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LIQUIDITY RISK IMPACT ON STOCK RETURNS

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ABSTRACT

This study investigates the impact of liquidity risk on stock returns in the Malaysian stock exchange using the LCAPM model of Acharya and Pedersen. This research employed firm-level equity data involving 419 continuously listed firms in Bursa Malaysia from January 2000 to December 2018. The study employed LCAPM asset pricing model tested using Fama-Macbeth two-stage cross-sectional regression. The findings suggest that the covariance between stock illiquidity and the market return is not priced in the Malaysian stock market. While, the other explanatory variables are significant in explaining the cross-sectional variations of stock returns, but only two variables; the commonality in liquidity and net liquidity risks are correctly signed. The evidence is limited to Malaysian corporations listed in the Main Market of Bursa Malaysia. These findings show some new evidence on the application of the LCAPM model in the emerging markets by using the closing per cent quoted spread impact (CPQS Impact) of Chung and Zhang (2014) as a measure of illiquidity. This research provides new insights on LCAPM application in the Malaysian stock market.

INTRODUCTION

The issue related to market microstructure and asset pricing has been recognized as one of the important finance research areas (Linnenluecke, Chen, Ling, Smith, & Zhu, 2017; Brooks & Schopohl, 2018). It entails an understanding on how various microstructure factors are related to trading activities (i.e. transaction cost, information asymmetry, and budget constraints) affect stock's liquidity (Amihud & Mendelson, 1986; Eleswarapu, 1997; Chalmers & Kadlec, 1998; Easley, Hvidkjaer, & O'Hara, 2002; Huang, 2003; Vayanos & Wang, 2012). Broadly speaking, liquidity determines how fast the asset can be traded at the prevailing market price, where the immediacy is commonly measured through the transaction cost. High transaction costs attribute to the illiquid of stocks (Amihud & Mendelson, 2012). Empirical studies by Amihud and Mendelson (1986) proven that investors demand higher returns for illiquid stocks than the more liquid ones. Thus, liquidity becomes an important factor for investors and portfolio managers in making investment decisions and designing a portfolio allocation strategy (Liew, Lim, P., & Goh, 2016). Concomitantly, the impact of liquidity on asset pricing has become a niche research area in asset pricing-market microstructure.

A study on the effect of firm's liquidity level has been long established in the literature, however, the recent move into analyzing the commonality in liquidity demonstrate that the firm's liquidity co-moves with market liquidity (Chordia, Roll, & Subrahmanyam, 2000; Hasbrouck & Seppi, 2001; Huberman & Halka, 2001; Moshirian, Qian, Wee, & Zhang, 2017). Accordingly, another interesting topic has become prevailing in liquidity related literature; which focuses on the effect of liquidity risk in explaining the return premium. Indeed, recent episodes of turbulence in global financial markets such as the demise of Lehman and Brothers in 2008 as a result of liquidity shortage in the market (Liang & Wei, 2012). Among initial studies that estimate the importance of liquidity risk on stock returns are Jacoby, Fowler, and Gottesman (2000), Pastor and Stambaugh (2003) and Acharya and Pedersen (2005). The work of Acharya and Pedersen (2005) is an extension of Jacoby et al. (2000) and Pastor and Stambaugh (2003); in which their liquidity adjusted CAPM (LCAPM) model nested both the effect of liquidity and liquidity risk in the stock returns. In addition to market beta as in the standard CAPM, their model decomposed three liquidity betas namely; 1. Covariance between individual stock liquidity and market illiquidity (Chordia et al., 2000), 2. Covariance between individual stock return and market illiquidity (Amihud, 2002; Pastor & Stambaugh, 2003), 3. Covariance between individual stock liquidity and the market return (Acharya & Pedersen, 2005). The model has been tested across different countries including in the Greek stock market (Papavassiliou, 2013), the Finish market (Butt & Virk, 2015), the Australian market (Vu, Chai, & Do, 2015), and the Portugal stock market (Miralles-Quirós, Miralles-Quirós, & Oliveira, 2017) as well as at the global market (Lee, 2011). Their study supports the significant effect of liquidity risk on stock returns. Albeit the literature has extensively admitted the role of liquidity risk in asset pricing, other scholars had provided opposition to this matter. For instance, Li, Sun, and Wang (2014) argue that the liquidity risk irrelevant in Japan stock market tested using the LCAPM model.

Besides Lee (2011), the economic significance of liquidity risk in the Malaysian stock market is still in its fancy with the literature on return-illiquidity risk premium that focuses on this market are scarcely reported despite liquidity being an important issue discussed globally (Liew et al., 2016). As one of the emerging markets that its attributes are far distinguished from the developed market; therefore, it makes them intriguing for research. They are to a great extent commanded by individual speculators with heavily intervened by the government (May, Fah, & Hassan, 2018), have low integration with world markets (Lee, 2011; Batten & Vo, 2014) and a noteworthiness level of internal and external's political, economic, social, and technological forces vulnerability (Tuyon & Ahmad, 2016). In response to this,

this study adds to the body of literature by studying the effect of the liquidity risks on the Malaysian stock market using Acharya and Pedersen's (2005) LCAPM framework. Further, the Malaysian stock market is an order-driven market structure where there are no market dealers (market makers) act as a liquidity supplier of last resort as compared to the quote-driven market structure. Thus, by studying the Malaysian stock market, it will provide further insight into the pervasiveness effect of liquidity risk on stock returns at different market settings.

Although the application of the LCAPM model has been tested in the Malaysian stock market by Lee (2011), however, this study is different in several ways. Firstly, their study utilized zero-return proportion liquidity measure of Lesmond, O'Connor, and Senbet (1999), which is, by contrast, this study employed closing per cent quoted spread impact (CPQS Impact) measure of liquidity as proposed by Chung and Zhang (2014). The use of CPQS impact is justified as a good substitute for Amihud's ILLIQ ratio (Liew et al., 2016). Further, CPQS Impact is a better and finer measure of liquidity as it utilizes a bid-ask spread that captures the impact of order flow on stock prices, a result of the inventory risk and information risk (Amihud, 2002). The validity of the CPQS impact as a good proxy for liquidity in the Malaysian stock market has been proven in the study of Fong, Holden, and Trzcinka (2017) and Liew et al. (2016). Secondly, this study covers the period starting from 2000 to 2018 that reflects certain events such as 2008 global financial crisis and local economic transformation and 2016 Malaysian political changes in which it occurred during the period of study is drawn.

The rest of the paper is organized as follows. Section 2 discusses the Malaysian stock market and its liquidity performances. Section 3 briefly discussed the LCAPM of Acharya and Pedersen. Section 4 describes the data and the sample construction procedure as well as the illiquidity measures used in the study. Section 5 explains the methodology. Results and discussions are presented in Section 6. Section 7 concludes the overall study.

MALAYSIAN STOCK MARKET AND ITS LIQUIDITY PERFORMANCE

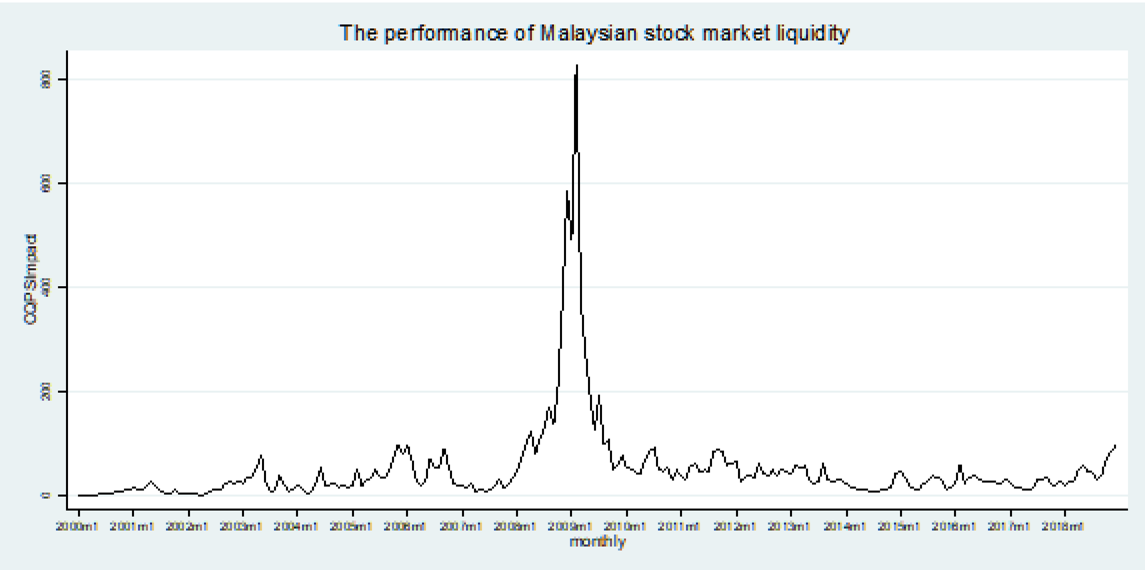
The Malaysian securities industry has experienced tremendous development and improvement in its structural and organizational ever since the mid-1980. The work of the Government and the Kuala Lumpur Stock Exchange (KLSE) in updating the securities industry through administrative development and the utilization of information technology has further enhanced the framework, hence, stimulate trading activities, and information dissemination channel (Ariff, Ramadili Mohd, & Md. Nassir, 1998).

Although the Malaysian Stock Market's history traces back in 1930, the present stock exchange was formally established in July 1973 known as KLSE. Later, in 2004 it was renamed the Bursa Malaysia. In 2005, Bursa Malaysia was listed and was recognized as the largest bourses in ASEAN with over 900 companies across 60 economics activities. The main objective of Bursa Malaysia is to provide facilitative infrastructure to create a marketplace that is vibrant and globally competitive. As a maturing emerging market, the Malaysian Stock Market is home to diverse portfolios across different key economics.

Enhancing liquidity of the Malaysian stock market has been one of the key objectives highlighted in the Capital Market Masterplan (Securities Commission Malaysia, 2011). Over the years, several moves have been undertaken by the Malaysian authorities to improve the liquidity performance of stock markets such as reinforcing the usage of new principles and bye-laws, introducing the provision of fidelity fund, and demutualization (Majid, 1993), as well as providing timely information on market trading (Bursa Malaysia, 2006, p. 35). Besides, the tradable lot size is also reduced from 1000 to 100 to encourage the trading environment (Lim et al., 2015). As for now, Bursa Malaysia is on the move to shorten the trade settlement from T+3 days to T+2 days (Chin, 2018, December 3).

Despite its hard work, the level of liquidity in the secondary market, i.e. the Kuala Lumpur Stock Exchange (KLSE) abide continuously low all through several decades (Ramlee & Ali, 2012). Although the Malaysian stock market is classified as having high market capitalization, yet its trading cost is still among the highest in emerging equity markets along with the Korean stock market (Domowitz, Glen, & Madhavan, 2000). This low liquidity is in part because of the unique institutional and political perspective surrounded the Malaysian stock market (Jais & Gunathilaka, 2016; May et al., 2018). The following Figure 1 presents the liquidity performance of the Malaysian stock market measured using equal-weighted liquidity indicators proposed by Chung and Zhang (2014) and Liew et al. (2016). Based on Figure 1, the liquidity performance of the Malaysian stock market was contracted significantly during the year 2008 – 2009 amid the arrival of the US crisis, indicating that the Malaysian stock market was not spared from the global crisis. The same pattern was also observed in the study of Liew et al. (2016) conducted in Malaysia and the study of Anand et al. (2013) in the US market.

Figure 1 The performance of Malaysian stock market liquidity



Note: The above figure shows the performance of the Malaysian stock market liquidity from 2000 to 2018. The closing per cent quoted spread impact of Chang and Zhang (2014) described in section 4.2 is used as a liquidity indicator for the Malaysian stock market.

LIQUIDITY ADJUSTED CAPITAL ASSET PRICING MODEL

In a standard CAPM model of Sharpe (1964), Lintner (1965) and Mossin (1966), the expected returns are solely related to its market beta, where the market is assumed to be perfectly liquid with no transaction cost involved. As a result, the expected returns of an asset are estimated to depend only on its covariance with market returns that yields the following equation;

$$E(r_{i,t} - r_f) = \lambda \frac{cov(r_{i,t}, r_{m,t})}{var(r_{m,t})} \quad (1)$$

Where, λ is the risk premium,
$\lambda = E\ (r_{m,t} - r_f)$

In equation (1), $\mathrm{E}(\mathrm{r}_{i,t})$ and $\mathrm{E}(\mathrm{r}_f)$ are the expected return on asset i at time t and the expected risk-free rate respectively. While, the risk premium (λ) is the beta of asset times the premium per unit of beta, which is the expected market return $E\ (r_{m,t} - r_f)$. The beta of asset i is the ratio between the covariance of its return with the market return divided by the variance of the market return estimated as per equation (1).

Conversely, however, Pastor and Stambaugh (2003) and Acharya and Pedersen (2005) empirically shown that liquidity can be part of securities attributes thus considered liquidity as a market-wide function rather than a "security-specific" value. Similar to the findings of Chordia et al. (2000) and Huberman and Halka (2001) they empirically found that liquidity systematically affects both market returns and at the industry level. Apart from the above-mentioned studies, other researchers that investigate the same notion including Lo and Wang (2000), Hasbrouck and Seppi (2001), Lustig and Chien (2005), Holmström and Tirole (2001), and Amihud (2002), among others. All of the researchers agree that the liquidity shocks affect return across the market systematically.

Corresponding to the previous studies such as Pastor and Stambaugh (2003) that have documented the effect of liquidity risk on stock return, thus Acharya and Pedersen (2005) developed LCAPM where the model decomposes both liquidities as a return characteristic and risk factor in the CAPM framework. Particularly, the expected stock return is estimated to be an increasing function of its expected illiquidity and its net beta and yields the following conditional version of LCAPM:

$$\mathrm{E}_{t-1}(\mathrm{r}_{i,t} - \mathrm{r}_f) = \mathrm{E}_{t-1}(\mathrm{c}_{i,t}) + \lambda_{t-1}\mathrm{cov}_{t-1}(\mathrm{r}_{i,t},\mathrm{r}_{m,t}) + \lambda_{t-1}\mathrm{cov}_{t-1}(\mathrm{c}_{i,t},\mathrm{c}_{M,t}) - \lambda_{t-1}\mathrm{cov}_{t-1}(\mathrm{r}_{i,t},\mathrm{c}_{M,t}) - \lambda_{t-1}\mathrm{cov}_{t-1}(\mathrm{c}_{i,t},\mathrm{r}_{m,t}) \quad (2)$$

Where, $r_{i,t}$ is the return for stock i at month t, r_f is the risk-free rate, and $c_{i,t}$ denotes the illiquidity cost for stock i at month t. The model above is made conditional to information at month t and estimates that the expected return $E_{t-1}(r_{i,t} - r_f)$ depends on its expected illiquidity cost $E_{t-1}(c_{i,t})$, and its four betas times the risk premium λ_{t-1}. The risk premium is derived as follows:

$$\lambda_{t-1} = \mathrm{E}_{t-1}(\mathrm{r}_{m,t} - \mathrm{c}_{M,t} - \mathrm{r}_f)$$

Where, $r_{m,t}$ is the market return, and $c_{M,t}$ is the market illiquidity. Without the illiquidity cost terms, equation (2) reflects the original CAPM.

By assuming constant conditional variances or a constant relative risk aversion (constant risk premium), the following unconditional LCAPM is derived as:

$$\mathrm{E}(\mathrm{r}_{i,t} - \mathrm{r}_{f,t}) = \alpha + \mathrm{E}(\mathrm{c}_{i,t}) + \lambda\beta_{1,i} + \lambda\beta_{2,i} - \lambda\beta_{3,i} - \lambda\beta_{4,i} \quad (3)$$

The four betas (i.e. $\beta_{1,i}$, $\beta_{2,i}$, $\beta_{3,i}$, $\beta_{4,i}$) define the various channel through which illiquidity costs and market risk give impact on stock returns. The first beta $\beta_{1,i}$ follows the standard CAPM assumption that is the expected stock return increase linearly with the covariance between the firm's stock return and market return $\mathrm{cov}_{t-1}(r_{i,t}, r_{m,t})$, translated into an economy with illiquidity costs, thus, a positive relationship is expected expressed as follows:

$$\beta_{1,i} = \frac{\text{cov}\left(r_{i,t}, r_{M,t}\right)}{\text{var}\left(r_{M,t} - c_{M,t}\right)} \quad (4)$$

In addition to that, Acharya and Pedersen (2005) introduced three aspects of beta regarded as liquidity risk in their model (i.e. $\beta_{2,i}$, $\beta_{3,i}$, $\beta_{4,i}$). The first liquidity beta $\beta_{2,i}$ assumes that the expected stock return increases with the covariance between the firm's stock illiquidity and the market illiquidity $\text{cov}_{t-1}\left(c_{i,t}, c_{M,t}\right)$. Since the previous studies such as Chordia et al. (2000), Huberman and Halka (2001), and Hasbrouck and Seppi (2001) provide evidence on the effect of the commonality in liquidity as well as time-varying properties of liquidity, it thus indicates the uncertainty in liquidity. As such, the investors require additional returns when stocks become illiquid during the illiquid market. This assumption is in line with the wealth effect theory where the investors willing to pay a premium for the stocks that remain liquid when low market liquidity is observed (Cochrane, 2005), hence, a positive relationship is expected. The second beta in LCAPM model is expressed as:

$$\beta_{2,i} = \frac{\text{cov}\left(c_{i,t}, c_{M,t}\right)}{\text{var}\left(r_{M,t} - c_{M,t}\right)} \quad (5)$$

While second liquidity beta $\beta_{3,i}$ estimates a negative relationship between expected stock return with the covariance between the firm's stock return and market liquidity$\text{cov}_{t-1}\left(r_{i,t}, c_{M,t}\right)$. The expected negative relationship is because the returns are estimated to be higher for an asset that is sensitive to market illiquidity. The empirical findings are supported by the studies of Domowitz and Beardsley (2002), Sadka (2003), and Pastor and Stambaugh (2003). The following equation (6) shows how it is derived:

$$\beta_{3,i} = \frac{\text{cov}\left(r_{i,t}, c_{M,t}\right)}{\text{var}\left(r_{M,t} - c_{M,t}\right)} \quad (6)$$

Finally, as the investors find it is difficult to sell illiquid security when the market is illiquid that is when the market is upset, thus the lower returns are accepted for the liquid security during poor states of market returns. Therefore, the third liquidity beta $\beta_{4,i}$ represents a negative correlation between expected stock returns and the covariance between the firm's stock illiquidity and market return $\text{cov}_{t-1}\left(c_{i,t}, r_{m,t}\right)$. This final beta is a new beta proposed by Acharya and Pedersen (2005) in the LCAPM model expressed as the following equation:

$$\beta_{4,i} = \frac{\text{cov}\left(c_{i,t}, r_{M,t}\right)}{\text{var}\left(r_{M,t} - c_{M,t}\right)} \quad (7)$$

Where the subscripts in equation (3) to (7) denote as follows; the respective $r_{i,t}$ and $r_{f,t}$ is the return for stock i at month t and the risk-free rate at month t. The $c_{i,t}$ is the illiquidity cost of stock i at month t, and $c_{M,t}$ is the market illiquidity cost at month t.

The illustration of four betas in the LCAPM model is shown in the following Figure 3.

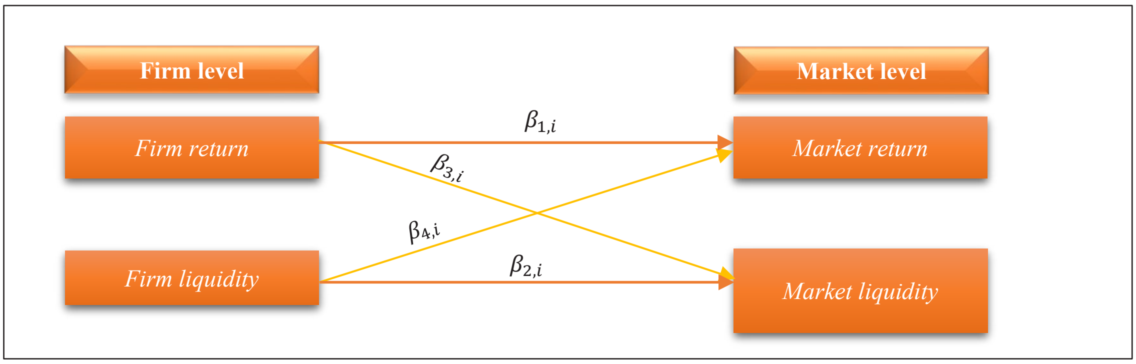


Figure 3 Illustration of the four betas

Source: Developed by author

Note: The above diagram shows the interaction of three liquidity betas and market beta between the firm return, market return, firm liquidity (firm variance) and market liquidity (market variance). Where $\beta_{1,i}$ correspond to the covariance between asset return and market return, $\beta_{2,i}$ is the covariance between the firm's stock liquidity and market liquidity, $\beta_{3,i}$ denotes the covariance between asset return and market liquidity, and $\beta_{4,i}$ is the covariance between the firm's liquidity and market return. The four betas are estimated using the entire time-series analysis.

As in the standard CAPM where there is only one risk premium, thus the LCAPM is estimated with the net beta becomes the single risk factor resulting in the final model; a combination of four betas (i.e. $\beta_{1,i} + \beta_{2,i} - \beta_{3,i} - \beta_{4,i}$) in the model as referred to in the succeeding equation. Of which this "net beta" determined by the asset's returns and liquidity risk.

$$\beta_{net,i} = \beta_{1,i} + \beta_{2,i} - \beta_{3,i} - \beta_{4,i} \tag{8}$$

Rewritten the above equation, the liquidity adjusted CAPM becomes;

$$E(r_{i,t} - r_{f,t}) = \alpha + \kappa E(c_{i,t}) + \lambda\beta_{net,i} \tag{9}$$

In the model of Acharya and Pedersen (2005), the non-zero intercept α is allowed by adjusting the calibration of κ, that is the coefficient of κ is adjusted in accordance to the average monthly turnover of all stocks in the sample[1]. Eventually, the empirical fit of the model does not improve by adding more factors in the model but rather by making liquidity adjustment. Although the model implies that the intercept is zero, it also relaxing this restriction by allowing the non-zero intercept during which the investor's holding period differs from the estimation period.

[1] Acharya and Pedersen (2005) assume that the k in the model (3.1) are adjusted in accordance of the investor's holding period; where $k = 1$ if the holding period is equal to estimation period. If the k is more than 1, then the excess portfolio returns (approximately) equal to k times the expected holding period return, and thus $\beta_{net,p}$ is assumed approximately k times the holding period net beta.

DATA AND ILLIQUIDITY MEASURES

Data

This research employed firm-level equity data involving 419 continuously listed firms in Bursa Malaysia from January 2000 to December 2018. The data used in the study are obtained from Bloomberg services. To avoid any estimation errors due to data snooping biases in the sample, several data screening procedures are considered namely; 1. Only securities that have the last return recorded will be included in the sample (Acharya & Pedersen, 2005), 2. Any stocks with special characteristics such as Depository Receipts (DRs), Real Estate Investment Trust (REIT), and preferred stocks will be dropped from the sample (Lee, 2011), 3. Securities of financial institutions will be excluded in the sample due to its special nature of having high leverage that likely indicates distress (Fama & French,1992; Cooper, Jackson III, & Patterson, 2003) and is a highly regulated institution (Cooper et al., 2003). Besides that, the data set in this study contains monthly return data, adjusted-monthly rate of return on the 3-month Treasury Bills rates as a proxy for the risk-free rate and Kuala Lumpur Composite Index (KLCI) as a proxy of the market return. While, daily data on the closing bid price, closing ask price, closing stock price and the number of shares traded are required to construct monthly illiquidity measure of each security.

Illiquidity Measure

This study will use the closing per cent quoted spread impact (CPQS Impact) of Chung and Zhang (2014) to estimate the stock's illiquidity cost ($c_{i,t}$) in replace of the Amihud's (2002) ILLIQ ratio. The following equation shows how CPQS Impact is derived:

$$\text{CPQS impact}_{i,t} = \frac{\text{CPQS}_{i,t}}{\text{P}_{i,t} \times \text{volume}_{i,t}} \tag{10}$$

Where $P_{i,t}$ and $\text{volume}_{i,t}$ are the closing price and the number of shares traded of firm stock i on day t respectively. Since the CPQS Impact measures the cost of trade per dollar of trading volume, therefore, a higher degree of illiquidity assumed for a higher value of CPQS Impact estimated. To overcome the peculiarities in intraday data and thus to have synchronous data as well as to ensure the data is more manageable (Chordia et al., 2000), therefore the mean of daily illiquidity ratio is required to construct monthly illiquidity measure of each stock i.

The closing per cent quoted spread ($CQPS_{i,t}$) in equation (11) is estimated as below;

$$\text{CPQS}_{i,t} = \frac{\text{Closing ask}_{i,t} - \text{Closing bid}_{i,t}}{\left(\text{Closing ask}_{i,t} + \text{Closing bid}_{i,t}\right)/2} \tag{11}$$

The CPQS is the ratio between the difference of daily closing ask price (Closing $\text{ask}_{i,t}$) and daily closing bid price (Closing $\text{bid}_{i,t}$) of stock i on day t to the mid-point of ask and bid prices. It assumes that an illiquid asset will have a higher value of CPQS indicates the difficulty to trade the assets a result of an imbalance in supply and demand, thus, the wider spread is expected. As the spreads become wider, the investors will incur higher transaction costs and higher liquidity risk assumed for the assets.

Market Illiquidity ($c_{M,t}$)

To estimate the market illiquidity, the following procedure will be employed to derive the liquidity of a stock market similar to the study of Liew et al. (2016);

(i) Each relative illiquidity measure $c_{i,t}$ of individual security i will be estimated for each month t of the sample.
(ii) From above, the monthly illiquidity is then averaging across stock by using equal weights to obtain the monthly illiquidity measure of the Malaysian stock market.

METHODOLOGY

This study employed Fama-Macbeth two-stages cross-sectional regression, where, in the first stage, the market beta (β_1) and three liquidity risks (i.e. β_2, β_3 and β_4) are estimated based on equation 5 – 7 using the individual stocks level data from the previous 60 months for the entire time-series (January 2000 – December 2018) following Lee (2011) and Vu et al. (2015). In particular, each month the regression is carried out employing the last 60-month observations and one beta is created through one new observation out of 60 observation windows. The 60-month windows start from January 2000 and then rolled forward at monthly intervals. In the second stage, the following Fama-Macbeth cross-sectional regression is performed where, in each month, the individual stock returns are regressed against the pre-estimated beta.

$$E\left(r_{i,t} - r_{f,t}\right) = \alpha + bE\left(c_{i,t}\right) + \lambda_j\hat{\beta}_{1,i,t} + \lambda_j\hat{\beta}_{2,i,t} - \lambda_j\hat{\beta}_{3,i,t} - \lambda_j\hat{\beta}_{4,i,t} \quad (12)$$

Where, $E\left(r_{i,t} - r_{f,t}\right)$ is the expected excess individual stock returns and b is the coefficient for the expected individual stock illiquidity. This study used the average monthly closing per cent quoted spread impact as a proxy of the expected illiquidity costs computed from the previous 12 months following Lee (2011). The $\hat{\beta}_{1,i,t}$, $\hat{\beta}_{2,i,t}$, $\hat{\beta}_{3,i,t}$, and $\hat{\beta}_{4,i,t}$ is the pre-estimated beta computed as per equation 5 to 7. The subscript λ_j denotes the risk premia for stock j, and therefore has 169 different values. This estimated 169 risk premia values are then averaged across time which is reported in Table 1 in the Appendix. The LCAPM model holds if the intercept (α) is equal to zero and the coefficient of the expected illiquidity costs (*b*) is equal to 1.

RESULTS AND DISCUSSION

Descriptive Analysis

The analysis is performed on 419 stocks that are continuously traded on Bursa Malaysia since 2004: 12 to 2018: 12[2] in various industry categories. The data are obtained from Bloomberg services. The sample of the study represents about 53 per cent of the total stocks traded on Bursa Malaysia (currently about 790 total listed companies on the stock exchange). The 419 stocks belong to different

[2] The data obtained starts from January 2000 to December 2018. The analysis starts from December 2004 because the market beta and illiquidity betas are estimated using the data from the previous 60 monthly returns.

industry sectors in Malaysia (i.e. plantation, construction, property, healthcare, consumer products and services, energy, industrial products and services, technology, telecommunications and media, transportation and logistics and utilities). Table 1 reports the descriptive statistics of the eight variables in the overall sample of studies.

Table 1 Data descriptive statistics

Variables	N	Max	Mean	Min	SD	Skewness	Kurtosis
r	70,811	2.088	−0.232	−30.50	0.757	−14.44	367.3
E(c)	70,802	9.274	0.810	−10.97	3.351	−0.536	2.881
β_1	70,618	79.11	1.832	−31.41	3.618	7.053	79.47
β_2	70,545	6.469	0.889	−2.722	0.844	0.460	4.425
β_3	70,618	1.314	−0.127	−9.704	0.403	−8.659	111.2
β_4	70,545	31.11	−8.552	−52.75	8.477	−0.252	3.813
β_5	70,544	55.36	9.568	−32.65	9.048	0.296	3.744
β_{net}	70,544	100.5	11.40	−49.60	10.70	0.856	5.984

Note: This table summarizes the descriptive statistics (i.e., number of observations (N), maximum (max), mean, minimum (min), standard deviation (SD), skewness, and kurtosis) of the overall sample. Data represent overall sample included in the study comprises monthly stock returns (r), expected stock illiquidity costs (E(c)), market stock beta (β_1), liquidity risk ($\beta_2, \beta_3, \beta_4$), aggregate liquidity risk (β_5), and net beta (β_{net}).

Correlation Analysis

The correlation analysis is performed using the correlation matrix to study the association among variables involved in the study. This study employs seven independent variables namely; expected illiquidity costs (E(c)), market stock beta (β_1), liquidity risk (β_2, β_3, β_4), aggregate liquidity risk (β_5), and net beta (β_{net}), and one independent variable that is individual stock returns (r). The result of the correlation analysis is reported in Table 2.

Table 2 Correlation matrix among variables

Var	*r*	*E*(c)	β_1	β_2	β_3	β_4	β_5	β_{net}
r	1							
E(c)	−0.279 (***)	1						
β_1	−0.377 (***)	0.245 (***)	1					
β_2	−0.0477 (***)	0.238 (***)	0.206 (***)	1				
β_3	0.351 (***)	−0.285 (***)	−0.830 (***)	−0.238 (***)	1			
β_4	0.0363 (***)	−0.194 (***)	−0.258 (***)	−0.551 (***)	0.158 (***)	1		
β_5	−0.0541 (***)	0.217 (***)	0.298 (***)	0.220 (***)	0.6215	−0.995 (***)	1	
β_{net}	−0.173 (***)	0.266 (***)	0.590 (***)	0.594 (***)	0.5462 (***)	−0.929 (***)	−0.947 (***)	0.9 (***)

Note: This table summarizes the correlation coefficients of the eight variables, stock returns (r), expected illiquidity costs (E(c)), market stock beta (β_1), liquidity risk ($\beta_2, \beta_3, \beta_4$), aggregate liquidity risk (β_5), and net beta (β_{net}) for the whole sample of study during December 2004–2018. The four betas β_1,β_2, β_3, β_4 are estimated for each stock using Fama Macbeth 60-month rolling window. The significant level denoted as; *** *p*<0.01, ** *p*<0.05, **p*<0.1.

Table 2 indicates that all independent variables (i.e. *E*(C), β_1, β_2, β_3, β_4, β_5, β_{net}) are significantly correlated with stock returns (*r*). The findings indicate that stock returns (*r*) have significant positive co-movement with the covariances between the stock's return and the market illiquidity (β_3) and the covariance between stock's illiquidity and the market return (β_4) by 0.35 and 0.04 respectively. Nonetheless, the expected stock illiquidity cost (*E*(c)) ($r = -0.279$), the stock market beta (β_1) ($r = -0.377$); the covariance between the stock return and the market return, the covariance between the stock's illiquidity and the market illiquidity β_2 ($r = -0.0477$), aggregate liquidity risk (β_5) ($r = -0.0541$), and net beta (β_{net}) ($r = -0.173$) are inversely correlated with the stock return (r), and all association being significant at the 1 per cent critical level.

Cross-sectional Regression

This study has formulated five regression models (i.e. Regression 1, Regression 2, Regression 3, Regression 4 and Regression 5) to empirically test the significant effect of liquidity and liquidity risk as well as the LCAPM model of Acharya and Pedersen (2005) on stock returns. In particular, in each month from December 2004 to December 2018, the monthly returns are regressed cross-sectionally separately and jointly on the illiquidity cost, liquidity risks, market risk, aggregate liquidity risks and net beta using Fama-Macbeth (1973) cross-sectional regression. Instead of using Fama-Macbeth OLS standard errors, this study used Newey-west estimates to correct for heteroskedasticity and autocorrelated problems. Table 3 reports the output of estimating five regression specifications of Fama-Macbeth regression. Interestingly, the findings show some new evidence of the LCAPM model. Regression 1 shows that the expected illiquidity cost (*E*(c)) is significant at 1 per cent critical value with a premium of −0.0375 (*t*-value = 0.0013) after controlling for market risk, but with a wrong sign. The findings indicate that every 1 per cent increase in illiquidity cost will cause the return to decrease by 3.75 per cent. The significance of illiquidity cost is also confirmed in another two specification models (Regression 3 to Regression 5) with a similar sign of the coefficient, confirming that illiquidity cost is priced for the cross-sectional returns in Malaysian stock market. These findings are consistent with the other studies conducted in emerging markets such as Bekaert and Harvey (1997), Lee (2011), and Nor (2006), Batten and Vo (2014) though it is contradictory with what Acharya and Pedersen (2005)'s LCAPM model suggests. The inverse signs could be explained by a sudden Macroeconomic shock that dampened market liquidity (Rahim & Nor, 2006).

For liquidity-related risks (Regression 2), with market risk presence as a control variable in the model, the result shows that only β_2 and β_3 are significant with a premium of 0.0280 (*t*-value is 0.0164) and 1.590 (*t*-value is 0.262) respectively. However, only β_2 is correctly priced, indicating that the investors are willing to pay a premium for a stock that is illiquid when the market generally becomes illiquid. This finding is consistent with the studies conducted in the US market (Acharya & Pedersen, 2005), and other emerging market as shown in the studies of Lee (2011). While, the β_3 shows a wrong sign of coefficient, which is opposite to what the model proposes. The positive risk premium indicates that the investors demand a high return on stock whose expected return is high during when the market is in general illiquid. This finding is compatible with the findings of Minović and Živković (2010), Lee (2011), and Altay and Çalgıcı (2019). The β_4 is not economically significant though it is correctly signed, summarizing that the co-variance between stock's illiquidity and the market return (β_4) is not statistically significant in the Malaysian stock market. Besides that, the effect of market risk (β_1) on stock, returns are not approved in this specification. The same results were also found in Regression 3 when the joint effect of liquidity level and individual betas are estimated in a model. Among other variables, β_3 has a strong effect on stock returns which is highly significant both economically (1.44 per cent) and statistically (*t*-value = 0.27).

The final LCAPM model restricts to only one risk premium that needs to be estimated in a model as in a standard CAPM, thus the total systematic risk (β_{net}) is formed as a linear combination of all betas (β_1, β_2, β_3, and β_4). Instead of the market risk (β_1) as in the standard CAPM, the LCAPM model (regression 5) used β_{net} as a risk factor. Before that, to investigate whether aggregate liquidity risks matter separately from β_1, both β_1 and β_5 are tested in regression 4 following Acharya and Pedersen (2005) and Lee (2011). The β_5 and β_{net} are estimated as a linear combination of as follows.

$$\beta_5 = \beta_2 - \beta_3 - \beta_4 \text{ ; and } \beta_{net} = \beta_1 + \beta_5$$

Regression 4 estimates the combined effects of illiquidity costs (E(c)), stock's market beta (β_1) and aggregate liquidity risk (β_5) on stock returns. The findings presented in Table 1 in the Appendix demonstrate that all explanatory variables are significant with a 99 per cent confidence interval but only the aggregate liquidity risk (β_5) is correctly priced as expected by the theory with a positive premium of 0.0083 (*t*-value = 0.0007). While the other two of E(c) and β_1 show a flipped sign with a premium of –0.0430 (*t*-value = 0.0016) and –0.0709 (*t*-value = 0.0144) respectively. The results conclude that liquidity risk matters for asset pricing though the risk premium of liquidity risk is slightly lower than market risk by 6.26 per cent. The reverse coefficient sign of E(c) and β_1 is consistent with the other studies documented in the emerging markets such as Bekaert and Harvey (1997), and Rahim and Nor (2006).

The final regression 5 indicates that the premium of illiquidity costs (E(c)) is -0.0459 (*t*-value is 0.0017), while the total systematic risk (β_{net}) is significant with a premium of -0.0053 (*t*-value is 0.0020) but both with a wrong coefficient sign, that is inconsistent with the LCAPM. The findings indicate that the investors require higher returns for stocks that low in its illiquidity cost and its total systematic risks (i.e. market risk and total liquidity risks). The negative premium of β_{net} is driven by the magnitude of β_1 (-0.0709) which is larger compared to β_5 (0.0083). The wrong coefficient sign is consistent with the findings of Lee (2011) when the illiquidity is measured using turnover, zero-return proportion and Roll's measure. In summary, a stock's required return is decreasing in its level of illiquidity costs, level of β_1, β_3, β_{net} and increasing its level of β_2 and β_5.

Table 3 Fama Macbeth cross-sectional regression

Variables /Models	α	E(c)	β_1	β_2	β_3	β_4	β_5	β_{net}	R^2	N
Expected sign		+	+	+	-	-	+	+		
Regression 1	-0.0786***	-0.0375***	-0.0610***						0.262	70,609
	(0.0141)	(0.0013)	(0.0138)						(0.260)	
Regression 2	-0.141***		0.0176	0.0280*	1.590***	-0.0017			0.344	70,544
	(0.0108)		(0.0166)	(0.0164)	(0.262)	(0.0012)			(0.339)	
Regression 3	-0.153***	-0.0287***	0.0142	0.0620***	1.438***	-0.0014			0.389	70,544
	(0.0105)	(0.0019)	(0.0168)	(0.0141)	(0.267)	(0.0011)			(0.383)	
Regression 4	-0.140***	-0.0430***	-0.0709***				0.0083***		0.281	70,544
	(0.0114)	(0.0016)	(0.0144)				(0.0007)		(0.278)	
Regression 5	-0.116***	-0.0459***						-0.0053***	0.136	70,544
	(0.0138)	(0.0017)						(0.0020)	(0.134)	

Note: Table 3 shows the coefficient estimated from Fama Macbeth (1973) regression of the LCAPM model for the overall sample. The relation is estimated using five regressions (i.e. Regression 1, Regression 2, Regression 3, Regression 4, and Regression 5) with the full model is written as below:

$$E(r_i - r_f) = \alpha + kE(c_{i,t}) + \lambda_1\beta_{1,i} + \lambda_2\beta_{2,i} - \lambda_3\beta_{3,i} - \lambda_4\beta_{4,i} + \lambda\beta_{5,i} + \lambda\beta_{net,i}$$

The dependent variable in all regression models is the individual stock excess returns. $E(c)$ is the average monthly illiquidity as a proxy of the expected illiquidity costs computed from the previous 12 months following Lee (2011). While, $\beta_{1,i}$, $\beta_{2,i}$, $\beta_{3,i}$, and $\beta_{4,i}$ are the pre-estimated beta computed as per equation 3.4 to 3.7described in section 3. While, the aggregate liquidity risk and net beta are estimated as $\beta_{5,i} = \beta_{2,i} - \beta_{3,i} - \beta_{4,i}$ and $\beta_{net,i} = \beta_{1,i} + \beta_{5,i}$. The standard errors (*t*-statistic) reported in parentheses is estimated using robust Newey-West method. The significant level denoted as; *** $p<0.01$, **$p<0.05$, *$p<0.1$. The *R*-squared (R^2) is derived from the single cross-sectional regression and the adjusted R^2 is in the parentheses. The estimations are corrected for both heteroscedasticity and autocorrelation problems according to Newey-West (1987) procedures.

SUMMARY AND CONCLUSION

This study examined the role of liquidity risks in explaining the variations in the cross-sectional stock returns using the LCAPM model of Acharya and Pedersen (2005) for the Malaysian stock market. The analysis is performed at the individual stock level using monthly data starting from 2000 to 2018. The illiquidity measure used in this study is the closing per cent quoted spread impact proposed by Chung and Zhang (2014) which is different from Acharya and Pedersen (2005) and Lee (2011).

The overall findings suggest that commonality in liquidity and aggregate liquidity risks are priced with a correct sign of the coefficient. While, the liquidity level, the covariance between stock return and the market return, and the covariance between stock return and market liquidity as well as the total systematic risks are priced but with a flipped sign which is inconsistent with the proposed theory. The inversed sign could be explained by a sudden macroeconomic shock that dampened market liquidity, especially when the 2008 – 2009 global financial crisis was covered in the period of the study. A high correlation among the variables involved in the study and a noisy measure used for illiquidity could be another possible reason. To reduce such noise, study such as and Sadka (2004) use principal component analysis in each of their illiquidity measures. The use of principal component analysis (PCA) can help to capture the important aspect of liquidity that each liquidity measures share a common proxy. Therefore, the future studies can consider using this PCA method in the beta estimation.

The important limitation of the study is that the study used a strong assumption of the one-month holding period and thus the output in this paper should not necessarily demonstrate the evidence against the LCAPM model. Another limitation is that this study assumes constant premia of the LCAPM model which ignores the time-varying feature of liquidity risks. Therefore, future studies can extend the time-varying version of the LCAPM model in investigating the pervasiveness impact of liquidity risks on stock returns.

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