	15.87	14.43	(11.78)	16.12	14.81	(10.92)	15.02	11.13	(14.30)	12.02	-1.29	1.55
1992	7.06	6.29	(10.60)	7.85	6.71	(11.16)	4.16	3.02	(7.57)	-1.43	13.12	2.40
1993	30.21	32.44	(20.37)	31.95	33.06	(21.26)	22.66	25.94	(13.70)	32.55	5.70	3.65
1994	-1.46	-1.12	(7.70)	-1.16	-0.88	(7.75)	-2.99	-4.50	(7.27)	-0.18	2.40	3.30
1995	11.92	10.76	(12.98)	12.53	10.83	(12.73)	9.19	9.32	(13.77)	14.53	4.07	1.87
1996	18.72	19.27	(13.05)	19.53	19.45	(12.52)	12.94	15.37	(15.22)	28.35	0.47	-1.22
1997	12.29	11.12	(18.40)	13.15	11.26	(17.10)	1.05	0.531	(28.62)	14.98	1.35	3.26
1998	6.68	2.90	(20.77)	6.90	2.90	(20.83)	-0.38	0.91	(17.31)	-1.58	0.21	2.87
1999	26.90	18.57	(29.33)	26.92	18.57	(29.36)	19.11	29.26	(18.51)	31.71	NA	NA
Mean	11.28	10.33	(13.54)	11.81	10.60	(13.52)	7.51	7.92	(12.63)	10.13	2.98	2.63

*Please refer to Table 4 for the numbers of funds in each category.
* EW and VW mean equally weighted and value-weighted, respectively.

Table 7 summarizes the difference both in the equally weighted and value weighted means between the sample of surviving funds, and the surviving and non-surviving funds for the full as well as the equity samples.

Table 7 Differences in Weighted Means for the Whole and Surviving Sample

	EW Mean (Basis Points)	VW Mean (Basis Points)
Full Sample	50	8
Equity Funds	53	27

* EW and VW mean equally weighted and value-weighted, respectively.

The difference in equally weighted means are 50 and 53 basis points while they are 8 and 27 basis points for the value weighted mean. The change from 27 basis points to 8 basis points in the value-weighted means differences indicates that the large surviving funds in categories other than equity did not realize much higher returns than the defunct funds.

Comparing our results with Brown and Goetzmann's (1995), we find that the difference of the equally weighted means of the mutual funds in our sample is smaller than those in their study, while value-weighted margin in our study is larger. The surviving equity funds in Canada are more likely to be larger funds that realized better performance than the defunct funds.

IV. METHODOLOGY

IV.1. Performance Persistence in Canadian Mutual Funds

Following Brown *et al.*(1992) and Brown and Goetzmann (1995), we track the evolution of the Canadian mutual fund universe in consecutive years with a nonparametric methodology based on contingency tables. Funds existing in a certain year are separated into winners and losers. This is done either in a relative or absolute sense. The relative measurement considers the performance of the median fund of a sample of funds, while absolute measurement is conducted by taking into consideration the performance of a market index.

A winner of a certain year is identified as a fund that reports average return higher than or equal to the median of average returns for all funds in that year. A loser is a fund with a performance figure inferior to the median. The same criterion is used to identify the funds in our sample as winners or losers in our sample period. Thereby, Winner-Winner (WW) for 1986 will be the count of the winners in 1986 that were also winners in 1987. Winner-Loser (WL), Loser-Winner (LW) and Loser-Loser (LL) are defined using the same principle. Winner-Gone (WG) and Loser-Gone (LG) categories include the funds that were winners, or losers, in the current period and disappeared in the next period. The category of New Funds reports the number of funds that were created in a certain year. This approach will be conducted on the full sample as well as on the subsample of equity funds.

Cross-Product Ratio (CPR) is the odds ratio of the number of repeat performers to the number of those that do not repeat, which is, (WW*LL)/(WL*LW). We test for the null hypothesis that the first period performance is not related to the following one by using CPR as follows:

H_0: CPR = 1, performance does not persist;

H_α: CPR $\neq$ 1, performance persists.

When a CPR has a value less than 1, the repeat performers are less than the reverse performers. For example, the CPR is less than 1 in 1986, it means that the mutual funds displayed a performance reversal in 1987.

When a CPR has a value larger than 1, the repeat performers dominate the reverse performance. Winners, or losers, in this year continue to be winners, or losers, in the next year.

In large samples with independent observations, the standard error of the natural log of the odds ratio is approximated as:

$$Std.error_{\ln(odds\ ratio)} = \sqrt{\frac{1}{W,W} + \frac{1}{W,L} + \frac{1}{L,W} + \frac{1}{L,L}}$$

The Z-statistic is obtained by dividing the natural log of the odds ratio by its standard error. The Z statistic is assumed to be normally distributed under the assumption of independent observations. At 95% confidence level, a value of Z larger than or equal to 1.645 is needed for statistical significance of a coefficient estimate.

We also study the performance persistence issue for the equity funds by taking the performance of a market index as our absolute benchmark. The market index employed in defining the winners and losers is the TSE300 Total Index, since TSE300 is an equity index, its performance can only be compared to the performance of the equity funds. We define the winners and losers as funds that outperform or underperform, respectively, the TSE300 Total Index in a given year. We obtain the Cross Product Ratios and use the Z-statistic tests to examine the same hypothesis as explained above.

IV.2. Fund Disappearance

To the best of our knowledge, Brown and Goetzmann (1995) were the first to employ a probit model to analyse the issue of fund disappearance. The dependent variable of any probit model will assume either 1 (for success) or 0 (for failure). A number of independent variables,

which follow from theory and/or earlier findings, are used in the probit models to test for their potential influence on the probability of success (or failure). Such models are widely used in many areas of finance and economics, dealing with choice issues.

Extending the probit model in Brown and Goetzmann (1995), we examine the odds of funds' disappearance under three different probit models. First, we employ a model which follows directly from Brown and Goetzmann (1995) and includes all 14 years of data in the sample. An inactive fund in its last full year of operation will be assigned a value of 0 for the dependent variable. All active funds, including those that become defunct in the future, will have a value of 1 for the dependent variable. The dependent variable will then be regressed on a number of specified variables, which are thought to influence funds' survival or failure. These variables are explained after we present our different probit models. A positive coefficient estimate for an independent variable will indicate a higher chance of fund survival.

Second, we take a yearly cross-sectional approach with the probit model. We separate the data file in the first probit model above by year and re-examine the possible factors that might lead to the disappearance of a mutual fund. The reason for doing this is that we try to distinguish the impact of possible factors over the years. Some factors, which may be significant last year, may become insignificant this year or the following years. Thus, it is a good idea to track down the influence of these factors year-by-year.

Similar to the first model, all active funds, even those that become defunct in a later year, will have a value of 1 for the dependent variable while the defunct funds in a given year will have a 0 value assigned to the dependent variable. The independent variables will model the possible influences of the specified factors on funds' disappearance.

For the two models above, we consider both contemporaneous and lagged independent variables in order to study the contemporaneous and lagged effects of the factors on the dependent variable. Brown and Goetzmann (1995) did not study the second model.

Third, we take an alternative approach to Brown and Goetzmann (1995). The construction of the dependent variable in this probit model differs from the first and the second probit models in a major way. We know the year, let's say τ, in which fund j disappears. A value of 0 is assigned to the dependent variable for fund j for all the years between (τ-T) and τ. The choice for year T is based on the researcher's discretion or interest on how far in time the researcher would like to go back to predict funds' failures. For example, if fund j disappears in 1990 and we are interested in tracking the annual evolution of the factors, which might influence fund j's disappearance since 1985, we can run five probit models under this modeling. The first model will assign a value of 0 for fund j's dependent variable between 1985-1990; the second will do the same between 1986-1990 and so on. Thus, the modeling innovation here is new in this literature and allows us to study the changes in the significance of the independent variables on a year-by-year basis. We chose a T value of three years and two years in this thesis, and will also consider the influence of factors two years prior to their disappearance. The coding of success or failure in the dependent variable is the main difference of this model representation from the model representation for the first and the second probit models.

A comparison of the third probit model with the first and the second probit models should be useful. Both the first and the third models are cross-sectional, time-series models. While the first model treats a defunct fund as alive until it is declared defunct, the third model treats the same fund as defunct for a number of years that precede the declaration of this fund's disappearance. Brown and Goetzmann (1995) employ the first approach and examine how some

factors influenced funds' disappearance in time by incorporating the lagged values of some of the independent variables. The third model is designed to capture largely the previous years' effects by constructing the dependent variable accordingly.

The second model is cross-sectional and a special case of the third model. The dependent variable is coded 0 for only the year in which a given fund disappeared. All active funds in that year assume a value of 1 in the dependent variable.

The following independent variables are examined in out probit models:

–Age of the fund (Age): number of years since the first inception of the fund, which is defined as:

Age = year of return reported – the year the fund was launched;

–New money (NM): percentage increase in a fund's total net asset value, defined as:

$$NM_t = [TNA_t - (1+r_t)TNA_{t-1}]/TNA_{t-1}$$

where TNA is the total net assets of that year, and r_t is the risk-free rate (yield on 30-day Treasury bill);

–Relative size: compares the scale of a fund's capitalization to the median capitalization of the all funds in a certain year. It is calculated as the Total Net Asset Value of an individual fund in a certain year less the mean capitalization of all funds existing in that year at the beginning of the period;

–Relative return: the excess or shortage of a fund's return relative to the return of the benchmark. We obtain the relative return as the difference between the mean return of individual funds and the mean return of all funds in that year;

–Sales Charge: examines the different patterns of funds' success or failure on different sales charge basis. Respective dummy variables are assigned to the funds sold on sales charge basis, no sales charge basis, optional sales charge basis, and deferred sales charge basis.

–Fund Group: examines whether success or failure is relevant to whether a fund is affiliated with an insurance company. A dummy variable is assigned for funds affiliated with insurance companies or not.

We include a dummy variable of Equity into the probit models on the full sample to examine whether equity funds display different pattern in the fund disappearance. We also include lagged new money and lagged relative return into our models. Lagged variables are included to consider how the previous decisions of mutual funds may have affected the probability of funds' disappearance.

V. PERFORMANCE PERSISTENCE IN CANADIAN MUTUAL FUNDS

Following Brown and Goetzmann (1995) and Malkiel (1995), we examine the phenomenon of repeat performers during the 15-year period in our sample. These tests are conducted on active and inactive funds as a whole. Both positive persistence and reversals are found in the Canadian mutual funds during our sample period. This finding indicates that performance persistence is across managers, which may be due to some common factors in managing the mutual funds, or to certain external factors.

V.1. Performance Persistence of Full Fample

Year-by-year results of the nonparametric examination of the repeat performers on the full sample are reported in Table 8.

Table 8 Performance Persistence of the Full Sample (1986-1999)

Year	Total	WW	WL	LW	LL	WG	LG	New Funds	CPR	Z-statistic
1986	381	82	103	107	80	5	4	NA	0.76	-1.27
1987	454	123	91	104	112	13	11	82	1.18	0.86
1988	538	155	109	109	151	5	9	108	1.42	1.99 **
1989	632	66	239	218	76	11	22	108	0.30	-6.2 ***
1990	694	181	154	159	175	12	13	96	1.14	0.84
1991	723	250	101	100	248	10	14	53	2.50	5.48 ***
1992	760	152	217	223	139	11	18	60	0.68	-2.53 ***
1993	822	171	227	222	169	13	20	89	0.77	-1.81 **
1994	926	195	257	303	144	11	16	138	0.64	-3.18 ***
1995	1226	362	212	219	355	39	39	328	1.65	4.12 ***
1996	1298	473	154	113	485	22	51	150	4.18	10.25 ***
1997	1496	388	331	373	337	29	38	271	1.04	0.37
1998	1731	442	409	410	425	15	30	302	1.07	0.77
Total	11681	3040	2604	2660	2896	196	285	1785	1.14	3.53 ***

1. * indicates a significance level of 90%, ** indicates a significance level of 95%, ***indicates a 99% significance level.
2. WW, WL, LW, LL represent Winner-Winner, Winner-Loser, Loser-Winner, and Loser-Loser, respectively. WG is Winner-Gone, while LG is Loser-Gone.

Only four years, 1988, 1991, 1995 and 1996, out of 13 years, display positive persistence. Three other years, 1989, 1992, 1994, display reversal persistence. A large portion of winners in 1989 turned out to be losers in 1990. The year 1989 showed a significant reversal among all the years in our sample period. When the growth of funds over the years is controlled for, the repeat performers from 1989 to 1990 are far more less than the reversal performers. The most significant persistence is found in 1991 and 1996. Repeat performers are 2.5 and about 4.2 times the reversal performers in these two years, respectively.

We observe a major jump in fund numbers starting from 1994, the number of the winners exited the market also increased sharply between 1994-1995, while the numbers remained constant for the previous years.

V.2. Performance Persistence of Equity Funds

Table 9 and Table 10 report the year-by-year results for the nonparametric test on the performance persistence of equity funds using relative and absolute measurements between 1986-1999. 56.64% of the active funds and 57.98% of the entire fund universe are equity funds.

Repeat performers are more apparent in equity funds. Seven out of 13 years indicate strong positive persistence, while two years, which are 1993 and 1998, indicate performance reversals. This strong pattern of persistence, along with the reversals, suggests that the success or failure is not unique to a certain fund manager; instead performance persists across managers. In later part of this thesis, we are going to test for the possible common factors in fund management that alter the odds of survival for our sample funds.

Similar to the full sample, the number of Winner-Gone in equity funds displays a significant jump from four in 1994 to 21 in 1995. The mutual funds in 1995 also displayed

positive persistence. The number of New Funds was also twice the number in 1994. A considerable number of winner funds in 1995 exited the market in 1996, while many new funds entered the industry in the same year. The market might perceive this high mortality as a negative signal toward the entry into the fund industry, since the New Funds in 1996 was only the half the number in 1996.

Table 9 Performance Persistence of the Equity funds (1986-1999), Relative Measurement

Year	Total	WW	WL	LW	LL	WG	LG	New Funds	CPR	Z-statistic
1986	156	35	41	45	33	2	0	NA	0.63	-1.44
1987	179	51	38	42	47	1	0	25	1.50	1.35
1988	215	52	55	55	52	1	0	37	0.89	-0.41
1989	244	67	55	47	74	0	1	30	1.92	2.50***
1990	277	84	50	54	85	4	0	34	2.64	3.90***
1991	295	111	36	34	108	1	5	22	9.79	8.31***
1992	314	84	67	76[1]	77	6	3	25	1.27	1.04
1993	352	73	97	101	67	6	8	47	0.50	-3.14***
1994	415	124	80	98	102	4	7	78	1.61	2.37***
1995	575	173	93	105	166	21	17	172	2.94	6.02***
1996	616	181	114	108	181	13	19	80	2.66	5.74***
1997	732	217	138	127	218	11	21	148	2.70	6.37***
1998	870	204	225	236	182	6	17	170	0.70	-2.59***
Total	5240	1456	1089	1813	1392	76	98	868	1.65	8.84***

1. One data point is missing in the return of the fund.
2. * indicates a significance level of 90%, ** indicates a significance level of 95%, ***indicates a 99% significance level.
3. WW, WL, LW, LL represent Winner-Winner, Winner-Loser, Loser-Winner, and Loser-Loser, respectively. WG is Winner-Gone, while LG is Loser-Gone.

In the following section, we redefine a winner as a fund that exceeds the return of an absolute benchmark, which is TSE300 Total Index in this thesis. TSE300 Total Index has been the most widely used by Canadian financial industry participants. In order to be consistent with the characteristic of the TSE300 index, which is an index of common equities, we conduct this absolute measure on open-end equity funds. When we define the winners as funds that outperform TSE300 Total Index, we observe a different pattern of persistence than when we define the winners as funds that outperform the median fund's performance. As suggested by

Lehmann and Modest (1987), performance measures are sensitive to the benchmark chosen. Reversals dominate positive persistence under absolute measurement. Winners tend to be losers in six years out of 13 years. Four years of data still show a positive pattern in persistence of performance.

Table 10 Performance Persistence of the Equity Funds (1986-1999), Absolute Measurement

Year	Total	WW	WL	LW	LL	WG	LG	New Funds	CPR	Z-statistic
1986	156	19	78	40	17	2	0	NA	0.48	-1.93 ***
1987	179	21	18	47	92	1	0	25	0.45	-2.19 ***
1988	215	17	60	33	104	1	0	37	0.52	-1.95 ***
1989	244	52	7	124	60	0	1	30	0.42	-2.01 ***
1990	277	122	82	34	35	4	0	34	3.59	4.56 ***
1991	295	158	9	72	50	2	4	22	2.19	2.02 ***
1992	314	74	167	24	40	8	1	25	3.08	3.84 ***
1993	352	38	67	118	115	4	10	47	0.32	-4.69 ***
1994	415	77	106	73	147	4	7	78	1.05	0.26
1995	575	46	140	52	299	15	23	172	0.88	-0.54
1996	616	93	13	385	93	5	27	80	0.24	-4.47 ***
1997	732	374	216	29	81	20	12	148	12.90	10.99 ***
1998	870	142	358	110	237	11	12	170	1.29	1.68 **
Total	5240	1233	1321	1141	1370	77	97	868	1.12	2.02 ***

1. *indicates a significance level of 90%, ** indicates a significance level of 95%, ***indicates a 99% significance level.
2. WW, WL, LW, LL represent Winner-Winner, Winner-Loser, Loser-Winner, and Loser-Loser respectively. WG is Winner-Gone, while LG is Loser-Gone.

The effect of defining the winners and losers in either relative or absolute measurements is also be exhibied in column charts by beginning year in Figure 1 and Figure 2.

Again, as it was for the full sample, both positive persistence and reversals reveal the trend of correlation across managers. The success or failure of fund management may be due factors other than the stock picking skills of the fund managers. It exhibits a group phenomenon in Canadian mutual fund industry. The performance pattern may also relate to the macro-economic factors in the Canadian economy.

Figure 1 Frequency of Repeat Winners and Losers, Relative Measurement

This figure shows the effect of defining a winner as a mutual fund that beats the median fund in that year.

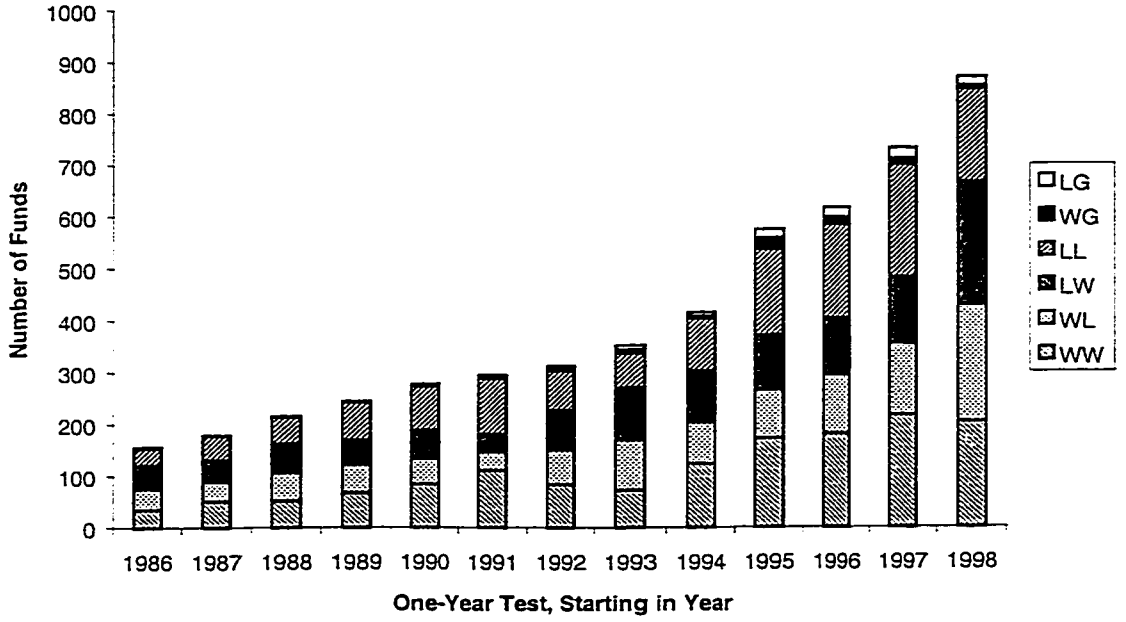
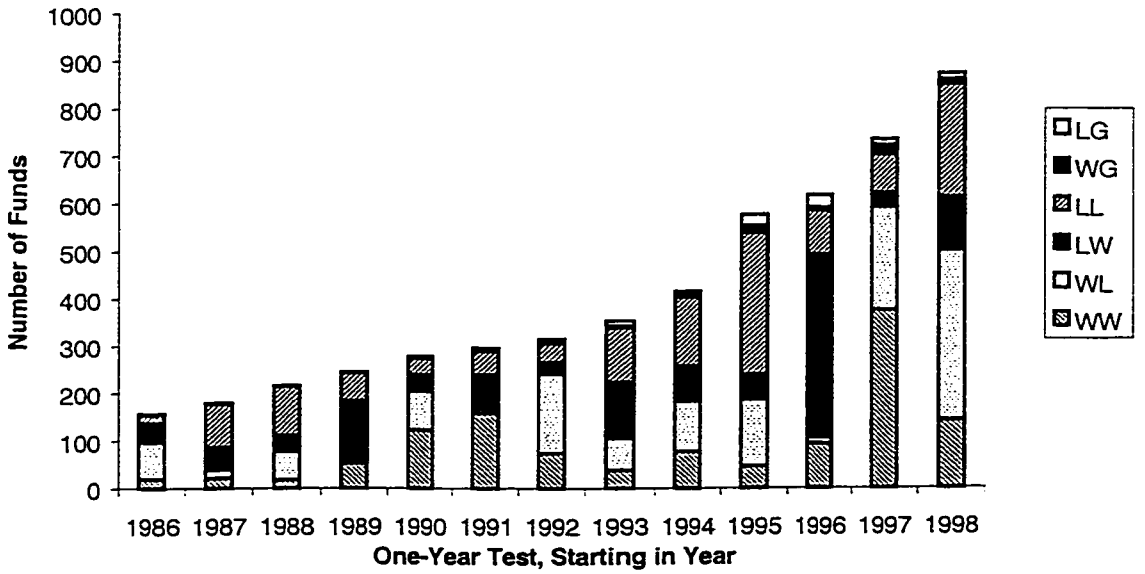


Figure 2 Frequency of Repeat Winners and Losers, Absolute Measurement

This figure shows the effect of defining a winner as a mutual fund that beats the TSE300 Total Index return.



VI. FACTORS CONTRIBUTE TO FUNDS' DISAPPEARANCE

Mutual funds typically become defunct following poor performance in the previous periods. Our sample allows us to examine the factors that may contribute to the disappearance of the funds.

Conclusions from many academic studies and advice of professional investment advisors indicate that investors select funds based on their past performance. So, we consider, following the extant literature and also observing the institutional differences between Canada and the US, the following factors as our independent variables in the probit models. The variable definition for each variable is given in the methodology section.

1. Relative return$_t$: This variable is used to test for the proposition that better performers are more likely to survive under competition than those with poor performance;
2. Relative size$_t$: Brown and Goetzmann (1995) found that the bigger funds are less likely to disappear. Therefore, we include this variable in our probit models to test whether this relationship holds for the Canadian funds.
3. Age of fund$_t$: Funds that have been in operation for a longer time must have some superior characteristics to other funds that become defunct. Meanwhile, as indicated in Brown and Goetzmann (1995), older funds with a longer track record for the investors and fund managers allow investors to infer differential performance in the fund universe. We examine whether the age of fund has a positive relationship with the survival odds of a fund.
4. Expense ratio$_t$: As indicated in Brown and Goetzmann (1995), and other studies (Malkiel 1995, Blake *et al.*1993, Carhart 1997), this variable is closely related to fund performance. The higher the expense ratio is, the more likely that a fund is going to be merged or delisted.

5. Relative new money$_t$: This is an indicator for the investors' reaction to fund performance. It is assumed that a fund with more positive reactions from the investors is less likely to become defunct.
6. Sales charge: We set up this dummy variable to test whether a fund that is sold on optional sales charge basis is more likely to disappear. According to John Kaszel in the Investment Funds Institute of Canada (IFIC), Canadian funds displays different expense structure than that in the US[14]. We also set up dummy variables for other sales charge categories. We note that these dummy variables turn out to be highly correlated with the dummy variable for optional sales charges and thereby are being omitted in the empirical models.
7. Fund group$_t$: This is a dummy variable to test whether a fund affiliated with an insurance company will have a better chance to survive.

Sales charge and Fund group are new variables to be examined in the literature on funds' disappearance. Following Brown and Goetzmann (1995), interaction terms between relative return, relative size, age, and relative new money are all included in our models. Lagged return and new money are included because we believe the past return figures and customer response to the funds' returns would be considered in closure decisions.

As explained in detail in the Methodology section of this thesis, three different probit models are specified. For each, we consider various combinations of independent variables, and run them separately for the full sample and for the equity sample.

The first probit model estimations follow directly from Brown and Goetzmann (1995). We use all of our data for 14 years and estimate four variations of this cross-sectional, time-series model.

[14] Information obtained through private communication.

We break the data down by year in the second probit model estimations, and also include the expense ratio in our probit model. Our data file only reports expense ratios for 1992 and thereafter, so, we have to limit our study to the period of 1992-1999.

The third probit model in this thesis pays particular attention to the design of the dependent variable in studying factors that add to predicting funds' failure. We know all the funds that exited from the industry by April 2000. The distributions of extant and defunct funds for the full sample and the equity subsample are reported in Table 3 and Table 4. Since, we know that there were only a few fund failures in 1999, we choose 1998 as our base year for predicting funds' disappearance[15]. To do so, we go back three years from 1998, including 1998, and assign a value of 0 to the dependent variable of those funds that closed their doors in 1998. That is, years 1996, 1997 and 1998 are assigned a value of 0 for these funds. The dependent variable for all surviving funds is assigned a value of 1. So, this is a probit estimation with three years of data.

We then consider whether some of these factors become more important while those that show significance in the three-year-probit-model earlier become either more or less significant between 1997 and 1998. Thus, a new version of the third probit model is formulated where the dependent variable of the defunct funds is coded 0 for 1997 and 1998 while the survivors' dependent value is coded 1. This is a probit model estimation with only two years of data.

VI.1. The First Probit Model Estimations

Relative return, relative size, relative new money, age, sales charge, and fund group indicators are included in the first probit model. Results are reported in Table 11 for the full sample, and in Table 12 for the equity funds.

[15] We decided to sit our study in 1998 because it is the most recent year with enough number of observations of defunct funds (51 for the whole sample, and 26 for equity funds). The number of defunct funds in 1999 was only seven for the whole sample and three for the equity funds.

Relative return, relative size, sales charge and fund group all turn out to be strengthening the probability of surviving. Age of the fund and new money show a positive relationship to funds' survival probability even though the effects are not significant in our model.

The first lags of relative return, and of relative new money, are added into the second specification model. Interactions between size and age, size and return, as well between size and return, are also included. New money does not show any significant effect still, neither does age. Relative return, and the first lagged of relative return exhibit significant positive relationships with the funds' survival probability. The higher the returns, relative to other funds' returns in the market, the more likely a fund is kept. The significant coefficient for the fund group implies that the funds affiliated with insurance companies tend to have a higher probability of surviving than funds affiliated with regular fund companies. This variable's effect on the probability of survival is reported for the first time in the literature on funds' disappearance. Interaction terms of age with relative size and, of age with relative return are negatively and significantly correlated with funds' survival, while age, size and return are all included in the model. These results are not consistent with those found in Brown and Goetzmann (1995). Nevertheless, their results on the interactions are not significant.

The third specification of the first model leaves out relative return, and its lagged values and adds the second lag for relative new money. New money and its lagged values are not significantly different from zero. The size, sales charge and fund group remain positively correlated to the funds' survival. The interaction between size and age is negatively correlated to the funds' survival. This is consistent to the corresponding term in Brown and Goetzmann (1995).

The second lag of relative return is included in the fourth model, as well as the relative returns and its first lag. New money is excluded from the model. All return values show positive and significant relations to the funds' survival.

Sales charge is significant and positively related to the survival probability of the funds. A fund sold on optional sales charge basis seems to have higher probability of surviving relative to other categories of sales charge on which the funds are offered.

Probit model estimations for the equity funds reveal information similar to those found for the full sample. Higher returns lead to higher probability of survival. Larger funds also have higher chances to stay alive in the market. New money shows a weak effect in explaining funds' survival.

Table 11 Results from the First Probit Model Estimations on the Full Sample, 1986-1999

	Model 1		Model 2		Model 3		Model 4	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	0.966	413.66***	0.968	364.28***	0.966	407.59***	0.964	405.78***
Relative return (*t*)	4.082E-02	4.51***	5.410E-02	4.25***			5.339E-02	4.18***
Relative return (*t-1*)			2.774E-02	2.99***			2.316E-02	2.45***
Relative return (*t-2*)							3.436E-02	3.69***
Relative new money (*t*)	8.354E-06	0.22	1.548E-05	0.41	-3.112E-05	-0.15		
Relative new money (*t-1*)			-9.819E-06	-0.26	-1.995E-06	-0.05		
Relative new money (*t-2*)					1.047E-05	0.27		
Relative size (*t*)	1.809E-08	4.92***	2.538E-08	4.16***	2.474E-08	4.21***	2.652E-08	4.28***
Age (*t*)	1.537E-04	1.07	1.769E-04	1.21	1.676E-04	1.14	1.864E-04	1.27
Sales charge	8.354E-03	2.66***	8.483E-03	2.68***	8.482E-03	2.68***	9.718E-03	3.05***
Fund group	2.058E-02	5.68***	2.006E-02	5.46***	1.921E-02	5.17***	2.273E-02	6.17***
Relative size*Age			-4.579E-10	-1.704*	-4.429E-10	-1.66*	-4.918E-10	-1.80*
Relative return*Age			-2.297E-03	-2.03**			-2.135E-03	-1.87*
Relative size * relative return			3.054E-09	0.08			3.346E-09	0.08
NM*Relative Size					-1.050E-10	-0.09		
NM*Age					4.296E-05	0.64		
Observations	12875		12685		12525		12899	

* indicates a significance level of 90%, ** indicates a significance level of 95%, *** indicates a 99% significance level.

Table 12 Results from the First Probit Model Estimations on Equity Funds, 1986-1999

	Model 1		Model 2		Model 3		Model 4	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	0.964	274.63***	0.965	271.19***	0.964	270.42***	0.964	274.09***
Relative return (*t*)	3.692E-02	3.32***	4.197E-02	2.80***			4.329E-02	2.90***
Relative return (*t-1*)			2.659E-02	2.33**			2.074E-02	1.81*
Relative return (*t-2*)							3.567E-02	3.15***
Relative new money (*t*)	2.237E-05	0.48	3.476E-05	0.75	-2.792E-05	-0.09		
Relative new money (*t-1*)			2.615E-06	0.06	1.250E-05	0.27		
Relative new money (*t-2*)					1.777E-05	0.38		
Relative size	1.578E-08	3.13***	2.311E-08	2.61***	2.232E-08	2.75***	2.185E-08	2.47**
Age	1.644E-04	0.86	1.663E-04	0.86	1.987E-04	1.02	1.649E-04	0.86
Sales charge	1.112E-02	2.48***	9.937E-03	2.20**	1.058E-02	2.33**	1.061E-02	2.37**
Fund group	2.000E-02	2.48***	1.876E-02	3.37***	1.823E-02	3.23***	1.988E-02	3.64***
Relative size*Age			-3.941E-10	-1.22	-3.841E-10	-1.20	-3.638E-10	-1.13
Relative return*Age			-1.380E-03	-0.94			-1.030E-03	-0.71
Relative size * relative return			2.303E-09	0.05			3.068E-09	0.07
NM*Relative Size					-1.873E-10	-0.10		
NM*Age					4.628E-05	0.48		
Observations	6155		6064		5987		6177	

* indicates a significance level of 90%, ** indicates a significance level of 95%, *** indicates a 99% significance level.

VI.2. The Second Probit Model Estimations

We estimate the second model for each of the eight years from 1992 to 1999. Our independent variables are relative return, its first lag, relative new money, relative size, age, sales charge, fund group, and expense ratios. Results are reported in Table 13 and Table 14 for the full sample and the equity funds subsample, respectively.

Surprisingly, the significant effect of relative returns faded away except for 2 years, 1995 and 1997 for the full sample, and 1997 for the equity funds. The relative returns do not seem to have enough influence in the destiny of the funds. However, the positive coefficients on relative returns still tell us that poor performers bear a higher change of being terminated. Age turns out to have a negative relationship with funds' disappearance in half of the years though it is significant only in 1992 (also 1993 for the equity funds).

Expense ratios are significant and negatively related with the funds' disappearance. For both the full sample and the subsample of equity funds, five out of eight years of expense ratios are significantly related to the funds' disappearance. In most of the years, except for 1994, a lower expense ratio increases the probability of the survival, while the sign reverses itself in 1994. Our results are in general consistent with the results in Brown and Goetzmann (1995).

Breaking down the data in an annual basis helps us understand the odds of funds' disappearance more thoroughly. Better performance increases the chances of survival. Higher expense ratios are bad news for survival. Being associated with an insurance company (i.e. fund group) appears to be a sign of good news for the survival of mutual funds in our sample. The effect of association of a mutual fund with an insurance company has a negative and significant effect on funds' survival in 1999. Further research needs to be conducted to understand this reversal in 1999. We remind that there were only three defunct funds in 1999 and that the results for 1999 in general are not reliable.

Table 13 Results from the Second Probit Model Estimations, Full Sample, 1992-1999

	1992		1993		1994		1995	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	1.027	61.20***	1.008	64.84***	0.956	71.52***	0.999	88.45 ***
Relative return (*t*)	7.661E-02	0.77	3.714E-02	1.29	5.193E-02	0.71	4.773E-03	0.12
Relative return (*t-1*)	0.155	1.58	4.169E-02	1.51	4.144E-02	0.57	7.545E-02	1.89 *
Relative new money (*t*)	1.127E-03	0.33	4.029E-02	0.52	-1.289E-03	-0.89	2.037E-05	0.34
Relative size	1.929E-08	0.61	3.190E-08	1.61	1.758E-08	1.40	1.460E-08	1.23
Age	-1.304E-03	-1.70*	-6.446E-04	-1.25	-1.280E-04	-0.29	-4.957E-05	-0.13
Expense ratio	-3.135E-02	-5.35***	-1.527E-02	-1.77*	2.153E-02	2.83***	-2.452E-03	-0.43
Sales charge	1.968E-02	1.18	2.007E-02	1.60	-1.541E-02	-1.41	-2.127E-02	-2.37 **
Equity	2.757E-02	1.66*	-2.463E-03	-0.21	-8.987E-03	-0.91	3.431E-03	0.42
Fund group	3.380E-02	0.84	2.925E-02	1.76*	1.369E-02	1.01	-1.080E-02	-0.96
Observations	346		555		666		870	

Table 13 (continued) Results from the Second Probit Model Estimations, Full Sample, 1992-1999

	1996		1997		1998		1999	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	1.024	58.33***	0.981	105.82***	1.029	138.67***	0.999	555.26 ***
Relative return (*t*)	6.083E-02	1.21	3.194E-02	1.61	1.565E-03	0.11	-1.766E-03	-0.72
Relative return (*t-1*)	3.614E-02	0.73	0.102	5.47***	1.114E-02	0.78	1.699E-03	0.77
Relative new money (*t*)	-1.336E-06	-0.01	-6.417E-07	-0.01	-9.365E-06	-0.09	4.885E-06	0.31
Relative size	1.568E-09	0.10	9.052E-09	1.42	4.509E-09	1.03	-7.483E-11	-0.08
Age	8.784E-04	1.44	1.330E-04	0.41	1.934E-04	0.70	1.134E-05	0.17
Expense ratio	-4.911E-02	-6.05***	-7.866E-04	-0.18	-2.692E-02	-7.77***	5.657E-04	0.72
Sales charge	7.806E-02	5.94***	1.101E-02	1.62	1.471E-02	2.58***	7.553E-05	0.06
Equity	-1.033E-02	-0.83	3.841E-03	0.61	1.305E-02	2.56**	-1.097E-03	-0.86
Fund group	7.277E-02	4.60***	1.767E-02	2.31**	2.457E-02	3.96***	-2.340E-03	-1.68 *
Observations	1031		1197		1418		1807	

* indicates a significance level of 90%, ** indicates a significance level of 95%, *** indicates a 99% significance level.

Table 14 Results from the Second Probit Model Estimations on Equity Funds, 1992-1999

	1992		1993		1994		1995	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	1.084	35.71***	1.089	32.70***	0.917	34.58***	1.002	36.28***
Relative return (*t*)	4.684E-02	0.40	-6.356E-03	-0.15	3.950E-02	0.46	-4.922E-02	-0.86
Relative return (*t-1*)	-1.561E-02	-0.16	1.350E-02	0.32	1.380E-02	0.16	-7.636E-02	-1.28
Relative new money (*t*)	-6.490E-05	-0.01	7.829E-04	0.68	2.594E-03	0.57	2.503E-05	0.27
Relative size	-7.257E-09	-0.14	3.380E-08	0.74	2.461E-08	1.14	2.247E-08	0.99
Age	-2.031E-03	-2.17**	-1.323E-03	-1.75*	1.229E-04	0.21	2.377E-04	0.36
Expense ratio	-4.571E-02	-4.15***	-5.454E-02	-3.75***	3.219E-02	2.64***	-1.262E-02	-1.05
Sales charge	5.066E-02	2.23**	4.759E-02	2.26**	-1.243E-02	-0.74	9.018E-03	0.53
Fund group	3.608E-02	0.63	2.607E-02	0.85	2.040E-02	0.96	2.439E-03	0.11
Observations	150		243		298		398	

Table 14 (continued) Results from the Second Probit Model Estimations on Equity Fund, 1992-1999

	1996		1997		1998		1999	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	1.127	28.08***	0.991	146.00***	1.050	79.65***	0.997	253.41***
Relative return (*t*)	1.961E-02	0.26	2.571E-02	2.65***	4.315E-03	0.27	-2.304E-03	-0.64
Relative return (*t-1*)	3.192E-02	0.41	9.559E-03	0.98	-4.331E-03	-0.27	4.038E-03	1.13
Relative new money (*t*)	-1.789E-06	-0.02	4.746E-06	0.18	-2.757E-05	-0.26	6.622E-06	0.29
Relative size	-7.632E-09	-0.30	1.549E-09	0.45	3.077E-09	0.55	-1.017E-10	-0.06
Age	1.011E-03	1.13	8.980E-05	0.55	2.160E-05	0.06	1.634E-05	0.14
Expense ratio	-0.107	-6.37***	3.593E-03	1.23	-2.992E-02	-5.32***	1.436E-03	0.83
Sales charge	0.126	5.84***	-5.297E-03	-1.36	1.590E-02	1.96**	-3.258E-04	-0.13
Fund group	9.479E-02	3.53***	2.522E-04	0.06	2.284E-02	2.58***	-4.876E-03	-1.75*
Observations	504		629		723		936	

* indicates a significance level of 90%, ** indicates a significance level of 95%, *** indicates a 99% significance level.

VI.3. The Third Probit Model Estimations

Table 15 and Table 16 report the results from the third probit model for 1996-1998. Sales charge, fund group, and expense ratio all exhibit significance in predicting the future closure of a fund in 1998. The results hold both for the full sample and equity subsample. Results for the interaction terms show similarities to those for the first probit model in Table 11 and Table 12[16].

Higher relative returns increase the probability survival for the full sample, although this effect is weaker in the equity funds. Larger and older funds are more likely to survive. Equity funds follow a similar pattern even though only marginally. Defunct funds' underperformance starts 2 years prior to their disappearance. Better performers are more likely to survive. When funds are sold on optional sales charge basis, the chances of disappearance are lower than when the funds are sold on other sales charge bases. Funds offered by insurance companies are also less likely to be closed than other funds. The higher the expense ratios of the funds are, the more likely the funds are going to be closed. Net growth of the funds marginally increases the probability of funds' survival.

When we conduct the third probit model on a sample of two-years of data in 1997 and 1998, relative return, size of the fund, sales charge, and fund group exhibit significant positive relationship to the funds' survival in the full sample. The second lag of new money also indicates negative relationship to the funds' survival. Expense ratio, consistently, is a significant factor that contributes to the funds' survival both in the full sample and the sub-sample of equity funds. All other factors are insignificant in the two-year probit model on the equity funds. As the time gets closer to 1998, the predictive powers of fund group and sales charges on equity funds' survival decline. Results from this two-year model are reported in Table 17 and Table 18.

[16] We tried to include interaction terms that we used in the previous two probit models in the third probit. However, except for the interactions between relative size and relative return, all others are highly correlated with the individual return, size and age.

VI.4 Summary of the Probit Model Estimations

Our study shows that the higher expense ratios are, the more likely the fund is to become defunct. This relationship is found in our three probit models. Relative size, in general, is positively correlated with funds' survival. These results are consistent with those found by Brown and Goetzmann (1995).

Unlike the results found by Brown and Goetzmann (1995), New Money is never a significant predictor on the funds' survival in our different approaches. Age is not a strong factor in predicting funds' disappearance, either. However, a weak, yet consistent effect shows that the older funds have higher probability of survival. Exception on this is the three-year approach in the third model of the full sample, where the Age is significantly and positively correlated to the odds of funds' survival.

Relative returns indicate strong correlations with the funds' survival in the first model. When we break down the data by year, Relative Return and its lags lose their predictive power on funds' survival. When we define our dependent variables on odds of survival differently, we find that the defunct funds experience poor performance three and two years that precede their disappearance in our full sample. Carhart (1997) showed a similar result as he found that the defunct funds underperformed as early as five years prior to funds' closures.

Unique in our study is the inclusion of the variable of the optional sales charges. Its coefficient estimate indicates strong relationship with the funds' survival in the first model, and in many of the years in the year-by-year model for both the full sample and equity funds subsample. This relationship holds for the full sample in three and two years, and for equity funds in three years, prior to the funds' disappearance. However, when we reduce the time period to two years, the sales charge is no longer a significant factor in predicting equity funds' disappearance. Surprisingly a similar pattern of correlation showed in the fund group. Whether a fund is affiliated with an insurance company or not affects the funds' survival any longer.

Interaction terms in our study reveal limited information on the odds of funds' disappearance.

Table 15 Results from the Third Probit Model Estimations on the Full Sample, 1996-1998

	Model 1		Model 2		Model 3		Model 4	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	1.013	137.75***	1.013	136.64***	1.014	136.21***	1.011	136.59***
Relative return (*t*)	3.772E-02	2.36**	2.805E-02	1.66*			3.312E-02	1.95*
Relative return (*t-1*)			2.816E-02	1.73*			2.106E-02	1.27
Relative return (*t-2*)							3.547E-02	2.19**
Relative new money (*t*)	1.060E-05	0.20	8.021E-06	0.15	1.467E-05	0.27		
Relative new money (*t-1*)			1.953E-05	0.30	2.339E-05	0.36		
Relative new money (*t-2*)					2.380E-05	0.44		
Relative size	8.861E-09	1.75*	8.029E-09	1.56	8.732E-09	1.71*	8.227E-09	1.60
Age	5.441E-04	2.05**	5.711E-04	2.14**	5.525E-04	2.05**	5.780E-04	2.18**
Sales charge	4.338E-02	7.78***	4.376E-02	7.79***	4.416E-02	7.80***	4.376E-02	7.81***
Fund group	5.030E-02	8.02***	5.008E-02	7.88***	5.070E-02	7.89***	5.061E-02	8.03***
Equity	2.196E-03	0.43	1.227E-03	0.24	5.487E-03	1.08	3.418E-04	0.07
Expense ratio	-3.123E-02	-9.10***	-3.121E-02	-8.97***	-3.314E-02	-9.55***	-2.998E-02	-8.65***
Relative size*Age								
Relative return*Age								
Relative size * relative return			-4.608E-08	-0.78			-4.341E-08	-0.73
NM*Relative Size								
NM*Age								
Observations	3671		3642		3614		3672	

* indicates a significance level of 90%, ** indicates a significance level of 95%, *** indicates a 99% significance level.

Table 16 Results from the Third Probit Model Estimations on Equity Funds, 1996-1998

	Model 1		Model 2		Model 3		Model 4	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	1.048	85.22***	1.047	83.99***	1.050	85.84***	1.046	84.39***
Relative return (*t*)	9.646E-03	0.55	7.209E-03	0.40			3.834E-03	0.21
Relative return (*t-1*)			1.680E-02	0.96			1.678E-02	0.97
Relative return (*t-2*)							2.376E-02	1.36
Relative new money (*t*)	1.402E-06	0.03	2.818E-06	0.05	1.877E-06	0.04		
Relative new money (*t-1*)			1.171E-05	0.18	1.599E-05	0.24		
Relative new money (*t-2*)					1.297E-05	0.24		
Relative size	3.624E-10	0.06	-4.577E-10	0.07	7.888E-11	0.01	-1.552E-10	-0.02
Age	4.836E-04	1.54	4.949E-04	1.55	4.912E-04	1.53	4.896E-04	1.56
Sales charge	4.197E-02	5.70***	4.185E-02	5.63***	4.222E-02	5.66***	4.159E-02	5.65***
Fund group	4.010E-02	4.81***	3.976E-02	4.70***	4.009E-02	4.70***	3.982E-02	4.77***
Expense ratio	-4.017E-02	-7.68***	-3.974E-02	-7.50***	-4.104E-02	-7.92***	-3.919E-02	-7.44***
Relative size*Age								
Relative return*Age								
Relative size * relative return			-3.526E-08	-0.58			-3.767E-08	-0.62
NM*Relative Size								
NM*Age								
Observations	1859		1843		1830		1858	

* indicates a significance level of 90%, ** indicates a significance level of 95%, *** indicates a 99% significance level.

Table 17 Results from the Third Probit Model Estimations on Full Sample, 1997-1998

	Model 1		Model 2		Model 3		Model 4	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	0.999	137.72***	0.999		1.002	138.05***	0.996	135.29***
Relative return (*t*)	4.081E-02	2.80***	3.736E-02	2.50***			3.785E-02	2.49**
Relative return (*t-1*)			2.420E-02	1.72*			2.295E-02	1.60
Relative return (*t-2*)							9.932E-03	0.70
Relative new money (*t*)	1.538E-05	0.24	1.020E-05	0.16	1.836E-05	0.28		
Relative new money (*t-1*)			1.134E-05	0.15	5.573E-05	0.70		
Relative new money (*t-2*)					-1.281E-04	-2.54**		
Relative size	9.414E-09	2.06***	8.722E-09	1.91*	9.268E-09	2.03**	9.035E-09	1.93*
Age	4.124E-04	1.58	3.895E-04	1.49	3.243E-04	1.22	4.606E-04	1.74*
Sales charge	2.196E-02	4.01***	2.155E-02	3.95***	2.171E-02	3.95***	2.247E-02	4.05***
Fund group	3.167E-02	5.23***	3.098E-02	5.13***	3.220E-02	5.31***	3.203E-02	5.22***
Equity	2.507E-04	0.05	7.334E-04	0.15	4.398E-03	0.90	4.365E-05	0.01
Expense ratio	-1.491E-02	-4.38***	-1.492E-02	-4.37***	-1.709E-02	-5.05***	-1.366E-02	-3.94***
Relative size*Age								
Relative return*Age								
Relative size * relative return			-4.818E-08	-0.942			-4.835E-08	-0.92
NM*Relative Size								
NM*Age								
Observations	2648		2628		2608		2647	

* indicates a significance level of 90%, ** indicates a significance level of 95%, *** indicates a 99% significance level.

Table 18 Results from the Third Probit Model Estimations on Equity Funds, 1997-1998

	Model 1		Model 2		Model 3		Model 4	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	1.022	124.21***	1.022	121.84***	1.024	123.32***	1.022	124.20***
Relative return (*t*)	1.105E-02	1.00	1.002E-02	0.88			1.062E-02	-0.42
Relative return (*t-1*)			5.163E-03	0.48			5.165E-03	0.49
Relative return (*t-2*)							-1.975E-02	-1.863*
Relative new money (*t*)	2.675E-06	0.06	1.294E-06	0.03	2.753E-06	0.06		
Relative new money (*t-1*)			5.672E-06	0.13	9.293E-06	0.21		
Relative new money (*t-2*)					-2.769E-06	-0.06		
Relative size	2.292E-09	0.59	1.874E-09	0.46	2.168E-09	0.55	2.103E-09	0.52
Age	1.140E-04	0.52	1.114E-04	0.50	9.574E-05	0.42	9.064E-05	0.42
Sales charge	6.097E-03	1.20	6.282E-03	1.23	6.481E-03	1.26	5.886E-03	1.16
Fund group	7.805E-03	1.39	7.873E-03	1.39	8.284E-03	1.46	7.858E-03	1.41
Expense ratio	-1.398E-02	-3.96***	-1.414E-02	-3.94***	-1.507E-02	-4.263***	-1.403E-02	-3.98***
Relative size*Age								
Relative return*Age								
Relative size * relative return			-1.433E-08	-0.391			-1.542E-08	-0.42
NM*Relative Size								
NM*Age								
Observations	1353		1342		1332		1353	

* indicates a significance level of 90%, ** indicates a significance level of 95%, *** indicates a 99% significance level.

VII. SUMMARY AND CONCLUSION

This study has focused on developing a brand-new survivorship bias free dataset for Canadian mutual funds to examine 1) the performance persistence of these funds and 2) what factors have influenced their survival between 1986 and 1999. Our unique database, covering monthly data from 1985 till 1999, has largely controlled for the survivorship bias. The number of funds and the annual returns of all the funds are reported in this thesis on an annual basis on the surviving funds, defunct funds, and the whole sample. The spreads of the survivorship bias are thereby gauged based on the gross returns of the funds. The effect of the survivorship bias on the returns of the funds has been nontrivial, as documented by Brown and Goetzmann (1995), Malkiel (1995) and Carhart (1997). Equally weighted return of surviving funds in all categories is 50 basis points higher than the whole sample including surviving and nonsurviving funds per year. The difference is 8 basis points per year if returns are scaled by capitalization. The smaller funds tend to disappear more easily. For equity funds, the spread is larger. Active and inactive equity funds realized an average of 53 basis points lower equally weighted return per year than the surviving equity funds. The difference of value-weighted average is 27 basis points.

After controlling for the survivorship bias, four out of 13 years of data for the full sample, including all categories of Canadian mutual funds, indicate significant positive persistence, while four other years exhibit reversals. The positive persistence is stronger in equity funds. We observe positive persistence in seven out of 13 years, while two years display reversals. As suggested in Brown and Goetzmann (1995), the reversals, along with the positive persistence, imply that persistence is correlated across fund managers. This phenomenon may be due to common factors that are not necessarily unique to managers. We examine the influence of some factors on funds' survival patterns in following section.

The probit models on the odds of survival reveal interesting results, in general consistent with results found by Brown and Goetzmann (1995). Expense ratio turn out to be a significant

factor that contributes to the funds' disappearance. Track records seem to be important. The higher the historical returns are, the more likely the fund will be surviving. Unique in this study, we find that funds sold on optional sales charge basis have higher chances of survival. A fund affiliated with an insurance company also tends to survive. However, when we restrict our examination to two years, the effect of optional sales charge and fund group fade away. If a fund has already existed in the market longer than its competitors, it is more likely that the fund will continue to stay alive. However, the relationship of age with the funds' survival is not very strong in our sample.

VIII. IDEAS FOR FUTURE RESEARCH

Literature documented that the poor performers are more likely to disappear. However, our data show that the number of Winner-Gone funds is quite close to that of Loser-Gone funds over time. As shown in the estimations of the second probit model, the relative return lost its predictive power when we broke the data down by year. Therefore, it would be interesting to track the funds back in their history for longer periods, such as 5 years, and see whether they exhibited different patterns of performance well before their disappearance. It will also be interesting to examine the history of the affiliation status of the Winner-Gone and Loser-Gone funds.

On the other hand, we calculated the funds' mortality rates based on whether they were surviving or not in April 2000. Another way to calculate the mortality rate is to track the funds that existed in a certain year, say 1986, to five years later, in 1990, and see how many of them were still surviving. The mortality rate of the year 1986 will then be the percentage of funds existed in 1986 and disappeared some time before or in 1990, which was five years after. The choice of five years is arbitrary. This type of tracking is implemented in the finance literature in the case of IPOs.

Our study has been done on gross returns of the mutual funds. As suggested in many influential studies, the persistence of mutual fund performance may be driven by the persistence of expenses to a large extent. Therefore, a study on returns net of expenses may help us understand the phenomenon of persistence more accurately. This could not be done in our study due to the data constraints in our sample.

We will undertake mean and median difference tests for the extant and defunct funds for each year. Since the samples for the extant and the defunct funds may come from two different populations, a Behrens-Fisher median difference test will be the appropriate median difference test.

Our study has used gross returns. The market or systematic risks were thereby not controlled. Our future research will certainly target the effect of the market or systematic risks on performance persistence. In particular, Jensen's α, and Fama and French's three factor models will be implemented to undertake risk adjustments.

Carhart (1997) detected the strongest performance persistence in the survivorship bias free sample. The survivorship biased sample displayed must weaker persistence. His results contradicted Elton *et al.*'s (1992), which indicated that the probability of the presence of persistence is 50% higher in survivorship-biased samples, and the probability increases with the extent of survivorship. This thesis reports persistence on the sample that includes active and inactive funds. To better understand the phenomenon of persistence in Canadian mutual funds, we may conduct our persistence tests on samples of surviving funds, and of defunct funds.

Several factors, including past returns, have been examined in our probit models and found to be influential on funds' survival. The superior performance and persistence may simply reflect or follow the rides of macro-economy in the host country. We may introduce particular indicators, such as GDP growth of Canada into our model, which may help explain the odds of fund disappearance.

While comparing our results with those obtained for the US, we noticed that certain characteristics of these two countries might affect the mutual fund performance differently. The most visible is the regulatory differences in these two countries. The Glass-Steagall Act in the US has prevented the commercial banks from entering the other financial services businesses. In November 1999, President Clinton's signing of the landmark financial services modernization legislation marked a milestone in the US banking and securities industries. The Gramm-Leach-Bliley Financial Services Modernization Act repealed the Glass-Steagall Act, removing many of the barriers the 1933 law had erected to block insurance companies, banks, and securities dealers from affiliating with one another and engaging in each other's business. Canadian banks and trust companies have been involved in the mutual fund business since 1970's. However, the 1979

Bank Act restricted them from selling any funds other than mortgage funds. The prohibition was lifted in 1987. Canada may provide lesons for what may happen in the US after the Glass-Steagall Act is repealed.

Last but not the least is that it would be interesting to extend the performance study to other countries, especially emerging markets. As suggested in Goetzmann and Jorion (1995), the survivorship bias may be even more severe in the emerging markets.

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Appendix 1. IFSC Mutual Fund Categories: A Standard for Canadian Mutual Fund Classification

The Investment Funds Standards Committee (IFSC) lists the following criteria to be applied to each fund, using its underlying holdings over the past three years.

1. Cash & Equivalent Funds

1.1. Canadian Money Market

Adherence to National Policy 39 requirements for Canadian money market funds. These funds have static unit values. Normally, the net asset value per share (NAVPS) does not change from month to month because of distributions. These portfolio restrictions also apply to segregated (insurance-based) funds despite not being governed by NP 39 and despite the allowance of variable unit values.

1.2. Foreign Money Market

Adherence to National Policy 39 requirements for U.S. money market funds. The name "Foreign Money Market" allows foreign, non-U.S. money market funds to be included in this category, provided they have the same structure as U.S. money market funds.

2. Fixed Income Funds

2.1. Canadian Bond

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 75% of the market value of the portfolio must be allocated to Canadian dollar-denominated Government and/or corporate bonds, debentures and short-term notes. Average term to maturity of portfolio including short-term investments must be greater than three years.

2.2. High Yield Bonds

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 75% of the market value of the portfolio must be allocated to Government and/or corporate bonds, debentures and short-term notes. A minimum of 25% of the market value of the bond section is comprised of issues with below investment-grade credit worthiness. The fund's investment

objective states clearly that higher yields through higher credit risk exposure are key components of the management strategy.

2.3. Canadian Short Term Bond

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 75% of the market value of the portfolio must be short-term Canadian debt instruments. "Short-term" is defined as an average term-to-maturity of less than 5 years and more than one year. Instruments include: Canadian bonds and/or mortgage-backed securities and/or term deposits and/or guaranteed investment certificates. A minimum of 50% of the fixed income section of the fund must be invested in short-term instruments with an average term-to-maturity of less than or equal to three years, but greater than or equal to ninety days.

2.4. Canadian Mortgage

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 75% of the market value of the portfolio must be Canadian industrial, commercial and/or residential mortgages, including mortgage-backed securities. A minimum of 50% of the fixed income section of the fund must be in mortgages or mortgage-backed securities.

2.5. Foreign Bond

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 75% of the market value of the portfolio must be in debt instruments that are denominated in a foreign currency, and which have a dollar-weighted term to maturity greater than one year.

3. Balanced Funds

3.1. Canadian Balanced

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 75% of the market value of the portfolio must be in a combination of Canadian Equity and Canadian Fixed Income. Equity component of no less than 25% and no more than 75% of the portfolio. Fixed income and cash together represent no less than 25% or more than 75% of the portfolio.

3.2. Global Balanced and Asset Allocation

Based on median values calculated from observations of fund holdings data over a period of three years, the portfolio must be invested in a combination of equity, fixed income investments, cash and cash equivalents. 25% or more of those securities must be in non-Canadian investments. No restrictions on asset weightings. The investment policy or stated investment objective must indicate significant investment in international markets.

3.3. Canadian Tactical Asset Allocation

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 75% of the market value of the portfolio must be in one or a combination of Canadian Fixed Income, Canadian Equities or Canadian cash and equivalents. No restrictions on asset weightings or less stringent than for balanced funds. These fund employ a tactical asset allocation strategy as distinct for a strategic asset allocation strategy.

3.4 Canadian High Income Balanced

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 25% of the total assets, including cash and equivalents must be interest income-bearing securities and a minimum of 50% non-interest, but income-producing investments.

4. Equity Funds

4.1. Canadian Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of non-cash assets of the portfolio in Canadian equities listed on a recognized exchange. In addition, based on median values calculated from observations of fund holdings data over a period of three years, a minimum of six of the 14 TSE 300 sub-indexes should be represented with a weighting of at least 50% of the sub-index weighting within the TSE 300 Index. Alternatively, the mean ISC value of the fund must not exceed 40.

4.2. Canadian Large Cap Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be

invested in companies of the TSE 100. Minimum of 50% of the equity weighting represent at least 2 of the 4 major sub-indices of the TSE 100. Passive funds designed to track the TSE 300 composite are excepted and allocated to the Canadian Equity category.

4.3. Canadian Dividend

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be dividend paying securities of Canadian corporations, equity securities convertible into the securities of Canadian corporations, or royalty and income trusts (restricted to 25% of the portfolio) listed on a recognized exchange. The investment objective of these funds is to provide a tax-advantaged (via the Canadian dividend tax credit provisions), regular stream of income. Distribution of dividend and other income occurs at least quarterly.

4.4. Canadian Small- and Mid-Cap Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the equity holdings in the portfolio, based on individual market value, must be Canadian equities that have a median market capitalization not more than 0.2% of the total market capitalization of the TSE 300 (November 30, 1998 = CDN $1.4 billion).

4.5. Labour Sponsored Venture Capital

As described above, these are defined by provincial and federal statutes.

4.6. U.S. Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be equities or equity equivalents of companies located in the United States or derivative-based exposure to the US market.

4.7. U.S. Small- and Mid-Cap Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets in the portfolio, based on individual market value, must be U.S. equities that have a market capitalization of less than US$6 billion.

4.8. North American Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be equities or equity equivalents of companies located in the United States and Canada (or derivative-based exposure to the Can-Am market). The U.S. Equity component must represent a minimum of 25% of the non-cash assets of the portfolio. Unlike Canadian equity funds with U.S. exposure, these funds are typically non-RRSP/RRIF qualified and, by prospectus, are permitted to hold up to 100% U.S. equities.

4.9. International Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be equities or equity equivalents of companies located outside of Canada and the United States, or derivative-based exposure to such markets.

4.10. European Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be equities or equity equivalents of European companies, or derivative-based exposure to developed European equity markets. More than one country must be represented in the portfolio at all times.

4.11. Japanese Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be equities or equity equivalents of Japanese companies, or derivative-based exposure to Japanese equity markets.

4.12. Asia ex-Japan Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be equities or equity equivalents of companies which are located in Asia, excluding Japan, Australia or New Zealand, or derivative-based exposure to such markets.

4.13. Asia/Pacific Rim Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be equities or equity equivalents of companies that are located in Asia, Australia or New Zealand, or derivative-based exposure to such markets.

4.14. Emerging Markets Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be equities or equity equivalents of companies that are located in Emerging Markets countries, or derivative-based exposure to such markets. Any country not considered one of the "developed" countries is an Emerging Market. The developed markets (a shorter list) are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Netherlands, New Zealand, Singapore, Spain, Sweden, Switzerland, United Kingdom and the United States. All other countries are considered Emerging Markets.

4.15. Latin American Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be equities or equity equivalents of companies located in Latin American countries, or derivative-based exposure to such markets.

4.16. Global Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be equities or equity equivalents of companies located in each of three geographic regions -- Asia, The Americas and Europe -- or derivative-based exposure to such markets.

5. Global Sector Funds

5.1. Specialty/Miscellaneous

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be related to the specific sector as established in the fund's prospectus.

Miscellaneous funds are those funds that do not fit into any of the other defined fund category criteria, and lack a sufficient number of peers to warrant a new category. This is considered a residual category.

5.2. Country Specific Equity

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be invested in a specific country.

5.3. Science and Technology

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be invested in equities or equity equivalents of companies primarily engaged in some aspect of science or technology. No geographic restrictions apply.

5.4. Natural Resources

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be firms whose primary business is related to the exploration, extraction or production of natural resources. No geographic restrictions apply.

5.5. Precious Metals

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be firms whose primary business is related to the exploration, extraction or production of precious metals. No geographic restrictions apply.

5.6. Real Estate

Based on median values calculated from observations of fund holdings data over a period of three years, a minimum of 50% of the total assets and 75% of the non-cash assets of the portfolio must be firms whose primary business is related or directly invested in commercial and residential real estate. No geographic restrictions apply.

Appendix. 2. Description on CRSP Survivor-bias free Mutual Fund Database

Background

The survivor-bias-free mutual fund database was constructed by Mark Carhart for his Ph.D. dissertation at the University of Chicago. Funding for data acquisition and part-time help was generously provided by Eugene F. Fama and the Center for Research in Security Prices.

The mutual fund database was created in four stages. First, we compiled an annual list of live mutual fund names and attributes along with organizational history such as name changes, mergers and liquidations primarily from Wiesenberger Investment Companies annual volumes, 1962 to 1993. Second, we obtained from Investment Company Data, Inc. (ICDI), in Des Moines, Iowa (now owned by Micropal) the monthly returns back to January 1962 and current attributes for all live funds annually since June 1993, as well as for most funds that perished since 1989. Third, we obtained all the available missing return and attribute information on all funds from various printed monthly sources going back to January 1962. In the third stage, we also added funds that were not in the Wiesenberger or ICDI database, although instances of this were rare. Fourth, we checked unusual data for entry and typographical errors against their original and alternate sources and have made numerous corrections to the data. Finally, we have updated the database to include 1994 and 1995 data with annual snapshots of ICDI's database. In the future, the database should continue be updated annually around April 1.

The database includes open-end mutual fund data from December 1961 to December 1995 for funds of all investment objectives, principally equity funds, taxable and municipal bond funds, international funds and money market funds. The data are principally divided into six sub-databases: (1) a record of each mutual fund entity's name(s) and organizational history (MMCNAMES, NAMECHNG). (2) annual mutual fund attributes (CONVERT, ANNUAL, ANN_SUP and GEN), (3) monthly returns (NAV, DIS, DEADRETS, RETCOMP), (4) monthly total net assets (TNA), (5) monthly net asset values (NAV), and (6) daily distributions (DIS). In 1993, I estimated that two-thirds of the data was obtained electronically from ICDI. In addition to Wiesenberger Investment Companies annual volumes (1962-1993), our printed sources for hand entry are the FundScope Monthly Investment Company Magazine (2/62-2/76), the United

& Babson Mutual Fund Selector (1/76 to 12/83), ICDI's MACOR and the Investor's Mutual Fund Guide printed monthly reports (6/83-12/93), and the Investment Dealers Digest Mutual Fund Guide (1993).

The entity/name database was compiled from Wiesenberger Investment Companies Annuals (1962-1993), FundScope Monthly Investment Company Magazine (2/62-2/76), ICDI's MACOR and Investor's Mutual Fund Guide monthly reports (6/83-12/93), ICDI's electronic database, and the Investment Dealers Digest (1993). The names of each fund entity are tracked, and if the fund perishes, we record when and why it disappears and its acquiring fund, if any. Also recorded in this database are the fund objective, offering date, load fees of the fund and, if it's included in ICDI's electronic database, its portfolio manager, fund family, average maturity (of bond funds) and last reported asset class composition. ICDI's electronic database includes all funds surviving as of 12/92 plus most funds that perished after 1988. The database includes 10,733 unique fund entities, and its scope is all mutual funds reported in Wiesenberger Panoramas plus several hundred additional funds included in ICDI's electronic database that are not in Wiesenberger. The database is not restricted to equity funds, and includes specialty, balanced, fixed income, non-taxable and money market funds.

The annual mutual fund attribute database covers year ends from 1961 to 1992 and is compiled mainly from Wiesenberger, but various holes are filled in through FundScope, ICDI and the United & Babson Mutual Fund Selector (1/76 to 12/83). This database includes annual fund objective, TNA, NAV, expense ratio, turnover, income and capital gains distributions and dividend yield, and load fees. Also recorded in this database are the fund objective (from three different sources), maximum front, rear and deferred sales charges, percentage invested in stocks, bonds and cash, and, if it's included in ICDI's electronic database, its portfolio manager, fund family, average maturity (of bond funds) and the exact dates for which this information applies. It totals approximately 62,000 fund-years.

The returns database includes monthly returns on 10,441 mutual fund entities, both surviving and non-surviving. For all funds included in ICDI's electronic database, the returns are calculated from month-end NAVs and the database of fund distribution history. For a few of these funds during the period 1962 to 1967, only quarterly NAVs are presently available, so only quarterly returns can be calculated on these funds. For funds not included in ICDI's electronic database, monthly year-to-date (YTD) returns are entered from FundScope (1/62 to 12/75), United & Babson (1/76 to 5/83) and ICDI monthly reports (6/83 to

12/92). Our preference is to use ICDI's reports because they cover the most funds and appear most accurate, but they have lost their historical monthly reports prior to June 1983. FundScope is an excellent source for the data on perished funds in earlier periods, but it discontinues after February 1976. The source we choose for dead fund returns in the intervening period is United & Babson, although it is not as comprehensive in terms of funds covered or breadth of information reported.

The hand-entered YTD returns are transformed to monthly returns. For smaller funds that are not included in FundScope or United & Babson, annual returns are obtained from Wiesenberger's annual returns section or, failing appearance there, calculated from Wiesenberger Panorama's annual change in NAV adjusted for capital gains distributions and the dividend income information. (FundScope does not cover funds smaller than about $2 million, United & Babson's TNA cutoff is about $10 million, and ICDI attempts to include all funds, regardless of size.) Suspicious equity fund returns up to the end of 1993 (and their NAVs and distributions), whether originally electronic or hand-entered, were checked and compared to alternate sources. The returns database includes about 636,000 returns observations for a total of 61,000 fund-years.

Occasionally, monthly returns on dead funds are not reported in the printed sources, usually because month-end NAVs or monthly distributions are not available. Since FundScope and United only report YTD returns, it is not possible to back out how much of the intervening two-month (or longer) return is attributable to the two (or more) separate months. In these cases, we record the multiple month return in the last of the consecutive months with missing returns.

The total net assets database is built from the electronic TNA database of ICDI. ICDI's electronic TNA database includes annual TNAs from 1968 to 1969, quarterly TNAs from 1970 to 1988, and monthly TNAs from 1989 to 1995. To ICDI's database are added annual year-end TNAs from the annual attribute database for the years 1962 to 1967, and the holes from dead funds are filled as well. The TNA database consists of 60,000 fund-years.

The NAV database is constructed mainly from ICDI's monthly NAV database, with year-end holes filled in from Wiesenberger annuals. The distributions database includes the date, type, amount and reinvestment NAV on approximately 400,000 dividend, capital gains and stock distributions (splits) from ICDI's electronic database. Annual dividend and capital gains distributions on dead funds are obtained

from FundScope and Wiesenberger Annuals, but exact dates and reinvestment NAVs are not available for these funds.

Description of the Data Files

ANNUAL: A merged file of annual data mainly from Wiesenberger (CONVERT) and ICDI (GEN). The key data in this file are fund name, objective, year organized, year-end total net assets (TNA), net asset value per share (NAV), total income and capital gains distributions, turnover, expense ratio, summary asset composition and load fees.

ANN_SUP: A merged file of annual data mainly from ICDI. The key data in this file are detailed asset composition, fund manager, fund management company, and initial offering date.

ASSTCOMP: Annual percentage breakdown of asset composition into stocks, bonds/preferred stocks, cash, etc. For some periods, bonds are reported separately from preferred stocks.

CHG_1292.XLS: A Microsoft Excel spreadsheet of ICDI's name change, merger and liquidation information as of 12/92. (Actually, it includes information on funds up to 6/93.)

CHG_1295.XLS: A Microsoft Excel spreadsheet of ICDI's name change, merger and liquidation information as of 12/95. (Actually, it includes information on funds up to 7/96.)

CHG_KEY: Key to the Action field in NAMECHNG.

CONVERT: Annual data from Panorama section of Wiesenberger Investment Companies Annual volumes. The key data in this file are fund name, objective, year organized, year-end total net assets (TNA), net asset value per share (NAV), total income and capital gains distributions, turnover, and expense ratio. Some of the holes in this file were filled from the Annual Summary section of FundScope (mainly turnover.)

DEADRETS: Monthly year-to-date (YTD) returns on dead (and some alive) funds, along with the source of the data.

DIS: A record of all known income and capital gains distributions on funds in ICDI's database, including the date, type, amount and reinvestment NAV on every distribution.

DIS_ADD: Additional DIS records that were missing from recent ICDI updates

ECD_KEY: Key to the ECD field in MMCNAMES.

FUNDSHEL: A record of all fund entities in the database by fund identifier (not name.) Includes merger/liquidation information, as well as the official end date and dates of the first and last data on the fund in the database.

GEN: General information on all funds in ICDI's database. Includes name, NASDAQ ticker symbol, objective, offering date, management company's name, portfolio manager's name, turnover, expense ratio, detailed asset composition data and the dates for which the information applies. The data for 1992 were obtained July '93. The data for 1993 were obtained Aug '94. The data for 1994 were obtained Dec '95. The data for 1995 were obtained Aug '96.

MMCNAMES: Fund entity name histories and reorganization information. This file includes dates of dead fund disappearance as well as what happened to the fund, e.g., if the fund merged, into which fund the assets were transferred, etc.

NAMECHNG: A compilation of name change, merger, liquidation and other reorganization information from Wiesenberger, FundScope, ICDI and my own analysis. This files contains many duplicate and conflicting records and is only a storage place for reorganization information. MMCNAMES contains the most reliable data on fund reorganizations.

NAV: Monthly net asset value per share on funds in ICDI's database.

NAV_ALL: A merged file of month-end NAVs from ICDI with some holes filled in by year-end NAVs from Wiesenberger and FundScope.

RETCHEKD: A list of unusual returns that were checked in alternate sources, along with any errors that were found in the data. See the document, "FFC Return Checking Project" for further information.

RETCOMP: Monthly returns database. A -95 means the fund did not exist in that month. This code only appears at the beginning and ending of a fund's return history. A -99 means that the monthly return is missing in that month. When a monthly return is -99, the next month's return cumulates the missing return. For example, if a fund has a valid return in January, a -99 in February and a valid return in March, the March return represents the two-month return over February and March.

TNA: Monthly total net assets on funds in ICDI's database.

TNA_ALL: A merged file of month-end TNAs from ICDI with holes filled in by year-end TNAs from Wiesenberger and FundScope.