Research Journal of Finance and Accounting
ISSN 2222-1697 (Paper) ISSN 2222-2847 (Online)
Vol.5, No.10, 2014

The Effect of Fund Size on Performance:The Evidence from Active Equity Mutual Funds in Thailand

NopphonTangjitprom
Martin de Tours School of Management and Economics, Assumption University, Hua Mak, Bangkok, Thailand
E-mail: tnopphon@gmail.com

Abstract
The effect of fund size on performance is an important issue in portfolio performance literatures. This paper studies the effect of mutual fund size on its performance based on active equity mutual funds in Thailand during 2006-2012. The results show that there is a significant relationship between fund size and performance. However, this relationship is not linear but quadratic. The quadratic relationship found in this study implies that there is an optimal size of mutual fund. For relatively small funds, the performance increases as fund size increases. This can be explained by size advantage from economies of scale. However, when funds become larger and larger, the performance is deteriorated by the size due to diseconomies of scale.
Keywords: Portfolio Performance, Fund Size, Portfolio Management, Four-factor Model

1. Introduction

In portfolio performance literatures, there are numerous studies discussing about various factors having an effect on fund performance. Among those factors, the factor about portfolio size has been intensively discussed. Regarding to the economies of scale, it is expected that funds with larger size have advantages. The average transaction costs should be relatively lower because of larger volume. Moreover, some fixed costs in portfolio management are lower in term of average. However, some literatures have suggested that funds can face the diseconomies of scale. If fund size is too large due to large volume of fund flow, fund managers may not be able to manage fund effectively. Fund managers may cope with large size by scaling up the current fund allocation instead of diversifying into new assets (Pollet and Wilson, 2008).

In order to examine the relationship between fund size and performance in Thailand, the data on active equity mutual funds during 2006-2012 is employed. Index funds, balanced funds,sector funds, and mutual funds investing in foreign market are excluded. The fund performance is based on the four-factor model. The results show that there is a significant relationship between fund size and performance. However, this relationship is not linear but quadratic. The coefficient of fund size is positive but the coefficient of square of fund size is negative. Funds with larger size tend to perform better only for a specific range of total net asset. Thereafter, larger size can deteriorate fund performance.

The result in this paper supports the role of mutual fund size on its performance. The quadratic relationship found in this study implies that there is an optimal size of mutual fund. For small funds, the performance is better as fund size becomes larger due to economies of scale. However, when funds become larger, fund size can deteriorate fund performance due to diseconomies of scale.

2. Literature about Portfolio Performance

Jensen (1967) has introduced the way to measure the abnormal performance of mutual fund as the deviation of actual returns and expected returns. The expected returns are based on the capital asset pricing model or CAPM (Sharpe, 1964; Lintner, 1965; Mossin, 1966). This measurement becomes popular and known as Jensen's Alpha, which represents the abnormal returns that cannot be explained by the risk factor as in CAPM.

Later literatures have shown that the single factor in CAPM, which is a market factor or market risk premium, cannot explain the stock risk premium adequately. There are many multi-factor models augmenting other factors. The most popular factors found to explain stock returns beside the market factor are size and value measured by book-to-market ratio (Fama and French, 1992). Fama and French (1993) augmented these two factors into an asset pricing model and become three-factor model.

Moreover, there is another factor known as momentum. Jegadeesh and Titman (1993) studied the performance of previously-outperformed stocks called winners and previously-underperformed stocks called losers. They found that stocks with good performance in previous period tend to perform well again in later period. This phenomenon is similar to a physics theory named momentum. Carhart (1997) has included the momentum factor into Fama-French's three-factor model and this model is known as four-factor model. This four-factor model is popularly used in evaluating portfolio performance (Fama and French, 2012). The abnormal performance on mutual fund should bethe portion of return that cannot be explained by this four-factor model.

In general, fund size is expected to positively contribute to fund performance. Larger funds can achieve the size advantages in term of economies of scale. However, there are numerous literatures found the negative effect of fund size on its performance. Berk and Green (2004) provided some explanation about fund size and

performance in their fund flow model. They proposed that fund flow is closely related to past fund performance regardless of its persistence. Funds with better past performance can attract more fund flow and fund size becomes larger and the future performance can be eroded by diseconomies of scale. One factor contributing to diseconomies of scale is trading cost (Yan, 2008). Pollet and Wilson (2008) found the evidence about this phenomena as when funds become larger, they failed to diversify into new assets. Instead of properly diversifying, those funds just scale up their current asset allocation.

Another explanation of the negative relationship between fund size and return is about liquidity concern. Chen et. al. (2004)provided the evidence to show that the returns have been lower for funds with larger size. The explanation of this finding is larger funds can face some difficultly to liquidate their stocks. The evidence to support this explanation is that the above evidence is more pronounced for funds investing in small stocks with illiquidity. However, Elton, Gruber, and Blake (2012) proposed that the diseconomies of scale of large fund can be offset by the decrease in expense ratio. They also found that fund size has no impact on future fund performance.

3. Mutual Fund Data and Performance in Thailand

The mutual fund data is collected from 2006 to 2012. Only active equity mutual funds are included in this study. Therefore,index funds, balanced funds,sector funds, and mutual funds investing in foreign market are excluded. The monthly fund return is total return including a capital gain from a change in NAV and a dividend.

Other mutual fund data are expense ratio, total net asset, fund age, and asset management firm age. Expense ratio is fund expenses divided by average fund net asset over 12 month. Fund age is the number of year from fund establishment to the current period. Asset management age is the number of year from the establishment of fund's asset management firms to the current period. The mutual fund description is reported in table 1.

From Table 1, the average expense ratio is 1.76% whereas the median is at 1.84%. The fund size is measured by total net asset. The mean of fund size is around 926 million baht and the median is around 297 million baht. The higher mean compared to median implies that total net asset or fund size is skewed positively. The biggest mutual fund has the total net asset of 25,712 million baht. The average age of equity in Thailand is around 8 years but the average age of asset management firms is around 16 years.

Table 1. Equity Mutual Fund Description in Thailand during 2006-2012

	Mean	Median	Min	Max
Expense Ratio (%)	1.76	1.84	0.04	3.60
Total Net Asset (in Million Baht)	926.92	297.08	0.56	25,712.56
Fund Age (Year)	8.38	6.54	0.04	20.93
Management Firm Age (Year)	16.64	16.55	0.04	37.74

The fund performance is measured by the abnormal performance or from the four-factor model (Carhart, 1997; Fama and French, 2012). The equation for four-factor model is as follows:

$$R_i - RF = \alpha_i + b_i(RM - RF) + s_i SMB + h_i HML + w_i WML + e_i, \qquad (1)$$

where R_i is return on mutual fundi, RF is risk-free that measured by return on one-month Thai treasury bill, RM is market return based on SET total return index, SMB is the difference between return on small stocks and big stocks. HML is the difference between return on stocks with high book-to-market and stocks with low book-to-market ratio, WML is the difference between return on winner stocks and loser stocks. The ex-post abnormal performance is measured by alpha or α_i in Equation 1. The ex-ante abnormal performance is measured by the difference between actual excess return of mutual fund and its expected excess return from the above four-factor model.

SMB, HML, and WML are computed based on Fama and French (2012). All stocks listed in Stock Exchange of Thailand are ranked at the end of June each year from the biggest ones to smallest ones based on their market capitalization at the end of last December. Big stocks are in the top 90 percent of total market capitalization of Stock Exchange of Thailand and small stocks are in the bottom 10 percent. Moreover, all stocks are also ranked at the end of June and separated into three groups at 30^{th} and 70^{th} percentile based on the book-to-market ratio at the end of last December. Each stock is classified into six portfolios in 2 x 3 table based on size and book-to-market ratio, which are Small/High BM (S/H), Big/High BM (B/H), Small/Mid BM (S/M), Big/Mid BM (B/M), Small/Low BM (S/L), and Big/low BM (B/L). The market value-weighted returns are computed for each of those six portfolios. The SMB is the difference between average return from small portfolios and average return of big portfolios as follows:

$$SMB = \frac{S/H + S/M + S/L}{3} - \frac{B/H + B/M + B/L}{3}. \qquad (2)$$

The HML is the difference between average return from high book-to-market portfolios or value portfolios and

average return of low book-to-market portfolios or growth portfolios as follows:

$$HML = \frac{S/H + B/H}{2} - \frac{S/L + B/L}{2}. \quad (3)$$

The above procedure is recomputed to obtain SMB and HML month-by-month and the six portfolios are reclassified or rebalanced yearly in June.

For WML or momentum factor, the separated 2 x 3 portfolios are formed based on size and momentum monthly. The momentum return is the cumulative return from the month t-11 to t-1. The breakpoint of momentum is similar to BM at 30th and 70th percentile. The stock with momentum return above 70th percentile is considered as winner and the stock with momentum return below 30th percentile is considered as loser. The stock with momentum return between 30th and 70th percentile is neutral. There will be size portfolios, which are Small/Winner (S/W), Big/Winner (B/W), Small/Neutral (S/N), Big/Neutral (B/N), Small/Loser (S/L), and Big/Loser (B/L). WML is computed as follows:

$$WML = \frac{S/W + B/W}{2} - \frac{S/L + B/L}{2}. \quad (4)$$

The above procedure is recomputed to obtain WML month-by-month. The six portfolios are reclassified or rebalanced monthly based on momentum return. The size is updated yearly in every June.

The four-factor model from equation 1 is estimated based on 24-month period. The coefficients of the four-factor model during 24-month estimation period are used to determine the expected fund return in the subsequent period. The abnormal return is the deviation of actual fund return from the expected one. The rolling window technique is applied month-by-month. Finally, the monthly abnormal return or alpha or each fund is obtained for 60-month test period.

4. Fund Size and Performance

4.1 Univariate Analysis

Figure 1 shows the graph plotting the fund performance measured by alpha against different fund size. Although there is no clear linear relationship in the graph, it shows some interesting pattern. When the alpha is positive, funds withsmaller size and funds with larger size have lower alpha compared to funds with middle size.

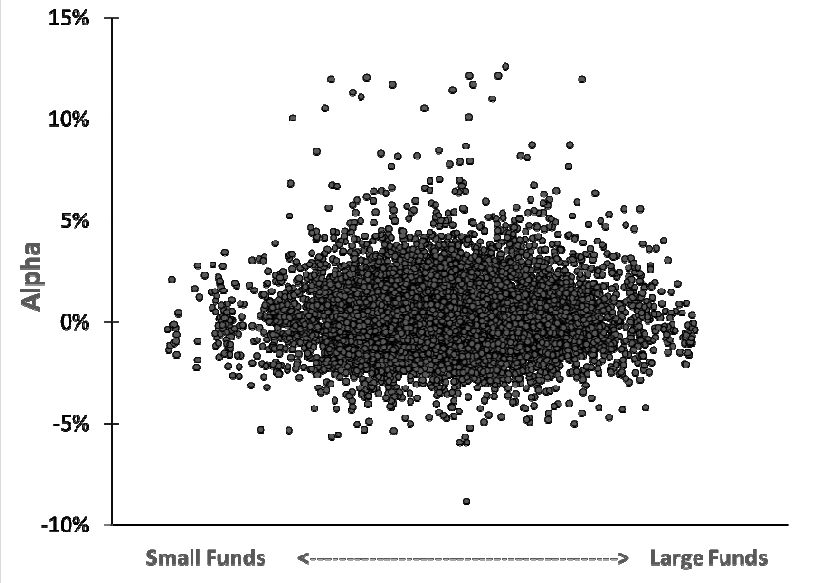

Figure 1. Fund Size and Performance

4.2 Regression Analysis

In order to examine the relationship betweenfund size and performancethe regression equation is shown as follows:

$$\alpha_{i,t} = \beta_{o,t} + \beta_{1,t} LnTNA_{i,t-1} + \beta_{2,t} lnTNA^2_{i,t-1} + \beta_{3,t} Exp_{i,t-1} + \beta_{4,t} LnAge_{i,t-1} + \beta_{5,t} LnAmAge_{i,t-1} + \varepsilon_{i,t}, \quad (5)$$

where$\alpha_{i,t}$is the mutual fund's abnormal return computed from the deviation of actual fund return and expected

return from the four-factor model as in Equation 1. $LnTNA_{i,t-1}$is the natural logarithm of total net asset of mutual fund. The control variables include expense ratio, fund age, and asset management firm age. $Exp_{i,t-1}$is the expense ratio computed from annual expenses divided by total net asset. $LnAge_{i,t-1}$is the natural logarithm of the age of mutual fund. $LnAmAge_{i,t-1}$is the natural logarithm of the age of mutual fund's asset management firms.

In order to examine the regression in Equation 5, the cross sectional regressions are estimated month-by-month independently during the whole test period of 60 months. The reported coefficients are the average of 60-month coefficients. The standard error is computed based on Fama and MacBeth (1973). Table 2 reports the result of regression analysis between mutual funds' abnormal return and size without control variables.

Table 2. The Effect of Fund Size on Performance without Control Variables

	Coefficient	**t-stat**	**+/-**
Panel 1: Simple Linear Relationship			
Constant	-0.0001	-0.02	47/53
LnTNA	0.0004	0.88	55/45
Panel 2: Quadratic Relationship			
Constant	-0.0454	-2.70**	33/67
LnTNA	0.0111	2.76**	68/32
$LnTNA^2$	-0.0006	-2.62**	32/68

*Note:**Coefficient** is based on the average of 60-month cross sectional regressions. **t-stat** is based on the standard error proposed by Fama and MacBeth (1973). +/- is the percentage of positive coefficient and negative coefficient of 60-month cross sectional regressions.*

*** indicates significant at 1%, * indicates significant at 5%.*

From Panel 1 of Table 2,when the simple linear relationship between fund size and performance is examined, it shows that there is positive effect of fund size on performance but it is not statistically significant. This result does not support the economies of scale. However, it is possible that the positive effect and negative effect of fund size have existed at different size level.

Instead of simple linear relationship, the quadratic relationship is examined by including the square term of fund size into the model. The result is reported in Panel 2 of Table 2. After including the square term of fund size, the coefficient of fund size is positive and significant at 1% level. The number of positive coefficients is more than two-third of 60-month cross sectional coefficients. Moreover, the coefficient of the square term of fund size is negative and significant and more than two-third of cross sectional coefficients are also negative. This result supports the significant impact of fund size on its performance. However, the relationship is quadratic rather than linear. To further examining the effect of fund size on performance, other control variables, including expense ratio, fund age, and asset management firm age, are added in the regression modelin Equation 5. The result is reported in Table 3.

Table 3. The Effect of Fund Size on Performance with Control Variables

	Coefficient	**t-stat**	**+/-**
Constant	-0.0539	-3.06**	40/60
LnTNA	0.0136	3.11**	67/33
$LnTNA^2$	-0.0008	-3.03**	32/68
Exp	0.0003	0.22	48/52
LnAge	-0.0019	-2.25*	40/60
LnAmAge	0.0006	0.63	52/48

*Note: **Coefficient** is based on the average of 60-month cross sectional regressions. **t-stat** is based on the standard error proposed by Fama and MacBeth (1973). +/- is the percentage of positive coefficient and negative coefficient of 60-month cross sectional regressions.*

*** indicates significant at 1%, * indicates significant at 5%.*

After including control variables in the model, the coefficients of fund size and the square of fund size are not altered. The coefficient of fund size is significantly positive whereas the coefficient of its square term is significantly negative. The positive effect of fund size on its level and the negative effect of its square term means that fund performance is the increasing function of fund size but at decreasing rate. It also implies that there is an optimal size of mutual fund regarding to its performance.

When fund size is small, increasing fund size can positively contribute to its performance because that mutual fund achieve the economies of scale. However, when a mutual fund becomes larger and larger, its performance can be eroded due to the diseconomies of scale.

5. Conclusion

The result of empirical studies about fund size and performance of mutual fund is mixed. Some studies reported that funds with larger size can generate better performance because larger funds can achieve more level of economies of scale and diversification. Their average transaction costs should be lower due to size advantages. However, some studied found that the performance is deteriorated by size. Such mutual funds may face diseconomies of scale due to the difficulty in liquidating large volume of stocks.

This paper studies the effect of mutual fund size on its performance based on active equity mutual fund in Thailand during 2006-2012. The results show that there is a significant relationship between fund size and performance. However, this relationship is not linear but quadratic. The coefficient of fund size is positive but the coefficient of square of fund size is negative. Funds with larger size tend to perform better only for a specific range of total net asset. Thereafter, larger size can deteriorate fund performance.

The result in this paper supports the importance of mutual fund size. The quadratic relationship found in this study implies that there is an optimal size of mutual fund. For relatively small funds, the performance increases as fund size increases. This can be explained by size advantage from economies of scale. However, when funds become larger, the performance is deteriorated by the size due to diseconomies of scale.

Previous literatures have suggested that this diseconomies of scale can arise from liquidity problem and ability to manage the portfolio property. Larger funds may face some difficulty in liquidating large volume of securities in their portfolio. Moreover, when funds become larger, fund managers cannot manage to diversify their portfolio properly but they just scale up the current allocation instead.

References

Berk, J. B., & Green, R. C. (2004). Mutual fund flows and performance in rational markets. *Journal of Political Economy*, 112(6), 1269-1295. http://dx.doi.org/10.1086/424739

Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance*, 52(1), 57-82. http://dx.doi.org/10.1111/j.1540-6261.1997.tb03808.x

Chen, J., Hong, H., Huang, M., &Kubik, J. D. (2004). Does fund size erode mutual fund performance?: The role of liquidity and organization. *American Economic Review*, 94(5), 1276-1302. http://dx.doi.org/10.1257/0002828043052277

Elton, E., Gruber, M., & Blake, C. (2012). Does mutual fund size matter? The relationship between size and performance. *Review of Asset Pricing Studies*, 2(1), 31-55. http://dx.doi.org/10.1093/rapstu/ras001

Fama, E., & French, K. (1992). The cross-section of expected stock returns. Journal of Finance, 47(2), 427-465. http://dx.doi.org/10.1111/j.1540-6261.1992.tb04398.x

Fama, E., & French, K. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), 3-56. http://dx.doi.org/10.1016/0304-405X(93)90023-5

Fama, E., & French, K. (2012). Size, value, and momentum in international stock returns. *Journal of Financial Economics*, 105(3), 457-472. http://dx.doi.org/10.1016/j.jfineco.2012.05.011

Fama, E., &MacBeth, J. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy,* 81(3), 607-636. http://dx.doi.org/10.1086/260061

Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance*, 48(1), 65-91. http://dx.doi.org/10.1111/j.1540-6261.1993.tb04702.x

Jensen, M. C. (1968). The performance of mutual funds in the period 1945-1964. *Journal of Finance*, 23(2), 389-416. http://dx.doi.org/10.1111/j.1540-6261.1968.tb00815.x

Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economics and Statistics*, 47, 13-37. http://dx.doi.org/10.2307/1924119

Mossin, J. (1966). Equilibrium in a Capital Asset Market. *Econometrica*, 34(4), 768-783. http://dx.doi.org/10.2307/1910098

Pollet, J. M., & Wilson, M. (2008). How does size affect mutual fund behavior? *Journal of Finance*, 63(6), 2941-2969. http://dx.doi.org/10.1111/j.1540-6261.2008.01417.x

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance*, 19, 425-442.

Yan, X. (2008). Liquidity, investment style, and the relation between fund size and fund performance. *Journal of Financial and Quantitative Analysis*, 43(3), 741-767. http://dx.doi.org/10.1017/S0022109000004270

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Recent conferences: http://www.iiste.org/conference/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar