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by

Roongkiat Ratanabanchuen and Kanis Saengchote

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Roongkiat Ratanabanchuen and Kanis Saengchote*

Chulalongkorn Business School

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ABSTRACT

One of the proposed explanations for the low-beta anomaly – a prevalent yet puzzling empirical finding that stocks with low systematic risk tend to earn higher returns than the Capital Asset Pricing Model (CAPM) predicts and vice versa – is that leveraged-constrained and index-benchmarked mutual funds drive up demand for high-beta stocks, leading to systematic mispricing. We find evidence that Thai mutual fund managers, on average, favor high-beta stocks and tend to alter their portfolio composition of high-beta stocks in response to fund flows. In addition, funds that hold high-beta stocks perform poorly compared to their peers: a one standard deviation increase in high-beta stock holdings is associated with a 1.3 percentage point decrease in future relative returns.

Keywords: high-beta stocks, mutual fund returns, low-beta anomaly

JEL Classification Code: G11, G23

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* Corresponding author. Chulalongkorn Business School, Chulalongkorn University, Phayathai Road, Pathumwan, Bangkok 10330, Thailand. (email: kanis@cbs.chula.ac.th).

1. Introduction

For many individual investors around the world, mutual funds provide a convenient way to participate in the capital market. Numerous studies have documented how mutual fund investors tend to asymmetrically reward funds with stellar returns than penalize funds with poor returns (e.g. Chevalier and Ellison (1997), Huang et al. (2007), Sirri and Tufano (1998)). As fund managers tend to be rewarded by the size of their TNA, this convex flow-performance relationship induce them to engage in risk-shifting behavior and make riskier investments in order to "chase returns" and attract inflows (e.g. Brown et al. (1996), Ha and Ko (2017)). In order to increase risk, mutual fund managers typically have few options, as usage of leverage, derivatives and short-selling is restricted, and even if permitted, tend not to be employed.[1] Because of this limitation, managers may resort to chasing returns by investing in riskier stocks instead.

The demand for high-beta stocks from leverage-constrained and index-benchmarked investors such as mutual fund managers has been proposed by Baker et al. (2011) as candidate explanation for the low-beta anomaly, a puzzling empirical finding that stocks with low systematic risk tend to earn higher returns than the Capital Asset Pricing Model (CAPM) predicts – a phenomenon first documented by Black (1972) and continues to be the subject of investigation today. Recent studies by Boguth and Simutin (2018) and Christoffersen and Simutin (2017) show that U.S. mutual fund managers do indeed tilt their portfolios toward riskier stocks, and their increased risk-taking is related to the returns to the betting-against-beta portfolio proposed by Frazzini and Pedersen (2014), shedding light on one potential source of the low-beta anomaly.[2]

In this article, we investigate the source of the low-beta anomaly in Thailand by examining the behavior of open-ended equity mutual funds through two research questions: (1) do fund managers change their funds' exposure to systematic risk in response to fund flows, and (2) do funds that have higher exposure to high-beta stocks experience worse relative returns? Mutual funds in Thailand are leverage-constrained and their performances are benchmarked against indices, which make them susceptible to returns-chasing behavior. We find that managers tend to

[1] For example, in the US, section 18 of the Investment Company Act of 1940 restricts the ability of funds to issue "senior securities", which are defined as "any bond, debenture, note, or similar obligation or instrument constituting a security and evidencing indebtedness". In Thailand, the Securities and Exchange Commission restricts fund's leverage to 10% of total net assets.

[2] The betting-against-beta (BAB) portfolio by Frazzini and Pedersen (2014) involves taking a long position on low-beta stocks and short position on high-beta stocks in a way that has net zero investment and net zero average beta.

adjust fund beta in response fund flows, but only for tax-privileged funds which are larger and more popular.

The second research question is our main contribution: our article explicitly investigates the relationship between stock holdings and future fund returns. We compute funds' holdings of low-beta stocks and high-beta stocks as percentage of TNA, and find that fund managers tend to invest disproportionately more in high-beta stocks (24%) than low-beta stocks (5%). We find that fund performance is related to the composition of stock holdings: funds that have more extreme beta (low and high) stocks tend to have worse future relative return. This result is similar to Stambaugh et al. (2012, 2015), who find evidence of long-short arbitrage asymmetry in several anomalies. The asymmetry suggests that the low-beta anomaly will likely persist in absence of investors able and willing to take short positions in high beta stocks, potentially suppressing returns for individual investors.

2. Data and Empirical Methodology

To examine the relationship between fund performance and risk-taking, we rely on multiple data sources. We obtain fund returns, investment objectives, fees, total net assets, fund holdings, and other fund characteristics from the Morningstar database from 2006 to 2017. We focus on open-ended equity funds that have at least 5 years of data and TNA of at least THB 100 million (approximately USD 3 million). The equity holdings are then matched to contemporaneous stock prices in Datastream, and betas estimated from past returns. [3] This allows us to compute the value-weighted, fund-level systematic risk loading, as well as examine the detailed composition of stock holdings. Annual relative returns are computed as the differences between the funds' raw returns and the benchmark index returns obtained from the Stock Exchange of Thailand.[4] Annual fund flows are calculated based on changes in assets, adjusted for the returns during the period, and scaled by lagged assets to control for differences in size, as describe by Equation 1.

$$Flow_{i,t+1} = \frac{TNA_{i,t+1} - TNA_{i,t}(1 + r_{i,t+1})}{TNA_{i,t}} \quad (1)$$

[3] We use the beta calculation method based on Frazzini and Pedersen (2014), where each stock's beta is calculated as the ratio of its covariance to the market return and the product of the stock's and market returns standard deviation.

[4] More than 80% of the funds are benchmarked to the SET Index, which is the market-value weighted index of all listed stocks in the Stock Exchange of Thailand. The second most popular benchmark is the SET50 Index, which includes 50 stocks with the largest market capitalization.

In Thailand, certain open-ended equity funds are tax-privileged: individuals who invest in such funds can deduct annual contributions (up to a certain limit based on their income level) from their taxable income, as long as they keep their funds invested for specified periods of time.[5] The policy was instigated in 2004 to encourage capital market participation and has proved hugely popular since, as evidenced by the differences in TNA. According to the Securities and Exchange Commission's Capital Market Report, TNA of tax-privileged mutual funds in December 2017 is THB 500 billion, representing 51% of all equity funds' TNA. As the lockup periods are defined based on calendar dates (for example, investment made in December of year t to January of year t+1 is counted as 2 years when it is effectively 2 months), Thai investors tend to make their tax-deductible investments in the last quarter of each year to minimize the effective lockup period. For this reason, we separate the analysis for tax-privileged and general funds (which we will refer to as "tax" and "non-tax" funds) and define the end of year for data aggregation at September. There are 161 funds, 65 of which are tax funds, with 1,420 fund-year observations.

Summary statistics of key variables used in our analysis are reported in Table 1. While there are more non-tax funds, tax funds tend to be larger in size and have higher expense ratios. On average, non-tax funds have slightly better returns, but tax funds tend to experience greater net inflows. Fund betas are also quite similar for both types. In each year, we rank the stocks based on their beta and classify the top 20% as high-beta stocks, and bottom 20% as low-beta stocks. In our sample, approximately 5% of TNA is invested in low-beta stocks and, surprisingly, 24% in high-beta stocks.

[TABLE 1 ABOUT HERE]

For our first research question, we consider 2 versions of regressions of model, first with forward fund beta on fund flow, and second with *change* in fund beta on fund flow, as described by Equation 2 and 3, where X_{it} is a vector of control variables that includes contemporaneous fund beta, log of fund size (TNA), and expense ratio. In Equation 3, dX_{it} represents the first-differenced values of the variables used in Equation 2, except fund flow and relative return. To mitigate

[5] There are two main classes of tax-privileged investments: the Long Term Equity Fund (LTF), which are subjected to a 5-year lockup period (amended to 7 years for investments beginning 2016), and Retirement Mutual Fund (RMF), which are subjected to a minimum 5-year lockup period and cannot be redeemed until the investor's age reaches 55. If investments are sold prior to the respective lockup periods, investors must return the tax deductions claimed. While the tax deduction limits are separate for LTFs and RMFs, LTFs are more popular in Thailand, as more than 86% of tax-privileged assets in the sample are held through LTFs, which have much shorter effective lockup period.

potential omitted variable bias, we include year (δ_t) and style (ψ_i) fixed effects in all regressions, and cluster standard errors by funds to account for serial correlation in the variables. Based on our prediction, we expect to see negative α.

$$Beta_{i,t+1} = \psi_i + \delta_t + \alpha\, Flow_{it} + \gamma' X_{it} + \eta RRet_{it} + \varepsilon_{it} \quad (2)$$

$$dBeta_{i,t+1} = \psi_i + \delta_t + \alpha\, Flow_{it} + \gamma' dX_{it} + \eta RRet_{it} + \varepsilon_{it} \quad (3)$$

For the second question, we use a similar specification as Equation 2 and regress forward relative returns on proportions of assets allocated to high-beta stocks, controlling for fund beta, as follow:

$$RRet_{i,t+1} = \psi_i + \delta_t + \beta_1 PctLow_{it} + \beta_2 PctHigh_{it} + \alpha\, Flow_{it} + \gamma' X_{it} + \eta RRet_{it} + \varepsilon_{it} \quad (4)$$

Here, our main coefficients of interest are β_1 and β_2. Based on the findings of the literature on the low-beta anomaly, we expect β_1 to be positive and β_2 to be negative.

3. Results

Table 2 reports the result of Equation 2. The α is negative and statistically significant as we expect, but only for tax funds. The α of the first-differenced specification of Equation 3, reported in Table 3, is also negative only for tax funds by less statistically significant. The results of Table 2 and 3 combined suggest that suggesting that fund flows can affect fund managers' risk-taking strategy: tax funds that experience lower (higher) fund flow tend to have higher (lower) beta in the subsequent period, and the fund beta increase (decrease) in response. Given the substantial differences in size of TNA for tax and non-tax funds, the stakes and thus incentives are larger to act.

[TABLE 2, 3 ABOUT HERE]

Next, we turn to a more pertinent issue: some mutual funds appear to adjust systematic risk exposure through overweighting high-beta stocks, so does this influence their future returns? Table 4 reports the result of Equation 4. In column 1-3, we first report results without the inclusion of beta composition as baseline: current fund beta is positively related to future relative returns, supporting the returns-chasing behavior of fund managers by increasing systematic risk exposure, and past relative returns are related to future relative returns, similar to Grinblatt and Titman (1992) and Vidal-García et al. (2016).

[TABLE 4 ABOUT HERE]

When we include the holding proportions, the result supports only one side of our prediction. On average, both types of funds that hold more high-beta stocks tend to perform worse. A one standard deviation increase in allocation to high-beta stocks leads to a 1.3 percentage point decrease in relative return.[6] Interestingly, non-tax funds that hold low-beta stocks also tend have worse performance, which seems inconsistent with international evidence on the low-risk anomaly. However, anomalies in Thailand are still little-studied. Indeed, Saengchote (2017) finds that the low-beta anomaly in Thailand is more about high-beta stocks earning low returns than low-beta stocks earning high returns, which is more consistent with the underperformance of the high-exposure funds in this study. As mutual funds cannot short stocks, their long positions can lead to overpriced stocks that cannot be arbitraged away, similar to the findings of Stambaugh et al. (2012, 2015).

4. Conclusion

Capital market frictions can artificially affect demand for assets and compel investors to make decisions that are inconsistent with traditional asset pricing models, such as "reaching for yield" in bond market and "chasing returns" in equity mutual funds.[7] In this article, we contribute to the growing evidence that frictions in mutual fund management and the beta anomaly are intertwined. The finding suggests that short-selling against mutual funds can be profitable, similar to the finding of Arif et al. (2015). Given that short-selling volatile stocks is risky, as documented by Engelberg et al. (2018), underperformance of high-beta stocks will likely persist, to the detriment of mutual fund investors.

[6] In unreported analysis, we rank mutual funds in each year based on their exposure to high beta stocks into 3 portfolios and compute value-weighted relative returns. The cumulative relative return between 2007 to 2017 for the low-, medium- and high-exposure portfolios are 59%, 47% and 34% respectively.

[7] For evidence of "reaching for yield" in bond market, see Becker and Ivashina (2015) and Choi and Kronlund (2017).

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Table 1: Summary Statistics

This table reports the average, standard deviation, and the key percentiles of fund characteristics. *t* or *t+1* denote the year (ending in September) in which the characteristics are measured. Fund beta is calculated as the value-weighted average betas based on the stock holdings reported as of (or latest available prior to) September in each year. Relative return is computed relative to the relevant benchmark (mostly SET Index and SET50 Index) in each year. Fund flow at t+1 is computed as $(TNA_{i,t+1} - TNA_{i,t}\ (1+r_{i,t+1})) / TNA_{i,t}$. Fund size (total net assets) and fund expenses are retrieved from Morningstar. In each year, stocks are ranked based on their beta and divided into quintiles. Low-beta stocks are classified as those in the bottom quintile and high-beta stocks top quintile respectively. Tax funds are mutual funds which are tax-privileged.

Tax funds

Variable	Mean	SD	P10	P50	P90
Relative return t+1 (in decimals)	0.03	0.06	-0.03	0.02	0.10
Fund flow t+1 (in decimals)	0.13	0.31	-0.10	0.08	0.39
Fund beta t	0.95	0.22	0.68	0.93	1.24
Fund size (TNA) t (in THB millions)	2,951	5,665	99	885	6,843
Expenses t (in %)	1.81	0.45	1.19	1.87	2.25
% low-beta stocks t (in decimals)	0.05	0.06	0.00	0.02	0.14
% high-beta stocks t (in decimals)	0.25	0.14	0.06	0.26	0.43
Observations	572				
Number of funds	65				

Non-Tax funds

Variable	Mean	SD	P10	P50	P90
Relative return t+1 (in decimals)	0.04	0.06	-0.03	0.04	0.12
Fund flow t+1 (in decimals)	0.02	0.60	-0.31	-0.07	0.27
Fund beta t	0.98	0.21	0.76	0.95	1.24
Fund size (TNA) t (in THB millions)	917	1,684	76	312	2,440
Expenses t (in %)	1.66	0.48	1.02	1.80	2.22
% low-beta stocks t (in decimals)	0.05	0.07	0.00	0.02	0.14
% high-beta stocks t (in decimals)	0.24	0.13	0.06	0.25	0.40
Observations	848				
Number of funds	96				

Table 2: Fund Flow and Mutual Fund Risk-Taking

This table report results from regressions of fund beta in year *t+1* on fund flow in year *t* and fund characteristics measured at the end of year *t* (ending in September), as specified in Equation 2. Fund beta is calculated as the value-weighted average betas based on the stock holdings reported as of (or latest available prior to) September in each year. All regressions include year and style fixed effects. Fund beta in year *t* is included to account for potential serial correlation of beta. Standard errors, reported in parenthesis, are clustered by fund. Stars correspond to statistical significance level, with *, ** and *** representing 10 percent, 5 percent and 1 percent level respectively. See Table 1 for definition of other variables.

	(1)	(2)	(3)
Depvar: Fund beta (t+1)	Pooled	Tax	Non-Tax
Fund flow	-0.0098	-0.0260**	0.0078
	(0.0079)	(0.0104)	(0.0123)
Fund beta	0.2737***	0.2921***	0.2139***
	(0.0395)	(0.0506)	(0.0724)
Log fund size	-0.0066*	-0.0117**	-0.0046
	(0.0038)	(0.0055)	(0.0054)
Expenses	-0.0197**	-0.0256	-0.0143
	(0.0100)	(0.0168)	(0.0128)
Relative return	0.2073**	0.3403***	-0.0034
	(0.0944)	(0.1252)	(0.1384)
Observations	1,420	572	848
Adjusted R-squared	0.512	0.499	0.532

Table 3: Fund Flow and Change in Mutual Fund Risk-Taking

This table report results from regressions of change in fund beta from year *t* to year *t+1* on fund flow in year *t* and changes in fund characteristics measured at the end of year *t* (ending in September), as specified in Equation 3. Fund beta is calculated as the value-weighted average of betas based on the stock holdings reported as of (or latest available prior to) September in each year. All regressions include year and style fixed effects. Standard errors, reported in parenthesis, are clustered by fund. Stars correspond to statistical significance level, with *, ** and *** representing 10 percent, 5 percent and 1 percent level respectively. See Table 1 for definition of other variables.

	(1)	(2)	(3)
Depvar: Fund beta (t, t+1)	Pooled	Tax	Non-Tax
Fund flow (t)	-0.0151	-0.0664*	0.0073
	(0.0213)	(0.0385)	(0.0226)
Fund beta (t-1, t)	-0.5513***	-0.5180***	-0.5742***
	(0.0192)	(0.0310)	(0.0268)
Log fund size (t-1, t)	0.0170	0.0165	0.0148
	(0.0224)	(0.0758)	(0.0241)
Expenses (t-1, t)	-0.0178	0.0119	-0.0504
	(0.0268)	(0.0460)	(0.0349)
Relative return (t)	0.0478	0.0629	0.0582
	(0.1022)	(0.1673)	(0.1270)
Observations	1,269	519	750
Adjusted R-squared	0.725	0.692	0.752

Table 4: High-Beta Stocks and Future Returns

This table report results from regressions of fund relative return in year *t+1* on proportion of stock holdings in year *t* and fund characteristics measured at the end of year *t* (ending in September), as specified in Equation 4. Relative return is computed relative to the relevant benchmark (mostly SET Index and SET50 Index). In each year, stocks are ranked based on their beta and divided into quintiles. Low-beta stocks are classified as those in the bottom quintile and high-beta stocks top quintile respectively. The proportion of stock holdings are computed as the market value of stocks with low-/high-beta relative to the fund's total net assets. All regressions include year and style fixed effects. Standard errors, reported in parenthesis, are clustered by fund. Stars correspond to statistical significance level, with *, ** and *** representing 10 percent, 5 percent and 1 percent level respectively. See Table 1 for definition of other variables.

	(1)	(2)	(3)	(4)	(5)	(6)
Depvar: Relative return (t+1)	Pooled	Tax	Non-Tax	Pooled	Tax	Non-Tax
% low beta stocks				-0.0597*	0.0562	-0.1606***
				(0.0340)	(0.0600)	(0.0394)
% high beta stocks				-0.0991***	-0.0852**	-0.1043***
				(0.0234)	(0.0358)	(0.0301)
Fund flow	-0.0044**	-0.0053	-0.0050**	-0.0045**	-0.0053	-0.0059**
	(0.0021)	(0.0044)	(0.0025)	(0.0022)	(0.0043)	(0.0026)
Fund beta	0.0049	0.0121	-0.0055	0.0207***	0.0288***	0.0017
	(0.0077)	(0.0106)	(0.0114)	(0.0075)	(0.0105)	(0.0107)
Log fund size	-0.0027***	-0.0028*	-0.0020	-0.0031***	-0.0042***	-0.0016
	(0.0010)	(0.0016)	(0.0013)	(0.0009)	(0.0015)	(0.0012)
Expenses	-0.0087**	-0.0062	-0.0090***	-0.0081**	-0.0051	-0.0089***
	(0.0033)	(0.0077)	(0.0030)	(0.0034)	(0.0078)	(0.0030)
Relative return	0.1557***	0.1573***	0.1387***	0.1421***	0.1430***	0.1304***
	(0.0257)	(0.0385)	(0.0347)	(0.0251)	(0.0399)	(0.0344)
Observations	1,420	572	848	1,420	572	848
Adjusted R-squared	0.391	0.393	0.378	0.406	0.408	0.401