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Liquidity-augmented performance evaluation of Thai's mutual funds

Abstract

This study proposes a liquidity-augmented performance measure and investigates the performance of Thai mutual funds for the period of 2002-2007. Liquidity effects are found to have statistically significant impacts. Overall, the results provide no evidence of abnormal performance. The performance of tax-benefit funds, however, is found to be superior and statistically significantly different from that of general funds, even when the liquidity premium is controlled for. We find evidence of short-term persistence in performance when controlling for momentum effects.

Introduction

There has been extensive research into mutual fund performance employing various research methods and different datasets. Due to the greater data availability, these studies have tended to be conducted within the developed markets. Regardless of data, and the measures used, most empirical evidence in developed markets concludes that fund managers, as a group, are unable to outperform the market, in particular after allowing for fees and expenses (see for example, Jensen, 1968; Malkiel, 1995; Ferson and Schadt, 1996; Wermers, 2000).

Although emerging markets are converging towards developed markets they still constitute an important distinct asset class (Eun and Lee, 2010). Bali and Cakici (2010) further highlight the importance of returns in specific countries and demonstrate that a country's return is priced relative to country specific risks, thus indicating that full international integration is not present in the data. Given the paucity of studies on mutual fund investment in emerging markets, we still know relatively little about their performance, especially in the Asia Pacific region. In addition, studies in this region frequently adopt less sophisticated modelling approaches or focus on performance of certain types of funds[1].

The liquidity risk premium has been identified in recent literature as one of the important determinants of stock returns. For example, liquidity effects relate to implicit transaction costs and they have a negative relationship with returns through the 'clientele effect' (Amihud and Mendelson, 1986; Rouwenhorst, 1999; Amihud, 2002; Pastor and Stambaugh, 2003; Acharya and Pedersen, 2005; Liu, 2006; Aragon, 2007). In an emerging market, the liquidity risk premium can be even more pronounced because these markets often feature low liquidity and infrequent trading (Bekaert et al. 2007; Bekaert and Harvey, 2002). Nonetheless, liquidity effects have been discussed and analyzed to a lesser extent in emerging markets. Thus, the purpose of the present study is to investigate mutual fund performance in an emerging market, Thailand, using an auxiliary performance measure to capture liquidity effects and to assess how important these effects are in the evaluation of mutual fund performance.

One of the distinctive features of the Thai fund industry is the exclusive tax-benefit funds which aim to encourage retirement and other long-term savings[2]. The funds provide investors with favorable income tax treatments while their money is tied up in a long-term investment agreement. For the fund managers, the restrictions are beneficial and, therefore, could have a positive effect on fund performance. This potential benefit arises from two main reasons: First, restrictions tend to reduce the cost of liquidity-motivated trading. Second, they allow fund managers to put more investment into illiquid assets and thereby potentially earn illiquidity rent. Since 2002, the tax-benefit funds have attracted considerable cash flows, thus contributing to Thailand achieving the highest fund growth in the Asia Pacific Region. The Thai market, therefore, provides an ideal and important setting for investigating the impact of the liquidity risk premium on fund performance.

This study uses a comprehensive dataset of Thai mutual funds and analyzes 211 mutual funds over the period of 2002-2007. We first find that, consistent with the evidence from developed

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[1] For example, Soo-Wah (2007) examines Malaysian unit trust funds' performance in different market conditions while Fikrihay et al. (2007) compare Malaysian Islamic with traditional funds.

[2] Thailand has two tax-benefit fund schemes namely the Retirement Mutual Fund (RMF) and the Long-Term Mutual Fund (LTF) in order to encourage retirement savings and long-term investment. Both tax-benefit fund schemes provide up to 15% income tax relief with some restriction requirements. RMF funds, for example, require a minimum investment of 5,000 Baht (or 3% of annual income) for 5 years continuously and the investor can only redeem the funds after the age of 55. LTF funds do not require a continuous investment but such funds can only be redeemed after 5 years of investment in the fund. Finally, RMF offer various investment policies (e.g. flexible and equity funds) while LTFs offer only equity funds.

markets, Thai mutual funds, as a whole, do not generate abnormal returns. Mutual funds insignificantly underperform the market by 1.12% per year, somewhat lower when using liquidity-augmented measures. Second, the liquidity-augmented model is both economically and statistically significant for the evaluation of mutual fund performance in Thailand. Third, the style of Thai fund managers is broadly homogeneous. An average Thai fund manager tends to avoid large and value stocks. Fourth, the performance of tax-benefit funds is higher than, and statistically significantly different from that of general funds. Finally, there is evidence of short-term persistence in fund performance. The above results remain robust to the use of an alternative proxy for size and consideration of microstructure issues related to infrequent trading.

The paper is organized as follows. Section 1 provides a rationale for the liquidity-augmented model. Section 2 describes the data and variables used in this study. Section 3 presents the empirical results of our liquidity augmented model for funds' performance. In section 4 we conduct various robustness tests. The last section presents the conclusions.

1. Rationale for using a liquidity-augmented measure

A number of studies argue that there are factors other than market returns which can explain the cross-sectional returns of stocks. For instance, the widely used Fama and French (1992, 1993) model finds that stock returns can be best explained by the return on the market portfolio and two additional factors that capture the size and the value premium. Jegadeesh and Titman (1993, 2001) also demonstrate the momentum anomaly, by which cross-sectional stock returns can be explained by prior year returns. As a consequence, Carhart (1997) proposed a four-factor model, which incorporated size and value risk premiums together with the momentum effect in addition to the market factor to evaluate mutual fund performance.

Amihud and Mendelson (1986) demonstrate that equilibrium expected returns increase with illiquidity, as measured by the bid-ask spread and suggest a 'clientele effect' in which longer horizon investors are positively disposed to expected returns because they hold more of their portfolios in illiquid assets. Eleswarapu and Reinganum (1993), in contrast, argue that the liquidity premium is merely a seasonal phenomenon. Brennan and Subrahmanyam (1996) employ intraday transaction data to measure liquidity instead of using the bid-ask spread as a measure of the liquidity premium. They find, consistent with Amihud and Mendelson (1986), a

positive and significant relationship between return and illiquidity in assets, after adjusting for the factors in Fama and French's (1992; 1993) three-factor model.

A number of studies investigate the effect of liquidity by looking at other dimensions. Brennan et al. (1998) and Datar et al. (1998) look at liquidity in the trading quantity dimension. Brennan et al. (1998) measure liquidity using trading volume and suggest a negative relationship between stock returns and trading volume. Similarly, Datar et al. (1998) employ a share turnover ratio measured by the number of shares traded divided by the number of shares outstanding. They argue that the share turnover ratio is an ideal proxy for liquidity because it has strong theoretical support and the data is easy to obtain[1]. Their results reveal that, over the period of 1963-1991, stock returns were negatively related to the turnover ratio, even after controlling for the size and book-to-market risk premium and there is no evidence of a seasonal effect. Pastor and Stambaugh (2003) find a 7.5% per annum return spread in the expected return between low and high liquidity stocks. They incorporate their liquidity factor into Fama and French's 3-factor model and conclude that the risk factor explains half the profit in a momentum strategy. Liu (2006) finds that the lowest liquidity decile portfolios outperform by 0.7% per month. In particular, he finds that liquidity risk is an important factor in asset pricing models.

There is however paucity of literature on importance of liquidity factors on performance of mutual funds. Notable exemptions are studies that examine importance of several restrictions (e.g. lockups, redemption notice periods, redemption frequency and minimum investment) on hedge fund returns (Aragon, 2007; Liang and Park, 2008; Agarwal et al., 2009). The liquidity premium effect has not, so far, been considered in the evaluation of mutual fund performance. Consequently, we construct a liquidity-augmented performance measure based on Carhart's 4-factor model, with an additional factor capturing the liquidity premium. The expected return on portfolio, p, as expressed in terms of the liquidity-augmented model is:

$$E(R_p) - R_f = \beta_{1p}(E(R_m) - R_f) + \beta_{2p}E(SMB) + {} + \beta_{3p}E(HML) + \beta_{4p}E(PR1YR) + \beta_{5p}E(LIQ), \quad (1)$$

where $E(R_p)$ is the expected return of portfolio p, R_f is the risk-free rate of return, R_m is the return on the market and SMB, HML and $PR1YR$ are the

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[1] This measure also takes into account the shareholder base which is ignored by some other liquidity proxies (Datar et al., 1998).

mimicking portfolio risk premia for size, book-to-market and one year momentum in the stock return factors. The last factor, *LIQ*, is a mimicking portfolio capturing the liquidity premium in our augmented liquidity model. The β_{ip}s represent the factor sensitivities.

Thus, we estimate mutual fund performance using the traditional capital asset pricing based model (Jensen, 1968), equation (2) below, and our proposed liquidity-augmented factor model, equation (3):

$$R_{pt} - R_{ft} = \alpha_{pt} + \beta_{1p}(R_{mt} - R_{ft}) + \varepsilon_{pt}, \qquad (2)$$

$$R_{pt} - R_{ft} = \alpha_{pt} + \beta_{1p}(R_{mt} - R_{ft}) + \beta_{2p}SMB_t + \\ + \beta_{3p}HML_t + \beta_{4p}PR1YR_t + \beta_{5p}LIQ_t + \varepsilon_{pt}. \qquad (3)$$

The intercept of the models, alpha (α_{pt}), measures the ability of the fund manager to generate performance.

2. Data

2.1. Mutual fund sample. Data pertaining to Thai mutual funds are obtained from the Association of Investment Management Companies (AIMC) which provides the most complete information on Thai mutual funds[1]. Our sample is from January 2002 to August 2007. We based our fund classification on that generated by the AIMC which classifies mutual funds on the basis of investment policy. There were 966 funds in our initial sample, in which defunct funds are also included. We then excluded closed-end funds, fixed-income funds, specific funds and also funds which change their policy over the study period. Subsequently, our sample size was narrowed down to 230 funds which comprise equity funds and flexible funds. In addition, we remove funds which have been in operation for less than 12 weeks over the sample period. This finally leaves 211 funds in our sample which is made up of 152 equity funds and 59 flexible funds[2]. The sample includes all defunct, surviving and new funds and, as such, is not affected by the survivorship bias (Brown et al. 1992). Table 1 shows the characteristics of the funds in our sample.

Table 1. Sample fund characteristics [a,b,c]

	N	Age	TAV	Size	NCF
Panel A: All funds					
All funds	211	207.89 (252)	110,096.56	583.14 (276.21)	112.19 (-10.08)

Panel B: Classified by investment policy					
Equity funds	152	208.28 (269)	82,020.98	558.09 (276.39)	75.74 (-5.94)
Flexible funds	59	206.86 (250)	28,075.58	646.66 (71.43)	39.25 (-2.23)

Notes: [a] *N* and TAV respectively refer to the number of funds and the total asset value (in THB million), in August 2007; [b] Size refers to the average market capitalization (in THB million); [c] NCF refers to the net cash flows of funds in the sample period. The table shows means and medians (in parentheses) of Age, Size and NCF.

More than two-thirds of the total asset values belong to equity funds. However, the average size of equity funds is slightly smaller than that of flexible funds. The average life of both equity and flexible funds is about the same, approximately 4 years. Furthermore, the last column shows evidence of large positive net cash flows, although equity funds enjoyed somewhat greater net cash flows than flexible funds did.

The AIMC provides weekly total asset values (TAVs) and net asset values (NAVs), accounting for capital gains, dividends (reinvested) and administration fees (subtracted)[3]. The weekly NAV data is then calculated to give the weekly continuously compounded returns as follows.

$$R_{p,t} = ln\left(\frac{NAV_{p,t}}{NAV_{p,t-1}}\right), \qquad (4)$$

where $R_{p,t}$ is the weekly, continuous time, return of portfolio p in month t. Unreported results suggest that mutual funds generate average raw returns of 14% per year (0.27% per week)[4]. Equity funds produce higher average returns than flexible funds, 15.7% as compared to 11.3%. The variability of returns for equity funds is also higher than for flexible funds.

2.2. Benchmarks and variables. The Stock Exchange of Thailand index (SET index) is used as the market benchmark portfolio. This index is a value-weighted index for all Thai securities traded on the Stock Exchange of Thailand and, as such, has the necessary characteristics of a market portfolio proxy[5]. The Bank of Thailand's 7-day repurchase rate is used as a proxy for the risk-free rate. We use Thai stock market data to construct size, book-to-market, liquidity and momentum factors. All data was collected from the Datastream database. First, all stocks are equally divided into small (S) and big (B) groups based on market value, at the beginning of each year. Then, we rank

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[1] Association of Investment Management Companies (AIMC) is an association in charge of supervising all asset management companies in Thailand. It is also responsible for setting guidelines for reporting standards.
[2] Out of 152 equity funds, 115 are general equity funds and remaining 37 are tax-benefit equity (LTF and RMF) funds. Out of 59 sample flexible funds, 47 are general flexible funds and remaining 12 are tax-benefit flexible (RMF) funds.

[3] Net Asset Values (NAVs) signify the total value of the fund's asset at current market value minus current liabilities and any prior charges.
[4] Results are available from authors upon request.
[5] We also used SET50 and SET100 indices, as alternative benchmarks, to check the robustness of our results. The results were economically and statistically consistent with the results based on the SET index.

stocks by their book-to-market ratios. The stocks are then assigned into one of three groups, high (H), medium (M) and low (L), based on the 30:40:30 split.

For the liquidity factor, we measure liquidity using a share turnover ratio which captures the trading quantity dimension of liquidity and has strong empirical backing (Datar et al., 1998; Chan and Faff, 2005; Amihud and Mandelson, 1986). Our share turnover ratio is calculated by the volume of shares traded in a month divided by the quantity of shares outstanding in that month. We then calculate the average monthly share turnover ratio over the year. For each year, we rank stocks based on the average turnover ratio for that year and break this ranking down into very liquid (V), moderately liquid (O) and illiquid (I) categories, based on the 30:40:30 split.

Subsequently, we construct 18 value-weighted portfolios defined by their size, book-to-market and liquidity characteristics (S/H/V, S/H/O, S/H/I, S/M/V, S/M/O, S/M/I, S/L/V, S/L/O, S/L/I, B/H/V, B/H/O, B/H/I, B/M/V, B/M/O, B/M/I, B/L/V, B/L/O and B/L/I)[1]. The size (SMB) portfolio is the difference between the average of 9 "small" portfolios and the average of 9 "big" portfolios. The book-to-market (HML) portfolio is measured by the difference between the average of 6 high book-to-market portfolios and 6 low book-to-market portfolios. Similarly, the liquidity (LIQ) portfolio is measured

by the difference between the average of 6 illiquid and 6 very liquid portfolios. This process is repeated at the beginning of each year from 2002 to 2007. Thus, this construction approach ensures that all three factors are orthogonalized and the effects of the two other factors on the mimicking portfolios are minimized.

We construct our momentum portfolio (PR1YR), using Thai stock returns, following Carhart (1997) who suggests that persistence in mutual fund returns is explained by the use of a momentum strategy. The PR1YR portfolio is the equally weighted portfolio of stocks with the top 30% past year returns minus the equally weighted portfolio of stocks with the 30% lowest past year returns.

Table 2, below, provides summary statistics and the correlation matrix of the variables used in this study. In contrast to previous studies, the mean returns of the HML and LIQ portfolios are negative. This suggests that value and illiquid stock portfolios lead to negative realized return premiums in the Thai market over our study period. The correlations are relatively small which is consistent with Fama and French (1993) who report that the correlation between SMB and HML equals -0.08 and of Chan and Faff (2005) who also report low correlations between their risk factors. Our results report only a high negative correlation between the excess market returns and our liquidity return premium[2].

Table 2. Summary statistics and correlation matrix for the factors of the liquidity augmented model [a]

Variable	Summary statistics		Correlation matrix				
	Mean	Std. dev.	$R_m - R_f$	SMB	HML	PR1YR	LIQ
$R_m - R_f$	0.0036	0.0302	1	-	-	-	-
SMB	0.0002	0.0142	-0.3827	1	-	-	-
HML	-0.0045	0.0163	-0.1872	-0.0563	1	-	-
PR1YR	0.0114	0.0221	0.0638	0.0028	-0.1051	1	-
LIQ	-0.0018	0.0328	-0.7022	-0.0432	0.0480	-0.0328	1

Notes: [a] R_f is the risk-free rate of return; R_m is the return on the market. SMB, HML, PR1YR, and LIQ are the mimicking portfolio returns for size, book-to-market value, momentum, and liquidity from equation (3).

3. Liquidity-augmented performance

3.1. Factor sensitivities. Table 3 demonstrates the importance of the liquidity premium in the liquidity-augmented model. Coefficients corresponding to the liquidity premium (LIQ) are negative and highly significant across all portfolios. The estimated market beta coefficient of the flexible funds' portfolio is 0.6477, which is lower than the equity funds portfolio (0.8549), indicating that flexible funds are less closely correlated to the market (Panel A). This is consistent with their investment policies, in that flexible funds invest in a combination of assets and, therefore, would have smaller proportions of equity. Both equity and flexible fund portfolios are more exposed to growth

stocks as the slope coefficients of the HML factor, representing the value premium of high book-to-market stocks, stands at -0.0562 and -0.0550, respectively. In both portfolios the coefficient is highly statistically significant at 5% and 1% level, respectively. The SMB factor, representing the size premium of small stocks, and momentum factor (PR1YR) are positive for the equity funds portfolio and negative in the flexible funds' portfolio. However, these coefficients are not statistically significant in any of the portfolios. Therefore, our results suggest that Thai fund managers give more weight to growth stocks in their portfolios and pay less attention to the size based styles and momentum strategies.

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[1] Our procedure for formation of liquidity portfolios is similar to Chan and Faff (2005).

[2] Chan and Faff (2005) also report high (-0.494) correlation between excess market returns and the liquidity factor returns, using monthly Australian data.

Table 3. Estimates of the liquidity-augmented model [a,b,c]

	β_{Rm-Rf}	β_{SMB}	β_{HML}	β_{PR1YR}	β_{LIQ}
Panel A. Results in total sample (ALL), sub-sample of equity funds (EQUITY), and sub-sample of flexible funds (FLEXIBLE)					
ALL	0.7998*** (38.43)	-0.0003 (-0.01)	-0.0568*** (-2.87)	0.0121 (0.8)	-0.0500*** (-3.12)
EQUITY	0.8549*** (35.00)	0.0053 (0.15)	-0.0562** (-2.5)	0.0189 (1.1)	-0.0546*** (-2.94)
FLEXIBLE	0.6477*** (46.39)	-0.0076 (-0.33)	-0.0550*** (-3.59)	-0.0112 (-0.94)	-0.0400*** (-3.55)
Panel B. Number of funds with positive and [negative] factors statistically significant at 5% level, or better					
ALL	198 [0]	4 [8]	0 [49]	10 [12]	7 [54]
EQUITY	145 [0]	2 [7]	0 [35]	7 [8]	7 [35]
FLEXIBLE	53 [0]	2 [1]	0 [14]	3 [4]	0 [19]

Notes: [a] $R_{pt} - R_{ft} = \alpha_{pt} + \beta_{1p}(R_{mt} - R_{ft}) + \beta_{2p}SMB_t + \beta_{3p}HML_t + \beta_{4p}PR1YR_t + \beta_{5p}LIQ_t + \varepsilon_{pt}$ (equation (3)). [b] t-statistics for estimated coefficients of the liquidity-augmented model are in parentheses. [c] *** Significant at 1% level; ** significant at 5% level; * significant at 10% level.

Panel B contains results at the individual level by looking at the number of funds with positive and negative factors with statistical significance at the 5% level, or better. The results are consistent with those reported in Panel A, highlighting the importance of the liquidity premium. Overall, the results suggest that Thai fund managers give more weight to growth and liquid stocks.

Our findings differ from much of the previous evidence generated in developed markets, which suggests the widespread use of momentum strategies (Grinblatt et al., 1995; Daniel et al., 1997; Carhart, 1997; Otten and Bams, 2002; Bauer et al., 2006; Gharghori et al., 2007). However, they are similar to those in the study by Fletcher and Forbes (2002), who find that the momentum factor is close to zero for the UK unit trusts. Similarly, Griffin (2003) suggests that Asian markets offer the weakest evidence of the application of momentum strategies.

3.2. Performance of Thai's mutual funds. We analyze mutual fund performance at both the aggregate and individual fund levels. Table 4 exhibits fund performance using the Jensen and the liquidity-augmented models, presenting results at the aggregate level (Panel A) and stratifying the results by positive and negative alpha (Panel B),

respectively. The results presented in Panel A, suggest that, overall, mutual funds did not outperform relative to the market benchmark. The Jensen's α_{pt} (alpha) of the all-fund portfolio is -0.04% per week or approximately -2% per annum, which is statistically insignificant[1]. At the investment policy level, the average performance of the flexible fund was comparable to that of equity funds although, in contrast, it was statistically significantly negative at the 10% level.

Performance estimated with the liquidity-augmented measure is presented in columns 4 and 5. When the liquidity-augmented model is used, mutual funds, on average, performed at about 2% per year (-0.07% per week) below the market. The alphas (α_{pt}) are marginally statistically significant at the 10% level. Thus, usage of more fully specified model for the evaluation of performance has increased the statistical significance of the results.

The adjusted R-squares are around 95% and 96%, respectively. These very high adjusted R-squares are consistent with the previous literature (e.g. Ferson and Schadt, 1996; Sawicki and Ong, 2000) and can be interpreted as evidence that both equity and flexible fund managers employ rather passive strategies.

Table 4. The performance (alpha) based on Jensen's and the liquidity-augmented model [a,b,c]

	Jensen		Liquidity-augmented		Wald test [c] {p-value}
	α_{pt}	Adjusted R^2	α_{pt}	Adjusted R^2	
Panel A. Results in total sample (ALL), sub-sample of equity funds (EQUITY), and sub-sample of flexible funds (FLEXIBLE)					
ALL	-0.0004 (-1.24)	0.95	-0.0007* (-1.86)	0.96	5.31 {0.00}
EQUITY	-0.0004 (-1.10)	0.95	-0.0008* (-1.78)	0.95	5.05 {0.00}
FLEXIBLE	-0.0004* (-1.75)	0.96	-0.0005* (-1.86)	0.96	5.99 {0.00}

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[1] Annual returns are calculated on a compounded basis.

Table 4 (cont.). The performance (alpha) based on Jensen's and the liquidity-augmented model

Panel B. *N*-alpha is number of funds with positive and [negative] alphas in relevant samples. Sig 5%- number of funds with positive and [negative] statistically significant alphas at 5% level, or better				
	N-alpha	Sig 5%-alpha	*N*-alpha	Sig 5%-alpha
ALL	82 [129]	12 [12]	76 [135]	19 [13]
EQUITY	64 [88]	13 [4]	59 [93]	18 [7]
FLEXIBLE	18 [41]	1 [7]	17 [42]	1 [6]

Notes: [a] Jensen and the liquidity-augmented model's alpha (α_{pt}) estimated by equations (2) and (3), respectively:

$$R_{pt} - R_{ft} = \alpha_{pt} + \beta_{1p}(R_{mt} - R_{ft}) + \varepsilon_{pt}, R_{pt} - R_{ft} = \alpha_{pt} + \beta_{1p}(R_{mt} - R_{ft}) + \beta_{2p}SMB_t + \beta_{3p}HML_t + \beta_{4p}PR1YR_t + \beta_{5p}LIQ_t + \varepsilon_{pt}.$$

[b] *t*-statistics for estimated alphas are in parentheses. *** Significant at 1% level; ** significant at 5% level; * significant at 10% level. [c] *P*-values for Wald test are in brackets { }.

In order to test the overall statistical significance of our liquidity-augmented model we employed the Wald test. The null hypothesis is that the four coefficients in the model (β_{SMB}, β_{HML}, β_{PR1YR}, β_{LIQ}) are jointly equal to zero. The Wald test statistics and the *p*-values {in brackets} are presented in the last column of the table (Panel A). The results reject the null hypothesis for all the funds and confirm the importance of variables included in our model.

Panel B contains a summary of mutual funds with positive and negative alphas (*N*-alpha) and those with positive and negative alphas that are statistically significant at 5% level, or better (Sig 5%-alpha). The results suggest that there are more funds with negative than positive alphas. For example, 82 funds produced positive alphas, whilst 129 funds had negative Jensen alphas. Nevertheless, only 24 funds (11.37% of the sample) exhibited statistically significant Jensen alphas at the 5% level, or better. Half of them (12 funds) performed positively and significantly whilst the other half (12 funds) performed in a negatively significant fashion. The results based on our liquidity-augmented model suggest an increase in the number of funds with negative alphas, from 129 to 135. Moreover, the number of funds with statistically significant alphas perceptibly increases. For example, using the liquidity-augmented measure, the performance of 19 (13) funds is positively (negatively) significant at the 5% level. Equity funds tend to be more sensitive to the liquidity-augmented measures than flexible funds. Using the liquidity-augmented measure, equity funds generate more abnormal performance (overall increase from 17 to 25 funds) whilst the number of abnormal performances for flexible funds

is not much different (overall decrease from 8 to 7 funds). The higher sensitivity of equity funds to the liquidity-augmented measures is due to the fact that the equity funds contain a greater portion of equity than flexible funds. Consequently, an extra variable which is measured by stock turnover would have stronger impacts on equity funds than flexible funds.

Overall, the results from this section lead us to conclude that our liquidity-augmented performance measure has both statistical and economic importance in Thai mutual fund performance evaluation, in particular for equity funds.

3.3. Performance of tax-benefit funds. As discussed earlier, tax-benefit funds require longer holding periods than other funds. They provide up to 15% income tax relief for investors while requiring at least a 5 year period of investment. The requirement of a longer holding period for tax-benefit funds could lead to an increased investment in less liquid assets with consequent liquidity impacts upon the funds' performance. Hence, we distinguish tax-benefit funds from general funds and investigate the differential performances of the two groups. Equally weighted portfolios of general and tax-benefit funds are constructed and the performances for both portfolios are estimated using Jensen and the liquidity-augmented model. Table 5 presents the results for the liquidity-augmented measure. General fund returns are negatively associated with the growth premium (at 1% level of significance). The coefficients for the liquidity factor are negative and statistically significant (at 1% level) in both regressions, thus explaining returns for both the general and tax-benefit funds.

Table 5. Estimates of the liquidity-augmented model for general and tax-benefit funds [a,b,c]

	α_{pt}	β_{Rm-Rf}	β_{SMB}	β_{HML}	β_{PR1YR}	β_{LIQ}
GENERAL	-0.0009** (-2.15)	0.8161*** (37.72)	-0.0003 (-0.01)	-0.0592*** (-2.89)	0.0102 (0.65)	-0.0479*** (-2.91)
Tax-benefit	0.0006* (1.71)	0.6551*** (24.05)	0.0127 (0.38)	-0.0235 (-0.97)	-0.0126 (-0.89)	-0.0715*** (-3.87)

Notes: [a] $R_{pt} - R_{ft} = \alpha_{pt} + \beta_{1p}(R_{mt} - R_{ft}) + \beta_{2p}SMB_t + \beta_{3p}HML_t + \beta_{4p}PR1YR_t + \beta_{5p}LIQ_t + \varepsilon_{pt}$. [b] *t*-statistics for estimated coefficients of the liquidity-augmented model are in parentheses. [c] *** Significant at 1% level; ** significant at 5% level; * significant at 10% level.

We further analyze the differences in average (mean) alphas (Jensen and liquidity-augmented) across funds' tax characteristics. The results, presented in Table 6, suggest a statistically inferior average performance in general funds, regardless of the performance measure used. Whilst tax-benefit funds generate marginally positive alphas (statistically significant at the 10% level in the liquidity-augmented model) the general funds exhibit negative and statistically significant (at the 5% level) average alphas by both Jensen's and the liquidity-augmented model. Using the liquidity-augmented measure, the average alpha ranges from 0.06% per week (over 3% per annum) for the tax-benefit funds to -0.09% per week (-4% per annum) for the general funds. The differences in average (mean) alphas for tax-benefit and general funds are found to be statistically significant at the 1% level, regardless of the performance model.

Table 6. The performance differences across tax characteristics [a,b,c,d]

	Tax-benefit funds (1) [b]	General funds (2) [b]	Differences (1)-(2) [c]
Jensen's α_{pt}	0.0005 (1.49)	-0.0006** (-1.66)	0.0010*** {3.12}
Liquidity-augmented α_{pt}	0.0006* (1.71)	-0.0009** (-2.15)	0.0015*** {3.86}

Notes: [a] This table presents average (mean) alpha (α_{pt}) for tax-benefit (1), and general funds (2). The differences between the average alphas (α_{pt}) for respective funds are presented in the last column. [b] *t*-statistics for two tail one sample *T* test for mean = 0 vs. mean ≠ 0, in parentheses. [c] *t*-statistics for two tail two sample *T* test for difference in means, in brackets { }. [d] *** Significant at 1% level; ** Significant at 5% level; * significant at 10% level.

The analysis presented here, therefore, supports the conclusion that tax-benefit funds significantly outperform general funds, even when the liquidity premium is controlled for. Thus, the evidence of superior performance in tax-benefit funds does not necessarily result from the liquidity premium alone as found in, for example, Edelen (1999) and Aragon (2007). In contrast, the higher returns in tax-benefit funds may be attributed to other reasons including managerial skills and the lower trading costs. Furthermore, significant cash inflows over time could potentially impact on a fund's systematic risk and subsequently its performance (see Ferson and Schadt, 1996; Edelen, 1999). The restriction on early redemption in tax-benefit funds is likely to have a positive impact on fund performance due to 'cost of liquidity-motivated trading'. For example, when fund managers experience a cash outflow shock, they are forced to liquidate their portfolio immediately and cannot trade on private information efficiently. Consequently, fund outflows could have a negative impact on fund performance. Since the tax-benefit funds restrict investors from liquidating their shares for a certain time period the potential negative impact of outflows would be reduced. The second reason for the positive impact of the restriction on performance is that it creates a longer investment horizon, a 'clientèle effect', in which longer horizon investors hold less in liquid assets and the return increases with illiquidity (Amihud and Mendelson, 1986).

4. Robustness tests and further analysis

4.1. Infrequent trading and market illiquidity. Infrequent trading (i.e. stale prices) could be an important driver of expected returns in emerging markets (Bekaert et al., 2007). Bekaert et al. (2007), for example, report average (value-weighted) monthly proportions of daily (local currency) zero returns of 38.2% for (204) Thai firms[1]. The same study reports, as expected, a negative correlation (-37%) between average levels of equity market turnover and average indices of zero daily returns in Thailand[2]. We checked our data for the occurrences of such infrequent trading types and calculated correlations between the two alternative measures of liquidity. Our unreported results suggest a correlation between share turnover and the proportion of zero returns of -47.74% (using an equally-weighted method)[3]. The results, therefore, show a high correlation between the alternative measures and are in line with the results reported in Bekaert et al. (2007)[4].

We further check robustness of our results by constructing new liquidity portfolios based on proportion of zero returns (LIQ-PROP) as a new alternative measure of liquidity. The unreported results are economically and statistically consistent with the results based on share turnover[5].

Finally, we check the robustness of our results we address the potential impacts of illiquidity on

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[1] The percentage is higher than average for 18 emerging markets (30.8%) but lower than the percentage reported for other 7 emerging markets examined in this study. The same study reports average turnover ratio of 7.4% for Thai firms (above sample average of 6.9%).
[2] The reported cross-sectional correlation for 18 emerging markets was -35%.
[3] The correlation was -44.55% (using value weighted method).
[4] It is worth noting that Bekaert et al. (2007) sample was 1993-2003 while ours is 2000-2007. Also, they report average monthly proportion of daily zero returns while we report average monthly proportion of weekly zero returns. Finally, Bekaert et al. (2007) measure turnover ratio as equity value traded for each month divided by that month's market capitalization. In our study, trading volume is divided by the number of shares outstanding thus taking into account the shareholder base.
[5] Similar results were also obtained after excluding all observation with zero returns from our sample. Results are available from authors upon request.

market values, returns, and the construction of our model factors. The unreported results based on newly constructed SMB and HML factors (using sales instead of market values) are economically and statistically consistent with previously reported results in Tables 3 and 4[1].

4.2. Persistence in performance. A number of studies provide evidence of short-term persistence, particularly among poorly performing funds (see, for example Hendricks et al., 1993; Goetzmann and Ibbotson, 1994). To investigate the evidence of performance persistence, we construct zero-cost trading strategy portfolios corresponding to past returns and estimate performance using both Jensen and the liquidity-augmented measures. This methodology allows us to investigate both the statistical and economic importance of past returns in relation to the current performance.

Unreported results suggest persistence in performance in Thai mutual funds over our estimation period even when we control for the use of momentum strategies[2]. This evidence is statistically and economically important. However, the evidence is weakest for tax-benefit equity funds. In addition, our results suggest that this persistence result applies only to poorly performing funds which continue to perform badly. Past outperforming funds do not generate an abnormal return in a subsequent period. Our results, therefore, are in line with several previous studies for developed markets (Hendricks et al., 1993; Goetzmann and Ibbotson, 1994).

4.3. Superior performance of tax benefit funds. We further check for the robustness of the results of superior performance of tax benefit funds within a cross-sectional regression model. The dependent variables in the models are the alphas (α_p) of each fund, estimated using both Jensen's and the liquidity-augmented models (models 1 and 2, respectively), over the period of 2002-2007. The explanatory variable in our models is a categorical variable taking a value equal to 1 for tax-benefit fund (TAX), and zero otherwise. We control for other fund characteristics such as: size (average market capitalization in THB million), fund net cash flows (NCF), age (funds' age in number of months), and investment policy (categorical variable for EQUITY funds). Thus, we estimate the following cross-sectional regression model:

$$Alpha_p = \beta_0 + \beta_1 TAX_p + \beta_2 SIZE_p + \\ + \beta_3 HCF_p + \beta_4 Age_p + \beta_5 EQUITY_p + \varepsilon_p. \quad (5)$$

The unreported results suggest that tax-benefit fund dummy variable (TAX) is positive and statistically significant (at the 5% level or better) in both the unconditional and conditional models of performance[3]. The tax-benefit funds, therefore, perform statistically significantly differently from other mutual funds, thereby providing further support for the results presented in Tables 5 and 6.

Conclusion

Mutual fund investment in emerging markets has grown substantially over the past few years. However, only a small number of studies in the fund performance area have been conducted in this setting and most of these studies have used conventional measures with relatively small datasets. More recently, several studies document the importance of additional factors to market risk in explaining asset returns. Therefore, this paper extends mutual fund performance measurement to a multifactor model which includes a liquidity factor as this effect is of some impact and concern in emerging markets. We use survivorship-bias-free data from 2002-2007, which is the most extensive period to be analyzed in mutual fund performance studies using Thai data. We propose a liquidity-augmented model in measuring mutual fund performance and also examine many aspects of fund performance, including the strategies and styles of fund managers and persistence in performance. In addition, this study also takes into account the style of tax-benefit funds which is a specific mutual fund style in Thailand. These require a long-term investment horizon and, therefore, can potentially impact on the performance and strategies used by a fund manager.

The findings are, first, that mutual fund managers do not generate abnormal performance. On average, mutual funds tend to underperform the market benchmark but not at a statistically significant level. The underperformance is approximately 2% per year over the study period. In addition, the number of negatively performing funds is also greater than the number of positive funds at the individual level. Second, the liquidity-augmented model is statistically important for performance measurement. The results are robust to use of alternative proxies for size and liquidity. Third, fund managers select stocks on the basis of value/growth characteristics (placing more emphasis on growth and liquid stocks), although there is no evidence to support the use of size and momentum strategies. Fourth, the performances of tax-benefit funds and general funds are statistically significantly different. Tax-benefit funds perform better than general funds, even when other

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[1] Results are available from authors upon request.
[2] Results are available from authors upon request.

[3] Results available from authors upon request.

characteristics are controlled for. Finally, there is persistence in performance even when momentum effects are controlled for. However, this result derives from poorly performing funds which continue to perform badly in the next period.

The results, then, show both similarities and contrasts to the previous literature. The similarity is that our results show evidence of no selectivity ability or timing ability among fund managers in Thailand which are consistent with the conventional worldwide findings (Malkiel, 1995; Ferson and Schadt, 1996; Wermers, 2000; Khanthavit, 2001). The multifactor model helps to explain mutual fund performance. Similar to findings in developed markets, our results reveal persistence in performance especially in poorly performing funds (Hendricks et

al., 1993; Goetzmann and Ibbotson, 1994; Otten and Bams, 2002; Bauer et al., 2006; Ferreira et al., 2009). Nevertheless, the main difference in our work is that the strategy which fund managers applied to their portfolios in Thailand is different to those in developed markets, in that Thai fund strategies are clustered. That is, fund managers put more emphasis on growth and liquid stocks and they do not employ size or momentum strategies. This is potentially due to specific characteristics of emerging markets where value and size premia are not high. Therefore, further studies of mutual funds in emerging markets need to place more emphasis on the specific emerging market characteristics, assess, and utilize the most appropriate models for evaluating fund performance in the particular emerging markets.

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