Risk and Return in The equity mutual fund industry: An unorthodox relationship and its application to new investment strategies

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Abstract
In 1980, Bowman proposed the Bowman paradox, a negative relationship between the risk and return in 85 U.S. industries, a contradiction with the high risk-high return doctrine. Examining the open-end equity mutual funds in Thailand, this study documents the negative relationship that can occasionally be seen between risk and return in the industry during 2003-2012. The study further examines the factors that will affect the probability that a fund will deliver an outstanding low-risk, high-return performance using unbalanced panel logistic regression on a binary dependent variable. The results showed that funds with high non-systematic risk, also called idiosyncratic risk, and/or older funds, were more likely to deliver a low-risk, high-return performance, and the funds that were managed by the company that managed a high number of funds were less likely to deliver such performance. This study proposes a new performance evaluation tool called the “risk-return matrix.” This matrix suggested the funds with outstanding low-risk, high-return past performance. This study applied the results to three new investment strategies. All simulations demonstrated returns better than the industry’s average returns.

JEL Classification: G11, G12
Keywords: Mutual Fund Performance, Bowman Paradox, Negative correlation, Risk and Return, Portfolio
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Chapter 1 Introduction

The conventional wisdom of economic theory suggests that one that expects a higher return should be able to assume higher volatility (Merton, 1973). However, in 1980, one of the studies in the management discipline affected this long-time widely accepted notion, a publication in the *Sloan Management Review* entitled “A Risk/Return Paradox for Strategic Management” (Bowman, 1980). It is known as the “Bowman paradox”.

Based on business administration and economic rationality, the managers of a firm will expect high return from a high-risk investment (Bowman, 1980). The empirical study of Bowman (1980) demonstrated a contradicting result. Using firm-level analysis of 85 U.S. industries, Bowman found that the companies that had a profit higher than average tended to have lower volatility of profit across the companies within industries. His study is also applicable to financial study since Bowman defined risk as the volatility of the company profit. He used the standard deviation of the return on equity as a proxy for risk.

There has been an increasing interest in extending the study of the Bowman paradox, especially in the United States, Europe, and other Western countries (Baucus, Golec, & Cooper, 1993; Fiegenbaum & Thomas, 1986; Guo & Whitelaw, 2006; Wiseman & Bromiley, 1991). Recently, Brockett et al. (1992) used chance constrained programing to study the correlation between the risk and return of 383 U.S. open-end mutual funds during 1984-1988, and Cooper et al. (2011) examined the quantitative evaluation of strategic performance of 120 U.S. equity mutual funds during 1993-1997. Both studies came to similar conclusions that the Bowman paradox could appear in the mutual funds industry.

There are many reasons that support the conduct of this study. First, despite the growth in the mutual fund industry in the emerging market, the mutual fund research of this market is still limited (Ungphakorn, 2014). Second, the Bowman paradox was evidenced in the...
U.S. mutual fund industry: during 1984-1988 (Brockett et al., 1992), and during 1993-1997 (Cooper et al., 2011). However, to the author’s best knowledge, a study of the Bowman paradox using Thai mutual fund samples has not yet been documented, despite, the high potential of the Thai financial market. The Thai stock market has had the highest daily trading value among the ASEAN countries for three consecutive years and the Thai mutual industry has had 23% growth in 2014 (Bank of Thailand, 2015; Deloitte, 2012; SET, 2014).

This study believes that the investigation of the paradox will be more useful for investors if they are able to understand the factors that affect the low-risk, high-return performance of mutual funds. The author was interested in finding out those factors and hopes that the examination of the paradox in Thai equity mutual fund industry will increase the understanding of the risk-return relationship in this industry, which may help investor enhance their portfolio-returns.

1.1 Research Objective

This study has three objectives.

1. To investigate whether the paradox exists in the Thai equity mutual fund industry.
2. To find out the characteristic of the low-risk, high-return performance funds.
3. To find out whether, in the market where a negative risk-return relationship exists, investors can capitalize on this phenomenon.

1.2 Expected Outcomes

1. This study expected to find that there is a negative relationship between risk and return in the Thai open-end equity mutual funds industry.

2. This study expected that some of the organizational factors and fund characteristics, such as the non-systematic risk, fund size, fund objective, type of parent company, fund age,
total number of funds, and the total assets under management within the same asset management company, would have significant effect on the low-risk, high-return performance funds.

3. This study hoped to offer some investment strategies that opens the opportunity for Thai investors to gain benefit from the phenomenon. That is they can have a low-risk, high-return investment.
Chapter 2 Literature Review

2.1 The Modern Portfolio Theory

Investors should maximize the expected return while minimizing risk (Markowitz, 1952). This notion of the modern portfolio theory of Markowitz pave the way to the Tobin's separation theorem (Tobin, 1958), and the capital asset pricing model, the CAPM (Sharpe, 1964; Lintner, 1965; Mossin, 1966). The essence of the CAPM is that the asset can be priced based on its co-variation with the systematic risk of the market. The non-systematic risk of the assets will be eventually diversified, so need not be priced. If the CAPM is considered the first breakthrough in the financial economic discipline during the 1960s, the arbitrage pricing theory (APT) should be considered the second breakthrough during the 1970s. The CAPM indicates that a single risk factor, beta, is accountable to the portfolio volatility, but APT of Ross (1976) expanded the definition of systematic risk to cover several risk factors. Nevertheless, the breakthrough from the arbitrage pricing theory (APT) in 1976 led to the development of the multifactor models (Carhart, 1997; Chen, Roll, & Ross, 1986; Fama & French, 1993). During the 1980s, various variables that were not previously part of the asset pricing model emerged.

2.2 The Bowman Risk-Return Paradox

A long generally-accepted notion that a high-risk investment should eventually deliver a high-return became conspicuous in a study of Bowman (1980), later known as the Bowman paradox. Bowman (1980) examined the average profit and volatilities of companies from 85 industries to cover 1,572 companies during 1968-1976. The results showed that 56 industries supported the hypothesis of a negative risk-return relationship, 21 industries did not support it, and 8 industries were tied. He concluded that the examination supported the negative correlation hypothesis. Bowman paradox aroused much academic attention. Many studies tried to explain the paradox from various angles, which can be categorized into three groups of explanations (Andersen, Denrell, & Bettis, 2007).
The first group explained the paradox based on behavioral theory, such as prospect theory, which holds that the risk-taking behavior of decision makers is influenced by the expected outcome. Examples of researchers in this group are Fiegenbaum (1990), Fiegenbaum and Thomas (1986, 1988), Jegers (1991), Johnson H. J. (1994), and Sinha (1994). They believed that in a situation of low prospect, decision makers tend to take higher risk.

The second group explained the paradox from the organizational management point of view, such as Andersen et al. (2007), Bettis and Hall (1982), Bettis and Mahajan (1985), and Miller and Chen (2003). This group believed that good management structure and practices matter to the risk-return relationship.

The third group explained the paradox based on statistical artifacts, such as the skewness of the return (Henkel, 2009), the choice of accounting data (Baucus, Golec, & Cooper, 1993).

After three decades of continued study on the issue, a conclusion was not reached as to why the paradox existed. Although a negative relationship between the risk and return of investment was unorthodox, numbers of empirical studies confirmed that they existed, as reviewed in the previous paragraphs. Recently the study of the Bowman paradox was extended from industrial firms to the investment industry. Brockett et al. (1992) used the chance constrained programming approach to study 830 U.S. mutual funds during 1984-1988. Later, Cooper et al. (2011) examined 120 U.S. funds during 1993-1997 using a two-stage data envelopment analysis (DEA) approach to evaluate the efficiency of fund strategic performances. Both studies concluded that the paradox could happen in the mutual fund industry.
2.3 Performance Measurements of the Mutual Fund

Some investors use the mutual fund return to substitute for the mutual fund performance. However, the Bank Administration Institute\(^1\) (BAI) required that the performance measurement should include both risk and return elements (Bacon, 2008). There are several types of performance measurements, which include both risk and return. For example the return-based measurements and the holdings-based measurements. The example of the return-based measurement are Treynor ratio, Sharpe ratio, Treynor-Mazuy measurement, Henriksson and Merton measurement, Jensen alpha. The example of the holdings-based measurements are Grinblatt-Titman measurement (GT) and Characteristic Selectivity (CS) of Daniel, Grinblatt, Titman, and Wermers (1997).

2.4 Factors Affecting the Mutual Fund Performance

2.4.1 Organizational Factor and the Role of Fund Characteristics

There have been many studies related to the characteristics of mutual funds on various subjects, such as performance (See & Jusoh, 2012; Huang & Shi, 2013), the growth opportunities of a firm value (Kogan & Papanikolaou, 2013), fund survivorship (Carhart, Carpenter, Lynch, & Musto, 2002), and fund disappearance (Cameron & Hall, 2003). All of these studies agreed that characteristics such as size (Berk & Green, 2004; Chen, Hong, Huang, & Kubik, 2004), age (Switzer & Huang, 2007), fund objective (Daniel et al., 1997; Fama & French, 1993) the fund-expense ratio, and others were important predictors of fund attrition, fund performance, etc.

\(^1\) The Bank Administration Institute is a non-profit organization, founded in 1924. It aims to promote banking industry standards in bank operations and auditing academics, conferences, and a research affiliate. It is the oldest and largest technical organization serving the U.S. banking industry.
The mutual fund by itself is not a stand-alone organization. Each fund belongs to a fund family, which is managed under an asset management company. As a result, the characteristics of a fund management firm such as the type of parent company (Bogle, 2005; Ferris & Yan, 2009), total numbers of fund (Bogle, 2010; Nanda, Wang, & Zheng, 2004; Pollet & Wilson, 2008) affected fund performance. The total asset under management (Bhattacharya, Lee, & Pool, 2013; Gasper, Massa, & Matos, 2006; Jong & Wingens, 2013) also affected how the fund carries its risk or delivers its return.

2.4.2 Diversifiable Risk: Idiosyncratic Risk

According to modern portfolio theory, the systematic risk of any portfolio plays an important role in forecasting expected return, whereas the idiosyncratic risk does not have that role. The reason is that the idiosyncratic risk is diversifiable; it is independent of the market and has zero expected value. Hence, the idiosyncratic risk should not, theoretically, relate to the expected return. However, its role on expected return has been documented. The explanation were the increment of institutional ownership (Malkiel & Xu, 2003), the firm’s fundamental characteristics such as maturity (Wei & Zhang, 2006; Irvine & Pontiff, 2009), etc. The role of idiosyncratic risk on an asset return has been documented more at the security level than at the mutual fund level. Moreover, there is a lack of such study in the Thai context.
Chapter 3 Research Framework and Hypotheses

3.1 Relationship between Risk and Return in the Thai Equity Mutual Fund Industry

Conventional wisdom leads us to believe that investors will require a high rate of return if they expect to face high uncertainty, and they will require a smaller return if they can be more certain about it. However, the theoretical relationship between the two does not indicate any certainty with regard to the sign of the relationship (Backus & Gregory, 1993). The fact that Bowman (1980) found a negative relationship between corporate returns and their standard deviations made it a valuable addition to the literature in the financial economics discipline. Additionally, previous studies suggested that a negative risk-return relationship could happen in the U.S. mutual fund industry (Brockett et al., 1992; Cooper et al., 2011).

Hence, this study offers the first null hypothesis to whether there is a significant positive or no relationship between risk and return in the Thai open-end equity mutual funds industry.

3.2 Characteristics of Funds with Low-Risk, High-Return Performance

As reviewed in Chapter 2, this study proposed to test whether the idiosyncratic risk level of the Thai equity open-end mutual fund has a significant effect on the probability that the mutual fund will deliver a low-risk, high-return performance.

Much of the literature has studied the effect of the organizational factors and fund characteristics on fund performance, but to the author’s best knowledge, the study of their effects on the probability that the fund will deliver a low-risk, high-return performance has not been documented. This study also examined these relationships.

This study proposed the research framework in Figure 1 as follows.
This study examined the effect of the organizational factors and fund characteristics on the mutual fund performance using the second to the eighth hypotheses. This study summarized the hypotheses and their expected outcomes in Table 1 as follows.

**Table 1: Summary of the Hypotheses and Their Expected Signs**

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Expected outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>(H_01): There is a significant positive or no relationship between risk and return in the Thai open-end equity mutual funds industry.</td>
<td>Reject the null hypothesis</td>
</tr>
<tr>
<td>(H_02): The idiosyncratic risk of a fund has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</td>
<td>Reject the null hypothesis and find a positive significant effect</td>
</tr>
</tbody>
</table>
### Hypotheses and Expected Outcomes

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Expected outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H₀3</strong>: Fund size has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</td>
<td>Reject the null hypothesis and find a negative significant effect</td>
</tr>
<tr>
<td><strong>H₀4</strong>: Fund objective has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</td>
<td>Reject the null hypothesis and find a negative significant effect - Other objectives are expected to have positive coefficients.</td>
</tr>
<tr>
<td><strong>H₀5</strong>: The type of parent company of an asset management company has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</td>
<td>Reject the null hypothesis and find a positive significant effect - A non-bank-related type company is expected to have a positive coefficient.</td>
</tr>
<tr>
<td><strong>H₀6</strong>: Fund age has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</td>
<td>Reject the null hypothesis and find a positive significant effect</td>
</tr>
<tr>
<td><strong>H₀7</strong>: The number of funds under the management of an asset management company has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</td>
<td>Reject the null hypothesis and find a negative significant effect</td>
</tr>
<tr>
<td><strong>H₀8</strong>: The total assets under the management of an asset management company have no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</td>
<td>Reject the null hypothesis and find a positive significant effect</td>
</tr>
</tbody>
</table>

Source: Developed for this study
3.3 Operationalization of the Independent and Dependent Variables

The variables used in this study, their symbols, conceptual definitions, and their operational definitions are summarized in Table 2 below.

<table>
<thead>
<tr>
<th>Construct and Variable Name</th>
<th>Conceptual definition</th>
<th>Operational definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutual fund performance ((SS))</td>
<td>A binary variable equal to 1 for the mutual fund that delivers a low-risk, high-return performance, and zero for other types of performance</td>
<td>A low-risk fund is a fund that is ranked in the lowest 30th percentile risk ranking. A high-return fund is a fund that is ranked in the highest 70th percentile return ranking</td>
</tr>
<tr>
<td>Idiosyncratic risk of mutual fund ((\psi))</td>
<td>The non-systematic risk of securities held by equity mutual funds that are not fully diversified</td>
<td>The square root of the sum of a regression residual squared. The regression residual is based on the Fama-French three-factor model.</td>
</tr>
<tr>
<td>Log of fund size ((Log Size))</td>
<td>Net asset value of fund</td>
<td>Log of the year-end net asset value</td>
</tr>
<tr>
<td>Fund objective ((DObj))</td>
<td>Fund investment style reflects the main type of stocks the fund invests, whether they are the growth stocks, value stocks, or a mix of both.</td>
<td>A dummy variable. It is equal to one if the fund invests mainly in the growth stock and equal to zero if the fund mainly invests in other type of stocks. The assignment of fund objectives was inferred from the Morningstar® style box.</td>
</tr>
<tr>
<td>Type of parent company ((DType\text{-parent}))</td>
<td>Type of parent company, whether they are bank-based or non-bank-based. It is inferred from the type of parent company that has the biggest share in an asset management company.</td>
<td>A dummy variable. It is equal to one for a bank-related parent company, and equal to zero for a non-bank-related parent company. The information is gathered from the company’s public-disclosure information, annual reports, and websites.</td>
</tr>
<tr>
<td>Construct and Variable Name</td>
<td>Conceptual definition</td>
<td>Operational definition</td>
</tr>
<tr>
<td>-----------------------------</td>
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<td>------------------------</td>
</tr>
<tr>
<td>Fund age ((Age))</td>
<td>The age of a mutual fund</td>
<td>Measured in years by counting from the month after the fund inception date to the cut-off month, and then divided by 12</td>
</tr>
<tr>
<td>Number of funds ((No.Fund))</td>
<td>Total number of funds managed under an asset management company</td>
<td>Total number of all funds managed under an asset management company at the end of the year</td>
</tr>
<tr>
<td>Log of total assets under management ((Log AUM))</td>
<td>Total assets under management</td>
<td>Log of year-end total net asset value of all funds managed by the firm</td>
</tr>
</tbody>
</table>

Source: Developed for this study
Chapter 4 Research Methodology

The sample selection is explained in 4.1. This study performed two separate statistical tests. The first test, described in section 4.2, is the correlation procedure to test the first hypothesis, $H_0 \text{1}$, which is the risk and return relationship in a Thai open-end equity mutual fund. The second test, presented in section 4.3, is the regression to test the hypotheses $H_0 \text{2} - H_0 \text{8}$, the factors that will affect the probability that a fund will deliver a low risk-high return performance. The simulations in section 4.6 were tested to meet the third objective.

4.1 Sample Selection and Data Sources

This study selected all active equity funds in Thailand during 2003-2012. It excluded international, closed-end, retirement (RMF) and long-term equity funds (LTF). Suppa-Aim (2010) and Tangjitprom (2014) also employed this data collection method in their studies of Thai equity mutual funds. The closed-end equity mutual funds in Thailand, which are mainly triggered funds, RMF and LTF funds are managed under some regulations because they are tax-benefited funds. This study excluded such funds because they have restricted risk patterns and appetites. This study required funds with at least 36 months history for regression purposes.

There were 118 funds under AIMC based on the AIMC$^2$ definition of the equity fund at the time of sample selection. After excluding 13 triggered funds, three index-tracked funds, and 22 funds with age less than 36 months, this study examined a total sample of 64 funds in

$^2$ AIMC is the Association of Investment Management Companies. Members consist of mutual fund, private fund, and provident fund managers. AIMC is an association relating to and representing investment management industry by the Office of the Securities and Exchange Commission (SEC).

4.2 The Risk and Return Relationship

This study tested the first hypothesis, $H_01$, using the Pearson product moment correlation coefficient, $\rho_{Tj}$. This study correlated the return in excess of the risk free rate, $r_{nj}$ and its standard deviation in one-year, three-year, five-year and ten-year timeframes. This study assumed no transaction costs.

4.2.1 Return

This study used the total capital gain and dividend in calculating the return, as it became a standard requirement in the latest 2010 Global Investment Performance Standards (GIPS 2013) item 2.A.1.

(1). Calculate the monthly return by

(i) For a fund with no dividend pay-out policy, the $r_{nj}$ reflects the capital gain as follows.

$$ r_{nj} = \left\{ \left( \frac{Nav_{end}}{Nav_{begin}} \right) - 1 \right\} - r_{f,n} $$

(ii) For a fund with a dividend pay-out policy, the $r_{nj}$ reflects the capital gain and the dividend income as follows.

$$ r_{nj} = \left\{ \left( \frac{Nav_{end}}{Nav_{xd}} \right) \left( \frac{Nav_{xd} + Div per unit}{Nav_{begin}} \right) - 1 \right\} - r_{f,n} $$

(2). Calculate the yearly return used the time-weighted rate of monthly return as its measurement (Lawton & Jankowski, 2001), as follows

$$ r_{Yj} = \left[ \prod_{i=1}^{n} (1 + r_{nj}) \right] - 1 $$

(1)

(3). Annualize the three-year, five-year and ten-year return using geometric mean return.

$$ r_{NYj} = \sqrt[n]{\left[ \prod_{i=1}^{n} (1 + r_{Ynj}) \right]} - 1 $$

(2)
\[ \Pi = \text{The product of one plus monthly return from period } 1 \text{ to } n \]

\[ r_Y^j = \text{Yearly return of fund } j \text{ for the measurement year } Y \]

\[ r_n^j = \text{Total return of fund } j \text{ at month } n, n=1-12 \]

\[ r_{f,n} = \text{Monthly risk free rate or T-bill rate.} \]

\[ Nav_{xd} = \text{Net asset value per unit at the end of the ex-dividend date.} \]

\[ Nav_{end} = \text{Net asset value per unit of the last working day of the testing month.} \]

\[ Nav_{begin} = \text{Net asset value per unit of the last working day of the previous month.} \]

\[ r_{NY}^j = \text{The N years annualized return of mutual fund } j. \]

\[ r_{YN}^j = \text{The yearly return of mutual fund } j \text{ at year } n. \]

### 4.2.2. Risk

Following Fama and French (2012), this study employed standard deviation as its risk measurement. This measurement is widely used by the mutual fund organization such as Association of investment management companies (AIMC, 2016) and Morningstar©³ (Morningstar, 2016). The standard deviation is the square root of the volatility of monthly returns of the testing year (Reilly & Brown, 2011) and multiplies by the square root of twelve to make it annualized.

\[ S_T^j = \sqrt{\frac{1}{n-1} \sum_{n=1}^{n} (r_n^j - \bar{r}_T^j)^2} \cdot \sqrt{12} \]  

\[ S_T^j = \text{Annualized standard deviation of monthly return of mutual fund } j \text{ for period } T \]

\[ \bar{r}_T^j = \text{Arithmetic mean of monthly return of mutual fund } j \text{ for period } T \]

\[ r_n^j = \text{Monthly return of mutual fund } j \text{ at month } n \]

The calculation used \( n = 36, 60 \) and 120 for the three-year, five-year, and ten-year standard deviations, respectively.

³ Morningstar, Inc. is a provider of independent investment research in North America, Europe, Australia, and Asia
This study also used Beta ($\beta$) as another proxy for risk since the slope angles of the characteristic lines of the managed funds provide a refined measurement of the funds’ volatility (Treynor, 1965), and it was widely used by many scholars (Black, Jensen, & Scholes, 1972; Fama & MacBeth, 1973). Beta can be estimated from regression equation below.

$$r^j_n = \alpha + \beta_T \left( r^j_{mkt,n} - r^j_{f,n} \right) + \epsilon^j_n$$  \hspace{1cm} (4)

- $r^j_n$ = The monthly return of mutual fund $j$ at month $n$ in excess of risk free rate
- $r^j_{mkt,n}$ = Market return in month $n$
- $r^j_{f,n}$ = Risk free rate in month $n$

### 4.2.3 Correlation between Risk and Return

This study used the Pearson product moment method because it is a suitable method for the Interval or ratio scaled (Coakes & Ong, 2010; Ho, 2006). There is no theoretical guideline as to how many years should be used to study the relationship between risk and return. However, a study by the Investment Company Institute indicated that about 40 percent of investors had an average of five years between the first purchase and redemption (ICI, 2001). As a result, this study performed the Pearson product moment correlation between the 60 monthly returns of mutual funds and their standard deviations in finding the correlation between the risk and return. However, this study investigated three more frequencies of data to cover wider scenarios. It cross-sectionally correlated the yearly, three-year, and ten-year returns and standard deviations of sample funds to minimize the specific effect that resulted from any individual year shock.

### 4.3 Measurement of Mutual Fund Performance

There are several performance measurements used in evaluating funds. Each method has its own strength and is suitable in different contexts. The return-based measurement such as the Treynor ratio or Sharpe ratio measures return per unit of risk. It is easy to calculate but does not tell the actual level of risk to which the fund is exposed. The
regression-based performance measurement suffer from the choice of the benchmark (Roll, 1978), such as alpha. The holding-based measurement such as the Grinbatt-Tittman measurement is good for the manager’s evaluation but overlooks the portfolio risk-adjusted return (Reilly & Brown, 2011). The Characteristic Selectivity (CS) by Daniel et al. (1997) measures the selection ability of the manager but requires a great deal of information about portfolio holdings during each period, which is sometimes a difficult task for the general investor. The percentile ranking of return is easy to understand but ignores the risk of the mutual fund.

4.3.1 Methodology for New Performance Measurement

Led by the above constraints, this study proposed a new performance measurement, which takes into account both level of risk and level of return. It is easy to use and, to a certain level, reveals the ability of the fund manager. While some performance evaluations require specific information and calculations that are achievable only by the financial analyst or people in the field, the new performance tool in this study requires information that is accessible by the general investor. This performance measurement is the 3x3 boxes of risk dimension and return dimension. This study called it the “Risk-Return Matrix”. The procedure is to independently rank the return and risk of funds and, then, to combine the characteristics of the two dimensions.

The Return Ranking: In each year the return of all mutual funds were sorted in ascending order from smallest to largest. This study calculated the position of the $30^{th}$ and $70^{th}$ percentile using the following calculation (Anderson, Sweeney, & Williams, 1990).

$$P_k = \left( \frac{k}{100} \right) \times n$$

\[ P_k = \text{The position in the sample set that represent the } k^{th} \text{ percentile} \]

\[ k = \text{The percentile point} \]

\[ n = \text{Total number of observations} \]
The position $P_{30}$ and $P_{70}$ were then marked for the next step. The funds that had return ranked in the first 30th percentile were marked as “low return,” those in between the 30th and 70th were marked as “medium return,” and those in the 70th percentile upward were marked as the “high return” group.

**The Risk Ranking:** This study independently ranked funds from their standard deviation level. The procedure in risk ranking was similar to the return ranking, except that it used the level of risk in the order sorting. The result generated three other groups of funds: the “low-risk,” the “medium-risk,” and the “high-risk” groups.

**The Risk Return Matrix:** The study developed a risk-return matrix based on the two dimensions: risk and return. The product of the two dimensions was the nine groups of funds: the low-risk, high-return group, the low-risk, medium-return group, the low-risk, low-return group, the medium-risk, high-return group, the medium-risk, medium-return group, the medium-risk, low-return group, the high-risk, high-return group, the high-risk, medium-return group, and the high-risk, low-return group. Apparently, it is quite confusing and difficult to refer to these groups in their full characteristics. For convenience, this study named these nine groups as shown in the italic-bolded characters in the risk-return matrix in Figure 2.

**Figure 2: The Risk-Return Matrix**

<table>
<thead>
<tr>
<th>Risk</th>
<th>Low-risk (≤30th)</th>
<th>Medium-risk (&gt;30th - &lt;70th)</th>
<th>High-risk (≥70th)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-return (≥70th)</td>
<td>Low-risk, High-return <strong>Sweet Spot</strong></td>
<td>Med-risk, High-return <strong>Umami-2</strong></td>
<td>High-risk, High-return <strong>Hot</strong></td>
</tr>
<tr>
<td>Medium-return (&gt;30th - &lt;70th)</td>
<td>Low-risk, Med-return <strong>Umami-1</strong></td>
<td>Med-risk, Med-return <strong>Salty</strong></td>
<td>High-risk, Med-return <strong>Sour-2</strong></td>
</tr>
<tr>
<td>Low-return (≤30th)</td>
<td>Low-risk, Low-return <strong>Bland</strong></td>
<td>Med-risk, Low-return <strong>Sour-1</strong></td>
<td>High-risk, Low-return <strong>Bitter Spot</strong></td>
</tr>
</tbody>
</table>

Source: Developed for this study

According to this study, the best type of mutual fund performance is the “Sweet Spot” in the upper left box, since it carries the lowest risk while delivers the highest return.
compared to its peers. It is clear according to the definition that the “Sweet Spot” is the preferable performance. This study was interested in examining the characteristic of the “Sweet Spot” funds. It used the risk-return matrix for the performance evaluation and assigned the dependent variable as a binary variable. In each calendar year, the funds that were placed in the “Sweet Spot” group were assigned the value of one. The rest were assigned the value of zero.

4.4 The Characteristics of the “Sweet Spot” funds

The Estimation of Idiosyncratic Risk ($\psi$): Following Ang et al. (2008), Fu (2008), and Goyal and Santa-Clara (2003), this study computed the idiosyncratic volatility of each mutual fund using Fama and French’s (1993) three-factor regression model. The regression equation is as follows:

$$r_n^j = \alpha_T^j + \beta_T^j (r_{mkt,n} - r_{f,n}) + s_T^j SMB + h_T^j HML + \varepsilon_n^j$$

(6)

$r_{mkt,n}$ = The market return at month $n$

$SMB$ = The size premium measured by the return of small cap stocks minus the return of big cap stocks

$HML$ = The value premium measured by the returns of high book-to-market value stocks minus the returns of low book-to-market value stocks

$\varepsilon$ = Regression residual

The measurement of the idiosyncratic risk of funds was the volatility of the regression residuals (Goyal & Santa-Clara, 2003). The regression residuals were obtained from regressing the equation (6) using historical 36-month data. The idiosyncratic volatility was a standard deviation of regression residuals, $\varepsilon_{j,T}$. The calculation can be seen in equation (7) and was annualized using equation (7.1).

$$\psi_n^j = \frac{1}{n} \sum_{j=1}^{n} \varepsilon_{j,n}^2$$

(7)

$$\psi_T^j = \psi_n^j * \sqrt{12}$$

(7.1)
\[ \psi_n^j = \text{The monthly idiosyncratic risk of fund } j \text{ during the period } T \]

\[ \psi_T^j = \text{The annualized idiosyncratic risk of fund } j \text{ at time } T \]

\[ \varepsilon_{j,n} = \text{Regression residual of fund } j \text{ at month } n \]

Fund Size (Log Size): The transformation of data into a logarithmic scale is useful when we have great variations in the value of the data. The sample fund in this study had sizes averaging from 4 million baht to 6,205 million baht. The author believed that using the logarithms in the calculation of this variable was appropriate in order to minimize the great variation in the data. This study used the logarithm of the fund size at the end of year \( T \) of the sample fund as the fund-size variable as follows.

\[ \text{LogSize}_T^j = \log (NAV_T^j) \quad (8) \]

\( NAV_T^j = \text{Net asset value of fund } j \text{ at the end of year } T \)

Fund Objective (DObj): This study used the dummy variable technique as a measurement of fund objective (DObj) and used a Morningstar style box as the basis for categorizing fund objectives (Morningstar, 2014). The assignment of the dummy variable for the fund objectives was as follows. The fund objective variable, DObj, takes a value of one if the fund is invested in the “growth stock” and zero otherwise.

Type of Parent Company (DType-parent): The type of parent company was a dummy variable. Following Nathapan (2010), this study divided the parent company of asset management firms into two groups: bank-related and non-bank-related. Out of 83 funds, bank-related asset management companies managed 48 funds and non-bank-related ones managed 35 funds. The study obtained this information from the websites of asset management companies, or annual reports. The assignment of the dummy variables for type of parent company was as follows. The type of parent company variable, DType-parent, takes a value of one if the asset management company is a subsidiary of a bank and zero otherwise.
Fund Age (Age): The fund age variable was measured in each year. The counting in a full month began from the inception date of the funds to the observed month. This study divided it by 12 in order to transform the unit into a year.

\[ Age_T^j = \frac{(No.\text{Mths})}{12} \]  

\( Age_T^j \) = Age of Fund \( j \) at time \( T \)
\( No.\text{Mths} \) = Number of months from the inception to the observed month

Total Number of Funds (No.Fund): This study obtained this variable by using the number of all funds under supervision of an asset management company published at the end of the year from www.aimc.or.th (AIMC, 2012).

Total Assets Under Management (Log AUM): The Log AUM variable was the logarithm of the total value of all assets under the management of the asset management company. This study used the total asset size as at the end of the T period.

\[ Log\ AUM_{k,T} = \log (AUM_{k,T}^k) \]  

\( AUM_{k,T}^k \) = Total assets under the management of the company \( k \) at the end of year \( T \)

The next section discusses the regression methodology used to test the second to the eighth hypothesis, which were aimed to answer the second research question.

4.5 The Regression Model

This study aimed with its second objective to ascertain the characteristics of the low-risk, high-return funds or the sweet spot funds. The methodology was set to examine hypotheses two to eight. The dependent variable was the binary variable of fund performance as explained in the section 4.3. The independent variables were the organizational factors and characteristics of the mutual funds in section 4.4. The regression was set as the following:

\[ \Pr(SS_T^j = 1) = \text{Logit} (\mu_0 + \mu_1 \psi_T^j + \mu_2 \text{Log Size}_T^j + \mu_3 \text{Obj}_T^j + \mu_4 \text{DType}_T^j - \text{parent}_k + \mu_5 \text{Age}_T^j + \mu_6 \text{No.Fund}_{k,T} + \mu_7 \text{LogAUM}_{k,T} + \varepsilon_T^j) \]  

(11)
\[ SS_T^j = \] The binary variable represents the performance of mutual fund \( j \) at time \( T \). It takes a value of one if the fund delivers a low-risk, high-return performance and zero otherwise.

\[ \psi_T^j = \] Idiosyncratic risk of fund \( j \) at time \( T \)

\[ \log \text{Size}_T^j = \] Log of size of fund \( j \) at the period \( T \)

\[ DObj^j = \] Dummy variable for fund objective of fund \( j \)

\[ DType - parent_k = \] Dummy variable for the type of the parent company of the asset management company \( k \)

\[ Age_T^j = \] Age of fund \( j \) at time \( T \)

\[ \text{No. Fund}_{k,T} = \] Total number of funds under management of an asset management company \( k \) at time \( T \)

\[ \log \text{AUM}_{k,T} = \] Log of the total assets under management of an asset management company \( k \) at time \( T \)

\[ \varepsilon_{j,t} = \] Regression residual

Since the sample funds in each year were not equal, ranging from 64 to 83 funds, this study tested the hypotheses by performing the logistic regression of equation (11) using the unbalanced panel data technique.

4.6 Enhancing Portfolio Performance with New Investment Strategies

The third objective of this study was to find out whether investors can gain some benefit from this unorthodox relationship in their investments.

4.6.1 Low-Risk Strategy vs. High-Risk Strategy

This section tests whether the strategy of investing in a low-risk mutual fund delivers returns comparable to the strategy of investing in a high-risk mutual fund, regardless of the market condition. This section simulates two portfolios with different strategies. One was the low-risk fund portfolio and the other one was a portfolio consisting of high-risk funds.
Each year the funds were ranked based on their risk. The funds ranked from the 30th percentile downward were selected to invest in the next calendar year. These funds were classified as low-risk funds and were selected to be in the low-risk portfolio. The high-risk portfolio was constructed in the similar manner except that the funds selected were the funds where the risk was ranked from the 70th percentile upward. Then, this study calculated the return of this low-risk portfolio and compared it with the high-risk portfolio using the following equations.

Equation (12) is the calculation for the average return of the portfolio consisting of low-standard deviation funds, and equation (13) is the calculation for the average return of the portfolio consisting of high-standard deviation funds.

\[
P r_{t}^{LSF} = \frac{1}{n} \sum_{i=1}^{n} r_{it}^{LS} \quad (12) \\
P r_{t}^{HSF} = \frac{1}{n} \sum_{i=1}^{n} r_{it}^{HS} \quad (13)
\]

\( P r_{t}^{LSF} \) = The average return of the portfolio consists of low-standard deviation funds.

\( r_{it}^{LS} \) = Return in year \( t \) of fund \( i \) that is a member of Set LS, and Set LS = Set of funds which have standard deviation in \( t-1 \), fall into the zero to 30th percentile.

\( P r_{t}^{HSF} \) = The average return of the portfolio consists of high-standard deviation funds.

\( r_{it}^{HS} \) = Return in year \( t \) of fund \( i \) that is a member of Set HS, and Set HS = Set of funds which have standard deviation in \( t-1 \), fall into the 70th to 100th percentile.

Apart from the use of the total volatility of the returns as risk proxy in equation (12) and (13), this study used beta as another proxy for risk in in equation (12.1) and (13.1), since the CAPM concerns only the systematic risk of assets.

\[
P r_{t}^{LBF} = \frac{1}{n} \sum_{i=1}^{n} r_{it}^{LB} \quad (12.1) \\
P r_{t}^{HBF} = \frac{1}{n} \sum_{i=1}^{n} r_{it}^{HB} \quad (13.1)
\]

\( P r_{t}^{LBF} \) = The average return of the portfolio consists of low-beta funds.

\( r_{it}^{LB} \) = Return in year \( t \) of fund \( i \) that is a member of Set LB, and Set LB = Set of funds which have beta in \( t-1 \), fall into the zero to 30th percentile.
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\[ P r_t^{HBF} = \] The average return of the portfolio consists of high-beta funds.

\[ r_{it}^{HB} = \] Return in year \( t \) of fund \( i \) that is a member of Set HB, and Set HB = Set of funds which have beta in \( t-1 \), fall into the 70th to 100th percentile.

This study calculated and compared the \( P r_t^{LSF} \) and \( P r_t^{HSF} \), as well as the \( P r_t^{LBF} \) and \( P r_t^{HBF} \) to verify whether this proposed investment enhanced the investment performance.

4.6.2 Investing in the “Sweet Spot” Performers Strategy

This simulation followed the conclusion of Brown and Goetzmann (1995)’s study that there was a performance persistence in the mutual fund industry (Brown & Goetzmann, 1995). One easy way is to invest in past-winner mutual funds. This study proposed a simple way to find out the winner funds using the feature of the risk-return matrix. The number of times each fund appeared in the "Sweet Spot" group in the matrix was tallied during 2005-2011. The funds that could make their way up to the ‘Sweet Spot’ group the most often were selected as the winners for this study. These funds were equally invested in the 2012-2014 simulation portfolio. In order to evaluate the effectiveness of this strategy, the average return of this winner portfolio was compared to the average industry return.

4.6.3 The strategy to invest in Funds with Characteristics of the “Sweet Spot” Fund

This section used the results from the regression of this study. It examined whether the characteristics, which showed a statistically-significant effect on the probability that the funds will deliver a “Sweet Spot” performance, would help investors create a portfolio that would yield returns higher than the industry average.

This study constructed portfolio \( S \), which was the set of funds that had the following conditions:

\[
S = \{ \text{Funds} | x_n > \bar{x}_n, \text{if } \mu_n > 0, x_n < \bar{x}_n, \text{if } \mu_n < 0, \} \quad (14)
\]
\( x_n = \) Coefficient of the significant explanatory variables

\( \mu_n = \) Regression coefficient from equation (11)

\( \bar{x}_n = \) Industry average value of variable \( x_n \)

Set \( S \) was the set of funds that had a value of \( x_n \) higher than the industry average value if its regression coefficient \( \mu_n \), was significantly higher than zero. It also consisted of funds that had a value of \( x_n \) lower than the average industry value if its regression coefficient \( \mu_n \) was significantly lower than zero. In order to determine the efficiency of this strategy, the study compared the return of portfolio \( S \) with the industry average return.
Chapter 5 Statistical Results

5.1 Descriptive Data on the Sample Funds

Table 3: Descriptive Data of Sample Funds

<table>
<thead>
<tr>
<th>Description</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Number of Sample Funds</td>
<td>64</td>
<td>70</td>
<td>78</td>
<td>80</td>
<td>80</td>
<td>83</td>
<td>83</td>
<td>83</td>
<td>77.6</td>
</tr>
<tr>
<td>(2) Average fund size (million)</td>
<td>564</td>
<td>478</td>
<td>602</td>
<td>347</td>
<td>465</td>
<td>545</td>
<td>483</td>
<td>718</td>
<td>525</td>
</tr>
<tr>
<td>(3) Max return</td>
<td>25.61%</td>
<td>8.33%</td>
<td>42.36%</td>
<td>-37.11%</td>
<td>76.88%</td>
<td>59.69%</td>
<td>13.72%</td>
<td>71.06%</td>
<td>32.57%</td>
</tr>
<tr>
<td>(4) Min return</td>
<td>1.25%</td>
<td>-10.76%</td>
<td>7.70%</td>
<td>-50.24%</td>
<td>24.67%</td>
<td>20.31%</td>
<td>-16.86%</td>
<td>20.57%</td>
<td>-0.42%</td>
</tr>
<tr>
<td>(5) Max-Min</td>
<td>24.36%</td>
<td>19.09%</td>
<td>34.66%</td>
<td>13.13%</td>
<td>52.21%</td>
<td>39.38%</td>
<td>30.58%</td>
<td>50.49%</td>
<td>32.99%</td>
</tr>
<tr>
<td>(6) Sample mean return</td>
<td>6.32%</td>
<td>-5.21%</td>
<td>33.16%</td>
<td>-43.45%</td>
<td>57.70%</td>
<td>41.62%</td>
<td>-3.38%</td>
<td>36.64%</td>
<td>15.43%</td>
</tr>
<tr>
<td>(7) STD</td>
<td>4.00%</td>
<td>4.44%</td>
<td>6.44%</td>
<td>3.19%</td>
<td>9.91%</td>
<td>8.89%</td>
<td>6.99%</td>
<td>9.17%</td>
<td>6.62%</td>
</tr>
<tr>
<td>(8) Total stock market return</td>
<td>10.50%</td>
<td>-0.73%</td>
<td>30.02%</td>
<td>-42.92%</td>
<td>66.08%</td>
<td>44.13%</td>
<td>2.94%</td>
<td>39.21%</td>
<td>18.90%</td>
</tr>
</tbody>
</table>

:Developed for this study

5.2 The Relationship between Risk and Return of Thai Equity Mutual Funds

In order to meet the first research objective of this study, this section tested the first hypothesis by examining the relationship between risk and return of the Thai open-end equity mutual funds as shown in Table 4 and 5.

Table 4 shows two yearly results, the return correlated with the standard deviations and the returns correlated with the beta. Table 5 shows the three-year, five-year, and ten-year correlations between the returns and standard deviations.
Table 4: The Correlation between the Risks and Returns of the Thai Open-End Equity Mutual Fund Industry from 2005-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Samples</td>
<td>64</td>
<td>70</td>
<td>78</td>
<td>80</td>
<td>80</td>
<td>83</td>
<td>83</td>
<td>83</td>
</tr>
<tr>
<td>(2) $\rho_{B,r} - \frac{r_i}{\sqrt{\sigma_i}}$, and Beta</td>
<td>.058</td>
<td>-.306***</td>
<td>.817***</td>
<td>-.515***</td>
<td>.553***</td>
<td>.481***</td>
<td>-.718***</td>
<td>-.745***</td>
</tr>
<tr>
<td>(3) $\rho_{S,r} - \frac{r_i}{\sqrt{\sigma_i}}$, and Annualized STD</td>
<td>-.428***</td>
<td>-.326***</td>
<td>.794***</td>
<td>-.613***</td>
<td>.637***</td>
<td>.256**</td>
<td>-.671***</td>
<td>-.337***</td>
</tr>
<tr>
<td>(4) Total market return</td>
<td>10.50%</td>
<td>-0.73%</td>
<td>30.02%</td>
<td>-42.92%</td>
<td>68.08%</td>
<td>44.13%</td>
<td>2.94%</td>
<td>39.21%</td>
</tr>
<tr>
<td>(5) Average industry</td>
<td>6.32%</td>
<td>-5.21%</td>
<td>33.16%</td>
<td>-43.45%</td>
<td>57.70%</td>
<td>41.62%</td>
<td>-3.38%</td>
<td>36.65%</td>
</tr>
</tbody>
</table>

*** Correlation is significant at the 0.01 level  
** Correlation is significant at the 0.05 level

For convenience in using Table 4, the negative correlation numbers are bolded. The table reveals the significant negative correlations in 2005, 2006, 2008, 2011, and 2012, and the significant positive correlations in 2007, 2009, and 2010. Though a negative correlation was not found in every period during 2005-2012, the Thai open-end equity mutual fund industry did post more negative-correlation years than positive ones.

The negative results in Table 4 could have accidentally happened due to some economic shocks in that year. In order to reduce the effect of that shock, this study expanded the correlation period into three, five, and ten years. Table 5 shows the results.

Both results in Table 4 and 5 documented that the open-end equity mutual fund industry in Thailand occasionally posted a negative relationship between risk and return in some individual years, as shown in Table 4, and some three-year and five-year intervals during 2003-2012, as shown in Panel A and B, Table 5. It also posts a significant negative relationship in the annualized ten-year cumulative investment in Panel C, Table 5.
The results from Table 4 and 5 led the author to reject the null hypothesis $H_0$, which stated that there is a positive or no relationship between risk and return in Thai open-end equity mutual funds industry. This result agreed with the conclusion of Brockett et al. (1992) and Cooper et al. (2011), that there could be a negative relationship between risks and returns the mutual funds industry.

### 5.3 Fund Performance as Dependent Variable

Using the risk-return matrix methodology as discussed in Chapter 4, for every year, this study classified the fund performance into nine groups. Table 6 distributes the samples into these nine groups.

Table 6 shows that during the study period, the industry had 71 fund-years with “Sweet Spot” performance and 550 fund-years with other types of performance.
Table 6: The Distribution of Fund Performance during 2005-2012

For each year, the samples are categorized into nine types of fund according to their characteristic of the level of risk and return. The numbers in the column under each year are the distribution of the sample funds in those years into the nine types of fund. The total number of samples in each year is presented in the last row. The total numbers in the far right column are a summation of each type of fund from 2005 to 2012. This study had 621 fund-year samples.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Return</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>High</td>
<td>10</td>
<td>5</td>
<td>7</td>
<td>13</td>
<td>0</td>
<td>9</td>
<td>17</td>
<td>10</td>
<td>71</td>
<td>Sweet Spot</td>
</tr>
<tr>
<td>Medium</td>
<td>Medium</td>
<td>8</td>
<td>7</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>14</td>
<td>65</td>
<td>Umami-1</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>2</td>
<td>9</td>
<td>14</td>
<td>2</td>
<td>15</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>52</td>
<td>Bland</td>
</tr>
<tr>
<td>Medium</td>
<td>High</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>7</td>
<td>13</td>
<td>2</td>
<td>5</td>
<td>12</td>
<td>53</td>
<td>Umami-2</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>7</td>
<td>10</td>
<td>18</td>
<td>23</td>
<td>11</td>
<td>17</td>
<td>22</td>
<td>16</td>
<td>124</td>
<td>Salty</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>14</td>
<td>11</td>
<td>8</td>
<td>2</td>
<td>8</td>
<td>14</td>
<td>6</td>
<td>5</td>
<td>68</td>
<td>Sour-1</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
<td>7</td>
<td>9</td>
<td>13</td>
<td>4</td>
<td>11</td>
<td>14</td>
<td>3</td>
<td>3</td>
<td>64</td>
<td>Hot</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>9</td>
<td>11</td>
<td>9</td>
<td>0</td>
<td>12</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>56</td>
<td>Sour-2</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>20</td>
<td>1</td>
<td>3</td>
<td>18</td>
<td>19</td>
<td>68</td>
<td>Bitter</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>64</td>
<td>70</td>
<td>78</td>
<td>80</td>
<td>80</td>
<td>83</td>
<td>83</td>
<td>83</td>
<td>621</td>
<td></td>
</tr>
</tbody>
</table>

Table 7: The Risk-Return Matrix for 2005-2012

The table combines the sample distribution funds during 2005-2012 into nine types of fund performance. The italic bolded numbers are the number of funds that fell into that category. The average return of each group is shown in percentage number. The average standard deviation is shown in parentheses.

<table>
<thead>
<tr>
<th>Return</th>
<th>Risk</th>
<th>Low-Risk</th>
<th>Medium-Risk</th>
<th>High-Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>“Sweet Spot” = 71</td>
<td>“Umami-2” = 53</td>
<td>“Hot” = 64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.46% (15.97%)</td>
<td>25.59% (17.56%)</td>
<td>25.77% (18.68%)</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>“Umami-1” = 65</td>
<td>“Salty ” = 124</td>
<td>“Sour-2” = 56</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17.66% (16.21%)</td>
<td>17.53% (17.55%)</td>
<td>17.55% (19.05%)</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>“Bland” = 52</td>
<td>“Sour-1” = 68</td>
<td>&quot;Bitter Spot” = 68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.39% (16.52%)</td>
<td>11.92% (17.62%)</td>
<td>11.66% (18.74%)</td>
<td></td>
</tr>
</tbody>
</table>
Table 7 shows that out of the total sample of 621 observations during 2005-2012, 71 observations exhibited a “Sweet Spot” performance with average return of 25.46% and standard deviation of 15.97%.

Table 7 also added other evidence—that Thai open-end equity mutual fund did not have a positive relationship during 2005-2012. The 621 observations are scattered over the nine boxes rather than clustered around the “Bland,” “Salty,” and “Hot” boxes. If we expect a high-risk, high-return relationship, the observations should form to demonstrate an upward slope from low-risk, low-return, to medium-risk, medium-return, and high-risk, high-return. Table 7 does not reveal such a pattern.

In the following diagram, this study demonstrates and discusses the risk and return of each group.

**Figure 3: The Average Performance of Each Group during 2005-2012**

<table>
<thead>
<tr>
<th>Group</th>
<th>Return</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet Spot</td>
<td>25.46%</td>
<td>15.97%</td>
</tr>
<tr>
<td>Umami-1</td>
<td>17.66%</td>
<td>16.21%</td>
</tr>
<tr>
<td>Bland</td>
<td>11.39%</td>
<td>16.52%</td>
</tr>
<tr>
<td>Umami-2</td>
<td>25.59%</td>
<td>17.56%</td>
</tr>
<tr>
<td>Salty</td>
<td>11.92%</td>
<td>17.55%</td>
</tr>
<tr>
<td>Sour-1</td>
<td>25.77%</td>
<td>17.55%</td>
</tr>
<tr>
<td>Hot</td>
<td>17.53%</td>
<td>17.55%</td>
</tr>
<tr>
<td>Sour-2</td>
<td>11.92%</td>
<td>17.62%</td>
</tr>
<tr>
<td>Bitter Spot</td>
<td>25.77%</td>
<td>18.68%</td>
</tr>
</tbody>
</table>

Source: Developed for this study

Focusing on the first three bars, the “Sweet Spot”, the “Umami-1”, and the “Bland” represent low risk groups since their risks are within the first 30th percentile. Within this group,
the “Sweet Spot” has the lowest risk of all at 15.97\% versus 16.21 \% and 16.52 \%, despite its highest return at 25.46 \% versus 17.66 \% and 11.39 \%. This information emphasizes the outstanding performance of the “Sweet Spot’ group when compared to peers.

5.4 Logistic Regression

In order to test the second hypothesis to the eighth hypothesis for the second research objective, which aimed to find out the characteristics of the “Sweet Spot” fund, this study performed a logistic regression using unbalance panel data analysis.

5.4.1 The Hausman Test

In the process of performing the Hausman test to decide whether to use the fixed-effect model or the random-effect model, this study found that the fixed-effect model dropped 370 observations. A possible explanation for this occurrence is multicollinearity. The model in this study contained two dummy variables, the $DObj$ and the $DType-parent$. The mechanism of the fixed-effect model was to create dummy variables for those fixed effects. This was done in order to control for the differences across groups; hence, the model relied on a reasonable amount of within-group variation. Having a dummy variable as a predictor reduces the within-group variation.

Due to this significant limitation in the data for the fixed-effect model, this study used the random-effect model in performing the logistic regression.

5.4.2 The Regression

The statistical results from the logistic regression using the random-effect model are shown in Table 8. Though it is more applicable to use the random-effect model than the fixed-effect model, this study shows the result of both models in Table 8 for comparison purposes.
Table 8: The Logistic Regression of the Characteristics of the Low-Risk, High-Return Fund

\[ Pr(SS^j = 1) = \text{Logit}(\mu_0 + \mu_1 \psi^j + \mu_2 \text{Log Size}^j + \mu_3 \text{DOB}^j + \mu_4 \text{DType} - \text{parent}_k + \mu_5 \text{Age}^j + \mu_6 \text{No. Fund}_k + \mu_7 \text{Log AUM}_k + \epsilon^j) \]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model (1): Fixed-effect</th>
<th></th>
<th>Model (2): Random-effect</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef.</td>
<td>z</td>
<td>P&gt;</td>
<td>z</td>
</tr>
<tr>
<td>( \psi )</td>
<td>0.299</td>
<td>1.97</td>
<td>0.048 **</td>
<td>0.419</td>
</tr>
<tr>
<td>\text{Log Size}</td>
<td>-0.244</td>
<td>-0.80</td>
<td>0.425</td>
<td>-0.042</td>
</tr>
<tr>
<td>\text{DOBj}</td>
<td>(omitted)</td>
<td>-</td>
<td>-</td>
<td>-0.045</td>
</tr>
<tr>
<td>\text{DType} - \text{parent}</td>
<td>(omitted)</td>
<td>-</td>
<td>-</td>
<td>-0.239</td>
</tr>
<tr>
<td>\text{Age}</td>
<td>0.236</td>
<td>2.12</td>
<td>0.034 **</td>
<td>0.101</td>
</tr>
<tr>
<td>\text{No. Fund}</td>
<td>0.007</td>
<td>0.64</td>
<td>0.524</td>
<td>-0.014</td>
</tr>
<tr>
<td>\text{Log AUM}</td>
<td>-1.802</td>
<td>-2.42</td>
<td>0.016 **</td>
<td>0.294</td>
</tr>
<tr>
<td>\text{Constant}</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-11.083</td>
</tr>
<tr>
<td>\text{No. obs}</td>
<td>251</td>
<td></td>
<td></td>
<td>621</td>
</tr>
<tr>
<td>\text{Chi2(df)}</td>
<td>14.04(5)</td>
<td></td>
<td></td>
<td>25.13(7)</td>
</tr>
<tr>
<td>\text{Prob&gt;Chi2}</td>
<td>0.0154 **</td>
<td></td>
<td></td>
<td>0.0007 ***</td>
</tr>
</tbody>
</table>

*** = significance at the 0.01 level.
** = significance at the 0.05 level

From Table 8, the idiosyncratic risk of fund, \( \psi \), shows its significant effect at the 99% confidence level on fund performance, as its p-value = 0.000. Fund age, \( \text{Age} \), and the total number of funds, \( \text{No. Fund} \), are significant at the 95% confidence level with p-values = 0.011 and 0.038, respectively. Other variables do not significantly affect the probability that a fund will deliver sweet spot performance.

The coefficient of 0.419 of the idiosyncratic risk (\( \psi \)) indicates that, holding other variables at fixed value, the fund with higher idiosyncratic risk is more likely to deliver “Sweet Spot” performance than a fund with lower idiosyncratic risk. The dy/dx value of 0.0262 indicates the marginal effect of the variable. The one unit increase in idiosyncratic risk
significantly increases the probability that that the fund will deliver “Sweet Spot” performance by 2.62%.

The \textit{Age} coefficient of 0.101 indicates that holding the other variables at fixed value, an older fund is more likely to deliver “Sweet Spot” performance than a younger fund. The \(\frac{dy}{dx}\) value of 0.0063 indicates that, as a fund gets older by one year, the probability that the fund will deliver “Sweet Spot” performance will increase by 0.63%.

The \textit{No.Fund} coefficient of -0.014 indicates that holding the other variables at fixed value, the fund under the supervision of an asset management company that manages a large number of funds is less likely to deliver “Sweet Spot” performance compared to funds under the supervision of an asset management company that manages a smaller number of funds. The \(\frac{dy}{dx}\) value of -0.0009 indicates that if the company increases the number of funds under its management by one, it will decrease the probability that the fund under its supervision will achieve “Sweet Spot” performance by 0.09%.

Table 8 shows the probability of getting greater chi-square is significant at 0.0007. It leads this study to conclude that the overall model is statistically significant.

From the regression results, this study concluded that the idiosyncratic risk of funds and the age of funds have significant positive effects on the probability that a fund will deliver low risk-high return performance. The total number of funds under the management of an asset management company has a significant negative effect on the probability that a fund will deliver “Sweet Spot”, low risk-high return performance.

\textbf{5.5 Summary of the Results of the Hypothesis Testing}

Table 9 summarizes all of the hypotheses of this study and their findings.
### Table 9: The Summary of the Results of the Hypothesis Testing

<table>
<thead>
<tr>
<th>The Hypotheses</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>$H_01$: There is a significant positive or no relationship between risk and return in the Thai open-end equity mutual funds industry.</strong></td>
<td>Rejected the null hypothesis and found a significant negative relationship from time to time</td>
</tr>
<tr>
<td><strong>$H_02$: The idiosyncratic risk of a fund has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</strong></td>
<td>Rejected the null hypothesis and found a significant positive relationship</td>
</tr>
<tr>
<td><strong>$H_03$: Fund size has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</strong></td>
<td>Failed to reject the null hypothesis</td>
</tr>
<tr>
<td><strong>$H_04$: Fund objective has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</strong></td>
<td>Failed to reject the null hypothesis</td>
</tr>
<tr>
<td><strong>$H_05$: The type of parent company of an asset management company has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</strong></td>
<td>Failed to reject the null hypothesis</td>
</tr>
<tr>
<td><strong>$H_06$: Fund age has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</strong></td>
<td>Rejected the null hypothesis and found a significant positive relationship</td>
</tr>
<tr>
<td><strong>$H_07$: The number of funds under the management of an asset management company has no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</strong></td>
<td>Rejected the null hypothesis and found a significant negative relationship</td>
</tr>
<tr>
<td><strong>$H_08$: The total assets under the management of an asset management company have no significant effect on the probability that a Thai open-end equity mutual fund will deliver a low-risk, high-return performance.</strong></td>
<td>Failed to reject the null hypothesis</td>
</tr>
</tbody>
</table>
5.6 Alternative investment Strategies

The statistical tests in this section are provided in order to meet the third objective of this study. They were to find out whether investors can capitalize on this unorthodox relationship and apply the results of this study to enhance their portfolio return. This study offered three simulations below.

5.6.1 Low-Risk Strategy vs High-Risk Strategy

Two types of risk were tested.

A. The low-standard deviation strategy vs the high standard deviation strategy: Table 10 shows that in Panel A, B, and C, the simulation results indicate the superior returns of the low standard deviation strategies compared to the high standard deviation strategies in 2006, 2008, 2011, and 2012, and the inferior performance in 2007, 2009, and 2010. However, when looking at the total period, the arithmetic mean of all seven years from 2006-2012 indicates the superior performance of the low-standard deviation strategies over the high-standard deviation strategies in all three panels.

Table 10: The Portfolio of the Low-Standard Deviation Funds vs. the High-Standard Deviation Funds

\[
\begin{align*}
PT_{t}^{LSF} & = \frac{1}{n} \sum_{i=1}^{n} r_{it}^{LS} \\
PT_{t}^{HSF} & = \frac{1}{n} \sum_{i=1}^{n} r_{it}^{HS}
\end{align*}
\]

STD is the standard deviation of fund returns. In Panel A, the equal-weighted return of low STD funds, in row (1), was computed using equation (12), where \( r_{it}^{LS} \) was the return of fund \( i \) in Set LS, which is the set of funds that have risk in \( t-1 \) falling into 0th - 30th when ranked by the standard deviation. The number in the parentheses under the average return of each year is the annualized standard deviation, and the italic number represents the number of funds selected. Row (2) Panel A reports an equal-weighted return of the high risk portfolio. It was computed using equation (13), where \( r_{it}^{HS} \) was the return of fund \( i \) in Set HS, which was the set of funds that had risk in \( t-1 \) falling into 70th - 100th when ranked by the standard deviation. Row (3) is the difference between the two strategies. Panel B follows the same demonstrations process, but changes the percentile cut-off to 0th - 15th and 85th - 100th. Panel C is the return of the portfolio of the ten lowest and ten highest STD funds. Panel D shows the industry average return in row (10) and the annualized total market stock return in row (11).
<table>
<thead>
<tr>
<th>Return/Risk</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Average</th>
<th>Cumulative Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Low VS High STD Strategy at 30\textsuperscript{th} percentile and 70\textsuperscript{th} percentile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Equal-weighted return of low STD (30\textsuperscript{th}) LS-30</td>
<td>-2.08%</td>
<td>33.38%</td>
<td>-40.21%</td>
<td>53.51%</td>
<td>37.31%</td>
<td>2.77%</td>
<td>45.81%</td>
<td>18.64%</td>
<td>147%</td>
</tr>
<tr>
<td></td>
<td>(16.36%)</td>
<td>(19.41%)</td>
<td>(33.27%)</td>
<td>(17.93%)</td>
<td>(16.43%)</td>
<td>(19.59%)</td>
<td>(12.67%)</td>
<td>(19.38%)</td>
<td></td>
</tr>
<tr>
<td>(2) Equal-weighted return of high STD (70\textsuperscript{th}) HS-30</td>
<td>-5.73%</td>
<td>36.69%</td>
<td>-46.08%</td>
<td>60.22%</td>
<td>47.67%</td>
<td>-3.91%</td>
<td>28.69%</td>
<td>16.79%</td>
<td>103%</td>
</tr>
<tr>
<td></td>
<td>(17.18%)</td>
<td>(19.81%)</td>
<td>(36.79%)</td>
<td>(22.60%)</td>
<td>(17.94%)</td>
<td>(22.38%)</td>
<td>(13.48%)</td>
<td>(21.46%)</td>
<td></td>
</tr>
<tr>
<td>(3) = (1) - (2)</td>
<td>3.66%</td>
<td>-3.31%</td>
<td>5.87%</td>
<td>-6.71%</td>
<td>-10.35%</td>
<td>6.67%</td>
<td>17.12%</td>
<td>1.85%</td>
<td>43.4%</td>
</tr>
<tr>
<td>B. Low vs. High STD Strategy at 15\textsuperscript{th} percentile and 85\textsuperscript{th} percentile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Equal-weighted return of low STD (15\textsuperscript{th}) LS-15</td>
<td>-0.64%</td>
<td>33.92%</td>
<td>-40.30%</td>
<td>47.79%</td>
<td>36.11%</td>
<td>6.97%</td>
<td>50.94%</td>
<td>19.26%</td>
<td>158%</td>
</tr>
<tr>
<td></td>
<td>(15.97%)</td>
<td>(19.07%)</td>
<td>(33.42%)</td>
<td>(16.86%)</td>
<td>(15.53%)</td>
<td>(18.64%)</td>
<td>(13.20%)</td>
<td>(18.98%)</td>
<td></td>
</tr>
<tr>
<td>(5) Equal-weighted return of high STD (85\textsuperscript{th}) HS-15</td>
<td>-4.86%</td>
<td>34.78%</td>
<td>-47.15%</td>
<td>61.17%</td>
<td>44.35%</td>
<td>-6.26%</td>
<td>27.60%</td>
<td>15.66%</td>
<td>88.58%</td>
</tr>
<tr>
<td></td>
<td>(17.17%)</td>
<td>(19.32%)</td>
<td>(37.90%)</td>
<td>(21.89%)</td>
<td>(17.86%)</td>
<td>(23.71%)</td>
<td>(13.46%)</td>
<td>(21.61%)</td>
<td></td>
</tr>
<tr>
<td>(6) = (4) - (5)</td>
<td>4.22%</td>
<td>-0.85%</td>
<td>6.85%</td>
<td>-13.38%</td>
<td>-8.24%</td>
<td>13.22%</td>
<td>23.34%</td>
<td>3.60%</td>
<td>69.44%</td>
</tr>
<tr>
<td>C. Ten Lowest vs Ten Highest STD Funds Strategy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7) Equal-weighted return of low STD (Lowest 10) LS-10</td>
<td>-0.64%</td>
<td>34.85%</td>
<td>-40.67%</td>
<td>47.12%</td>
<td>35.95%</td>
<td>7.87%</td>
<td>52.32%</td>
<td>19.40%</td>
<td>159%</td>
</tr>
<tr>
<td></td>
<td>(15.97%)</td>
<td>(18.88%)</td>
<td>(33.55%)</td>
<td>(16.89%)</td>
<td>(15.05%)</td>
<td>(18.68%)</td>
<td>(13.21%)</td>
<td>(18.89%)</td>
<td></td>
</tr>
<tr>
<td>(8) Equal-weighted return of high STD (Top 10) HS-10</td>
<td>-4.86%</td>
<td>34.20%</td>
<td>-47.29%</td>
<td>59.59%</td>
<td>43.94%</td>
<td>-5.71%</td>
<td>28.11%</td>
<td>15.43%</td>
<td>86.74%</td>
</tr>
<tr>
<td></td>
<td>(17.17%)</td>
<td>(19.23%)</td>
<td>(38.09%)</td>
<td>(21.43%)</td>
<td>(18.03%)</td>
<td>(13.45%)</td>
<td>(13.29%)</td>
<td>(21.53%)</td>
<td></td>
</tr>
<tr>
<td>(9) = (7) – (8)</td>
<td>4.22%</td>
<td>-0.35%</td>
<td>6.62%</td>
<td>-12.47%</td>
<td>-7.99%</td>
<td>13.58%</td>
<td>24.21%</td>
<td>3.97%</td>
<td>72.57%</td>
</tr>
<tr>
<td>D. Mutual Fund Industry and Total Stock Market</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(10) Average return of industry</td>
<td>-5.21%</td>
<td>33.16%</td>
<td>-43.45%</td>
<td>57.70%</td>
<td>41.62%</td>
<td>-3.38%</td>
<td>36.65%</td>
<td>16.73%</td>
<td>110%</td>
</tr>
<tr>
<td></td>
<td>(16.59%)</td>
<td>(19.27%)</td>
<td>(34.62%)</td>
<td>(20.18%)</td>
<td>(17.56%)</td>
<td>(22.04%)</td>
<td>(13.26%)</td>
<td>(20.50%)</td>
<td></td>
</tr>
<tr>
<td>(11) Total stock market return</td>
<td>-0.73%</td>
<td>30.02%</td>
<td>-42.92%</td>
<td>68.08%</td>
<td>44.13%</td>
<td>2.94%</td>
<td>39.21%</td>
<td>20.10%</td>
<td>155%</td>
</tr>
</tbody>
</table>
The 2006-2012 cumulative return in the far right column also reveals the superiority of the low-risk strategies over the high-risk strategies in all three panels. The cumulative return of investing in the funds with the lowest 30th percentile risk (LS-30) in row (1) is higher than the cumulative return of investing in the funds with the highest 70th percentile risk (HS-30) in row (2) by 43.40%. The cumulative return of investing in the funds with the lowest 15th percentile risk (LS-15), in row (4), is higher than the cumulative return of investing in the funds with the highest 85th percentile risk in (HS-15), in row (5), by 69.44%. The cumulative return of investing in the ten funds with the lowest risk (LS-10) in row (7) is higher than the cumulative return of investing in the ten funds with the highest risk (HS-10) in row (8) by 72.57%.

In summary, Table 10 demonstrates that the three investment strategies which invested in the low-standard deviation funds, selected from $t-1$, during 2006-2012, yielded a higher return than investing in the high-standard deviation funds during the same period. Using the information from Table 10, Figure 4 shows the scatter plots of the average return and standard deviation of each strategy during 2006-2012.

**Figure 4: The Scatter Plot between the Average Returns and Standard Deviations of the Portfolios during 2006-2012**

The markers in the graph represent the average return and average standard deviation of the different portfolios as follows:
LS-30 = The portfolio of the low-standard deviation funds that were ranked in the 30th percentile and below
LS-15 = The portfolio of the low-standard deviation funds that were ranked in the 15th percentile and below
LS-10 = The portfolio of the ten lowest standard deviation funds
HS-30 = The portfolio of the low-standard deviation funds that were ranked in the 70th percentile and above
HS-15 = The portfolio of the low-standard deviation funds that were ranked in the 85th percentile and above
HS-10 = The portfolio of the ten highest standard deviation funds

Figure 4 illustrates an interesting outcome with its downward pattern. The seven-year average returns of low-standard deviation strategies (LS) are all higher than the seven-year average returns of the high-standard deviation strategies (HS). The points LS-30, LS-15, and LS-10 are all on the upper left of the graph, while the points HS-30, HS-15, and HS-10 are all at the lower right of the graph. All “LS” strategies have an average return ranging from 18.34% - 19.40% with a standard deviation of 18.89% -19.38%, while the “HS” strategies have an average return ranging from 15.44% - 16.79% with a standard deviation of 21.46% -21.61%. It can be inferred from Figure 4 that the “LS” strategy of this study is superior to the “HS” strategy of this study.

B. The low-beta strategy vs the high-beta strategy: The methodology of this section was the same as the methodology in previous section, but the ranking criteria were changed to the beta of funds. The results showed that the cumulative return of all three types of portfolio with low-beta funds were higher than that of high-beta funds by 31%-66%. To save space, this study will not demonstrate its empirical result here. However, the results confirmed the superiority of low risk strategy over the high-risk strategy during the studying period.
5.6.2 Investing in the “Sweet Spot” Performers

This second simulation requires some data preparation on the part of the investor. Prior to the construction of the portfolio, investors need to do a simple analysis of the risk and return level of funds using the Risk-return Matrix proposed by this study. Each year the matrix offers “Sweet Spot” funds. This study tallied the frequency at which each fund fell into the “Sweet Spot” performance during 2005-2011. The simulated portfolio would invest in these funds which, by definition of this study, are the best performers. The results are shown in Figure 5.

Figure 5: The Distribution of Funds with a “Sweet Spot” Performance (2005-2011)

![Bar chart showing the distribution of funds with a Sweet Spot performance during 2005-2011.](chart)

Source: Developed for this study

Figure 5 demonstrates that during the seven-year period, from 2005-2011, there were five funds that reached the “Sweet Spot” four times in seven years. Four funds were rated “Sweet Spot” three times in seven years, and four others that were rated the “Sweet Spot” two out of seven years. Eight funds were able to make it to this group one time, while there were 43 funds that had never reached the “Sweet Spot” performance at all.
This study tested whether investing in funds with a strong history of a “Sweet Spot” performance would yield a favourable return. The results are shown in Table 11.

**Table 11: The Return and Standard Deviation of the Portfolio of the “Sweet Spot” Winner**

The table presents a 2012-2014 portfolio of five funds selected from the “Sweet spot” winner, evaluated during the period 2005-2011. The return and risk of the five selected funds are in rows (1) to (5). The average return and risk of the selected funds are in row (6) and the industry averages are in row (7). Row (8) is the difference between the two.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Fund # 4</td>
<td>79.43%</td>
<td>17.24%</td>
</tr>
<tr>
<td>(2) Fund # 5</td>
<td>71.87%</td>
<td>12.43%</td>
</tr>
<tr>
<td>(3) Fund # 7</td>
<td>73.32%</td>
<td>12.33%</td>
</tr>
<tr>
<td>(4) Fund # 8</td>
<td>72.58%</td>
<td>12.25%</td>
</tr>
<tr>
<td>(5) Fund # 11</td>
<td>64.46%</td>
<td>12.79%</td>
</tr>
<tr>
<td>(6) Equally-weighted of the selected five</td>
<td>72.33%</td>
<td>13.41%</td>
</tr>
<tr>
<td>(7) Industry average</td>
<td>58.11%</td>
<td>15.16%</td>
</tr>
</tbody>
</table>

(8) = (6)-(7) | 14.22% | (1.75)%

Table 11 demonstrates the aggregated return of investment during the 2012-2014. Rows (1) to (5) are the three-year aggregated return investment of the funds with the highest frequency into the ‘Sweet Spot” performance during 2005-2011. The results show the superior return of this selected portfolio compared to the industry average. The average return of these five “Sweet Spot” winners, in row (6), is 72.33% while for the industry, in row (7), it is at 58.11%. The average standard deviation of these five “Sweet Spot” winners is 13.41% while for the industry, in row (7), it is 15.16%. The difference in row (8) shows that, during 2012-2014, the simulated portfolio delivered a return higher than the industry average by 14.22%, while carried lower risk.
Using the risk-return matrix proposed earlier, this study offers a second alternative investment strategy, which shows that the ability to select high frequency “Sweet Spot” performers may enhance the portfolio return by not necessarily assuming higher risk.

5.6.3 The Portfolio Emphasizing the Characteristics of the Sweet Spot Fund

This third strategy utilized the regression results from the regression. This section simulates the portfolio consisting of funds with these characteristics called “Portfolio S” as shown below.

\[
S = \{\text{Funds}|\psi > \overline{\psi}, \text{Age} : \overline{\text{Age}}, \text{No. Fund} : \overline{\text{No. Fund}}\}
\]

This study filtered those three variables using the marginal effects, dy/dx, as their criteria. As a result, Portfolio S consisted of funds that had an idiosyncratic risk level higher than the industry average, were older than the industry-average fund age, and were managed by an asset company that had a lower number of funds under management than the industry average, at t-1. This study simulated the investment of portfolio S at time t. The results can be seen in Table 12.

| Table 12: Portfolio Emphasizing the Characteristics of the “Sweet Spot” Fund |
|-------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Portfolio                          | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | Average | Cumulative |
| (1) Funds with \( \psi \) higher than average |        |        |        |        |        |        |        |         |          |          |
| \( \psi \)                          | -3.70% | 33.93% | -42.17%| 54.63% | 35.44% | -1.66% | 36.59% | 16.15%   | 110%      |
| \( \psi \)                         | (17.06%) | (18.63%) | (33.60%) | (18.72%) | (17.37%) | (22.70%) | (13.59%) | (20.24%) |          |
|                                    | 28     | 18     | 30     | 32     | 30     | 26     | 44     |          |          |
| (2) Funds with \( \psi \) and Age higher than average |        |        |        |        |        |        |        |         |          |          |
| \( \psi \) and Age                  | -2.68% | 33.60% | -41.20%| 50.25% | 32.47% | -2.06% | 43.08% | 16.21%   | 113%      |
| \( \psi \) and Age                  | (16.81%) | (18.36%) | (32.86%) | (17.94%) | (16.33%) | (21.89%) | (13.18%) | (19.62%) |          |
|                                    | 18     | 14     | 14     | 14     | 14     | 10     | 21     |          |          |
| (3) Funds with \( \psi \) and Age higher than average and No.Fund lower than average |        |        |        |        |        |        |        |         |          |          |
| \( \psi \) and Age                  | -0.19% | 33.60% | -41.20%| 48.27% | 31.45% | 3.04%  | 46.14% | 17.30%   | 130%      |
| \( \psi \) and Age                  | (16.95%) | (18.36%) | (32.86%) | (17.56%) | (16.15%) | (20.34%) | (13.05%) | (19.32%) |          |
|                                    | 10     | 14     | 14     | 12     | 12     | 6      | 16     |          |          |
| (4) Industry average                | -5.21% | 33.16% | -43.45%| 57.70% | 41.62% | -3.38% | 36.65% | 16.73%   | 110%      |

The results in Table 12 show that the portfolio return conditioning on these characteristics performed better than the industry average. Row (1) shows the portfolio
consisting of funds that had an idiosyncratic risk higher than the industry average. Its average return was 16.15\%, the average standard deviation was 20.24\%, and the cumulative return was 110\%. In Row (2), the portfolio added one more filter. It took out the fund with an age lower than the industry average. This process slightly increased the portfolio return to 16.21\% while decreased its volatility to 19.62\%. Row (3) shows the results after another filter, the funds that were managed by the company with a high number of funds under management, were taken out. The cumulative return of the selected funds in row (3) is 20 \% higher than the industry average, in row (4), at 130\%-110\%.

The simulation approach in section 5.6 reveals some useful results. Section 5.6.1 simulated the simplest strategy. Investors just selected and invested in the low-risk fund compared to their peers and still got a higher return. The simulation in section 5.6.2 added a ranking analysis of the fund performance. This strategy was trying to capitalize from the funds suggested by risk-return matrix. The result revealed that if investors believe in a “Sweet Spot” winner, evaluated by the matrix, and invest in these funds, they should get higher portfolio performance than the industry average. The third experiment in section 5.6.3 used the significant characteristics suggested by the regression results. This study screened funds at \( t-1 \) based on these characteristic criteria and invested in the subsequent year. This portfolio gave a return higher than the industry average.

Section 5.6 offered three new investment strategies. This section was set to meet the third objective of this study. The results from Section 5.6 found that, in the mutual fund market where a negative relationship between risk and return exists, there could be strategies that assist investors in managing their mutual fund investment such that they will receive a higher return while not assuming a higher risk.
Chapter 6 Conclusion and Implications

6.1 Overview of the Study

Bowman (1980) introduced controversial results concerning the negative relationship between risk and return in his examination of the correlation between the return on equity ratio of a firm (ROE) and the standard deviation of ROE. The study implied that a high-return company has lower risk. Bowman (1980) offered the Bowman paradox as another angle on asset pricing study, which traditionally believed that a high return could be expected from the high-risk investment. The issue brought about many subsequent studies. Those studies offered various hypotheses to explain the paradox. Andersen (2007) concisely summarised the direction of that literature into three groups. The first group was interested in the behaviour of the investment decision maker and used behavioural theory, such as the prospect theory, to explain the paradox. The second group was interested in the organizational factors that explained the paradox through the fundamental factors of the firm. The third group suspected that the paradox occurred from risk misspecification. Most of these studies examined the paradox using the industrial sector as their sample rather than the financial sector, such as banks or mutual funds. However, the two recent works of Brockett et al. (1992) and Cooper et al. (2011) studied the paradox using the U.S. mutual fund as their sample.

This study has extended the paradox into the Asian context for various reasons. First, the Asian market is a high-potential investment market with assets under management of 129.2 billion USD in 2013 and the Bowman paradox is an argument against the high-risk, high-return notion of the asset pricing subject. Knowing more about the paradox in the Asian context will help our understanding of the asset-pricing subject better. Second, the literature on the mutual fund in the Asian context is limited, and this study will certainly be beneficial for future investigation of the mutual fund industry in Asia. This study used the Thai market as its
sample because the Thai stock market is considered structured—its capitalization in 2014 had the highest trading value within ASEAN for three consecutive years (SET, 2015).

This study is sought answers to three research questions. First, it wanted to find out whether there was a negative relationship between risk and return in Thai open-end equity mutual fund industry. Second was to find out which characteristics of funds would affect the probability that the funds can deliver a low-risk, high-return performance. Third was to find out whether the results of this study can be used to enhance the investment return.

This study set the first hypothesis under the first research question. It hypothesised that there is a negative relationship between the risk and return of Thai open-end equity mutual funds. This study used the Pearson product moment correlation between the return versus the standard deviation and the return versus the beta of funds as its methodology to answer this question. The discussion of the findings is in part (1) of section 6.2.

In order to address the second research question, this study constructed seven hypotheses to find out the effect of seven variables on the probability that a fund will deliver a low-risk, high-return performance. This study used unbalanced panel data logistic regression as its methodology for this objective. A 95 percent confidence level was used to determine the significance of the tests. The findings are discussed in part (2) of section 6.2.

In order to answer the third research question, this study simulated three types of portfolios. The first simulation was the comparison of the return of the low-risk fund portfolio versus the high-risk fund portfolio. The second type was the portfolio consisting of the fund suggested by the risk-return matrix, the performance measurement proposed in this study. The third portfolio consisted of funds filtered according to the results of the regression of this study. The findings are discussed in part (3) of section 6.2.

6.2 Summary of the Findings

This section summarises the findings that answered the three research questions.
(1) Does the Thai open-end equity mutual fund industry have a negative relationship between risk and return?

This study suggests that there could be a negative risk-return relationship in the Thai open-end equity mutual fund industry from time to time. The Pearson product moment correlation between risk and return during the study period of 2003-2012 showed that there was a significant negative relationship with a correlation of -0.299 between the risk and return of the sample funds during this ten-year period. When examining different frequencies, one-year, three-year, and five-year periods, the results documented the presence of a negative relationship between risk and return in the industry as follows: in the eight one-year period tests of the correlation between the returns and standard deviations, there were five significant negative relationships and three significant positive relationships. In the eight three-year period tests of the correlation, there were three significant negative relationships, two significant positive relationships, and three non-significant ones.

In the six five-year period tests of such correlation, there were three significant negative relationships, one significant positive relationship, and two non-significant ones. Although the results showed mix types of correlations, there were more negative-correlation years/intervals than positive ones from all tests.

The fact that the ten-year period showed a negative relationship and the other types showed more negative relationships than positive ones led this study to conclude that the Thai open-end equity mutual fund industry does not always have a positive, high-risk, high-return relationship; there can occasionally be a negative risk-return relationship in the industry.

(2) What organizational factors or characteristics of a fund have a significant effect on the probability that a fund will deliver a low-risk, high-return performance?

This study explored seven organizational factors and fund characteristics that affected fund performance. They were non-systematic risk, fund size, fund objective, type of parent company, fund age, total number of funds, and the total assets under management
within the same asset management company. The results showed that the fund with high idiosyncratic risk and/or an older fund was more likely to deliver a low-risk, high-return performance. The fund that belongs to the asset management company that manages too many funds is less likely to deliver a low-risk, high-return performance.

This study concludes that the idiosyncratic risk of a fund and the age of a fund have positive effects on the probability that the fund will deliver a low-risk, high-return performance. The total number of funds managed by the asset management company was seen to have an adverse effect on the probability that funds will deliver such performance.

(3) Can the results of this study be used to enhance the investment portfolio return?

This study offers three new investment strategies as alternatives. The simulation experiments revealed that the results of this study can be used to help investors enhance their investment portfolio return, as discussed below.

(3.1) The first simulation portfolio showed that, under the study period, investing in low-standard deviation mutual funds delivered a return comparable to investing in high-standard deviation mutual funds. The results showed that investors that invest at time $t$, in the mutual funds that were classified as low-standard deviation at $t-1$ will accumulate wealth better than those that choose to invest in high-standard deviation funds. Such results persisted when this study changed its risk proxy from the standard deviation to the beta.

(3.2) The use of the risk-return matrix, the performance measurement proposed by this study, is helpful and can be a convenient tool for investors to implement. This performance measurement is based on the percentile ranking procedure and can suggest funds that have excellent performance during any testing period. This study simulated the portfolio which invested in 2012-2014 in the funds that fell into the “Sweet Spot” type in the past the most often, and the results were impressive. During 2012-2014, this “Sweet spot” fund portfolio could deliver a return higher than the industry average by 14.22%, while carrying lower risk.
(3.3) Using the results of the regression, this study constructed a portfolio consisting of funds that had characteristics of “Sweet Spot” funds. These characteristic were obtained from the regression results of this study. The results in Chapter 5 shows that, from 2006-2012, investing in an older-than-average fund with an idiosyncratic risk higher than average, and that was managed by a company with a number of funds less than industry average, yielded an average higher return and lower volatility than the industry average. This study suggests that these three characteristic can be used as a guideline to select funds with a high performance.

6.3 Conclusion

The study provides further empirical support that there is not always a positive risk-return relationship in the mutual fund industry. It also provides a new performance evaluation technique, the risk-return matrix, which is easy to prepare, uses data that are accessible by general investors, and yet is proved to be useful in helping investors evaluate fund performance. The study regressed the proposed model and found the characteristics of these winner funds. The results showed that the level of specific risk of funds, fund age, and number of funds managed by a company can indicate the probability of the winner funds. The study also showed how new investment strategies, which do not necessarily follow the high-risk, high-return notion, can assist investors in obtaining a higher return while being exposed to lower risk.

6.4 Implications of the Research

Meeting the first objective, which was to find the relationship between the risk and return of the Thai open-end equity mutual fund industry, this study documented that there are times when the funds with high-standard deviation deliver low returns and funds with low-standard deviation deliver high returns. The phenomenon implies that, in the Thai open-ended equity mutual fund industry, the market information is not always efficient; some fund managers may be able to obtain some information that other managers cannot, hence helping them to
make better investment decisions. Furthermore, the study also found that, from time to time, the funds with a high beta deliver low returns and the funds with a low beta deliver high returns. This shows that the beta of the Thai open-end equity mutual fund does not behave according to the modern portfolio theory and that the beta can be responsible for this unorthodox relationship. The CAPM is a single factor model which is based on the beta of the asset. The irregular behaviour of the betas in these mutual funds also implies that a single factor model might not be a suitable model for estimating the expected return for the Thai equity mutual funds.

The results that satisfied the second objective also suggest the characteristics of the Thai-equity mutual fund industry. The positive significant effect of the idiosyncratic risk of funds on fund performance in this study emphasizes the role of the diversification effect as a third dimension of performance evaluation, as pointed out by Gibson and Sidoni (2013). In their book, the authors suggested that a performance evaluation using only two dimensions, return and volatility, might not be enough in the present investment environment. Gibson and Sidoni (2013) suggested that the high total volatility of funds comes from the inability of managers to diversify the diversifiable risk.

However, the results from this study—that the high level of idiosyncratic risk is associated with the high performer fund—implies that the high level of idiosyncratic risk may come from the intention not to diversify to the full level rather than the inability to diversify, as pointed out by Gibson and Sidoni (2013). Nevertheless, this study agrees with Gibson and Sidoni (2013)—that perhaps the third dimension of performance evaluation could be useful. Adding idiosyncratic risk, apart from total volatility and return, as the third dimension could enhance the performance evaluation of mutual funds.

The significance of the Age variable from the regression was interesting. As a fund ages its management team can also gain experience about the market, hence can manage the fund better. This implies that the human capital that is inherited in the fund may play a significant role in the success of the fund. Another advantage of aged fund versus younger
funds is that the unitholder of the aged fund may be more stable compared to the unit holder of the younger fund. The fluctuation of fund inflow and outflow in a turbulent time could be less with aged funds compared to younger funds, and this would help the fund manager manage better. These characteristics embedded in the older funds increase the probability that these funds will perform better than younger funds.

The significant negative impact of the No.Fund variable on the fund performance has implication about managements as well. The efforts that the management teams have to put into managing more funds could limit their abilities to perform well. Companies with too many funds were documented to divert their resources from their focus on managing the funds to marketing and administration activities (Bogle, 2010).

The results of the three simulations in meeting the third objective, which tested whether the results from this study could be applied to the enhancement of investment return, also offer suggestions concerning the characteristics of the Thai open-end equity mutual fund industry.

The first simulation results uniformly indicated that over the seven-year period, all types of low-risk strategies could help investors accumulate their wealth better than the high-risk strategies. This implies that risk is manageable, especially in the hands of professional management. Funds with low risk can deliver a return higher than funds with high risk.

The second simulation suggest the best fund to invest in using the risk-return matrix. The matrix revealed the top five funds that can perform the highest number of times at the “Sweet Spot” as candidates. The return of these suggested funds beat the average industry. One interesting fact is that these five funds were all managed by the same company. This implies that the organization variable may play an important role in the fund’s performance. This implication is in line with the regression results that indicated that fund age and the number of funds in the company are significant factors in the ability of the fund to deliver a low-risk, high-return performance.
In the third simulation where the portfolio consisted of funds that passed the characteristic criteria, the average return of the portfolio was higher than the industry average. This implies that the organizational factors and the characteristic of funds can be a useful indicator of fund performance.

The results of this study imply that perhaps the fundamental multifactor model could be explored further to see whether it will have better predictive power on mutual fund performance than the single factor model.

6.5 Limitations of the Research and Recommendations for Future Studies

The mutual fund market in Thailand has a rather short history compared to the western market; hence, at the time of this research, there were limited numbers of literature concerning the Thai market. To make the study more meaningful, the author of this study expanded its literature review section to cover both Thai and foreign studies.

There were limitations regarding the sample used in this study. Although this study concluded that, the Bowman paradox could exist in the mutual fund industry, which was in line with the studies of Brockett et al. (1992) and Cooper et al. (2011), such a conclusion is based on samples from the Thai mutual fund industry only. In order to strengthen the evidence of such a phenomenon, this study encouraged the examination of the paradox using samples from other countries.

Another limitation concerning the sample was that the Thai mutual fund industry is considered to be in its youth, since the industry opened to retail investment only in 1996 (Thaimutualfund, 2014). The rather short history of the industry led to the necessity of applying the panel data analysis. The advantages of this technique are that it increases the degree of freedom and hence will increase the variability of the data and can capture greater capacity for the complexity of data than single cross-section or time-series data. The panel methodology has advantages as well as limitation. The challenge of applying this technique is to be cautious regarding the impact of unobserved heterogeneity. In order to overcome this challenge, this
study verified the suitability of the fixed-effect model versus the random-effect model using the specification test. The Hausman specification test suggested the random-effect model for this study.

In order to strengthen the accuracy of the results, this study encourages similar testing in the future, when the Thai mutual fund industry is more mature. If, in the future, the negative risk-return relationship is still present in the absence of the above limitations, its time and space invariance results will be most valuable to the academic society.

Despite the above limitations, the sample of this study is still valid enough to support its results. The ten-year period sample in this study is already longer than the five-year period used in Bowman (1980), in Brockett et al. (1992), and by Cooper et al. (2011), and the Thai mutual fund industry is considered a good representative of the emerging market (Suppa-Aim, 2010).

This study attempted to explore the factors affecting the negative risk-return trade-off. In this very first attempt, it used the idiosyncratic risk and other fund characteristics as the explanatory variables, since they were supported by various literature in terms of having effects on the fund performance. The results have already revealed three factors that will affect the probability that the funds will deliver low-risk, high-return performance: idiosyncratic risk, fund age, and the total number of funds managed by an asset management company. As elaborated previously, there are sound reasons why these three factors explain the paradox. However, this study encourages more research on other factors that will have an effect on such performance.

The last recommendation for future study concerns the risk-return matrix, the performance measurement proposed in this study. This study showed that this two-dimension matrix is an efficient tool to be used in mutual fund investment; however, the results of this study also open the opportunity to explore the third dimension of performance evaluation.
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