CHAPTER 4

RESEARCH DESIGN, DATA AND METHODOLOGY

4.1 INTRODUCTION

This chapter describes the research design and the methodology. Section 4.2 presents the research design. Based on the relevant literature in the previous chapter, the theoretical framework is developed to investigate the impact of unit trust families on investors risk and return. The relevant hypotheses and the rationale behind each testable hypothesis are discussed in this section. Section 4.3 describes the data used in this study and explains the sources of data and the way they are collected. The research methodologies related to the study of the impact of unit trust families on investors risk and return is explained in section 4.4. This chapter ends with a section defining the terminology used.

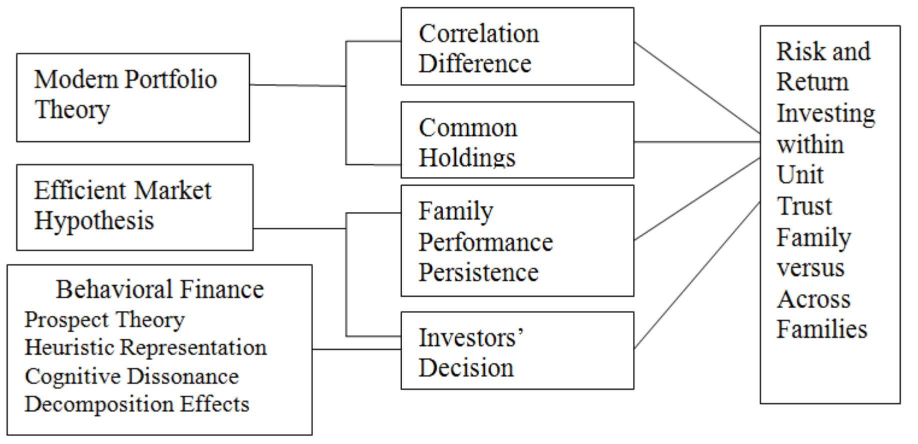
4.2 RESEARCH DESIGN

4.2.1 Theoretical Framework

This section provides the theoretical background, which is needed to understand the context of the research questions and all aspects of this thesis. Figure 4.1 shows the diagrammatic representation of the theoretical framework developed in the study. The diagram shows the variables to be examined in this study. The aim of the study is to examine the impact of unit trust family membership on investors risk and return. The risk and return from investing within unit trust families is examined from the aspects of the return correlation difference of funds within and outside families, the common stock holding difference of funds within and outside families, fund family performance persistence, and the response of investors to the star performance of a fund. This study is grounded on three main finance and economic theories, namely, the Modern Portfolio Theory, the Efficient Market Hypothesis and the Theory of Behavioural Finance.

Figure 4.1

Theoretical Framework



Note: Theoretical Framework developed for this dissertation.

The first theory related to this study is the Modern Portfolio Theory (MPT), developed by Markowitz (1952). Our investigation on the portfolio diversitication, correlation of returns within and between fund families and common holdings across funds are grounded on the Modern Portfolio Theory. Markowitz (1952) identified the risk-reduction benefits associated with holding a diversified portfolio of assets in addition to the risk and return relationship that maximizes the expected return based on a given level of market risk. However, the degree to which diversification can reduce risk depends on the correlation among asset returns. The total risk of an asset is less important than the impact of the inclusion of the new asset on the investor's portfolio.

This implies that the purchase of a relatively high risk or low return asset is still worthwhile if its return has a low correlation with the return of other assets in an investor's portfolio that reduce the portfolio risk. Markowitz (1952) showed that investment involves the selection of securities as well as the selection of the right combination of assets.

The first objective of this thesis is to study whether risk reduction benefits can be achieved through diversifying across fund families. It is examined through analyzing the correlation difference between the two groups of the within and the across family groups. This provides an answer to the question of whether the return correlation of funds within the family is higher than diversifying across fund families. According to Elton, Gruber and Green (2007), the correlations between funds can be decomposed into the systematic movement and the idiosyncratic movement. They reported that more than 80 per cent of the difference in within and between family correlations is due to the idiosyncratic correlation. The increase in systematic movement arises from the systematic market effects. It develops from the common sensitivity of funds to the market, which results from the common family investment strategy, which splits between stocks and bonds. The increase of correlation in residual movement comes from the common funds sensitivity to the non-market factors. Elton *et al.* (2007) used the multi-factor model of Fama and French (1992) to capture all the non-market factors. The size, value, three bond index and five industry portfolio factors were included in the model. Elton *et al.* (2007) attributed the remaining correlations in residual movement to the common holdings of stocks in funds. Hence, this study also investigates the level of common holding of stocks in unit trusts in Malaysia.

The second group of theories related to this study is that if Efficient Market Hypothesis (EMH). This theory is related to the second main issue investigated in this study which concerns the persistence in mutual fund performance. The literature regarding performance persistence started way back in the 1960s (Sharpe, 1964, Treynor, 1965 and Jensen, 1968) and through the 90s (Hendrick *et al.*, 1993; Goetzmann and Ibbotson, 1994; Brown and Goetzmann, 1995; Elton, Gruber and Blake, 1996 and Carhart, 1997). Most studies documented the existence of mutual fund performance persistence. The evidence of fund performance persistence challenges the EMH, which states that past performance contains no information about the securities future performance. Consequently, the performance of securities should not persist. However, Carhart (1997) explained that performance persistence does not arise from the managerial stock picking skills, rather it was due to the difference in the expenses costs, transaction costs and load fees. This thesis examines whether family level performance persistence exists. This is to identify whether common management strategies have any impact on performance persistence.

The third block of theory related to this study is that of Behavioral Finance Theory. A large amount of the investment theories (CAPM, Arbitrage Pricing Theory, Black Scholes Option Pricing Theory) were predicted based on the EMH and whether securities prices fully incorporated all available information or are priced rationally. The critiques of EMH state that investors do not always behave rationally. Human decisions show some behavioural biases. Humans use a heuristics strategy (base on past experience) to make investment decisions, which helps them to make quick, but not necessarily optimal decisions. Behavioural studies on irrational decision making include the Cognitive Dissonance (Festringer, 1957), Prospect Theory and Loss Aversion (Kahneman and Tversky, 1979; Shefrin and Statman, 1985), Regret Theory (Bell, 1982) and Herding (Huberman and Regev, 2001). In general, behavioural economists concluded that the market is unlikely to be efficient. It is evident in the convex relationship between fund's flows and past return is documented in several studies (Ippolito, 1992, Chevalier and Ellison, 1997; Sirri and Tufano, 1998). Funds with good recent returns attract unevenly larger new money inflows, while poor performers suffer smaller outflows of money. This thesis investigates whether the spillover effects exists within a family, and whether flows of new money to the fund and other funds in the family are affected by star performance. Meantime, the determinants of family fund flows were also examined.

In summary, this thesis explores the impact of unit trust families on investor risk and return in three main analyses. First, the correlation of return of funds within and outside the family by funds objective classification is examined. Next, the source of the difference in this fund correlation is also investigated. This investigation is premised on portfolio diversification techniques of the Modern Portfolio Theory. Second, whether the fund family's performance is persistent, that is, whether the performance of a particular fund family tends to repeat itself period after period. This investigation is based on whether the fund performance is consistent with the Efficient Market Hypothesis. Finally, this study looks at whether investor decisions are affected by the family star performance, and whether this star performance phenomenon in a family persists. This last investigation draws heavily on the Behavioural Finance Theory that provides alternative explanations to deviations from the EMH.

4.2.2 Development of Hypothesis

The hypotheses for the research proposed herein focuses on the return correlation and common holdings within and across Malaysian fund companies, the performance persistence of Malaysian unit trust companies and Malaysian investors' response to fund companies' performance and the star status of fund companies over the period 2003 to 2009. Twelve hypotheses are developed in this thesis. They are expressed in both the null and the alternative form.

4.2.2.1 Correlation Analysis and Common Stock holdings

Elton, Gruber and Green (2007) explained that fund families, in order to make money, try to capture as much of the investors capital as possible, by offering distinct sets of funds with dissimilar objectives. These funds usually have higher correlation than the randomly selected funds across a family due to the common management of funds. The higher correlation within families than across families is due to managers in a family having access to the same research resources and a similar view on stocks, which leads the different family funds to hold the same stocks even though they have different objectives. Some families have even imposed investment approaches, which restrict the investment option of funds. Park (2009) provided evidence that fund commonalities can add risk by decreasing an investor's portfolio diversification where the return correlation of funds in a fund family is increased. The higher risk resulting from the higher correlation leads us to expect that unit trust investors would require an additional return to add funds in the same family than adding funds outside the family to justify the extra risk of investing in funds within the family. Therefore, this research postulates that the correlation of fund returns within a fund family is significantly higher than between fund families. The following hypothesis is formulated.

Hypothesis 1

$H_0 1$: The correlation of return of funds within a fund family is the same as across fund families.

H_a1: The correlation of return of funds within a fund family is higher than across fund families.

Fund managers in the same family are likely to have access to an identical pool of research resources produced by the same internal research team or by the same external resources provider. A similar perception on the performance of individual stocks will lead to holding similar stocks in the fund portfolio, which belongs to the same family. Many families have a stipulated investment approach that influences the type of securities they invest in and the family relation with the securities firm will also lead to a common holding of stocks in a fund family. This commonality is especially great when a portfolio management team manages funds in the same company, as suggested by Elton *et al.*(2007). Another reason to expect that stock holdings of funds in a fund family are similar is as per the suggestion of Khorana and Servaes (2003), who stated that product proliferation is effective in capturing market shares, which leads to a large number of similar funds being offered in a single fund family. Offering different funds, albeit similar in nature, will attract investment capital to funds in the family as a whole. Thus, it is expected that the common stock holding in equity unit trusts within the unit trust family is higher than between fund families. This leads to the formation of the following hypothesis.

Hypothesis 2

H_02: The common stock holding in unit trusts within a fund family is the same as across fund families.

H_a2: The common stock holding in unit trusts within a fund family is higher than across fund families.

Islamic versus Conventional Funds

Due to the increase popularity of Islamic Funds, we are compelled to also investigate if Islamic Funds are any difference from the conventional funds. One would speculate that due to the Shariah restrictions, Islamic funds would contain more similar stocks compared to conventional funds. By including a combination of Islamic and conventional funds in a fund investors' portfolio, the investor risk can be reduced as a result of the reduction of return correlation and common stock holding. This is because conventional funds are found to hold a slightly better diversification level than the Islamic funds (Abdullah, Hassan and Mohamed, 2007). Shariah restrictions refer to the prohibition of interest or *riba*, prohibition of doubtful transactions or *gharar* or gambling, prohibition of unlawful food and drink, principle of moderation, (neither be excessive nor deficient), principle of ethical behaviour (good ethical and moral behaviour) and the principle of complete ownership of an item is necessary before goods are sold. Islamic investment does not allow for speculation or high debt level, it promotes risk sharing. Han and Rarick (2009) stated that several issues, including diversification, cause Islamic finance to remain a niche in the financial services industry. However, 88 per cent of the Bursa Malaysia listed securities were Shariah compliant as at 29 March 2010 (Bursa Malaysia). These securities represent two thirds of the market capitalization in Malaysia. As such, the choice of investment of securities from the securities list, by the unit trust fund managers in Malaysia for Islamic funds and conventional funds is somehow different. Thus, another issue of interest in this research is to examine whether this Shariah restriction has any impact on the diversification of unit trust investment. Therefore, the following hypotheses are postulated.

Return Correlations

Hypothesis 3 (a)

$H_0$3(a): The mean return correlation of only Islamic funds is the same as the mean return correlation of a combination of Islamic and conventional funds.

H_a3(a): The mean return correlation of only Islamic funds is greater than the mean return correlation of a combination of Islamic and conventional funds.

Hypothesis 3 (b)

$H_0$3(b): The mean return correlation of only conventional funds is the same as the mean return correlation of a combination of Islamic and conventional funds.

H_a3(b): The mean return correlation of only conventional funds is greater than the mean return correlation of a combination of Islamic and conventional funds.

Hypothesis 3 (c)

$H_0$3(c): The mean return correlation of only the Islamic funds is the same as the mean return correlation of only the conventional funds.

H_a3(c): The mean return correlation of only the Islamic funds is greater than the mean return correlation of only the conventional funds.

Hypothesis 3 (d)

$H_0$3(d): The mean return correlation of only the Islamic funds within family is the same as the mean return correlation of only the Islamic funds across families.

H_a3(d): The mean return correlation of only the Islamic funds within family is greater than the mean return correlation of only the Islamic funds across families.

Hypothesis 3 (e)

$H_0$3(e): The mean return correlation of only the conventional funds within family is the same as the mean return correlation of only the conventional funds across families.

H_a3(e): The mean return correlation of only the conventional funds within family is greater than the mean return correlation of only the conventional funds across families.

Hypothesis 3 (f)

$H_0$3(f): The mean return correlation of a combination of Islamic and conventional funds within family is the same as the mean return correlation of a combination of Islamic and conventional funds across families.

H_a3(f): The mean return correlation of a combination of Islamic and conventional funds within family is greater than the mean return correlation of a combination of Islamic and conventional funds across families.

Common Holdings

Hypothesis 4 (a)

$H_0$4(a): The mean common holding of only Islamic funds is the same as the mean common holding of Islamic and conventional funds.

H_a4(a): The mean common holding of only Islamic funds is greater than the mean common holding of Islamic and conventional funds.

Hypothesis 4 (b)

$H_0$4(b): The mean common holding of only conventional funds is the same as the mean common holding of Islamic and conventional funds.

H_a4(b): The mean common holding of only conventional funds is greater than the mean common holding of Islamic and conventional funds.

Hypothesis 4 (c)

$H_0$4(c): The mean common holding of only the Islamic funds is the same as the mean common holding of only the conventional funds.

H_a4(c): The mean common holding of only the Islamic funds is greater than the mean common holding of only the conventional funds.

Hypothesis 4 (d)

$H_0$4(d): The mean common holding of only the Islamic funds within family is the same as the mean common holding of only the Islamic funds across families.

H_a4(d): The mean common holding of only the Islamic funds within family is greater than the mean common holding of only the Islamic funds across families.

Hypothesis 4 (e)

$H_0$4(e): The mean common holding of only the conventional funds within family is the same as the mean common holding of only the conventional funds across families.

H_a4(e): The mean common holding of only the conventional funds within family is greater than the mean common holding of only the conventional funds across families.

Hypothesis 4 (f)

$H_0$4(f): The mean common holding of a combination of Islamic and conventional funds within family is the same as the mean common holding of a combination of Islamic and conventional funds across families.

H_a4(f): The mean common holding of a combination of Islamic and conventional funds within family is greater than the mean common holding of a combination of Islamic and conventional funds across families.

4.2.2.2 Family Performance Persistence

Mutual fund families try to attract investors by presenting the superior historical performance of star funds by advertising campaigns. It is assumed therefore, that past performance does provide useful information to investors as well as to the fund managers. Past performance does have some predictive power about future performance according to Grinblatt and Titmann (1992), Hendricks *et al.* (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), Gruber (1996). Thus, a superior performing unit trust family is expected to continue to perform better than other unit trust families, though Cheng, Pi, Wort (1999) found no evidence of the hot-hand effect in the Hong Kong fund houses. The two motives for the persistence analysis are: (1) to test whether the EMH holds in the unit trust market, and (2) to assess whether past performance provides information about a fund's future returns. Fama (1970) stated that if EMH holds, it does no good to analyse the funds' past return since the basic idea behind EMH is that securities prices fully reflect all available information. Short term performance persistence is also known as hot-hand phenomenon by Hendricks *et al.* (1993). The following hypothesis is developed to test whether the performance persistence of fund families exists in Malaysia or, in other words, whether the hot-hand or cold-hand phenomenon exists in Malaysia's unit trust market.

Hypothesis 5(a)

$H_0$5(a): Well-performing unit trust families do not continue to perform well in the subsequent period.

H_a5(a): Well-performing unit trust families continue to perform well in the subsequent period.

Hypothesis 5 (b)

$H_0$5(b): Poor-performing unit trust families do not continue to perform badly in the subsequent period.

H_a5(b): Poor-performing unit trust families continue to perform badly in the subsequent period.

The relevance and significance of a hot-hand fund family to investors is the real concern of unit trust investment. It is the key interest to the investors whether the hot-hand families are generally performing well throughout the whole period. Cheng *et al.* (1999) documented that hot hand fund families commonly have better overall performance and are less likely to persist poor performance. The authors also claimed that performance persistence is a timing issue. If a fund family has only a few winning months, which are clustered together, the persistence measure (repeat winning ratio), a conditional probability of winning repeatedly in the consecutive months, will be high even if its total winning period in percentage is low. Therefore, whether the hot-hand families are generally superior performers is examined. This leads to the following hypothesis.

Hypothesis 6

$H_0$6: The hot-hand unit trust families are not the overall superior performers in general.

H_a6: The hot-hand unit trust families are the overall superior performers in general.

The next issue of concern to unit trust investors is, if a fund family's performance is persistent, would it generate higher average returns for its investors? If the higher return is associated with family performance persistence, then only it justifies investment in the performance persistent fund family. Guedj and Papastaikoudi (2005) found evidence of the excess returns of best performing funds persistence and conjectured that a fund family allocates resources according to fund performance rather than fund needs; which implies that better performing funds are more likely to get more managers and more resources. Either way, if the performance of a superior family persists, it is expected that investors are able to gain from investing in funds in the same family. However, Cheng *et al.* (1999) found no relationship between the statistical significance of being hot-hand and the implied economic significance of investing in hot hand fund houses. The following hypothesis is formed.

Hypothesis 7

$H_0$7: Investors do not make higher excess returns from investing in a performance persistent family.

H_a7: Investors make higher excess returns from investing in a performance persistent family.

4.2.2.3 Spillover Analysis and Star Phenomenon

The spillover effect is a phenomenon where a fund family signals its superior performance by having some star funds or by closing a star fund, etc, to attract investors' attention and investment to other funds in the family. Studies on whether capital flows to other funds in the same family are greater with the existence of star funds in the family have been carried out by past researches (Massa, 1998, Sirri and Tufano, 1998; Zhao, 2004; Nanda *et al,* 2004; Huij and Verbeek, 2007). This may happen when investors are confident in the superior performing fund family, the star family, and, therefore, with the other funds in the same family. The star status of a fund family causes an increase in new money flow into the non-star funds in these star families compared to other similar non-star funds with the same objective in the non-star family. This is the spillover effect. If the increase in cashflow of the star fund is due to cannibalizing cashflows from other non-star funds in the family, the new money growth of the non-star funds in the star family will be lower than other similar non-star funds in other families. Massa (1998) recorded that the active market strategies used by fund families include market segmentation and fund proliferation and to make use of the heterogeneity of the investors to produce the positive spillover effects within fund families. Zhao (2004) provided evidence of the existence of spillover effects in the fund families, which motivates fund closing decisions. He showed that closing star funds would shift investors' attention and capital to other funds in the family. Nanda *et al.* (2004) showed that star status leads to greater capital flow to the star fund itself and to other funds in the family. They further claimed that the existence of spillovers may induce the fund families that are less competent to follow some star creating strategy. Huij and Verbeek (2007) found that funds with high marketing expense generate spillovers and enhance money inflow to family members with low marketing expense.

Thus, it is expected that non-star funds belonging to a star family generate a greater amount of new money than funds belonging to a non-star family. As non-star funds in a star family do benefit from sharing the same market information with the star fund in the same family, the spillover effect does exist. In addition, non-star funds in the star family are more visible than the other non-star funds in the non-star family, which leads them to attract more money inflows. Hence, it is presumed that the spillover effect exists within Malaysian star families.

Hypothesis 8(a)

$H_0$8(a): New fund flows to non-star funds in the one-year star family is the same as the other non-star funds in the one-year non-star family, that is, there is no evidence of spillover effects within one-year star families.

H_a8(a): New fund flows to non-star funds in the one-year star family is greater than the other non-star funds in the one-year non-star family, that is, , the spillover effect exists within one-year star families.

Hypothesis 8(b)

$H_0$8(b): New fund flows to non-star funds in the three-year star family is the same as the other non-star funds in the three-year non-star family, that is, there is no evidence of spillover effects within three-year star families.

H_a8(b): New fund flows to non-star funds in the three-year star family is greater than the other non-star funds in the three-year non-star family, that is, , the spillover effect exists within three-year star families.

Ippolito (1992), Gruber (1996), Sirri and Tufano (1998), Goetzmann and Peles (1997), Del Guercio and Tkac (2002), Nanda *et al.* (2004) showed that the capital flow into and out of mutual funds are reliably related to lagged fund returns and that the relationship is asymmetric in nature; which implies that investors buy the good past performance funds but do not sell inferior performing funds. In other words, capital flows are responsive to the past returns. In addition, Nanda *et al.* (2004) provided evidence that star funds with superior past performance attract greater inflows. The Prospect Theory suggests that people value gain more than lose, which is known as the certainty effect (Kahneman and Tversky, 1979). Investors' capital is expected to flow into the superior funds. Thus, this research postulates that a star fund with good historical returns will have greater inflows than other funds. This is based on the reason that star funds are more visible than their non-star counterparts as the media and investors are more inclined to seek star funds when making investment decisions in order to maximise their returns and to minimise their search costs. However, the result could be the opposite, due to the difference in market size and the smaller fund family size in Malaysia. The reaction of mutual fund investors in small markets can be very different from those in more developed markets, as stated by Alves and Mendes (2006). This could be because the public information availability in the small market is not as much as in the developed market. In addition, the trading environment is also different in the sense that there is a lack of independent brokers filling the gap between the retail investors and mutual fund companies. In order to examine the existence of the star fund phenomenon in an emerging market such as Malaysia, the following hypothesis is formed.

Hypothesis 9 (a)

H_0 9(a): One-year star funds do not generate greater money inflows than non-star funds.

H_a 9(a): One-year star funds generate greater money inflows than non-star funds.

Hypothesis 9 (b)

$H_0$9 (b): Three-year star funds do not generate greater money inflows than non-star funds.

H_a9 (b): Three-year star funds generate greater money inflows than non-star funds.

Hypothesis 9 (c)

$H_0$9 (c): Dog funds do not generate less money inflows than non-dog funds.

H_a9 (c): Dog funds generate less money inflows than non-dog funds.

Nanda *et al.* (2004) found evidence that fund families attempt to generate star performing funds. This strategy is motivated by the fact that star funds help to raise family level new money flows. It is expected that having a star fund in a family attracts investment into the family as a whole. Some possible explanations for investors behaviour are: investors might believe that the good performance conveys information of the good quality of the fund family to which the star fund belongs in terms of quality management or quality research or monitoring activities on fund managers; it could also be due to media attention when the fund is a star, thus, making the family more visible and reducing search costs (Sirri and Tufano, 1998). From the behavioural aspect, Barber *et al.* (2005) documented that investors' representative heuristic induces overly optimistic decisions and mutual fund investors make their investment decision based on a funds past superior performance. Behavioural finance concludes that most investment decisions are made irrationally, more due to the fear of losing. Hence, it is expected that having a star fund increases family level new money flows, whilst having a dog fund decreases family level new money flows. The following hypothesis is formulated.

Hypothesis 10(a)

$H_0$10(a): Having a one-year star fund does not increase family level new money flows.

H_a10 (a): Having a one-year star fund increases family level new money flows.

Hypothesis 10(b)

$H_0$10(b): Having a three-year star fund does not increase family level new money flows.

H_a10 (b): Having a three-year star fund increases family level new money flows.

Hypothesis 10(c)

$H_0$10(c): Having a one-year dog fund does not decrease family level new money flows.

H_a10 (c): Having a one-year dog fund decreases family level new money flows.

A rational investor allocates their capital according to funds that do well in the previous period. Hendricks *et al.* (1993), Ippolito (1992), Gruber (1996), Chevalier and Ellison (1997), Sirri and Tufano (1998), and DelGuercio and Tkac (2002) found that investors are attracted to good historical performance. Fund flows are used as a measure of investors' response in these studies. The representativeness heuristic, developed by psychologists Tversky and Kahneman (1973), happens when investors over rely on the past performance of funds. Investors tend to assume that funds with superior past returns will perform well and those with weak past returns will perform poorly. Grinblatt, Titman and Wermers (1995) documented that mutual fund investors picked funds based on historical funds performance and bought funds that were past winners. Thereby, it is expected that the relation between the new investment and the funds past returns is positive. The following hypothesis is developed.

Hypothesis 11

$H_0$11: There is no relationship between fund flows and past performance.

H_a11: There is a positive relationship between fund flows and past performance.

Massa (1998) and Khorana and Servaes (2005) provided evidence that product proliferation is effective in capturing mutual fund's market share. Hence, it is expected that fund families issue and manage as many funds as possible. Khorana and Servaes (1999) showed that families open new funds in strategies to generate additional income. Massa (2003) documented that fees in fund families were reduced by offering many funds. Additionally, Elton *et al.* (2007), and Park (2009) argued that investors tend to restrict their investment in a single fund family. They invested in large unit trust families for economic, convenience or for reasons of simplicity, especially when the number of funds offered is large. Here, we test whether investors capital are responsive to the number of funds issued in a fund family with the following hypothesis.

Hypothesis 12

$H_0$12: There is no relationship between fund flows and the number of funds in a fund family.

H_a12: There is a positive relationship between fund flows and the number of funds in a fund family.

4.3 DATA

4.3.1 Data Description

This thesis employed secondary data for the analysis. To analyse the return correlation by fund objective within and across families, all the Malaysian unit trust funds published by Bursa Malaysia were used. The sampling frame of the Malaysian unit trust funds were identified from the member list of the Federation of Investment Managers Malaysia (FIMM), formerly known as the Federation of Malaysian Unit Trust Managers (FMUTM). The sample includes all fund families that existed in June 2009. Monthly returns for six-and-a-half years from January 2003 to June 2009 were used. Since there is no database available for unit trust information in Malaysia, the month-end fund's Net Asset Values (NAV) were obtained from the daily leading newspapers, such as The Star and New Straits Times; and it was keyed in to the spreadsheet manually. The old newspapers were obtained from the National Library and University of Malaya's library in the form of hard copies and the earlier newspapers were in the form of microfilm. The error of data entry was identified by cross-checking the entry and the line graphs of the time series NAV of funds plotted so that the outliers were identified. Fund dividends were obtained from the master prospectus and were cross-checked with dividend announcements published on the fund management companies' websites. The dividend was keyed in to the spreadsheet. The master prospectuses and annual reports for the funds were obtained from the individual management companies and the Securities Commission's library.

Special objective funds like capital protected funds, real estate investment trusts (REIT) and exchange traded funds (ETF), international funds and regional funds were eliminated because they experience different risk exposure and investing in different countries involves different levels of country risk, which comes from cross-country differences in the policies, economic structures, socio-political geography, institutions and currencies. Capital protected funds basically try to guarantee investors against losing the initial investment value as long as investors do not redeem their investment before the maturity date. Most capital protected products have average to poor performance. In addition, funds issued by Amanah Saham Bumiputra (ASB) and Amanah Saham National (ASN)[1], managed by Permodalan Nasional Berhad, a government linked company, are non-floating, and, hence, were excluded from our study.

There is no system of classification for fund objectives available in Malaysia. However, this study requires funds to be classified according to their fund objectives in order to control for risk differential and also the difference in fund characteristics. Therefore, funds are categorised by mapping the individual fund's objective to the objective

[1] ASN is a scheme for assembling Malay savings for equity investment which launched in 1981. It is a main vehicle for implementing the transfer of corporate assets held under trusteeship to the Bumiputra.

classifications obtained from the CRSP [2] survivor-bias-free U.S. Mutual Fund database for the Investment Company Data Inc. (ICDI). The mapping of a fund's objective classification is done by going through each individual fund's objective listed in the fund's prospectus.

Table 4.1 presents the number of funds in the 7 main objective categories in the sample after the mapping process. Equity funds are categorised into the Aggressive Growth (AG), Long term Growth (LG), Growth and Income (GY) and Income (Y). The total of 222 funds is made up of 124 equity funds, 39 balanced funds, 45 bond and 14 money market funds. The total number of funds used in the analysis is robust in terms of the sample size. When the Shariah objectives are differentiated in the second analysis, there are 14 objective categories and the number of funds by objective classification is as shown in Table 4.1.

Table 4.1

Number of Funds in Sample by Objective

		Conventional	Islamic	Total	%
1	Agressive Growth	29	7	36	16.2
2	Long term Growth	41	18	59	26.6
3	Growth and Income	13	3	16	7.2
4	Income	11	2	13	5.9
5	Balanced	25	14	39	17.6
6	Bond	28	17	45	20.3
7	Money Market	10	4	14	6.3
	Grand Total			222	100

Table 4.2 presents the classification of funds according to the descriptions of the main objectives. These descriptions are adopted from the Investment Company Data

[2] CRSP represent Center for Research in Security Prices, it is a research centre at the University of Chicago Graduate School of Business. Their research is based on Standard & Poor's Fund Services database.

Incorporate (ICDI) listed in the CRSP survivor-bias-free U.S. Mutual Fund database. The detailed descriptions of each objective classification are listed in Table 4.2.

Table 4.2
Descriptions of Main Objectives of Classification

Description	Main Objective	Code
Aggressive Growth	To provide capital appreciation through investment in growth stocks, and to meet at least one of the following criteria: i) The investors' risk profile is 'aggressive', which indicates high capital growth and its corresponding high risk. ii) A portfolio turnover rate of 100% or more per year is permitted by prospectus. iii) The fund primarily invests in new, speculative or unproven or recovering or undervalued securities. iv) The investment in stocks or sectors are identified through an aggressive selection strategy.	AG
Long Term Growth	To achieve long term growth of capital as primary objective and income as the secondary objective.	LG
Income	To obtain income from investment, e.g. Dividends	Y
Growth and Income	To achieve capital growth plus income.	GY
Balanced	Contains a mixed portfolio of both fixed income and equity.	BL
Bond	To obtain income returns through investment in fixed interest income.	BY
Money Market	To provide liquidity and current income while maintaining capital stability by investing primarily in money market instruments.	MM

Note: Islamic objective funds aim to achieve similar goals as the conventional funds presented in the table in addition to compliance with Shariah principles.

Table 4.3

Malaysian Unit Trust Management Companies

Sample Selection		**Number**
Total Approved UTMC (as at June 2009)		39
Less :	Governement / GLC	5
	State owned	6
	REIT	2
	UTMC with < 2 funds in an objective class	11
Total number of UTMC in sample		15

Table 4.3 reports the Unit Trust Management companies used in the sample. There are 39 approved Unit Trust Management companies as at 30 June 2009. The government, government-link and state owned funds are excluded from this study. In addition, Unit

Trust Management companies that have one fund left in the objective classification are also excluded from this study. Ultimately, there are fifteen (15) Unit Trust Management companies left in the sample.

Next, data on the respective fund holdings was collected for the analysis of the common stock holdings for fund families in Malaysia. The stock holdings as at 31 December 2007 to 31 May 2008 were used. These were obtained from the annual reports of the funds, which were published at the fund's financial year-end. The annual reports of the funds between 31 December 2007 and 31 May 2008 were studied. The total number of equity funds included in the sample is 112, which comprises 43 aggressive growth funds (AG), 48 long term growth funds (LG), 18 growth and income funds (GY) and 3 income funds (Y). Money Market funds, bond funds and balanced funds are excluded in this part of the analysis. To examine the common stock holding of funds within and across fund families, the equity funds in the sample are studied. The stock holding in a fund's portfolio reported in the annual report or the interim report was used, whichever falls in the first half of the calendar year 2008, from 31 December 2007 to 31 May 2008, was used.

In this analysis, it is made clear that the findings provided are limited by the level of information disclosed. The limitation of this analysis in Malaysia is that the detailed portfolio holding for the stocks that funds are invested in for each individual fund are only disclosed semi-annually, that is, during the fund's financial year-end, in the fund's annual reports or in the interim reports. There is no database in Malaysia that can provide various kinds of information concerning the financial assets such as the securities held in funds. Additionally, funds may have different financial year-ends, even for funds belonging to the same family. This makes the comparison not in line because the portfolio holding may change from time to time depending on the fund objective and the investment strategy of the fund managers. However, individual funds do disclose their top-five or top-ten largest stocks in their portfolio every month in the funds' factsheets. However, this information only provides 20 to 40 per cent of the portfolio holding for each fund. Therefore, there are two options available for this analysis. First, we include all stocks for common holdings but with some time differential. The weakness of this method is that the portfolio may change over time. However, this method is assumed not to affect the analysis significantly as the average portfolio turnover ratio of funds is less than 1.0. The stock holding in a fund's portfolio reported in the annual report or the interim report, whichever falls in the first half of the calendar year 2008, from 31 December 2007 to 31 May 2008 was used. Hence, the maximum time variance in the sample is six months. In the second option, with a predetermined cut off date of say 31 December 2007, the top-five or top-ten largest portfolios in each fund were collected and compared. This method allows for comparison with a common timing. However, over 65 to 80 per cent of portfolio holding information will be lost. In view of the weakness of the respective method, the first option is selected for the common holding analysis. In other words, the whole range of data is preserved in the analysis instead of only the top-five or the top-ten funds in the fund family. However, the problem of timing difference exists.

To analyse family performance persistence, the month-end fund's Net Asset Values (NAV) and dividends of all equity and balanced funds in 15 fund families from January 2003 to January 2010 were obtained. The sample consists of 121 equity funds and 40 balanced funds. Bond funds, money market funds, guaranteed funds and foreign funds are excluded in this study because the behaviour and the risk exposure of these funds are different, as are the returns. The final sample in this study is 161 funds. As the equity funds and balanced funds accounted for over 70 per cent of the total asset value, it is sufficient to use the equity and balanced funds in this study.

For the analysis of star phenomenon and fund family's spillover effect, similar to the persistence study, the sample includes all equity and balanced funds for the period of four years from 2006 to 2009 for 15 fund families. However, annual data are used in this part of analysis. The final sample used is 161 funds from 15 fund families. The funds' total net assets, management expense ratio and portfolio turnover ratio and fund's age were extracted from the individual fund's annual reports and master prospectuses and were keyed in to the spreadsheet. The master prospectuses and annual reports for the funds were obtained from the individual management companies and the Securities Commission's library. The fund's total net assets were also downloaded from Bloomberg for cross-checking. The survivorship bias issue is addressed, as all the funds that had survived or ceased were included in the study. The analysis was done at the annual interval due to the data availability. The fund management expense ratio and portfolio turnover ratio were calculated and published annually in the individual fund reports. The year-end Lipper Star rating was extracted manually from the Personal Money magazine. Not every issue of this old magazine is kept in the public library. Due to the limitation of data, we only have four years Lipper one-year and three-year rating information.

Table 4.4 summarises the data used in the study. The first column of Table 4.3 presents the type of analysis. The second column shows the sample period included in each study. The third column presents the interval of data used in the analysis. The fourth reports the type of funds included and the last column shows the total sample size in the study.

Table 4.4

Unit Trust Funds Included in The Study

	Analysis	Sample period	Interval	Type of funds included	Number of funds	Sample size	Number of fund Families
				Equity,	124		
1	Correlation	January 2003 - June 2009	monthly	Balanced,	39		
				Bond and Money Market	59	222	15
2	Stockholdings	As at 31 Dec 2007 to 31 May 2008	`-	Equity	112	112	15
3	Persistence	January 2003 - January 2010	monthly	Equity	122		
				Balanced	40	161	15
4	Flow Growth	2006 -2009	yearly	Equity	122		
				Balanced	40	161	15

Table 4.5 shows the annual summary statistics for unit trust families for the period 2003 to 2009. The average fund flow growth in the sample decreased from an inflow growth of 33.7 per cent (2003) to an outflow growth of -29.1 per cent in 2008 and increased to an inflow of 45.2 per cent in 2009. The average flow growth for the fund family was calculated by first calculating the yearly average of the variables, then, the mean of the average was calculated across all families. The average flow growth by fund family shows 206.9 per cent inflows in 2003 decreasing to -287.2 per cent outflows in 2008 and increasing to 461.5 per cent inflows in 2009. The average number of funds managed by each fund family increased from 7 to 10. The number of fund families in the sample were 14 in 2003 and 15 throughout the rest of the period. The average TNA per fund decreased from RM201.2 million in 2003 to RM99.12 million in 2008, and increased to RM148 million in 2009. This trend was due to the launching of new funds in the industry. The average family's TNA increased from RM1,307.8 million in 2003 to RM1,519.60 million in 2005, followed by a decreasing trend in 2006 to 2008, then increased to RM1,490.4 million in 2009. The average management expense ratio

(MER) was quite stable over the sample period with the highest ratio of 1.81 per cent in 2003 and the lowest of 1.63 per cent in 2004. MER represents management expense ratio, which is the ratio of the total investment that investors paid for the fund's operating expenses, calculated as the total fees of the unit trust fund to the average value of the unit trust fund, which includes management fees, administrative expenses and trustee fees. It is fees/average value of funds. Similarly, the average portfolio turnover ratio (PTR) was also fairly stable over the sample period with the highest ratio of 1.15 times per year in 2003 and the lowest of 0.71 times per year in 2004. PTR is the portfolio turnover ratio calculated as [(total acquisition + total disposal)/2] / (average value of fund). It is the percentage of mutual fund holdings that are being replaced or turned over in a given period. The annual portfolio turnover rate conveys to investors whether a unit trust fund trades securities frequently. A fund's portfolio that is turned over only once for that year has a portfolio turnover ratio of 1.0.

Table 4.5

Descriptive Statistics for Funds, 2003 – 2009

Year	FlowGrowth (%)	Family's FlowGrowth (%)	Average Fund Return (%)	Average TNA per fund (RM'mil)	Family TNA (RM'mil)	Number of Fund Family	Number of Fund per Family	PTR (times)	MER (%)	Exchange Rate (RM per USD)
2003	33.68	206.87	1.25	201.20	1,307.8	7	14	0.71	1.81	3.8000
2004	1.66	13.61	0.78	181.77	1,337.3	8	15	0.85	1.63	3.8000
2005	-9.09	-66.61	-0.08	163.99	1,519.6	10	15	0.89	1.72	3.7872
2006	-27.74	-256.46	2.59	133.75	1,319.7	10	15	0.85	1.68	3.6669
2007	-13.25	-128.35	3.64	130.41	1,330.2	10	15	1.15	1.75	3.4556
2008	-29.08	-287.19	0.26	99.12	1,017.7	10	15	0.99	1.70	3.3308
2009	45.24	461.48	0.41	148.05	1,490.4	10	15	1.01	1.75	3.5245

Note: The table presents the annual summary statistics for unit trust families for the period 2003 to 2009. Government and state-owned families were excluded in this study. For each year, the table present the means of the fund families attributes. It includes the year-end number of fund families, the new money growth (%), the family new money growth (%), the Total Net Asset per fund (RM 'million), the family Total Net Asset (RM 'million), the number of fund families, the management expense ratio (%) and the portfolio turnover ratio (%). For each fund family, the yearly average of the variables are first calculated, then the mean of the average are calculated across all families.

4.3.2 Survivorship Bias Issue

Survivorship bias arises when the non-inclusion of closed funds produce biased results in studies analysing the fund performance. This bias overestimates the performance of funds. As a consequence of the poor performance funds are liquidated or merged into better performing funds. As such, these ill performers disappear and this results in an overestimation of the past returns of mutual funds. The survivorship bias issue affects almost every study of mutual fund performance in the U.S. (Grinblatt and Titman, 1989. Brown, Goetzmann, Ibbotson, and Ross, 1992; Malkiel, 1995; Brown and Goetzmann, 1995; Elton *et al.* (1996). Elton *et al.* (1996) showed that survivorship bias is more prominent in the small fund sector, but less serious in large mutual funds. However, the survivorship bias effect is addressed in this analysis of Malaysian unit trusts by collecting all the data for those that survived and those that ceased to operate. Although the data available from Bloomberg suffers survivorship bias, manually collected data does not suffer this problem, therefore, the survivorship bias issue is addressed.

4.4 METHODOLOGY

4.4.1 Return Calculation

In this study, the measure 'raw return', also known as the 'discrete return' is used. The research literature reveals different views with respect to the use of raw returns and risk-adjusted returns when analyzing fund performance. The different measures used in the past studies were raw returns, risk-adjusted returns such as Jensen alpha, Fama and French's three-factor and four-factor measures. Raw returns are commonly referred to when investment decisions are made by an average investor. Hallahan and Faff (2001), Capon, Fitzsimons and Prince (1996), Lawrence (1998) and Giles, Wilsdon and Worboys (2002) used raw returns in their study of fund performance, which they justified by explaining that raw returns are the most frequently reported figures and that they are most commonly referred to when investment decisions are made by an average investor. Another argument put forward for the use of raw returns is that by comparing mutual fund returns within certain objective classifications, risk is already accounted for. Hence, risk adjustment is no longer necessary in this case (Blake and Timmermann, 2003). In addition, when Blake and Timmermann (2003) used both the raw returns and the risk-adjusted return to assess the manager's skill, they admitted that raw returns represent a model-free approach, that is, it is independent of which particular model is more suitable to be used. White and Miles (1999) used raw returns in their study of fund performance persistence. Additionally, prior studies like Jain and Wu (2000), Del Guercio and Tkac (2002) and others, provide evidence that the results of mutual fund asset flows analysis using Jensen's alpha or Fama-French three-factor alphas as a measure of performance yield similar results as the raw returns performance measure. The evidence from the literature strongly supports the view that investors respond to both types of return (e.g. Ippolito, 1992; Hendricks *et al.,* 1993; Harless and Peterson, 1998; Jain and Wu, 2000; Del Guercio and Tkac, 2002). Harless and Peterson (1998) concluded that investors respond to large and current raw returns; but do not respond to Jensen's alpha.

The one fund return is the most basic and simple measure of fund returns. In this study the natural log function, which is the continuously compounded rate of return, is used in the fund return calculation. It is the first difference of log prices sampled at a specific interval. The natural log function produces better return distribution when the returns are not normal. However, skewness is sensitive to log transformation (Singleton and Wingender, 1986). Logarithmic returns are often used by academicians in their research. The main benefit of the logarithmic of compounded return is symmetric; while the arithmetic return is asymmetric, which means the positive and negative per cent arithmetic returns are unequal. For example, the returns are not symmetric if an investor invests an amount of capital and yields a return of -0.01 in period 1 and a return of +0.01 in period 2, the initial value of the investment has not been recovered. Log return solves this problem.

The continuous raw return adjusted for dividend is calculated as follows:

$$R_{j,t} = \log_e \frac{NAV_{j,t} + D_{j,t}}{NAV_{j,t-1}}$$

Where:

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

$\log_e$ = natural logarithm to the base e,

$NAV_{j,t}$ = Net asset value for unit trust j at the end of month t,

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

The average return can be used to compare to the average return of the benchmark. The average return is calculated as:

$$R_{j,t} = \frac{1}{n}\sum_{i=1}^{n} R_{j,t}$$

$R_{j,t}$ = Monthly return on fund j at time t,

n = The number of fund returns in the sample.

4.4.2 Return Correlation

In the correlation analysis, the fund's returns for each pair-wise combination of fund objectives were calculated. For the within fund family, the correlations with all other funds with the same objectives were calculated. For the across fund families, the correlations of funds with the same objectives outside the fund family were calculated. Elton *et al.* 's (2007) methodology is applied in this part of the analysis. Table 4.6

shows the correlation matrix of the fund objectives to be calculated for fund pairs within and across families.

Table 4.6

The Correlation Matrix of Fund Objectives

	Aggressive Growth (AG)	Long term Growth (LG)	Growth and Income (GY)	Income (Y)	Balanced (BL)	Bond (B)	Money Market (MM)
Aggressive Growth (AG)	AG-AG						
Long term Growth (LG)	LG-AG	LG-LG					
Growth and Income (GY)	GY-AG	GY-LG	GY-GY				
Income (Y)	Y-AG	Y-GY	Y-GY	Y-Y			
Balanced (BL)	BL-AG	BL-LG	BL-GY	BL-Y	BL-BL		
Bond (B)	B-AG	B-LG	B-GY	B-Y	B-BL	B-B	
Money Market (MM)	MM-AG	MM-LG	MM-GY	MM-Y	MM-BL	MM-B	MM-MM

Note: The correlation between two assets i and j is calculated as:

$$COR_{ij} = \frac{COV_{ij}}{\sigma_i \sigma_j}$$

Cov_{ij} = The covariance between the rates of return for assets i and j,
σ_i, = The standard deviation of the rate of return for asset i,
σ_j = The standard deviation of the rate of return for asset j.

The correlations were first averaged within families and then across families. The two-sample t-test was performed to test whether there was any significant difference in the mean correlation. To test the difference of the mean correlation between the two groups, the pair-sample t-test was used. In the t-test, two steps are involved: the equality of variance (homoscedasticity) is first tested followed by the equality of mean.

In the test for the equality of variance, the alternative hypothesis was formulated as - the variance of the two groups, between family and within family, are not the same (H_a: $\sigma_{betw}^2 \neq \sigma_{within}^2$). The F-statistic was applied. With a confidence level of 90 per cent, a p-value of smaller or equal to 0.10, is deemed to be significant and the null hypothesis of no difference is therefore rejected. Hence, the two groups do not have the same variance, that is, unequal variance is assumed. Subsequently, the equality of mean is tested. The alternative hypothesis was formulated as - the mean average return correlations of the two groups, the between family and the within family, are not the same' (H_a: $\rho_w \neq \rho_b$). The t-test was performed. Likewise, a confident level of 99 per cent is used as a decision guide. It is used when the number of observations is small and the population standard deviation is unknown. The two samples are assumed to be drawn from normal distribution. The t-statistic is as follows:

Unequal sample sizes, equal variance

$$t = \frac{\text{mean1} - \text{mean2}}{\text{variability of random mean}} = \frac{X_1 - X_2}{S_{X_1X_2}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$S_{X_1X_2} = \sqrt{\left(\frac{(n_1 - 1)S_{X_1}^2 + (n_2 - 1)S_{X_2}^2}{(n_1 + n_2 - 2)}\right)}$$

Where $S_{X_1X_2}$ = pooled standard deviation,
1 = group one, 2 = group two.
n = number of pair-wise correlations of each group.

Unequal sample sizes, unequal variance

$$t = \frac{\text{mean1} - \text{mean2}}{\text{variability of random mean}} = \frac{X1 - X2}{S_{X_1 - X_2}}$$

$$S_{X_1X_2} = \sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}$$

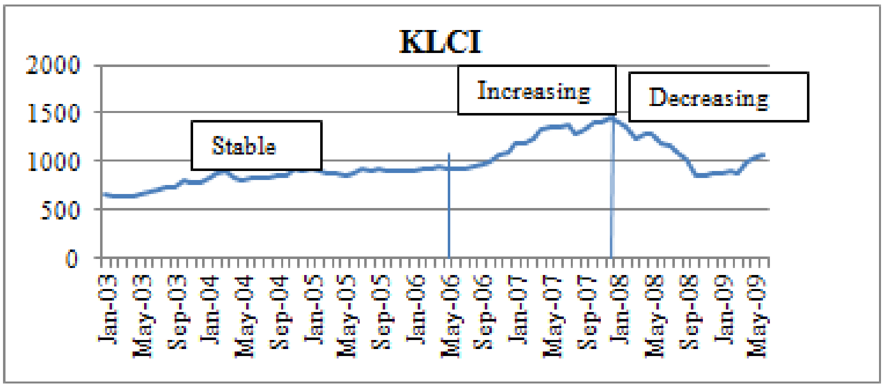
Where
s^2 = the unbiased estimator of variance of the two groups,
1 = group one, 2 = group two.
n = number of pair-wise correlations of each group.

Sub-period Analysis

The correlation analysis was first done on the whole sample, over the six and a half years. Then, in order to provide some form of robustness check to the results, the sample was divided into three sub-periods: the stable period from January 2003 to May 2006; the bull period from June 2006 to December 2007; and the bear period from Jan 2008 to June 2009, using the Bursa Malaysia Composite Index as a proxy. This sub-division is to ensure that the analysis is robust against the economic condition during different financial periods. The Bursa Malaysia Kuala Lumpur Composite Index was used to proxy the market condition because the Net Asset Value of unit trusts closely follows the Bursa Malaysia Kuala Lumpur Composite Index. Therefore, our data were sub-divided according to the trend of the Kuala Lumpur Composite Index from January 2003 through June 2009. In the studies of portfolio diversification, Ang and Chen (2002), Butler and Joaquin (2001) and Wang and Wang (2007) broke the samples down into sub-periods according to the economic conditions. According to Ang and Chen (2002), correlations between U.S. stocks and the aggregate U.S. market are much greater for downside moves than for upside moves. Longin and Solnik (2001) argued that the correlation of stocks has no relation with market volatility, rather it is related to the market trend; and stocks correlation increases in the rising, but not in the declining markets. In addition, Costa, Jakob and Porter (2006) provided evidence that managers significantly underperform the market during bull periods and vice versa.

Figure 4.2

Bursa Malaysia Kuala Lumpur Composite Index from January 2003 to June 2009



The analysis also divided the sample into the conventional objective classification and the Islamic objective classification. In addition, funds were also separated into fund type for a robustness check. They were categorized into three main types: the equity, balanced and bond. In practice, mutual funds are categorized into equity, balanced, fixed income or bond and also money market funds. Different types of funds have different objectives and risk profiles. Equity funds are volatile. Their value can fluctuate up and down tremendously over a short period of time. Hence, the expected returns are higher over a long term period. Mutual funds that buy a combination of equity stocks and bonds are known as balanced funds. This type of fund, sometimes called hybrid funds, aim to provide both capital appreciation and income while avoiding excessive risk. Bond funds invest in both the government debt and corporate debt with the aim of paying back through interest payments. They are also known as fixed income funds. Money market funds have lower risks compared to other mutual funds. These funds attempt to keep their net asset value at a constant RM1 per share. However, if the fund's investments perform poorly the NAV may fall below RM1.

The possibility of risk reduction on funds investment when the consideration of Shariah restrictions is included was explored. This was done by dividing the sample into the conventional objective classification and Islamic objective classification. The fund returns correlation across investment in conventional and Islamic objective group versus the investment solely in the Islamic objective group was analysed. The common portfolio holding of funds within the Malaysian unit trusts families, as compared to across different families, was also examined. Similarly, the possibility of risk reduction through the combination of conventional and Islamic funds was studied by comparing the fund common holdings in conventional and Islamic objective group versus the Islamic objective group.

Abdullah, Hassan and Mohamed (2007) showed that Islamic funds have a marginally lower diversification level than the conventional funds. Han and Rarick (2009) concluded that the issues of standardization and regulation, liquidity, diversification, shortages of qualified overseers, and the negative perceptions are some of the reasons that Islamic finance remain a niche in the financial services industry. The level of diversification is different between these two groups of funds, the conventional and Islamic, because Islamic funds have a more restricted choice of stocks to invest in. Thus, this study explores whether the return correlation of funds of investing across conventional and Islamic objective group is lower than the returns correlation of funds of investing all monies in Islamic objectives. Considering only the equity funds, the correlations of the fund's return for each pair-wise combination of fund objectives were first calculated. Then, the calculated pair-wise correlations were grouped into six groups: (1) Within family combination consists of only Islamic funds; (2) Within family combination consists of mixture of conventional and Islamic funds; (3) Within family combination consists of only conventional funds; (4) Across family combination consists of only Islamic funds; (5) Across family combination consists of a mixture of conventional and Islamic funds; (6) Across family combination consists of only conventional funds. The pair-sample t-test, was performed to test whether there were any significant difference in the means of correlation.

4.4.3 The Magnitude of Common Stockholdings

Common Stockholdings as one of the causes of the higher correlation among funds within a family are examined. This argument is based on the rationale that if portfolio managers within a family use a shared economic forecast in their portfolio stock selection process, one may expect within family funds to have similar exposure to different economic factors, and, therefore, within family funds are highly correlated with each other as compared to funds outside family.

Elton *et al.* (2007) decomposed the correlation into two components: (1) the correlation due to systematic market effects; and (2) the correlation due to residual (beyond market) movements with the aid of the multi-factor model. They further argued that residual correlation arose from: (1) two funds holding the same assets (common holding); and (2) two funds that are sensitive to identical factors not captured by the two-factor model, the common factors outside market factors (common sensitivity to non-market factors). For example, a family may adopt the same style alternatives across its fund under management concerning the split between stocks and bonds or perhaps emphasizing small growth stocks or stocks that are large in size or medium capital or the two funds have the same sensitivity to a particular industry factor such as technology stocks. Elton *et al.* (2007) reported that common stock holdings in funds explain approximately two-thirds of the fund's return correlation difference for funds within and across different fund families. Two funds holding the same assets, known as the common holding, are examined in this thesis.

The securities holding in common between funds in the same families were compared to funds in different families. In order to do so, the common holdings of two funds were calculated. It was calculated as the sum of the minimum fraction of the portfolio held in any stock A between the two funds, following Elton *et al.* (2007)'s methodology. For example, Public Bank stock is held in both the Public Savings Fund (11.1 per cent of TNA) and Public Growth Fund (11.4 per cent of TNA); and Tenaga National stock is also held commonly in the Public Savings Fund (5.8 per cent of TNA) and Public Growth Fund (6.2 per cent of TNA), the sum of the minimum fraction of the portfolio held is calculated as 11.1 per cent plus 5.8 per cent and the minimum fraction of other stocks that are held in common between the two funds.

Percentage holding in common for each fund pair = COM (i,j) = $\sum_i \min(X_{iA}, X_{jA})$

Where:

X_{iA} = The fraction of fund i's portfolio invested in stock A.

X_{jA} = The fraction of fund j's portfolio invested in stock A.

This common holding was calculated as a percentage of total net assets and the calculated common percentage holding was averaged for within and outside fund families. The two-sample t-test was then performed to test whether there were any significant differences in the mean of common holding within family and between families in the same category.

Similarly, the impact of the Shariah restrictions on fund investments in portfolio diversification was analysed in fund common stock holdings. The fund objectives were separated into the conventional and Islamic objective. They were then grouped into pairs of common stock holdings in the following categories: Across Islamic-

Conventional, Across Conventional-Conventional, Across Islamic-Islamic, Within Islamic-Conventional, Within Conventional-Conventional and Within Islamic-Islamic. An examination was made to see whether the common stock holdings of funds between the Islamic objectives were lower than the fund common stock holdings of across conventional and Islamic objective group.

4.4.4 Family Performance Persistence

This part of the study uses the contingency table following Cheng *et al.* (1999) study to track the fund house performance persistence. A similar methodology was used by Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), Malkiel (1995), and Droms and Walkers (2006) in studying the individual fund performance persistence. The contingency table was used to analyse and to identify the frequency with which funds defined as winners or losers maintained that rating over succeeding time periods. The persistence test refers to the status of winners and losers at one period and their status at the following period. The performance of the fund family was examined on a rolling month-by-month basis. Funds were ranked and ordered by monthly returns of each fund family. The monthly average return of all equity funds in a fund family from January 2003 to December 2009 was calculated. The use of monthly returns maximises the number of assessment periods. This evaluation assumes that fund managers are competing with their peers and try to perform better than the others on a monthly basis. Next, only the returns of equity fund were used in this thesis to avoid bias from mixing returns of equity with bond and cash returns. Thus, only fund families with more than one equity fund were included in this analysis. Subsequently, fund family returns were ranked and the median fund family return was computed as the benchmark.

The performance of fund families was also examined on a rolling quarterly, semi-annually and yearly basis. This was to explore the length of fund family performance persistence, both the winning and losing performance. This finding enables investors to know whether past returns can be used as a guide for fund selection.

The fund families were classified into four groups: (1) superior in one month and also superior in the following month (WW); (2) inferior in one month and also inferior in the following month (LL); (3) superior in one month and inferior in the following month (WL); and (4) inferior in one month and then superior in the following month (LW). Families with an average rate of return of funds above the median return of all fund families were labelled as 'winners'. These funds achieved a rate of return equal to or higher than the median family return. The lower half families with the lowest returns were labelled as 'losers'. These include the funds with a rate of return lower than the median family return. A two-by-two table of family returns were formed to identify whether the winner (W) or loser (L) funds in one period were the winners (W) or losers (L) in subsequent periods. 'Hot-hand' is defined as a fund that wins in one month and is followed by a win in the next month, whereas 'cold-hand' is a loser that loses in successive months. The earlier is the positive persistence and the latter is the negative persistence. For each case, if winner remains a member of winner, it is known as win-win (WW) or if winner is shifted to the lower half of returns, it is a win-lose (WL). A fund that shifts from winner to loser is known as win-lose (WL) and a fund that shifts from a loser to winner is known as a lose-win (LW). The same rule describes the other categories. Thus, win-win (WW) is the count of the winners in the first month that were also winners in the following month. Lose-lose (LL) is the count of the losers in the first month that were also losers in the following month. The contingency table, in a matrix form, with two rows and two columns, is represented in the general format in Table 4.7.

Table 4.7

Two-by-two Contingency Table

		Period (t+1)		
		winner	loser	Totals
Period (t)	winner	WW	WL	WW+WL
	loser	LW	LL	LW+LL
	Totals	WW+LW	WL+LL	WW+WL+LW+LL=N

In period t+1, the total number of families after adjusting for new families and families that ceased operation was ranked. The winners or losers were identified as repeat winners or repeat losers. The matrix path only includes the families that operate in the following periods. Families that cease operation will be excluded.

The null hypothesis is – the family performance in the first period is not related to the next period; there is no existence of performance persistence. The alternative hypothesis being – performance persistence in the fund family does exist. Repeat-winner is the ratio of fund families being winners in any two months repeatedly. Repeat-loser is the ratio of fund families being losers in any two months continually. A fund family is considered as a hot-hand fund family if the chance of repeating the superior performance is significantly higher than 50 per cent in the following period, that is, the repeat winner ratio, in percentage, is calculated as the count of winning in two months in a row (WW) divided by the sum of WW and LL.

The analysis applies the z-scores statistical significant test following Brown and Goetzmann (1995), Malkiel (1995) and Cheng *et al.* (1999) and Aukinen and Bostrom (2006). In this method, the repeat winner and the repeat loser are calculated. Then, the z-statistics for the repeat winner and the repeat loser are computed. The z-statistic is used to examine the significance of persistence of return. It is distributed normally with a zero mean and a standard deviation of 1.0. The z-test for repeat winners is constructed to test the hypothesis of no winning persistence. The test considers the ratio of repeat winners to the sum of winners and losers, WW / (WW + WL). If the chance of a winner family continuing to win in the following period exceeds 0.50 it indicates the existence of performance persistence. If this chance has a value of less than 0.50 it indicates that the family performance reverses in the subsequent period; that is, performance persistence does not exist. The one-tailed z-test assumes a binomial distribution of consecutive winners and the random variable of z-statistic is calculated as (Cheng, Pi and Wort, 1999):

$$Z = \frac{\text{Any value} - \text{Mean(of that value)}}{\text{StandardDeviation (of that value)}}$$

$$Z = [(y - np)/\sqrt{np(1-p)}]$$

Where:

p = 50%, q = 50%,
Mean = E(x) = np
Variance = V(x) = npq = np(1-p)
Standard deviation = S(x) = $\sqrt{np(1-p)}]$

The z-statistic of Repeat winning ratio is calculated as:

$$Z = \frac{W_{t+1} - W_t p}{\sqrt{W_t p(1-p)}}$$

Where:

W_{t+1} = Count of winning in period t+1 of fund family,
W_t = Total count of winning in period t of fund family,
p = Probability of Repeat winning of fund family.

The z-statistic of repeat losing ratio is calculated as:

$$Z = \frac{L_{t+1} - L_t p}{\sqrt{L_t p(1-p)}}$$

Where:

L_{t+1} = Count of losing in period t+1 of fund family,
L_t = Total count of losing in period t of fund family,
p = Probability of Repeat losing of fund family.

Using a 5 per cent level of significance, the null hypothesis of no hot-hand performance persistence of mutual fund families is rejected if the calculated z-score was larger than the critical z-value of 1.645. The repeat losing percentage and z-score were calculated using the same principle as the winning funds. As this random variable z of the number of continuously winning funds follow a binomial distribution of b(n,p), the probability of persistent winning, that is, more than 0.5 can be determined. The number of winner-winners, represented by W_{t+1}, becomes larger. The random variable z will be distributed approximately normal with a mean equal to zero and standard deviation equal to one. When a high percentage of the winners in one period continue to be winners in the following period tested, a large positive z-statistic is observed. A large negative z-statistic is obtained when a high percentage of winners in one period become losers in the following period. The z-statistic would be zero if exactly the same proportion of winners continue to remain winners and the same losers remain losers in the next periods. When there is no clear pattern in the returns, small z-statistics are obtained. Statistics were judged at the 5 per cent level of significance.

Adjustment for Small Sample Size

Chi-square statistic and Fisher's exact test is performed to adjust for small sample bias. In some studies where small sample size involved, the z-statistic, the chi-square and the Fisher's Exact is reported (Cortez and Silva, 2000). In Satjawathee *et.al.* (2009) and Cortez (1998, 2010), the authors calculated the Cross-Product ratio. In addition, the Fisher's exact test is used as a statistical significant test on the small sample to study fund performance persistence. Fisher's exact test is a non-parametric statistical significance test used in the analysis of contingency tables where sample sizes are small and it is independent on any large sample approximations. It is useful for categorical data to examine the significance of association between the two kinds of classification.

Fisher's test determines whether the two groups, the following period's winner and the following period's loser, differ in the proportion with which they fall into the two classifications, the previous period's winner and the previous period's loser. The Fisher's exact probability of observing a particular set of frequencies in a 2 x 2 table is given by the hypergeometric distribution[3].

$$\mathrm{p} = \frac{\text{number of ways getting p successes x number of ways getting n} - \text{p failures}}{\text{number of ways of selecting objects from a set of F}}$$

$$p = \frac{\binom{a+c}{a}\binom{b+d}{b}}{\binom{N}{a+b}}$$

$$p = \frac{\frac{(a+c)!}{a!\,c!}\frac{(b+d)!}{b!\,d!}}{\frac{N!}{(a+b)!\,(c+d)!}}$$

$$p = \frac{(a+b)!\,(a+c)!\,(c+d)(b+d)!}{a!\,b!\,c!\,d!\,N1}$$

The exact probability is compared to our predetermined level of significance of 5 per cent. If it is smaller than 5 per cent, the null hypothesis of no association of the variables is rejected in favour of the hypothesis of independence. The test is based on two-tails.

The chi-square statistic (χ^2) is used to test the statistical significance of the observed association in a cross-tabulation to aid in determination of whether any systematic association exist between the two variables. The value of chi-square is calculated as follows:

[3] Hypergeometric distribution is sampling without replacement which is analogous to the binomial distribution.

$$\chi^2 = \sum_{\text{all cells}} \frac{(\text{Actual obs freq} - \text{Expected cell freq})^2}{\text{Expected cell freq}}$$

$$\text{Expected cell freq} = \frac{\text{total no. in row x total no. in col}}{\text{total sample size}}$$

$$df = (r-1) \times (c-1)$$

The null hypothesis of no association between the variables will be rejected if the calculated value of the test statistic exceeds the critical value of the chi-square distribution. For 1 degree of freedom, the critical value for a significance level of 0.05 is 3.841.

Next, in order to determine whether the mean excess returns of the win-win months were statistically significantly above the median family returns for each family over the January 2003 to December 2009 period, the mean of excess returns was calculated. The result shows that the average monthly economic gain (and loss) in the month of win-win (and lose-lose) for each fund family. It was calculated as the difference between the monthly average return of the fund family and the median family return. The fund families were ranked with their average returns for each monthly period. For each period, the family's median return is calculated. Above the median was labelled as winner (W) and below as loser (L). For each fund family, the monthly return was grouped into the winner and the loser group and the mean of each winner and loser were calculated as the sum of the excess returns which are calculated as the difference of monthly return of family and median returns for all families. This sum is then divided by the number of winning or losing months. The median family returns for each period were calculated and were allocated to the winner and loser periods. A paired-t test was run to determine whether there was any statistically significant difference between the monthly average return of family and the median family return for both the winner and loser periods. If the t-statistics of win-win excess returns were statistically significant it would mean that the excess returns were significantly higher than the median family returns.

In order to examine the relationship between the fund family's short-term performance persistence and the relative fund family's overall performance for the whole period, we assumed that fund families were competing with their peers in the industry. Thus the repeat-winner ratio (measure of performance persistence) was compared with its overall win-win ratio (unconditional probability measure of overall family performance). Both of these ratios were calculated and ranked in order to determine whether a hot-hand family is a relative superior performer in the industry. The repeat winning ratio was calculated as $\frac{WW}{WW+WL}$. If this ratio exceeds 50 per cent, the fund family is known as a hot-hand family. The win-win ratio was calculated as $\frac{WW}{WW+WL+LL+LW}$. This ratio should not be different from 25 per cent. When the win-win ratio exceeds 25 per cent, the fund family is a superior performer while for lose-lose ratio's that exceed 25 per cent, the fund family is an inferior performer. The ratio of win-win and the repeat winning ratio were then compared to determine whether fund families with a high repeat winning percentage also have a high win-win percentage and low lose-lose percentage; and, hence, whether performance persistence families are overall superior performers. The null hypothesis is that performance persistence families are not overall superior performers. The Z-statistic of WW ratio is calculated the same way as the repeat winning ratio's Z-statistic.

The fund family performance persistence relates to a family's ability to generate a relatively higher average return for their investors. It would only justify investment in the performance persistence fund family if there is an economic gain to the investors.

Following Cheng *et al.*'s (1999) methodology, it is assumed that the higher the annualised excess return of the fund family, the higher the economic gain for investors. However, Cheng *et al.* (1999) found no relationship between the statistical significance of being hot-hand and the implied economic significance of investing in hot-hand fund families. In examining whether there is any significant gain for investors from investing in a performance persistent family, the z-score of the repeat winning ratio of each fund family was ranked and the annualised excess return in percentage was calculated for each fund family. The annualised excess return is an absolute measure of the magnitude of family return over the period of study. It was calculated as the annualised difference between the average monthly return of an individual fund family and the median return of all fund families. The magnitude of annualised excess returns earned by hot-hand families was analysed to determine the economic gain to investors who put their money in fund families. In addition, the correlation between the annualised excess returns, performance persistence measures, repeat winning z-statistic and repeat losing z-statistic was computed. The relationship between these variables was further examined.

4.4.5 Star Phenomenon And Spillover Effect

Expanding upon the literature citing a convex flow-performance relation, the star fund effect on the cash flow of the family and on other non-star funds in the same family was investigated. Nanda *et al.*'s (2004) methodology was applied to the study of the flow-performance relationship of the Malaysian unit trust industry at the fund family level. Annual data was applied to the panel data regression model. Annual data was used for two reasons. First, to follow Chevalier and Ellison (1997) and Deaves (2004); both the authors used a yearly sampling interval and found a significant relationship between current return and fund flows, and, second, due to data availability. The nonperformance variables used in the regression include the fund management expense ratio (MER) and the portfolio turnover ratio (PTR), which are only published once a year in the fund master prospectus or fund annual report.

The spillover effect is a phenomenon where a fund family signals its superior performance, by having some star funds or by closing a star fund to attract investors' attention to other funds in the family. To examine this spillover effect, the following regressions were estimated using the fund-level information.

Regression Model 1:

$$\text{Flow Growth}_{(i,t)} = \alpha_i + \beta_1 * RET_{(i.\ t-1)} + \beta_2 * Stddev_{(i,t-1)} + \beta_3 * Size_{(i,t-1)} + + \beta_4 * Age_{(i,t-1)} + \beta_5 * MER_{(i,t-1)} + \beta_6 * PTR_{(i,t-1)} + \mu_{(i,,t)}$$

Regression Model 2:

$$\text{Flow Growth}_{(i,t)} = \alpha_i + \beta_1 * RET_{(i.\ t-1)} + \beta_2 * Stddev_{(i,t-1)} + \beta_3 * Size_{(i,t-1)} + + \beta_4 * Age_{(i,t-1)} + \beta_5 * MER_{(i,t-1)} + \beta_6 * PTR_{(i,t-1)} + \beta_7 * Star_{(i,\ t-1)} + \beta_8 * StarFam_{(i,\ t-1)} + \beta_9 * Dog_{(i,\ t-1)} + \beta_{10} * DogFam_{(i,\ t-1)} + \mu_{(i,,t)}$$

Regression Model 3:

$$\text{Flow Growth}_{(i,t)} = \alpha_i + \beta_1 * RET_{(i.\ t-1)} + \beta_2 * Stddev_{(i,t-1)} + \beta_3 * Size_{(i,t-1)} + + \beta_4 * Age_{(i,t-1)} + \beta_5 * MER_{(i,t-1)} + \beta_6 * PTR_{(i,t-1)} + \beta_7 * Lstar1D_{(i,\ t-1)} + \beta_8 * LipFam1D_{(i,\ t-1)} + \mu_{(i,,t)}$$

Regression Model 4:

$$\text{Flow Growth}_{(i,t)} = \alpha_i + \beta_1 * RET_{(i.\ t-1)} + \beta_2 * Stddev_{(i,t-1)} + \beta_3 * Size_{(i,t-1)} + + \beta_4 * Age_{(i,t-1)} + \beta_5 * MER_{(i,t-1)} + \beta_6 * PTR_{(i,t-1)} + \beta_7 * Lstar3D_{(i,\ t-1)} + \beta_8 * LipFam3D_{(i,\ t-1)} + \mu_{(i,,t)}$$

Regression Model 5:

$$\text{Flow Growth}_{(i,t)} = \alpha_i + \beta_1 * RET_{(i.\ t-1)} + \beta_2 * Stddev_{(i,t-1)} + \beta_3 * Size_{(i,t-1)} + + \beta_4 * Age_{(i,t-1)} + \beta_5 * MER_{(i,t-1)} + \beta_6 * PTR_{(i,t-1)} + \beta_7 * Star_{(i,\ t-1)} + \beta_8 * StarFam_{(i,\ t-1)} + \beta_9 * Dog_{(i,\ t-1)} + \beta_{10} * DogFam_{(i,\ t-1)} + \beta_{11} * Lstar1D_{(i,\ t-1)} + \beta_{12} * LipFam1D_{(i,\ t-1)} + \beta_{13} * Lstar3D_{(i,\ t-1)}\ \beta_{14} * LipFam3D_{(i,\ t-1)} + \mu_{(i,,t)}$$

The explanatory variables in the fund-level flow model are selected based on past literature. The fund average monthly return (RET) is calculated following Nanda *et.al.* (2004)'s in their flow growth study. This variable is included in the flow model in all the fund flow study. Fund size, MER and fund age are included in most of the fund flow study (Sirri and Tufano, 1998; Nanda *et.al.*,2004; Kempf and Ruenzi, 2008; Sawacki, 2001; Deaves, 2004; and Sinha and Jog, 2005). The standard deviation of funds is included following Sirri and Tufano (1998), Deaves (2004) and Sinha and Jog (2005). PTR variable and the star dummy variables are included following Nanda *et al.* (2004).

The dependent and independent variables of this regression are explained in Table 4.8. The left column in the table presents the variables included in the equation, while the right column explains each of these variables.

Table 4.8

Flow Growth Regression Model With Funds Attributes

Variables	**Descriptions**
Flow $growth_{i,}$	The fund i's growth of new money flow at time t,
αi	Captures the fund fixed effects,
i	The fund index,
t	The index for each year,
RET	The fund-level average annual return, calculated over the past 12 months at time t,
Size	Represents fund size. It is computed as the logarithm of fund level TNA relative to the TNA of the median fund, the log lag TNA,
StdDev	The standard deviation of returns across all funds.
Age	The number of months from the fund date of inception to year t,
MER	Represents management expense, the fund-level expense ratio, which is the ratio of total investment that investors paid for the fund's operating expenses, calculated as the total fees of the unit trust fund to the average value of the unit trust fund, which includes management fees, administrative expenses and trustee fees. It is fees / average value of funds.
PTR	The Portfolio Turnover Ratio calculated as [(total acquisition for time t + total disposal for time t)/2]/ (average value of fund for time t). It is the percentage of a mutual fund holdings that is being replaced or turned over in a given period,

Star	Represents star fund dummy; D= 1 if the fund itself is a star fund and has value of 0 if the fund is not a star.
Star family dummy	Has a value of 1 if the fund is not a star but belongs to a star family that has at least one star and a value of 0 if it is a non-star fund belonging to a non-star family,
Dog	Represents dog fund dummy; D= 1 if the fund itself is a dog. D = 0 otherwise,
Dog family dummy	D = 1 if the fund is a non-dog but belongs to a family that has at least one dog. D = 0 if it is a non-dog fund belongs to a non-dog family.
Star fund and star family	It is identified by ranking the monthly average of returns over the past 12 months. Star family dummy represents the star identity. This dummy enables the analysis of the impact of star performance at the family level. This dummy captures the mean difference in new money growth between star and non-star family. The sign of this dummy coefficient is expected to be positive since the star identity attracts new money flows into the family. Star funds and the star family are identified by ranking the monthly average of returns over the past 12 months. The star funds are the top 10 per cent funds with the highest average returns measured by the past performance at time t.
Dog fund and dog family	Dog funds and the dog family are identified by ranking the monthly average of returns over the past 12 months. The dog funds are the bottom 10 per cent funds with the lowest average returns measured by the past performance at time t. The dog family dummy is expected to be negative, which means that having a dog fund decreases the total new money flow into the family.
Lstar1D and Lstar3D	Represents the one-year Lipper Star fund Dummy and three-year Lipper Star fund Dummy, respectively. They are dummies indicating whether the fund is a Lipper star.
LipFam1D and LipFam3D	Represents the one-year Lipper Star family Dummy and three-year Lipper Star family Dummy, respectively. It has a value of 1 if the fund is not a Lipper Star but belongs to a Lipper Star family that has at least one Lipper Star, and a value of 0 if it is a non-star fund that belongs to a non-star family for one year and three years, respectively.
Lipper star fund or Lipper star family	The Lipper ratings are based on the equal-weighted average of percentile ranking for the Total Returns metrics over one-year and three-year periods. Lipper Leaders are the top 20 per cent of funds in each peer group, a score of 4 is given to the next 20 per cent, a score of 3 is assigned to the middle 20 per cent, score 2 to the following and score 1 to the bottom 20 per cent. Lipper ratings reflect fund historical total returns performance relative to their peers. For fund families that have at least one star Lipper Leader fund, the highest 20 per cent of funds in each peer group have a family star dummy equal to 1.

A positive spillover effect would lead to a higher new flow growth for the non-star fund in a star family than the similar fund in other non-star families. This evidence would be shown if the coefficient of the non-star or star family dummy was positive and significant. A negative spillover effect would be shown in a negative and significant dog family dummy.

If the new flow growth for the non-star fund in a star family was found to be lower or negative, this would mean that the higher cash inflows to star funds were mainly due to cash flows cannibalizing from the non-star funds in the same family. That is funds are flowing out from the non-star funds to the star funds.

From the above regression analysis, the magnitudes of the coefficient of the star fund dummy and the non-star or star family dummy were computed to determine whether a star fund attracts more money than a non-star fund that belongs to a star family. Likewise for the dog fund dummy and dog family dummy. This will answer the question of whether a star fund attracts investment into the star fund itself or into the star family as a whole.

To examine the star phenomenon, that is, whether star identity increases fund familiy's cash flows, the new money growth of a star family was compared to the new money growth of a non-star family, after controlling for the past family performance and other family specific characteristics. A fixed effect panel data regression was used following Nanda *et al.* (2004), and Sigha and Jog (2004), who studied the flows and performance relationship with the star or loser funds impact accounted. The regressions were estimated using the family-level information as follows:

Regression Model 6:

$$\text{Flow Growth}_{(f,t)} = \alpha_f + \beta_1 * RET_{(f,\, t-12,t-1)} + \beta_2 * Stddev_{(f,t-1)} + \beta_3 * Size_{(f,t-1)} + \beta_4 * NoFunds_{(f,t-1)} + \beta_5 * Age_{(f,t-1)} + \beta_6 * MER_{(f,t-1)} + \beta_7 * PTR_{(f,t-1)} + \mu_{(f,,t)}$$

Regression Model 7:

$$\text{Flow Growth}_{(f,t)} = \alpha_f + \beta_1{*}RET_{(f.\ t-12,t-1)} + \beta_2{*}Stddev_{(f,t-1)} + \beta_3{*}Size_{(f,t-1)} + \beta_4{*}NoFunds_{(f,t-1)} + \beta_5{*}Age_{(f,t-1)} + \beta_6{*}MER_{(f,t-1)} + \beta_7{*}PTR_{(f,t-1)} + \beta_8{*}DSF_{(f.\ t-12,t-1)} + \beta_9{*}DDF_{(f.\ t-12,t-1)} + \mu_{(f,,t)}$$

Regression Model 8:

$$\text{Flow Growth}_{(f,t)} = \alpha_f + \beta_1{*}RET_{(f.\ t-12,t-1)} + \beta_2{*}Stddev_{(f,t-1)} + \beta_3{*}Size_{(f,t-1)} + \beta_4{*}NoFunds_{(f,t-1)} + \beta_5{*}Age_{(f,t-1)} + \beta_6{*}MER_{(f,t-1)} + \beta_7{*}PTR_{(f,t-1)} + \beta_8{*}L1D_{(f.\ t-12,t-1)} + \mu_{(f,,t)}$$

Regression Model 9:

$$\text{Flow Growth}_{(f,t)} = \alpha_f + \beta_1{*}RET_{(f.\ t-12,t-1)} + \beta_2{*}Stddev_{(f,t-1)} + \beta_3{*}Size_{(f,t-1)} + \beta_4{*}NoFunds_{(f,t-1)} + \beta_5{*}Age_{(f,t-1)} + \beta_6{*}MER_{(f,t-1)} + \beta_7{*}PTR_{(f,t-1)} + \beta_8{*}L3D_{(f.\ t-12,t-1)} + \mu_{(f,,t)}$$

Regression Model 10:

$$\text{Flow Growth}_{(f,t)} = \alpha_f + \beta_1{*}RET_{(f.\ t-12,t-1)} + \beta_2{*}Stddev_{(f,t-1)} + \beta_3{*}Size_{(f,t-1)} + \beta_4{*}NoFunds_{(f,t-1)} + \beta_5{*}Age_{(f,t-1)} + \beta_6{*}MER_{(f,t-1)} + \beta_7{*}PTR_{(f,t-1)} + \beta_8{*}DSF_{(f.\ t-12,t-1)} + \beta_9{*}DDF_{(f.\ t-12,t-1)} + \beta_{10}{*}L1D_{(f.\ t-12,t-1)} + \beta_{11}{*}L3D_{(f.\ t-12,t-1)} + \mu_{(f,,t)}$$

The explanatory variables in the family-level flow model are selected based on past literature. The family average monthly return (RET) is calculated following Nanda et.al. (2004) in the flow growth study. Standard deviation of returns across funds (stddev), a proxy for star-creating strategy or focused strategy was included in the model, following Sirri and Tufano (1998), Deaves (2004) and Sinha and Jog (2005). The number of funds (NoFunds) is included as a control variable for flow model following Nanda *et al.* (2004). The variable of family size is included in the flow model in Sirri and Tufano (1998), Nanda *et al.* (2004) and Sinha and Jog (2005). The age of the fund family (Age) is included in Deaves (2004) and Sinha and Jog (2005) flow model. Both the MER and PTR are included based on Nanda *et al.* (2004). The dummy variables representing the star and the dog identity are included in the flow model following Nanda *et al.* (2004).

The dependent and independent variables of this regression are explained in Table 4.9. The left column in the table presents the variables included in the equation, while the right column explains each of these variables.

Table 4.9

Flow Growth Regression Model With Family Attributes

Variables	**Descriptions**
Flow $growth_{i,}$	Represents family's flow $growth_{f,.}$ It is the family f's growth of new money flow at time t,
α_f	Captures the family fixed effects,
f	The fund family index,
t	The index for year,
RET	The family-level average return over the past 12 months at time t;
StdDev	The standard deviation of returns across all funds in the family. High standard deviation is the proxy for family star-creating strategy and low standard deviation is the proxy for focused strategy.
NoFunds	It is a control variable, it is the logarithm of the total number of funds managed by the family at time t;
Size	Represents the size of fund family, which is computed as logarithm of the sum of Total Net Assets of the funds of the fund family, it is the log lag Total Net Assets.
Age	It is measured by the number of months from the family date of inception to year t, taking the age of the oldest fund.
MER	Represents the Management Expense Ratio. It is the family-level average expense ratio, that is, the average ratio of total investment that investors paid for the fund's operating expenses in family f at time t-1. It is the average of MER of all member funds in the family.
PTR	Represents the Portfolio Turnover Ratio. It is calculated as [(total acquisition for time t + total disposal for time t)/2]/ average value of fund for time t. It is the percentage of a mutual fund holding that is being replaced or turned over in a given period, it is the weighted average of the fund-level measures.
DSF	Represents the Star Family Dummy. It is = 1 if the family has at least one star. D=0 if the family has no star fund or it is a non-star family.
DDF	Represents the dog family dummy. D = 1 if the family has at least one dog fund.

	D=0 if the family has no dog fund, or it is a non-dog family. Star fund and star family are identified by ranking the monthly average of returns over the past 12 months. They are dummies indicating whether the family has at least one star or dog fund under management.
L1D and L3D	Represents the one-year Lipper Star Family Dummy and three-year Lipper Star Family Dummy, respectively. They are dummies indicating whether the family has at least one Lipper star fund under management.

The dependent variable is the new cash flow of a mutual fund family, the growth of new money flow. Following prior literature (Chevalier and Ellison, 1997; Sirri and Tufano, 1998; Del Guercio and Tkac, 2002; Nanda *et al.* 2004), it was measured as the money change of total net assets (TNA) over the last period that comes from new money inflow from outside investors and net of the price appreciation on the assets under management, normalised by total net assets (TNA) at the beginning of period. The growth of new money flow is a good measure of investors' investment decision. This equation is shown as follows:

$$\text{Flow growth}_{i,t} = \frac{\text{TNA}_{\text{i,t}} - \text{TNA}_{\text{i,t}-1} * (1 + \text{R}_{\text{i,t}})}{\text{TNA}_{\text{i,t}-1}}$$

Where Flow $\text{growth}_{(\text{i,t})}$ is fund i's growth of new money flow at time t, R $_{i,t}$ is the average return of all funds with objective i at time t.

For any mutual fund family f, the family level new money growth is the sum of the individual fund *i's* growth of new money flow in a family.

$$\text{Flow growth}_{f,t} = \sum_{\text{i}=1}^{\text{n}} \left(\frac{\text{TNAi, t} - \text{TNAi, t} - 1 * (1 + \text{Ri, t})}{\text{TNA}_{\text{i,t}-1}}\right)$$

With respect to the regression method applied to the model, the following two regressions that were considered are: (1) Ordinary Least Square (OLS) regression and (2) Fixed effect panel regression.

The OLS regression is likely to endure the endogeneity bias[4] in the kind of omitted variable bias because the data used in the model includes both cross-sectional and time-series data, there are two variations within the data, namely, the inter-fund variation and the intra-fund variation. The inter-fund variation signifies the variation in the average growth of money flow from one fund to another, while the intra-fund variation represents the variations within each fund over time. The shortfall of the OLS regression is that it is unable to cover the combined effect of these variations. Thus, a panel data regression was applied in this thesis. The intercept is allowed to change across both the time and fund sectors. To minimize the likelihood that the outcome is influenced by the individual inequality among the family, the fixed effect panel regressions were applied by controlling for the fund and family special features. The methodology employed by Nanda *et al.* (2004) was applied to explore the star effect on family fund flows.

Panel data analysis is a form of longitudinal data analysis, which allows the regression with both the spatial and temporal dimension. It is suitable to study the behaviour of fund investors over time. The combination of cross-sections with time series can enhance the quality and the quantity of data. The fund family, i, is the cross-sectional unit of observations while the year in study is denoted as t. The error term has two dimensions, which represent the fund family and the time period, respectively. The data used in this study represents an unbalanced data. The standard fixed effects model specification is as follows (Greene, 2003):

$$Y_{it} = \alpha_i + \sum_{j=2}^{k} \beta_i X_{jit} + \varepsilon_{it} + v_i$$

[4] A loop of causality between the independent and the dependent variable of a model leads to endogeneity. It occurs when the independent variable is correlated with the error term in the regression.

Where:

Y_{it} = the dependent variable
X_i= observed independent variables of interest
α_i= observed group effects
i = unit of observation
t = time period
j= observed variables
ε_{it}= disturbance term
v_i = the cross-section specific error

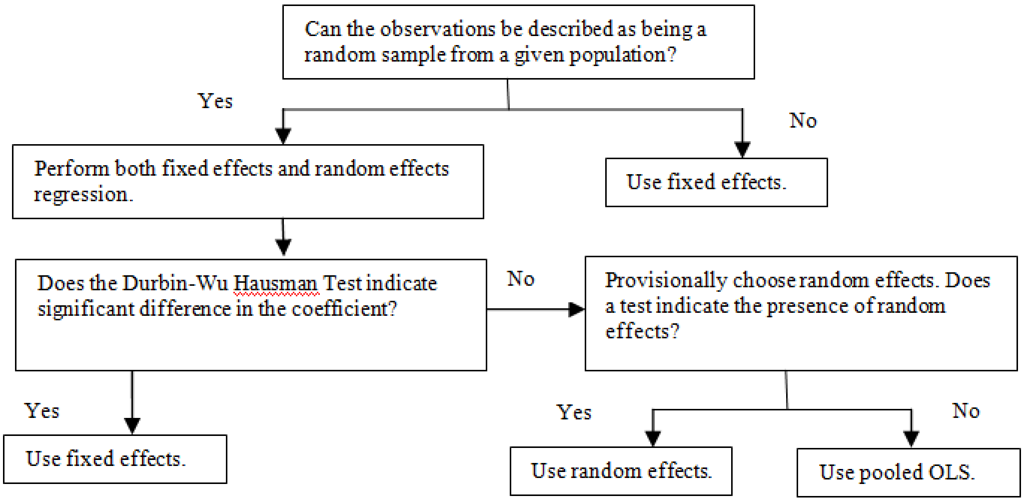
The fixed effects model has constant slopes, however, the intercepts are different for each individual firm as the intercepts are cross-section specific (the family in this study), which may or may not differ over time. This model describes the variations about the mean of the dependent variable in terms of the variations about the means of the independent variables for a group of observations relating to a given individual. This model tracks the unobserved heterogeneity bias. This is known as the within-groups regression model or Least Square Dummy Variable. The fixed effects model controls for time-invariant omitted variables using firm fixed effects. The high R-square suggests that time-invariant firm-specific characteristics are important sources of cross-firm variation in the fund flows.

There are two preconditions to use random effects. First, the fixed effects model is valid when the entities in the sample effectively constitute the entire population. Random effects model is more appropriate when the entities in the sample are possible to be treated as being selected randomly from the population. Second, random effects model is valid only when the composite error term, W_{it} (observed omitted variables) is (are) uncorrelated with all the included independent variables. This can be tested with Hausman Test. The individual observations are distributed independently of all the independent variables. Otherwise, random effects estimation will be biased and inconsistent, if then fixed effects estimation have to be used.

The fixed effects model cannot include variables that are constant for each individual. It would not be an effective measurement model in this case. An alternative model is the random effect model. The fixed effects model treats the constant term as fixed while the random effects treats the constant term as a random. The use of the random effect model is subject to whether the observations can be described as being randomly drawn from a given population and whether the data is representative of the population as a whole. The random effects model is suitable if the difference across firms have some influence on the independent variables. However, in our data set, all fund families or the firms other than state-owned or government-linked were included in this study. These firms in the sample cannot be regarded as representing a random sample of all the unit trust firms in Malaysia, and it cannot represent the world population as a whole since only the Malaysian unit trusts data is examined. Therefore, the random effects model is not suitable in this study based on the first precondition discussed in the paragraph above. As such, the fixed effects model was used in this study. In addition, in a similar study by Nanda *et al.* (2004) on fund flow growth, the fixed effects model was used.

Figure 4.1

Choice of Regression Model for Panel Data



Source : Dougherty (2007)

In order to justify the use of the fixed effects model rather than the pooled regression model, the fixed effect (group effect) hypothesis testing was carried out using the redundant F-test for change in R-squared between the fixed effects model and pooled regression model.

$$F = \frac{\text{explained variance}}{\text{unexplained variance}} = \frac{\text{between−group varibility}}{\text{within−group varibility}}$$

$$F_{\text{family effects}} = \frac{(R^2_{\text{fem}} - R^2_{\text{pooled}})/(n-1)}{(1 - R^2_{\text{LSDV}})/(nt - n - k)}$$

Where:

fem = Fixed effect model,

LSDV = Least square dummy variable,

t = Number of temporal observations,

n = Number of fund families,

k = Number of regressors in the model.

If the observed r-squared of the fixed effect (group effect) model is better than the pooled regression model, then we have a statistically significant group effect (Yaffe, 2003). Hence, the fixed effect model is applied in the study.