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Liquidity and the Stock Returns: A Re-examination of the Vietnamese Stock Market

Nhan Tran Nguyen Thanh[1] and Sung Sup Brian Choi[2]

[1]*Ph.D. student at Economics Department, the Graduate School, Binghamton University, SUNY (State University of New York), U.S.A. E-mail: ntran7@binghamton.edu*
[2]*Corresponding Author; Professor of Finance at Gachon University, South Korea. E-mail: sschoiss@gachon.ac.kr*

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Abstract: Liquidity is a major factor in pricing. Most extant literature suggests a negative relationship between liquidity and stock returns. Some claim, however, that liquidity has a different role in the emerging market. In particular, using Vietnamese stock market data, Batten and Vo (2014) and Vo and Bui (2016) showeda positive relationship between liquidity and stock returns. This paper re-investigates this subject in the framework of the augmented Fama-French model that includes liquidity. Employing eight years of data from 2009 to 2017 in the Vietnamese stock market, the study finds that the size effect and the value effect exist in Vietnam. More importantly, the liquidity factor is not only priced in Vietnamese stock market, but it is also a negative relationship that exists between liquidity and stock return.

Keywords: Liquidity, Vietnamese Stock Market, Fama-French Model, Augmented Fama-French Model, Negative Relationship between Liquidity and Stock Returns,

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1. Introduction

It is commonly accepted that liquidity is an important factor in asset pricing. In fact, itis defined as the capacity of the assets by which investors can trade quickly and cheaply. Therefore, in making investment decisions, investors consider the liquidity of assets by demanding a higher return for less liquid assets than otherwise. This suggests a negative relationship between liquidity and stock returns. This proposition appears to be satisfactorily supported by empirical evidence that employs data from developed stock markets. The problem, however, results when we employ emerging markets' data, since theyshow conflicting results.After Batten and Vo (2014) used share turnover as a proxy for liquidity after controlling for momentum, size, and seasonalityin the cross-sectional asset pricing framework of Fama and French (1992, 1993, 1996), they recently found thatlack of liquidity is a less important risk factor for Vietnamese stock market data. Furthermore, both Batten and Vo (2014) andVo and Bui (2016)showed that more liquid stocks are associated with higher returns, which goes against results from findings of developed stock markets.

The positive relationship between liquidity and stockreturnsthat they indicated also persists after controlling for the stock returns determinants, including three Fama-French factors and the momentum factor.

Does thismean that liquidity plays two different roles depending on whether we look at developed stock markets or emergingones? Batten and Vo (2014) and Vo and Bui (2016) both agree. In analyzing the Vietnamese stock market, they claimed thatliquidity plays a different role in emerging markets partly because their stock market is not yetadequatelyintegrated with the globalmarket.Furthermore, small Vietnamese investors trade more frequently than large institutional counterparts. This implies that their preferences toward stocks of large and liquid firms lead to an increase in the demand for large and liquid stocks. This contradicts most extant literature. Among others, Pastor and Stambaugh (2003), Liu (2006), and Lam and Tam (2011) alsoshowed a negative relationship between liquidity and stock returns in their analysis of relatively developed markets. Even with emerging markets, Chung and Wei (2005) found a negative relationship between liquidity and Chinese stock returns, while Bekaert *et al.* (2007) studied 18 emerging stock markets. They found the same negative relationship as well. Thus, the results of Batten and Vo (2014) and Vo and Bui (2016) are puzzling. We, therefore, suspect that their different results may be either due to the specificity of the Vietnamese stock market, or the effect of global credit crisis. Moreover, both use data that span a relatively short period of time—roughlythree years—which also includes the global credit crisis period. Batten and Vo (2014) used monthly returns from January 2007 to June 2010. Vo and Bui's (2016) data entail monthly returns, covering the period from 2009 to 2012, the beginning of which, we believe, was still under the influence of the global credit crisis. Now that the time has passed, there is a need to re-examine the Vietnamese stock market in order to re-evaluate the role of liquidity with a more robust data set. In this paper, we address this issue.

We use the monthly data from July 2009 to June 2017, and adopt a time-series regression as well as Fama-MacBeth's approach. In so doing, we compare the result of Fama-French threefactor model with that of augmented Fama-French five factor model with momentum and liquidity.If liquidity is to be priced, the factor model with liquidity must show statistical significances of liquidity factors—with statistical improvements—when compared to the alternative model. The intercepts of these regressions should be jointly equal to zero as well. Furthermore, in case the liquidity factor turns out to be statistically significant, it must show a more concrete relationship between liquidity and stock returns—positive or negative—after controlling for the stock returns determinants, including Fama-French three factors as well as the momentum factor. The Vietnamese stock market used to be dubbed as a frontier market, in the sense that its market was not fully-integrated into the international market. In this regard, Batten and Vo (2014) and Vo and Bui

(2016) claimed that liquidity might have a different role in the Vietnamese stock market, and showed that, unlike many other countries, liquidity and the stock return has a positive relation in the Vietnamese stock market. Noting that their data include the period of financial crisis 2007 and 2008, however, we re-examine the Vietnamese stock market by excluding the period of financial crisis in terms of the framework of the augmented Fama-French model with liquidity and momentum factors. Our findings suggest that the size and value factors in the Fama-French model are priced in the Vietnamese stock market, liquidity is also priced in the market, and the relationship between liquidity and stock returns is negative. Our last finding contradicts the conclusion raised by Batten and Vo (2014) and Vo and Bui (2016) that the relationship between liquidity and stock returns is positive. This finding (i.e., negative relationship between liquidity and stock returns) is consistent with a large body of research in both the advanced and emerging markets fields.

The paper is structured as follows. Section 2 reviews and briefly discussesextant literature on the return-liquidity relationship. Section 3 illustrates our data, variables, and proposed methodologies. We employ six liquidity proxies to investigate the relationship between the return and the liquidity factor. In addition to the liquidity factor, traditional Fama-French model determinants, such as market portfolio, SMB, and HML portfolios, are considered with additional popular factor, the momentum factor. Section 4 goes over the empirical results. Section 5 concludes the paper.

2. Literature review

Amihud and Mendelson (1988) first introduced the "bid- ask" spread as a proxy for liquidity. Although their methodology was simple, they revealed that low-liquidity investments were expected to produce a higher stock return, and hence, a negative relationship between liquidity and stock returns. Huberman and Halka (2001) employed the absolute bid-ask spread, the spread/price ratio, the sum of the number of shares bid and offered, and the sum of the dollar value of shares bid and offered as their liquidity proxies. They showed that the temporal variation in the liquidity proxies positively correlated with return and negatively correlated with volatility. However, since then, there was a growing concern about the bid-ask spread. Many financial researches criticized this proxy, because it did not capture the difference in smaller and larger equity trades. As a result, several alternative liquidity proxies had been proposed in order to better cope with the return-liquidity relationship. For example, Brennan *et al.* (1998) introduced the trading volume and turnover ratio, which they claimedare better proxies. Datar (1998) and Chan and Faff (2005) showed yet another alternative—the standard deviations of the turnover ratio and of trading volume along with coefficients of variation of the turnover ratio (trading volume) and liquidity by Chordia *et al.* (2001).

These various liquidity measures are known to be related to asset returns. Chordia *et al.* (2001) considered the Fama-French model. By controlling return determinants—such as size, book-to-market ratio, momentum, and the level of dollar volume or share turnover—they found a negative and surprisingly strong cross-sectional relationship between stock returns and the liquidity proxy measured by the variability of dollar trading volume and share turnover. Amihud (2002), on the other hand, showed that expected market illiquidity influences positively ex ante stock excess return, implying that expected excess return represents an illiquidity premium in part. In using the Fama-French three factor model, Liu (2006) developed a new measure of liquidity. He showed that a two factor model that includes market and liquidity explains stock returns well. Additionally, in pricing stock returns ofmany different markets, Jankowitsch *et al.* (2011) and Lam and Tam (2011) used various liquidity measures to investigate the role of liquidity. They basically showed a negative relationship between liquidity and stock returns. In terms of emerging stock markets, Chung and Wei (2005) found a positive relation between holding periods and bid-ask spreads in Chinese stock markets; that is, a negative relationship between liquidity and stock returns. After examining 18 emerging stock markets, Bekaert, Harvey, & Lundblad (2007) also found the existence of a negative relationship between liquidity and stock returns. Overall, these studies view liquidity as additional risk factor, and are capable of capturing what the Fama-French three factor model cannot. Furthermore, it is the negative relationship between liquidity and stock returns that penetrates all these studies.

Batten and Vo (2014), however, recently investigated the relationship between liquidity and stock returns in the Vietnamese stock market during the global credit crisis. They identified a positive relationship between liquidity and stock returns. At the same time, they attributed their result to the fact that the Vietnamese stock market is not entirely integrated with the global economy. Furthermore, Vo and Bui (2016) employed an updated dataset of this stock market from 2009 to 2012.They documented another positive relationship between liquidity measures and stock returns. They also claimed that a reverse relationship—opposed to the negative relationship between liquidity and stock returns—exists in the Vietnamese emerging market. They then provided another explanation for their different result for this market where small investors traded more frequently than large institutional investors. They argued that the dominance of small investors implied that they preferred stocks of large and liquid firms, which, in turn, pushed the returns on these stocks higher. Given that these two studies offer contradicting results on liquidity in emerging markets, we adopt a time-series regression approach of Lam and Tam (2011), as well as Fama-MacBeth cross-sectional regressions (in terms of their second pass regression), in order to investigate the return-liquidity issue in the Vietnamese stock market. Vietnamese stock market is a rapidly growing

emerging market, part of the 2020 vision. With its market capitalization predicted to reach 60% GDP, many expect it to be one of the biggest markets in South East Asia. Lam and Tam (2011) compared traditional Fama-French three factor model with augmented Fama-French model with momentum and liquidity factors using widely used liquidity proxies. We employ the same models as Lam and Tam (2011), and use similar methodologies and liquidity proxies.

3. Data, variables, and proposed methodologies

3.1. Data

Vietnamese stock market data of listed corporations were used from TaiViet Corporation, a data service company. Vietnamese accounting data, on the other hand, were used online from available financial statements of listed corporations. The dataset consists of non-financial companies on the Ho Chi Minh stock exchange from July 2009 to June 2017. Regarding the risk-free rate, Vietnamese 1-month-treasury bill rate was used from the International Monetary Fund.

3.2. Variables and proposed methodologies

We examinethe Fama-French three factor model, and the augmented Fama-French model with momentum and liquidity factors, hence the five-factor model, by Lam and Tam (2011), and comparetheir results in order to investigate the liquidity in Vietnamese stock market. In so doing, we employ a time series regression as well as Fama-MacBeth cross-sectional regression. Using Vietnamese stock market data, we construct 27 portfolios as Left-Hand Side (LHS) portfolios for each year by forming three dimensions of portfolios based on size, book-to-market (BM) ratio, and one of the liquidity proxies[1]. We apply six liquidity proxies, which are used only once each time in forming the portfolios. These proxies are as follows:

- Turnover ratio (LIQ1): the average number of the monthly traded shares divided by the average number of outstanding shares over 12 months before July
- Trading volume (LIQ2): the natural logarithm of the monthly volume of traded shares over 12 months before July
- Standard deviation of turnover ratio (LIQ3): the standard deviation of the monthly turnover ratio over 12 months before July
- Standard deviation of trading volume (LIQ4): the standard deviation of the monthly volume of traded shares over 12 months before July
- The coefficient of variation of turnover (LIQ5): the standard deviation divided by the average of turnover ratio over 12 months before July

– The coefficient of variation of trading volume (LIQ6): the standard deviation divided by the average of the monthly volume of traded shares over 12 months before July

To form 27 portfolios, at the end of June every year, we rank Vietnamese stock market data yearly by market capitalization, and divide the sampleequally into three different size-portfolios—small, medium, and big. By the same token, we independently sort the same data based on a book-to-market ratio dimension. As a result, we have three different groups of book-to-market ratio[2]—low, middle, and high.Similarly, we assign the same data equally in terms of liquidity[3] dimension, and the resulting liquidity portfolio is divided into threedifferent groups—low, medium, and high. Afterwards, 3 X 3 X 3=27 combinations of portfolios are formed by an intersection of three different sizes, three different book-to-market ratios, and three different levels of liquidity. Then, we compute the portfolios' equally-weighted monthly return, and keep rebalancing the portfolios at the end of June every year from 2009 to 2015.

In time series regressions, we then test the Fama-French three factor model, and augmented Fama-French model with momentum and liquidity factorsas below:

$$R_{pt} - R_{ft} = a + bMP_t + sSMB_t + hHML_t + \varepsilon_{pt} \quad (1)$$

$$R_{pt} - R_{ft} = a + bMP_t + sSMB_t + hHML_t + wWML_t + \psi LIQ_t + \varepsilon_{pt} \quad (2)$$

wherein, $R_{pt} - R_{ft}$ is portfolio excess return; MP_t is market excess return, where market is the value-weighted average of market return; ε_{pt} is error term. SMB, HML, WML, and LIQ are defined below.

– Size (SMB): This determinant is the same as the one in Fama and French (1993); it represents the size factor to capture the "size effect"
– Value (HML): This determinant is the same as the one in Fama and French (1993); it representsthe value factor to measure the "value premium effect"
– Momentum (WML): This determinant is the momentum factor to capture the "momentum effect."
– Liquidity (LIQ): This determinant is the liquidity factor, and one of liquidity proxies is used.

In equation (1) and (2), SMB, HML, WML, and LIQ factors are constructed in the same way as introduced in Fama and French (1993), and Lam and Tam (2011), which can be briefly summarized as follows[4].

In June of year t, firm size is measured by the market capitalization computed by multiplying the outstanding shares by the closing stock price in June of year t. The book-to-market ratio is calculated by taking the book equity value of a firm dividing by its market capitalization at the end of December year t-1. We also exclude any sample with negative book-to-market ratio.According to the market capitalization in June of year t, we put every

single stock into two portfolios, namely Small (S) and Big (B). Similarly, we put stock independently into three portfolios, namely Low (L), Medium (M), and High (H), based on its book-to-market ratio. Therefore, we form six portfolios (S/L, S/M, S/H, B/L, B/M, B/H), and calculate the equally-weighted monthly returns for each portfolio for the period from July 2009 to June 2015. Thus, SMB (Small minus Big) is calculated as follows:

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

HML (High minus Low) is calculated as follows:

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

For the momentum effect, we firstly calculate the prior performance based on the nominal stock return from year June year t-1 to May year t. Winner (W) is the top 30% of the total stocks with the highest prior performance. Medium (M) is the next 40% of the total stocks and Loser (L) is the bottom 30% of the total stocks. Along with two portfolios sorted by market capitalization, six portfolios are formed (S/L, S/M, S/W, B/L, B/M, B/W), and the equally-weighted monthly returns for each portfolio for the period from July 2009 to June 2015 is calculated. WML (Winner minus Loser) is calculated as follows:

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

Last but not the least, the liquidity factor (LIQ) is constructed in the following way. Take the liquidity factor given by turnover ratio (LIQ1), for instance. At the end of each June, firms are sorted by size in terms of market capitalization; we take two portfolios, Small(S) and Big(B). We also sort the same stocks into three different portfolios(30% most illiquid—L1, 40% medium—L2, and 30% most liquid stocks—L3) based on their turnover ratios. Alongsidetwo portfolios sorted by market capitalization, six portfolios are formed (S/L1, S/L2, S/L3, B/L1, B/L2, and B/L3) at the intersection of size and turnover ratio; the equally-weighted monthly returns for each portfolio for the period from July 2009 to June 2017are calculated every year. LIQ (Liquidity) factor is then calculated as follows:

$$LIQ = \frac{(S/L1 - S/L3) + (B/L1 - B/L3)}{2}$$

4. The Empirical Results

4.1. Data Description

Table 1 shows the average liquidity of three different liquidity groups in the case of turnover ratio (LIQ1), when we form 27 portfolios into three different

dimensions of size, book-to-market, and liquidity. Most illiquidliquidity groupshave the average liquidity of 0.3650, while most liquidity one have the average of 0.6912.

Table 2 shows the descriptive statistics of the independent variables for the time series regressions used in the paper. The average SMB and HML are positive, but trivial. It is worth noting that the average monthly momentum premium is positiveand consistent with the US market, but theHong Kong market experienced a negative return, according to Lam and Tam (2011). Regarding liquidity factors, the monthly average liquidity premiums vary from -0.17% (LIQ5) to 0.82% (LIQ3).The monthly average market premium return over the period is -0.63%, which is far less than that in Hong Kong (1.19% by Lam and Tam (2011)) and the United States (0.43% by Fama and French (1993)). This is troubling as it means that, in the Vietnamese market, the stock risk does not seem to be sufficiently compensated. Either Vietnamese preference for the stock market risk was peculiar or something bad during the period might have occurred in Vietnamese stock market.[5] However, it was a possibility, given the fact that the risk premium is time varying.High equity premium is a phenomenon we observe only in the United States.Even average returns vary as much as the size of average returns in many other countries, and portfolios of high-volatility stocks have lower risk-adjusted returns than portfolios with low-volatility stocks in most markets studies.

Table 3 provides the correlation among all independent variables in the time series regressions.As can be seen from Panel A, all liquidity proxies highly correlate with each other. Further, all correlations are positive, and the majority of correlations have values over 0.7, which indicates that they tend to move together most of time. All correlations in between independent variables are reported in the Panel B, where the liquidity proxy is used by LIQ1. Note that liquidity negatively correlates with the market excess return (approximately -0.62) in the Vietnamese stock market; the correlation is not only high, but negative. This implies that, when liquidity is low, the market excess return is high, and vice versa. On the other hand, most correlations in Panel B are less than 0.5, and the least correlation comes between WML and co-skewness, which is about 0.02.

4.2. The Empirical Results

4.2.1. Model Performance

We use four metrics employed by Fama and French (2017)in order to measure the model performance. Those are one, p-value of GRS statistics, two, average absolute value of intercepts,A|ai|, three, average absolute value of intercepts scaled by the average absolute value of $|\overline{r_1}|$that is the difference between the average return of portfolio i and the average return of equally weighted market portfolio, which is represented by $A|a_i|/A|\overline{r_1}|$, and four, average estimated

Table 1: Twenty-seven LHS portfolios have been re-allocated into three different subgroups, 1 (=small or most illiquid), 2 (=medium or medium-liquid), and 3 (=large or most liquid), depending on their size, book-to-market, and liquidity. BM stands for book-to-market ratio

		Most illiquid stocks		*Medium-liquid stocks*		*Most liquid stocks*	
Size	*BM*	*Avg. of size*	*Avg. of BM*	*Avg. of size*	*Avg. of BM*	*Avg. of size*	*Avg. of BM*
1	1	37,512,616,919	1.01215	38,221,427,003	0.98130	47,217,088,778	0.82101
	2	43,901,258,033	1.41505	44,910,837,010	1.10134	42,910,124,671	1.12266
	3	43,850,269,514	2.86917	45,360,905,608	2.98712	49,105,203,107	3,15403
2	1	157,073,929,371	0.95010	149,788,510,913	0.98101	132,142,033,562	0.91887
	2	148,000,510,676	1.72196	160,024,787,192	1.12019	152,643,898,109	1.57023
	3	154,037,318,270	2.35007	155,996,300,125	2.51494	144,016,222,797	3.35000
3	1	5,492,153,908,217	0.80155	3,501,216,008,501	0.85437	1,800,101,776,818	0.93966
	2	1,511,825,719,683	1.47101	921,543,202,337	1.51612	1,222,765,916,003	1.72170
	3	800,347,818,206	1.98734	1,109,547,089,285	2.48765	912,124,555,399	2.99181
Avg. of liquidity		0.36501		0.51872		0.69117	

Table 2: Table 2 is the descriptive statistics of independent variables in the regression from July 2009 to June 2017. MP is the monthly market premium return, $(MP_t - \overline{MP})^2$ is co-skewness, SMB is the spread of monthly return between small stocks and big stocks, HML the spread of monthly return between high BM stocks and low BM stocks, and WML is the spread of monthly return between winners and losers in preceding 11 months. LIQ1 through LIQ6 are the measures of liquidity factors, using six different liquidity proxies.

Variables	*MP*	$(MP-\overline{MP})^2$	*SMB*	*HML*	*WML*	*LIQ1*	*LIQ2*	*LIQ3*	*LIQ4*	*LIQ5*	*LIQ6*
Mean	-0.0063	0.0040	0.0044	0.0085	0.0023	0.0079	0.0074	0.0082	0.0062	-0.0017	-0.0012
Median	-0.0071	0.0015	0.0027	0.0021	0.0078	0.0055	0.0024	0.0034	0.0037	-0.0012	-0.0008
Maximum	0.1815	0.0276	0.1285	0.1429	0.1120	0.1571	0.1561	0.1298	0.1601	0.0823	0.0758
Minimum	-0.1735	0.0000	-0.0552	-0.0622	-0.1415	-0.1172	-0.1572	-0.1000	-0.1721	-0.0703	-0.0815
Std. Dev.	0.0702	0.0081	0.0388	0.0333	0.0469	0.0671	0.0619	0.0538	0.0604	0.0287	0.0378
Skewness	-0.1315	2.3134	0.9725	1.2010	-0.6375	0.2289	-0.0200	0.1897	0.0710	-0.0745	-0.0562
Kurtosis	3.2276	6.9153	6.0215	5.6782	4.6723	2.5671	2.9871	2.9201	3.0012	3.2365	3.4298

Table 3: Table 3 describes the correlation among liquidity proxies, as well as for all explanatory factors used in time-series regressions from July 2009 to June 2017. Panel A reports correlation for all liquidity proxies. Panel B reports correlation for LIQ1 and non-liquidity factors.

Panel A

	LIQ1	*LIQ2*	*LIQ3*	*LIQ4*	*LIQ5*	*LIQ6*
LIQ1	1.0000					
LIQ2	0.9109	1.0000				
LIQ3	0.9763	0.9116	1.0000			
LIQ4	0.9324	0.9708	0.9367	1.0000		
LIQ5	0.6902	0.7721	0.6654	0.7544	1.0000	
LIQ6	0.7135	0.7920	0.6719	0.7401	0.9812	1.0000

Panel B

	MP	*(MP - $\overline{MP}$)²*	*SMB*	*HML*	*WML*	*LIQ1*
MP	1.0000					
(MP - $\overline{MP}$)²	-0.0615	1.0000				
SMB	-0.3914	-0.1173	1.0000			
HML	0.1729	0.2010	-0.1491	1.0000		
WML	-0.1811	0.0212	0.2134	-0.5018	1.0000	
LIQ1	-0.6193	0.1405	0.3269	-0.4119	0.4123	1.0000

standard error of intercepts scaled by the average absolute value of intercepts, denoted by As(a_i)/A|ai|. The p(GRS) tests whether the expected values of all intercept terms are jointly zero. As p(GRS) becomes higher, it is unlikely that the expected values of all intercepts are jointly zero. The smaller A|a_i|, the better the model performs. By the same token, a smallA|a_i|/A|r $\overline{r_1}$ | implies the dispersion of intercept terms is small relative to that of LHSportfolio's excess average returns, and a big As(a_i)/A|ai|indicates that sampling error is relatively bigas compared to the dispersion of intercept terms. As a result, for the first and the last metrics, the bigger is the better for the model, while, for the second and the third metrics, the smaller is the better for the model. The whole idea is to identify if the intercept terms in regressions for any portfolios on factors are jointly different from zero. In this context, we measure and compare the performances of two models: the three-factor model of Fama and French (1993), which is based on equation (1), and the five-factor model, which is equation (2). The LHS portfolios are 27 portfolios based on size, book to market ratio, and liquidity. Table 4 provides the summary test statistics of these two models in terms of four metrics.

Both models pass the GRS test. Yet, we areinterested in the relative improvement in the model. As it turns out, there exist distinct improvements from the three-factor model to five-factor model in all four areas of performance. To start with, the p-value of GRS statistic is better in five-factor

Table 4

Summary tests statistics of three-, and five-factor models for the 27 portfolios: 07/2009–06/2017, 96 months. The table reports the summary tests of two asset pricing models for the 27 portfolios. Two asset pricing models are Fama and French (1993) three-factor model including Mkt, SMB and HML, and the augmented five-factor model with WML and Liquidity. The probabilities p(GRS) are the p-values of GRS statistics that test whether the expected values of all intercepts are zero. $A|a_i|$ is the average absolute value of intercepts, $A|a_i|/A|\bar{r}_i|$ is the average absolute value of intercepts divided by the average absolute value of $\bar{r}_i$, which is the average return of portfolio i minus the average return of market portfolio. $As(a_i)/A(a_i)$ is the average estimated squared standard error of intercepts divided by the average absolute value of intercepts.

	Three-factor model	*Five-factor model*
p(GRS)	0.52	0.73
$A\|a_i\|$	0.0193	0.0062
$A\|a_i\|/A|\bar{r}_i|$	3.69	1.703
$As(a_i)/A(a_i)$	0.0879	0.1497

model. However,we tend to use the GRS statistic in order to see if the model is true, but does not use it in testing which one is better; that is because the covariance matrix of time-series regression residuals functions as the weight matrix for intercepts, blowing up it easily reduces the statistic, and makes no progress on the intercept terms, a. The simplest way in this case is to use the average absolute value of intercepts $A|a_i|$. Relative to the three-factor model, the five-factor model improves much in thisaverage absolute intercepts; in the five-factor model, its value shrunk more than one tenth of the size in the three-factor model. Also, the dispersion of average returns measured by the estimates of $A|ai|/A|\bar{r}_1|$ is smaller in the five-factor model than the half of the size in the three-factor model. This implies that the intercept dispersion in the five-factor model is much lower relative to the dispersion of LHS average returns.In addition, theproportion of sampling error in unexplained dispersion of average returns measured by the estimates of $As(a_i)/A|ai|$is more than 50% higher in the five-factor model than the three-factor model. Again, this means that the five-factor model is superior. Overall, based on the results of Table 4, the five-factor model that includes a liquidity factor has a better performance than the Fama-French three-factor model.

4.2.2. Time Series Regression

With the performance of models in mind, we report the estimate details of time-series regressions of the three-factor and the five-factor models for the portfolios. Table 5 shows and compares the results of two models. Let's start from constant intercept coefficients, aof two models. There are 10 versus 20 statistically insignificant intercept terms in the three-factorversus the five-factor

models, respectively—it shows a 100% improvement in the latter model in terms of t-statistics. When point estimates of the intercepts are compared in both models, we also find that many more point estimates of the intercepts in the latter model are closer to zero.

Table 5

The results below are from the time series regression of equation (1) and (2), the Fama-French three factors model and the augmented Fama-French five factors model with momentum and liquidity factors, respectively. The table reports the coefficients along with t-statistics and R^2. a, b, s, h, w, and ψ are coefficients of equation (1) and (2), where equation (1) is $R_{pt} - R_{ft} = a + bMP_t + sSMB_t + hHML_t + \varepsilon_{pt}$ and equation (2) is $R_{pt} - R_{ft} = a + bMP_t + sSMB_t + hHML_t + wWML_t + \psi LIQ_t + \varepsilon_{pt}$. Since 27 LHS portfolios use three different dimensions of liquidity, size, and book-to-market ratio, LIQ 1 and size-BM 1-1 indicate the portfolio that is most illiquid and has the smallest size and the lowest book-to-market ratio. Size-BM 1-2 indicates the portfolio that has the smallest size and the medium book-to-market ratio.

	LIQ ➔			*LIQ* ➔		
	1	*2*	*3*	*1*	*2*	*3*
Size- BM ➔	*Three-factor model*			*Five-factor model*		
a						
1-1	-0.0099*	-0.0087	-0.0199*	-0.0057	-0.0023	-0.0055
1-2	-0.0088*	-0.0153	-0.0057***	-0.0069	-0.0079**	-0.225**
1-3	-0.0109*	-0.0006	-0.0085***	-0.0219*	-0.0019	-0.0111
2-1	-0.0040*	-0.0073*	-0.0199***	-0.0015	-0.0025	-0.0105**
2-2	-0.0053	-0.0034	-0.0062***	-0.0062	-0.0045	-0.0018***
2-3	-0.0078	-0.0053	-0.0176**	-0.0015	-0.0078	-0.0012
3-1	-0.0026*	-0.0208**	-0.0020***	-0.0109	-0.0008	-0.0215**
3-2	-0.0215*	-0.0077	-0.0183*	-0.0015*	0.0023	0.0002
3-3	-0.0117	-0.0023*	-0.0087	-0.0031	-0.0017	0.0009
b						
1-1	0.5897***	0.7117***	1.3001***	0.3657***	0.4199***	0.3118
1-2	0.3460***	0.5472***	1.0171***	0.6021***	0.4036***	0.4304***
1-3	0.4293***	0.6791***	0.8356***	0.5118***	0.7102***	0.5117***
2-1	0.7734***	1.2115***	1.2305***	0.4003***	0.6795***	0.4091***
2-2	0.5133***	0.9862***	1.1022***	0.4659***	0.4128***	0.4319***
2-3	0.7426***	0.8718**	1.0093.***	0.6673***	0.5001***	0.4510***
3-1	0.4892***	0.9070***	1.1314***	0.4893***	0.5191***	0.4902***
3-2	0.7555*	0.7308***	1.0053***	0.2568***	0.4323***	0.4012***
3-3	0.4210**	0.8974***	1.0091***	0.2017*	0.4199***	0.3891***
s						
1-1	1.1131***	1.1137***	2.2101***	1.1018***	1.3911***	2.3401***
1-2	1.2191***	0.8190***	1.1148***	0.8892***	1.1298***	1.3114***
1-3	0.9854***	1.3232***	1.0237***	1.1349**	1.1256***	1.1088***
2-1	0.7602***	0.9573***	0.3079	0.6815***	1.0085***	0.5092***
2-2	0.9145***	0.7577***	0.6192*	0.7209***	0.7347***	0.1256***
2-3	0.6101**	0.6091**	0.3105	0.7113***	0.6929***	0.4377***
3-1	0.0181*	-0.0210	0.0218	0.2161	0.0981	0.3908**
3-2	0.0213	-0.0713	-0.0678	0.1342	0.1267	0.1298
3-3	0.5197**	0.0102*	-0.5123**	0.4571***	0.0916	-0.2173**

contd. table 5

	LIQ ➔			*LIQ* ➔		
	1	*2*	*3*	*1*	*2*	*3*
Size- BM ➔	*Three-factor model*			*Five-factor model*		
h						
1-1	-0.0329	0.1341	0.5867	-0.0181	-0.195	-0.1897
1-2	0.5007***	0.6098***	1.0325***	0.4322***	0.6289***	0.6024*
1-3	0.9176***	1.0956***	1.1576***	0.7815***	0.7005***	0.7187***
2-1	0.2225*	0.2185	0.2193*	0.0105	-0.1187	-0.251
2-2	0.3178**	0.4078***	0.6549***	0.4439*	0.1219	0.1185
2-3	0.5190***	0.6607***	1.2567***	0.5981***	0.4509**	0.5065***
3-1	-0.1326	0.0871	0.1239	-0.128***	-0.0708	-0.234*
3-2	0.8673***	0.6093***	0.7347***	0.5910**	0.2061	0.0177
3-3	0.7210***	0.7115***	0.8561***	0.5618	0.5763**	0.4190*
w						
1-1		Not applicable		0.0175	0.0164	0.2016
1-2				0.0905	0.2089*	0.0573
1-3				0.0156	-0.1156	0.1903*
2-1				-0.0288	0.1997*	-0.0086
2-2				0.0783	-0.1423	-0.0678
2-3				0.0912	-0.0788	-0.2089**
3-1				-0.1023	0.2184	0.0167
3-2				-0.0568	-0.0921	-0.1278
3-3				0.1392	-0.0077	-0.0956
ψ						
1-1		Not applicable		-0.3912**	-0.717**	-2.2305***
1-2				-0.1981	-0.6882***	-1.3157***
1-3				-0.1102	-0.3116***	-1.1782***
2-1				-0.1276***	-0.1892**	-1.9102***
2-2				-0.3675	-0.1987***	-1.5619***
2-3				-0.3002***	-0.4781***	-1.2083***
3-1				-0.3734***	-0.7036***	-1.3081***
3-2				-0.2190***	-0.5672***	-1.0238***
3-3				-0.8745***	-0.6543***	-1.1093***
$\mathbf{R^2}$						
1-1	37%	40%	37%	46%	49%	69%
1-2	59%	55%	53%	60%	65%	74%
1-3	51%	69%	63%	54%	80%	84%
2-1	60%	62%	50%	65%	80%	84%
2-2	47%	62%	55%	50%	75%	85%
2-3	55%	68%	63%	62%	73%	88%
3-1	57%	64%	65%	66%	78%	90%
3-2	48%	69%	61%	53%	83%	86%
3-3	34%	55%	69%	51%	68%	87%

In both three and five factor models, we notice the size and the value effects in Vietnamese stock market. From top to bottom, along with the increase of size, the monthly average return on SMB decreases. Also, stocks with high BM ratios tend to outperform stocks with low BM ratios, because coefficients with high BM ratios are higher than those with low BM ratios. This is consistent with

the size and the value effects that we observe in other countries. As for the market factors, however, the market beta in the three-factor model does not seem to be distributed uniformly. The lowest market beta is 0.3460, and the biggest is 1.3001; both of these betas are statistically significant too. This implies that, even when we find the additional factor related effect, such as the size and value effects, we cannot say whether it comes from the additional factor like SMB or HML. The reason is that the market betas here also vary, and the effect of additional factors may as well be mixed up with the effect of different market betas. On the other hand, in the five-factor model, most market betas take values in between 0.4 and 0.6, which can be considered relatively uniform. Since we have relatively uniformly distributed market betas in the five-factor model, we now can safely separate the size and value effects whenthey exist.

In the five-factor model, the momentum effect is unlikely to impact on the average stock return in case of Vietnamese stock market. Specifically, only three out of WML 27 coefficients are statistically significant, whereas 24 out of 27 are not statistically significant. Meanwhile, LIQ1 tends to play a very significant role in the Vietnamese stock market, and 24 out of 27 coefficients of LIQ1 are statistically significant. Furthermore, all of LIQ1 coefficients are negative[6] and illiquid stocks are less negative than liquid stocks. In the other words, we have a negative liquidity-return relationship in case of Vietnamese stock marketin the period from 2009 to 2017.

4.2.3. Liquidity in Vietnamese Stock Market

So far, we have shown that the five-factor model is superior in explaining Vietnamese market. Compared to the three-factor model, it has two additional factors, the momentum and the liquidity factors. Yet, the momentum factors are mostly not significant, while the liquidity factors are. It implies that liquidity plays a role in explaining the Vietnamese stock market. Although we observe the size and the value effect in both models, liquidity stands out in the five-factor model, which we consider superior. To be more specific, in the three-factor model, the number of significant coefficient for market, SMB, and HML factors is 27, 19, and 20, respectively, and the average R^2 is around 56%. In the five-factor model, however, the number of significant coefficient for market, SMB, and HML factors is 26, 21, and 15, respectively, and the average R^2 is approximately 71%, ranging from 46% to 90%. The better goodness of fit seems to come from the fact that in the five-factor model, we have a liquidity factor, where most coefficients of liquidity are statistically significant. Further, the relationship between liquidity and stock returns is negative. This opposes what was found by Batten and Vo (2014) and Vo and Bui (2016)—they reported a positive relationship between liquidity and stock return in Vietnam.Figure 1 below shows the relationship of our 27 portfolios in between their liquidity (measured by LIQ1) and their average returns in terms of the five-factor model based on equation (2).

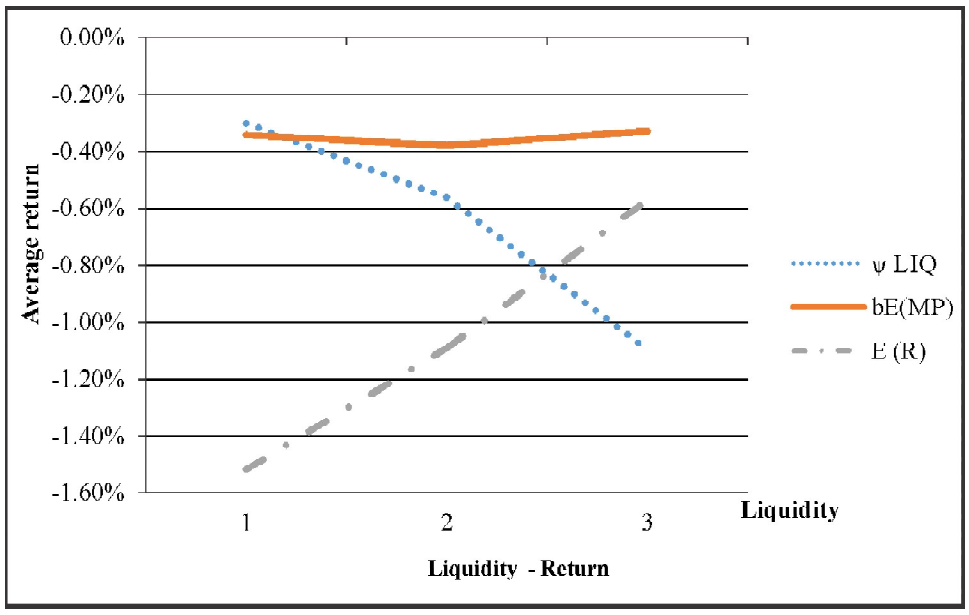

Figure 1: From the five-factor model, $R_{pt} - R_{ft} = a + bMP_t + sSMB_t + hHML_t + wWML_t + \psi LIQ_t + \varepsilon_{pt}$, and E(R) below indicates the average returns of $R_{pt} - R_{ft}$ of our LHS 27 portfolios, while ψLIQ_t is the portion related to liquidity and bE(MP) explains the part of bMP_t.

Evident in Figure 1, we see that, as the stock in Vietnam becomes more liquid, its return falls. Note, however, that its market risk-related component stays almost the same. In other words, we have the negative relationship between the stock return and its liquidity in the Vietnamese stock market, where this liquidity effect does not have anything to do with different market betas.

Using different liquidity proxies of LIQ2 to LIQ6, we lastly run the five-factor model that includes liquidity. The results are very similar, and the summary of remaining five liquidity proxies is reported as follows.

Table 6: Indicates some of properties of the five-factor model when we use different liquidity proxies.

	LIQ2	*LIQ3*	*LIQ4*	*LIQ5*	*LIQ6*
No. of insignificant intercepts	15	21	18	10	6
No. of significant SMB coefficients	20	19	16	18	18
No. of significant HML coefficients	13	13	11	12	16
No. of significant WML coefficients	4	3	4	2	2
No. of significant liquidity coefficients	22	23	22	17	17
R^2 on average	64%	71%	61%	63%	63%

From Table 6, LIQ5 and LIQ6 produce relatively poor results among these liquidity proxies. The number of insignificant intercepts are low (10 and 6 respectively) compared to other liquidity proxies (15 to 21). Nevertheless, 17 out of 27 liquidity coefficients (approximately 63%) are still statistically significant and R^2 is also above 60% level. On the other hand, LIQ3 produces the most consistent result with LIQ1 (high R^2, high number of significant liquidity coefficients).

4.2.4. Fama-MacBeth Cross-sectional Regression

We also run cross-sectional regressions in terms of the second pass regression of Fama-MacBeth. Table 7 shows and compares the results for the three-factor versus five-factor models. According to the three-factor model, all three of the market, size, and value factors are statistically significant. Yet, the market factor[7] is negative, which is troubling. One explanation may be that the three-factor model is lack of liquidity. In the five-factor model with liquidity factor, however, the market factor takes a positive value, although it is not statistically significant anymore. On the other hand, the liquidity factor in the five-factor model becomes statistically significant. Liquidity seems to play a role here. In other words, without liquidity consideration, the market factor seems to be penalized more than what it deserves. As we introduce liquidity into the picture, however, we observe a positive risk premium on the market factor, albeit statistically not significant.

Both in the three-factor and in the five-factor models, we note that the size factor andthe value factor are priced in Vietnamese stock market, since they are both statistically significant in cross-sectional regressions. More importantly, the liquidity factor is statistically significant too, and is priced in Vietnamese stock market. As far as the momentum factor is concerned, however, it is not statistically significant, and thus is not priced. By the way, these findings are consistent with the results of above time-series regressions. Lastly, in table 5, we saw that the liquidity related betas were all negative and mostly statistically significant. Now that those negative betas are used as an independent variable for the second pass regression of Fama-MacBeth and the liquidity factor is positive and statistically significant in table 7, it means that there exists a negative relationship between liquidity and the stock return in Vietnamese market.

4.4. Robustness Check

For a robustness check, we have also made the matrix form of two-dimensional portfolios, such as 3X3 size by BM portfolios, 3X3 size by liquidity portfolios, 3X3 BM by liquidity portfolios, and run the time series regressions. Again, Table 8 manifests the liquidity effect on top of the size and the value effects in Vietnamese market as we observed in Table 5.

Table 7: Indicates results of the second pass regressions of Fama-MacBeth for three versus five factors models:

	Constant	*Market factor*	*Size factor*	*Value factor*	*Momentum factor*	*Liquidity factor*
Three-factor model	0.0031	-0.0296***	0.00323*	0.0059***		
Five-factor model	-0.0087	0.0018	0.0031**	0.0076***	0.0013	0.0092***

Table 8

The results below are from the time series regression of equation (1) and (2), the Fama-French three factors model and the augmented Fama-French five factors model with momentum and liquidity factors, respectively. The table reports the coefficients along with the degree of statistical significance, and a, b, s, h, w, and ψ are coefficients of equation (1) and (2), where equation (1) is $R_{pt} - R_{ft} = a + bMP_t + sSMB_t + hHML_t + \varepsilon_{pt}$ and equation (2) is $R_{pt} - R_{ft} = a + bMP_t + sSMB_t + hHML_t + wWML_t + \psi LIQ_t + \varepsilon_{pt}$. As compared to Table 5 where 27 LHS portfolios use three different dimensions of liquidity, size, and book-to-market ratio, here in Table 8 we make the matrix form of two-dimensional portfolios, which are 3X3 size by BM portfolios, 3X3 size by liquidity portfolios, and 3X3 BM by liquidity portfolios. Table 8 shows the result of the time series regressions with the matrix form of two-dimensional portfolios.

	Three-factor model			**Five-factor model**			
Panel A Size-BM portfolios							
s	*BM*				*BM*		
	Size	*1*	*2*	*3*	*Size*	*1*	*2*	*3*
	1	1.1186***	1.0127***	1.2153***	1	1.1312***	1.2807***	1.3218***
	2	0.6248***	0.7001***	0.6953***	2	0.7809***	0.9176***	0.6935***
	3	0.0218	-0.0286	-0.2387	3	0.0779	0.0912	0.0137
h								
	1	0.0981	0.7803**	1.0147***	1	0.3916***	0.6125**	0.5139***
	2	0.2133	0.6045***	1.2081***	2	0.2802*	0.1140	0.3697***
	3	0.1012	0.6278***	1.0129**	3	-0.0515	0.0319	-0.0287
φ								
	1		Not applicable		1	-0.1061**	-0.482***	-1.2126***
	2				2	-0.3498***	-0.6532***	-1.3907***
	3				3	-0.2855***	-0.5524***	-1.07833***
Panel B Size-Liquidity portfolios								
s	*LIQ*				*LIQ*		
	Size	*1*	*2*	*3*		*1*	*2*	*3*
	1	1.0501***	1.3521***	1.3975***	1	1.3101***	1.3297***	1..3306***
	2	0.5881***	0.2731***	0.4902	2	0.5829***	0.6004***	0.7513**
	3	-0.0102	-0.0618	-0.3019	3	0.0558	0.0410	-0.0326
h								
	1	0.6010***	0.8023***	0.9715***	1	-0.2503*	0.6198***	0.1077***
	2	0.8725***	0.4587***	0.9866***	2	-0.1977	0.3025	0.5970***
	3	0.1413	0.2940**	0.6171***	3	-0.1803**	0.2565*	0.6012***
φ								
	1		Not applicable		1	-0.5331***	-0.1342***	-0.5432***
	2				2	-0.8168***	-0.7251***	-0.6534***
	3				3	-0.7142***	-0.8119***	-1.0013***

Panel CBM-Liquidity portfolios

s		*LIQ*				*LIQ*		
	BM	*1*	*2*	*3*		*1*	*2*	*3*
	1	0.3244***	0.4195**	0.3672	1	0.5601***	0.5548***	0.6120***
	2	0.6074***	0.5725**	0.5011**	2	0.5773***	0.6194***	0.7734***
	3	0.7310***	0.8088***	0.3560	3	0.8934***	1.0001***	0.6721***
h								
	1	-0.0051	0.1314	0.3725*	1	-0.2098**	-0.0972	-0.1918
	2	0.4994***	0.6196***	0.7517**	2	0.4007***	0.2601**	0.2614*
	3	0.7356***	0.8920***	0.8219***	3	0.7281***	0.6721***	0.5081***
φ								
	1	Not applicable			1	-0.3125***	-0.8016***	-1.2876***
	2				2	-0.2181**	-0.6998***	-1.0187**
	3				3	-0.2513**	-0.6572***	-0.9972***

In addition, we use a couple of methods—an additional factor, a seasonality check on January and non-January months.[8]As in Lam and Tam (2011), we also augment the co-skewness, first derived by Kraus and Litzenberger (1976),to our augmented Fama-French five factor model. We see if there is an improvement, especially in explaining liquidity. The equation is illustrated as follows:

$$R_{pt} - R_{ft} = a + bMP_t + sSMB_t + hHML_t + wWML_t + \psi LIQ_t +_{\varphi} (MP_t - \overline{MP})^2 + \varepsilon_{pt}.$$

To save space, we do not represent the result here. However, the empirical result proves that all properties of coefficients and intercepts of the five-factor model in Table 5 remain the same. None of co-skewness intercepts is statistically significant.Secondly, we additionally check the January effect. By adding a dummy variable—which takes 1 if it is January, and 0 otherwise—we re-run the augmented Fama-French model with momentum and liquidity factors. All the dummy variable coefficients slightly fluctuate around 0,butare statistically insignificant. On the other hand, most of other properties offive factors in the five-factor model are stable. All of these robustness checks suggest that our results are sufficiently good even with additional factor or seasonality.

In addition, wealso re-run the five-factor model by dividing the sample period into two sub-periods: (1) the first half in between July 2009 and June 2013, the period relatively closer, and thus, more vulnerable to the global credit crisis; and (2) the second half between July 2013 and June 2017, the period more far away from the global crisis. Consistent with our results for the whole sample period, wefind that most liquidity factors are statistically significant; both results show a negative relationship between liquidity and stock returns.Most liquidity factor loadings were negative, but the latter period shows a few positive liquidity loadings. Moreover, the GRS F-tests in both periods show that the intercept terms are jointly equal to zero.Besides, point estimates of those intercept terms in the latter period are much closer to zero

than those in the former period. This suggests that our five-factor model that includes liquidity factor fits both periods, and yet, it better fits the latter period as it movesfurther away from the global credit crisis.

5. Conclusion

In this paper, we investigate the implication of liquidity in Vietnamese stock market in terms of the augmented Fama French three-factor modelwith momentum and liquidity factors, thus the five-factor model. Althoughthe relationship between liquidity and average stock return is likely to be out-of-date in some developed markets, itsapplication to a 15-year-old market like Vietnam is still limited and inconsistent. For instance, using Vietnamese stock data, Batten and Vo (2014) and Vo and Bui (2016) showed the existence of a positive relationship between liquidity and stock returns and that the liquidity is priced; however, most extant literature suggests a negative relationship. Hence, we clarifythese confusing results onliquidity with Vietnamese stock market data in terms of the five-factor model that includes liquidity factor.

Our finding suggeststhat liquidity is priced as an important factor in Vietnamese stock market, and more importantly we show a negative relationship between liquidity and stock returns. In so doing, we compare 1) the Fama-French threefactor model, with2) the five-factor model, which is the augmented Fama-French model with liquidity and momentum factors. These models were also considered by Lam and Tam (2011) whileinvestigating liquidity and asset pricing with Hong Kong stock market data.Both models are accepted by the GRS test, and yetwe findthat the latter modelis a better fit in explaining Vietnamese stock market because all of the four metrics employed by Fama and French (2017)(such as 1. p-value of GRS statistics,2. average absolute value of intercepts,3. average absolute value of intercepts scaled by the average absolute value of $|r\tilde{a}\ddot{y}_i|$, and4. average estimated standard error of intercepts scaled by the average absolute value of intercepts) demonstrate the superiority on the latter model.

In terms of time-series regressions, we notice the size and the value effects in Vietnamese stock market. More importantly, we also find a very strong liquidity effect in terms of the five-factor model.Compared to Batten and Vo (2014) and Vo and Bui's (2016) results who found a positive correlation between liquidity and the stock return, however, ourresults reveal the opposite relationship—anegative correlation between liquidity and the stock return. Our finding, not Batten and Vo (2014) and Vo and Bui (2016)'s finding, is consistent with what previous empirical studies have found inmost of other markets, not to mention markets in developed countries.From Fama-MacBeth's cross-sectional regressions, we also find similar results; both the size and the value effects exist, and the liquidity factor is priced. Further, a negative relationship between liquidity and the stock return is confirmed. Adding co-skewness and considering the January effect on top of the five-factor model

do not change our results. Moreover, dividing the sample period into two sub-periods generates similar results to those of the whole sample period, although the second half seems relatively more desirable than the first half.

Notes

1. We also construct 3X3, 4X4, 5X5 size by book-to-market ratio based portfolio, 4X4 size by liquidity based portfolio, and 4X4 book-to-market ratio by liquidity based portfolio, and yet the result turns out to be similar to what we have in this paper.
2. To calculate the book-to-market ratio by the end of June of the year t, we take the book value of equity of each stock by the end of year t-1, dividing it by the market capitalization by the end of December of the year t-1.
3. Following Keene and Peterson (2007), Nguyen *et al.* (2007), and Lam and Tam (2011), we choose the turnover ratio as a reported proxy. Other proxies provide similar results, and will be available on request. Turnover ratio is the calculated by taking the average of the monthly number of traded shares over the average of outstanding shares during 12 months prior to July.
4. This is the same way of forming factors as Fama and French (1993, 1996) and Lam and Tam (2011).
5. Our data spans from 2009 to 2015. In 2007, Vietnamese stock market skyrocketed to the historic level of 1,000. Then, the 2008 global credit crisis hit the Vietnamese stock market very hard. From 2009 to 2010, the stock market fell down to 235 points. Vinashin, a state-owned ship-building firm in Vietnam, heavily indebted of US$4.5 billion, went bankrupt. This caused a number of leading banks and financial institutions to seriously suffer. The credit rating agents, S&P and Moody's, downgraded Vietnam's credit index, and investors were pessimistic about the prospects. During 2011, 50% of listed stocks had market values smaller than the par, and the high interest rates due to high inflation made Vietnamese stock market look even less attractive. In between 2012 and 2013, debt crisis in Europe aggravated the economic situation in Vietnam. Top managers of Vietnamese leading banks were arrested, which kept suppressing the stock market. From 2014 to 2015, the downward trend in crude-oil price negatively affected the Vietnamese stock market; most blue-chip stocks in Vietnam are oil-related, and state-owned. The depreciation of Chinese Yuan forced Vietnamese government to adjust Vietnamese Dong. The South China Sea conflict between China and Vietnam caused some concerns among investors, especially foreign investors, to leave the market. In short, the mainstream period was mostly downward.
6. Why all liquidity coefficients are negative in Vietnamese stock market needs further investigation, but is beyond the scope of this paper.
7. To be more specific, it is the market excess return, which is the market portfolio risk premium subtracted by the risk free rate.
8. All robustness check results are not reported to save space, but available upon request.

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