STOCK LIQUIDITY AND CASH HOLDINGS: EVIDENCE FROM MALAYSIA

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ABSTRACT

The level of cash held by listed companies has raised academic interest. In particular, many studies have been conducted to understand the reason why companies hold so much cash. Previous studies on the determinants of cash holdings have focused on firm-specific characteristics. More recently, researchers have found that stock liquidity played an important role in explaining the cash holding behaviour. This study examines the effect of stock liquidity on cash holdings among listed companies in Malaysia. The findings indicate that stock liquidity has a positive impact on cash holdings. This suggests that companies have a higher propensity to hold cash to repurchase its own stocks, which resulted in higher stock liquidity.

Keywords: Cash holdings, Stock liquidity, Stock buyback, Amihud liquidity ratio, Panel data

INTRODUCTION

Pinkowitz et al. (2012) observed that multinational companies hold more cash after 1998 and they suggested that this cash hoarding behaviour needed to be investigated further. In addition, firms increased cash holdings especially during the financial crises as firms rely less on capital markets for liquidity needs (Frésard,

2010). Furthermore, Pinkowitz et al. (2016) found that U.S. firms hold more cash than foreign firms between 1998 and 2011. The high cash holding behaviour poses these questions:

1. Why do companies hoard cash since cash yields low return?

2. Are companies hoarding cash because they have no other investment opportunities?

In the corporate finance literature, holding cash is useful in hedging against liquidity constraint, especially for companies facing capital markets devaluation and high credit risks (Harford et al., 2014). Although higher cash holdings reduce the external financing costs, it can bring an adverse impact. Firstly, Ferreira and Vilela (2004) argued that when firms use cash to finance the purchase of liquid assets, they must consider the opportunity cost of capital. Secondly, managers could pursuit their self-interest by extracting private benefits and invest in value-decreasing capital expenditures (Lee & Lee, 2009). Thirdly, high cash levels decrease the value of a firm (Frésard & Salva, 2010) as cash generally provides a low return (Dittmar et al., 2003).

While many studies have explored the motives of holding cash by looking at firm-specific characteristics such as firm size and leverage level, this study looked from the stock liquidity perspective. An increase in stock liquidity, an indicator of how easily a stock can be bought or sold without affecting the stock price significantly, will decrease firms' capital costs (Amihud & Mendelson, 1986). From the perspective of trade-off theory, Hu et al. (2019) found that companies with high stock liquidity tended to hold less cash as higher stock liquidity decreases the cost of debt and equity issuance, thereby allowing companies to raise funds with fewer constraints and at a lower cost. However, there is a counterargument to this non-mainstream idea, which stipulated that companies with higher cash holding tend to repurchase its own stocks which led to higher stock liquidity (Nyborg & Wang, 2021).

In light of these conflicting arguments, there is a need to examine the relationship between stock liquidity and cash holding behaviour. Previous studies on the relationship between stock liquidity and cash holding behaviour are generally limited. Notably, Hu et al. (2019) and Nyborg and Wang (2021) investigated the link between stock liquidity and cash holding behaviour among listed companies in U.S. To date, there is hardly any study that examine this link in the context of emerging markets. The only study to date is a study on the Turkish stock market by Kuzucu (2021). Hence, this paper contributes to the existing literature by investigating the effect of stock liquidity on cash holding behaviour in Malaysia, an emerging market.

HYPOTHESIS DEVELOPMENT

The level of cash holdings may differ significantly across firms. Such difference may be better understood by ascertaining the relationship between firm characteristics and their cash holdings. Extant literature suggests that several theories, namely the trade-off theory, the pecking order theory and the agency theory are instrumental in shaping such relationships in firms.

Stock Liquidity and Cash Holding

Current literature suggests that a channel from the capital market could affect the cash holding behaviour. Following the trade-off theory, Hu et al. (2019) found that firms with higher stock liquidity tended to hold less cash as they are able to raise more cash from the capital market through issuing of new stocks. Furthermore, since stock liquidity is an indication of asymmetry information (Glosten & Milgrom, 1985) and greater asymmetric information increases the cost of external financing (Myers & Majluf, 1984). Therefore, firms with less liquid stocks, indicating a higher level of information asymmetry, would have greater financial constraints. As a result, they would pile up more cash to reduce the high costs of external financing. Meanwhile, Nyborg and Wang (2021) found that higher stock liquidity increases firm cash holdings. This positive relationship suggests that firms will hold more cash to finance the purchase of their own stocks when opportunity arise. The study hypothesised that cash holding and stock liquidity may have a positive or negative relationship.

Other Firm Specific Factors and Cash Holdings

Literature review suggests that studies on cash holdings have been focusing on firm characteristics (Kim et al., 1998; Opler et al., 1999) as the determinants of cash holdings in firms. In this regard, numerous studies have provided evidence on how cash holding is impacted by firm characteristics such as firms size (Titman & Wessels, 1988; Guney et al., 2007; Ferri & Jones, 1979; Opler et al., 1999; D'Mello et al., 2008; Bates et al., 2009; Al-Najjar & Belghitar, 2011; Opler et al., 1999; Ferreira & Vilela, 2004), growth opportunities (D'Mello et al., 2008; Harris & Raviv, 1990; Opler et al., 1999; Ozkan & Ozkan, 2004; Bates et al., 2009; Borhanuddin & Ching, 2011; Jani et al., 2004; Ferreira & Vilela, 2004), leverage (John, 1993; Ferreira & Vilela, 2004; D'Mello et al., 2008; Deloof, 2003; Opler et al., 1999; Guney et al., 2007; Harford et al., 2014), cash flow (Kim et al., 1998; Riddick & Whited, 2009; Bao et al., 2012; Opler et al., 1999; Ferreira & Vilela, 2004; Deloof, 2003; Drobetz & Grüninger, 2007; Horioka & Terada-Hagiwara, 2014), asset liquidity (Ferreira & Vilela, 2004; Bates et al., 2009; Al-Najjar,

2013), investment activities (Opler et al., 1999; Dittmar et al., 2003; Bates et al., 2009; Jani et al., 2004) and dividend payment (Opler et al., 1999; Ozkan & Ozkan, 2004; Drobetz & Grüninger, 2007; Ferreira & Vilela, 2004; Bates et al., 2009).

Given that studies that investigate the link between cash holdings and stock liquidity remain scarce (see for example, Hu et al., 2019; Kuzucu, 2021; Nyborg & Wang, 2021) and with inconclusive findings, this study therefore aims to address the knowledge gap by contributing further evidence to this relationship.

DATA AND METHODOLOGY

The study examines the relationship of stock liquidity with cash holding behaviour of firms listed on the Main Market of Bursa Malaysia, the stock exchange of Malaysia, over the period from 2000 to 2018. As at 31 December 2018, there were 953 active firms listed on the Main Market. However, this paper excluded real estate investment trusts (REITs), exchange-traded funds (ETFs), special purpose acquisition companies (SPACs), closed-ended funds and firms that were highly regulated such as utility firms and financial institutions. Financial firms were excluded as their nature of business entails inventories of cash and marketable securities that are needed to meet the statutory capital requirements. In addition, only firms that have complete historical financial data from 1999 to 2018 were included in the study. The final sample is made up of 132 firms. The main source of data is Datastream.

The baseline model was adapted from Opler et al. (1999) and Hu et al. (2019) and it is as follow:

$$
\begin{aligned}
CASH_{it} = \ &\beta_0 + \beta_1 LOG\_AMIHUD_{it} + \beta_2 SIZE_{it} + \\
&\beta_3 MTB_{it} + \beta_4 LEVERAGE_{it} + \beta_5 CASH\_FLOW_{it} + \\
&\beta_6 LIQUID\_ASSET_{it} + \beta_7 CAPEX_{it} + \beta_8 DIVIDEND_{it} + e_{it}
\end{aligned} \tag{1}
$$

where $CASH_{it}$ is the ratio of cash and marketable securities to total assets of firm i in year t, LOG_AMIHUD_{it} is the negative natural logarithm value of the Amihud (2002) illiquidity ratio, $SIZE_{it}$ is the natural logarithm of the total assets, MTB_{it} is the market-to-book ratio, $LEVERAGE_{it}$ is the ratio of debts to total assets, $CASH\_FLOW_{it}$ is the ratio of operating cash flow to total assets, $LIQUID\_ASSET_{it}$ is liquid assets, $CAPEX_{it}$ is the ratio of capital expenditures to total assets, $DIVIDEND_{it}$ is a dummy variable that equals 1 if firm i paid dividend in year t and 0 otherwise, and e_{it} is the error term.

The dependent variable of this study is cash holdings (CASH), which is measured by the ratio of cash and marketable securities to total assets. This measurement has been used by many previous studies (see for example Opler et al., 1999; Ozkan & Ozkan, 2004; Bates et al., 2009; Liu et al., 2015; Qiu & Wan, 2015; Phan et al., 2019; Thakur & Kannadhasan, 2019).

To examine the relationship of stock liquidity with cash holdings, the Amihud Liquidity ratio (LOG_AMIHUD) was used as a proxy of stock liquidity. The Amihud (2002) Illiquidity ratio is the most reliable measurement of stock liquidity based on annual data (Hasbrouck, 2009) and pricing impact (Goyenko et al., 2009). It is defined as the negative natural logarithm of the Amihud (2002) Illiquidity ratio for ease of interpretation and to ensure that the liquidity measure is normally distributed (see for example Brockman et al., 2008; Gatev & Li, 2017; Gu et al., 2018):

$$LOG\_AMIHUD_{i,t} = -\frac{1}{D_{i,t}}\sum_{d=1}^{D_{i,t}} log\left(\frac{|R_{i,t,d}|}{Vol_{i,t,d}}\right) \tag{2}$$

where d is the trading day d, D is the number of trading days, R is the stock return and Vol is the daily ringgit trading volume. The higher is the LOG_AMIHUD, the more liquid is the firm's stock.

A set of control variables were included in the model to examine the relationship between stock liquidity and cash holdings. These variables controlled for the size of the firms, asset liquidity and activities that reduce cash holdings (i.e., growth opportunities, payment of capital expenditure, servicing debt, dividend payment).

Firm size (SIZE) is defined as the natural logarithm of the total assets of the firm. According to Ferri and Jones (1979), larger sized firms can benefit from a diversified funding sources compared to smaller firms as they have a better credit ratings (Opler et al., 1999). Hence, large sized firms can maintain lower cash holdings. However, the agency theory predicts that large sized firms have a more dispersive pool of shareholders, hence less vulnerable to hostile takeovers. This encourages managers to accumulate more cash to extract personal benefits as they have more discretion over the firm's cash management policy and investment activities (Ferreira & Vilela, 2004). In view of this, the relationship between firm size and cash holdings is non-conclusive.

The market-to-book ratio is used as a proxy for growth opportunity. As defined by Opler et al. (1999), this is the book value of total assets minus the book value of equity plus the market value of equity, then divided by the book value of total assets. Firms with higher growth opportunities tend to have a higher

probability of financial distress (D'Mello et al., 2008). In addition, these firms require more liquidity to fund future investment projects (D'Mello et al., 2008). Therefore, these firms retain higher cash levels to prevent liquidity shortfalls (Opler et al., 1999; Ozkan & Ozkan, 2004; D'Mello et al., 2008; Bates et al., 2009; Borhanuddin & Ching, 2011), to decrease the costs of external financing (Opler et al., 1999) and to prevent any underinvestment (Bates et al., 2009). On the contrary, the agency theory predicts that companies with low growth opportunities will accumulate more cash to make provision for future investment opportunities (Ferreira & Vilela, 2004; Jani et al., 2004; Bates et al., 2009). Besides, entrenched managers in low-growth firms tend to pile up cash to increase their managerial discretion so that they can use internal cash as they wish without scrutiny from the capital market (Bates et al., 2009). Based on the above arguments, cash holding may have either a positive or negative relationship with book-to-market ratio.

In this paper, firms' leverage level is measured by the leverage ratio (LEVERAGE) which compares the total debts to total assets. The level of debt affects company's cash holding behaviour in two different ways. On one hand, John (1993) postulates that the level of leverage is an indication of company's ability to raise liquidity in the capital market. Companies with a higher ability to raise funds are expected to hold less cash (Ferreira & Vilela, 2004; D'Mello et al., 2008). On the other hand, the precautionary motive views that highly-leveraged companies are expected to increase cash holdings in order to mitigate the risk of being financially distressed (Deloof, 2003). In view of these contradicting views, the relationship between cash holdings and leverage is expected to be ambiguous.

Another activity that may be related to the cash holding behaviour is capital expenditure. Companies with higher capital expenditures tend to hold more cash and liquid assets to reduce transaction costs arising from external financing (Jani et al., 2004). However, Opler et al. (1999) indicate that companies with high capital expenditure are expected to have lesser internal resources to invest in liquid assets, so they possess a lower level of cash holdings. Moreover, if a company uses its capital expenditure to generate assets that can be utilised as collaterals, the company will be able to grow its debt capacity and subsequently reduce the needs to hold more cash (Bates et al., 2009). In view of these conflicting arguments, the relationship between capital expenditure and cash holdings is ambiguous.

Numerous studies suggest that companies that hold more cash tends to pay higher cash dividend (see for example, Kumar & Ranjani, 2018; Moin et al., 2020; Yang et al., 2020). This is because dividend-paying firms need to retain a higher level of cash to avoid any liquidity shortfalls to support dividend payments (Ozkan & Ozkan, 2004). However, the pecking order theory expects

a lower level of cash holdings among dividend-paying firms as cash dividend payment decreases cash holdings (Jani et al., 2004). In order to determine if dividend paying firms hold more cash, a dividend dummy (DIVIDEND) was used to differentiate between a company that pays dividend in a particular year and non-dividend paying company. A value of "1" was assigned if the firm has made cash dividend payments in a specific year and "0" if no dividend was paid. The use of dividend dummy is in line with previous studies (see for example, Drobetz & Grüninger, 2007; Bigelli & Sánchez-Vidal, 2012; Ahmad & Adaoglu, 2019; Ranajee & Pathak, 2019; Nyborg & Wang, 2021).

From the perspective of the trade-off theory, cash flow is a representation of a readily available substitute for liquidity, hence it minimises firms' dependence on cash (Kim et al., 1998). Riddick and Whited (2009) and Bao et al. (2012) support the negative association between cash flow and cash holdings as they observed that firms tend to reduce cash holdings when they have positive cash flows. However, the pecking order theory postulates that firms with high cash flows maintain a higher level of liquidity because they hold most of the cash flows generated as cash (Opler et al., 1999; Ferreira & Vilela, 2004; Drobetz & Grüninger, 2007). Consistent with the definition used by previous studies, cash flow (CASH_FLOW) is measured as the ratio of operating cash flow to total assets (see for example, Opler et al., 1999; Drobetz & Grüninger, 2007; Pinkowitz et al., 2012; Chen et al., 2015).

Liquid assets play an important role in influencing cash holding behaviour. According to the trade-off theory, an inverse relationship exists between liquid assets and cash holdings as firms that possess a higher level of liquid assets can address cash shortfalls by converting these assets into cash easily (Ferreira & Vilela, 2004; D'Mello et al., 2008) since the cost of conversion of such assets is relatively lower than other assets (Al-Najjar, 2013). Following Opler et al. (1999), liquid assets (LIQUID_ASSET) is measure as a firm's current assets minus current liabilities and cash. This study hypothesises that liquid asset has a negative relationship with cash holdings.

RESULTS AND DISCUSSIONS

Descriptive Statistics

The descriptive statistics for the full sample are presented in Table 1. On average, for every Ringgit of total assets owned by a Malaysian firm, 4.96% was retained as cash holdings. In comparison, Pinkowitz et al. (2016) reported that the average cash holdings of U.S. firms was 20.17% between 1998 and 2011. In addition, the

average level of cash holdings of firms in advanced countries was 13.52% during the observed period and was constantly higher than firms in developing countries (Pinkowitz et al., 2016). The high cash holdings of U.S. firms were due to the presence of firms with an enormously high ratio of R&D-to-sales (Pinkowitz et al., 2016). It is worth nothing that despite most firms have positive cash holdings as exhibited by the positive skewness of this variable, some firms possess high liquidity risk since they have zero cash holdings.

Table 1
Descriptive statistics for all the variables

Variable	Mean	Median	Maximum	Minimum	S.D.	Skewness	Kurtosis
CASH	0.0496	0.0290	0.7941	0.0000	0.0707	4.7837	35.2973
LOG_AMIHUD	14.4709	14.3110	21.3493	7.7139	2.3234	0.1817	2.5924
SIZE	5.9261	5.8324	8.0135	3.3483	0.6524	0.3774	3.2137
MTB	1.3026	0.9479	25.4533	0.2954	1.4588	6.4993	63.4599
LEVERAGE	0.2417	0.2287	10.2731	0.0000	0.3407	19.1562	533.9416
CASH_FLOW	0.0580	0.0445	0.8270	−0.6380	0.1000	1.1571	11.4170
LIQUID_ASSET	160,766	48,088	17,604,900	−29,198,896	1,512,451	−2.9565	117.6677
CAPEX	0.0379	0.0240	0.3356	0.0000	0.0414	2.2122	10.0367
DIVIDEND	0.6938	1.0000	1.0000	0.0000	0.4610	−0.8408	1.7070

Moreover, the cash ratio of 4.96% is relatively lower compared to other studies in Malaysia. Previous studies on Malaysia have reported cash holdings ranged from 6% to 14% (see for example, Wasiuzzaman, 2014; Al-dhamari & Ismail, 2015; Ashhari & Faizal, 2018; Demir et al., 2019). These differences are mainly due to the companies studied, sample period and definition of cash holdings. It is worth noting that one company has recorded zero cash for a few years.

To measure stock liquidity, the value of Amihud Illiquidity ratio was inverted to obtain the Amihud Liquidity ratio (LOG_AMIHUD). The higher the Amihud Liquidity ratio, the more liquid the stock is. The results show that all firms in the study possess liquid stocks and the level of stock liquidity ranged from 7.7139 to 21.3493. On the other hand, both Amihud Liquidity ratio and firm size have among the lowest kurtosis value of 2.5924 and 3.2137, respectively, suggesting that these two variables have fewer extreme values in either tail of their normal distribution.

In terms of the control variables, it is interesting to learn that the average market-to-book ratio of all firms is more than 1, indicating these firms' market value exceeds their book value hence higher growth opportunities. On average, approximately 24.2% of the assets held by all firms are acquired using debt

financing, with the lowest leverage ratio being zero and the highest being 1027.3%. Another interesting observation is that one company has a total debt of more than 10 times of their assets given that the company has very little total assets. As some firms are highly geared, it causes the leverage ratio to be the variable with the highest positive skewness and kurtosis among all variables. This suggests that there is a tendency for some firms to use debt to finance assets.

The average cash flow value is 0.058, which means 5.8 cents of cash was generated for every Ringgit invested in these firms' assets. Besides, these firms averagely hold RM160,766 as liquid asset, with a negative value of RM29,198,896 as the minimum and a positive value of RM17,604,900 as the maximum. The negative liquid asset value suggests an aggressive strategy for working capital investment, while the positive value reflects a fairly flexible policy because it means that extra capital is needed to finance the working capital (Hill et al., 2010). The average capital expenditure incurred by these firms is 3.79%. Between 2000 and 2018, approximately 69.4% of the time these firms paid dividends.

Association between Stock Liquidity and Cash Holdings

The effect of stock liquidity on cash holding behaviour is analysed using panel data regression techniques and the estimated results are presented in Table 2. Before turning attention to the interpretation of the estimated coefficients, the estimated results based on the three different estimating techniques were tested for unbiasedness and efficiency. Since the test statistics for the redundant fixed effect tests are significant, these indicate the existence of unobserved effects in the model. Hence, the estimated coefficients based on ordinary least squares (OLS) are biased. Next, the Hausman test was conducted to examine if the random effect model is preferred over the fixed effect model. With a chi-square test statistic of 28.0731, the null hypothesis of random effect is more efficient is rejected. Based on these two tests, the interpretation of the estimated results is based on the fixed effect model.

From Table 2, the fixed effects model shows that different outcomes as compared to the pooled OLS regression model. Most notably, stock liquidity (LOG_AMIHUD) is positively associated with cash holdings in the fixed effects model but not significant in the pooled regression model. The positive association between cash holding and stock liquidity supports the argument of Nyborg and Wang (2021), suggesting that when firms' stock is more liquid, the firms have higher incentive to hold more cash as this will increase their ability to repurchase their own stock and without reverting the stock price to its fair value (Brockman et al., 2008). The estimated result provides no support for the trade-off theory

as suggested by Hu et al. (2019). Overall, the finding indicates that the stock repurchase motive takes precedence over their real investment motive.

Table 2
Regression results of OLS, fixed effects and random effects models

Variable	OLS	Fixed Effects Model	Random Effects Model
LOG_AMIHUD	−6.94E-05	0.0025***	0.0023***
	(0.000689)	(0.0008)	(0.0007)
SIZE	0.0015	−0.0106*	0.0159***
	(0.0026)	(0.0058)	(0.0039)
MTB	0.0024**	0.0026*	0.0048***
	(0.0011)	(0.0014)	(0.0013)
LEVERAGE	−0.0174***	−0.0050	−0.0123***
	(0.0045)	(0.0040)	(0.0040)
CASH_FLOW	0.0038	0.0047	0.0137
	(0.0180)	(0.0166)	(0.0165)
LIQUID_ASSET	−2.72E-09***	−5.41E-09***	−4.48E-09***
	(9.35E-10)	(9.99E-10)	(9.86E-10)
CAPEX	0.0022	−0.0174	−0.0391
	(0.0357)	(0.0355)	(0.0351)
DIVIDEND	−0.0041	0.0012	−0.0067*
	(0.0035)	(0.0040)	(0.0038)
Intercept	0.0453***	0.0736**	−0.0758***
	(0.0140)	(0.0364)	(0.0241)
No. of observations	2,508	2,508	2,508
R^2	0.0110	0.4229	0.0290
Adjusted R^2	0.0078	0.3843	0.0258
Redundant fixed effect γ^2 statistics			
Cross-section effect	–	1211.4220***	–
Year effect	–	172.3084***	–
Cross-section and year effect	–	1351.0212***	–
Hausman test γ^2 statistics	–	–	28.0731***

Note: Standard errors are in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

The finding suggests that large-sized firms retained less cash, and it is in line with the findings of Titman and Wessels (1988) and Opler et al. (1999). This negative relationship is probably due to firms have more diversified sources of funding (Ferri & Jones, 1979), face a lower probability of being financially distressed (Guney et al., 2007), are less prone to bankruptcy risk (Al-Najjar & Belghitar, 2011), possess higher economies of scale (D'Mello et al., 2008) and are more capable of liquidating their non-core assets (Bates et al., 2009). Furthermore,

smaller firms tend to hold more cash as they face higher external financing costs and have more constraints in fund-raising due to higher information asymmetry (Ozkan & Ozkan, 2004).

In line with the findings of previous studies by Ferreira and Vilela (2004), Ozkan and Ozkan (2004), D'Mello et al. (2008) and Al-Najjar and Belghitar (2011), liquid assets are found to be negatively associated with cash holding. Consistent with the trade-off theory, since liquid assets can be easily converted into cash with little transaction costs, firms with higher holding of liquid assets do not need to hold too much cash.

Growth opportunities have a positive impact on cash holdings at the 10% level, which is reflective of the results of previous literature (Opler et al., 1999; Ferreira & Vilela, 2004; Ozkan & Ozkan, 2004; D'Mello et al., 2008; Bates et al., 2009; Borhanuddin & Ching, 2011). The positive relationship reflects the precautionary motive for holding cash and the trade-off theory prediction, in which high-growth firms will hold more cash to stay away from financial distress and cash shortfalls. This also corresponds to the pecking order theory and transaction cost motive for holding cash (Harris & Raviv, 1990).

The estimated coefficient for leverage is negative albeit not significant. This finding is not in line with the result of John (1993) which predicted that firms with a higher ability to borrow money will hold less cash. In addition, the finding also did not support the precautionary motive of holding cash and the agency theory. Another important finding from the study is that cash holdings did not increase significantly with the capital expenditure ratio. This result is not consistent with the pecking order theory which suggests that firms with higher capital expenditure will use up their cash to finance investment opportunities, thus, reducing the cash holdings (Opler et al., 1999; Jani et al., 2004).

The results in Table 2 suggest that the decision to hold cash is not influence by dividend payment. Although previous studies have suggested that firms will hold more cash to finance dividend payment (see for example, Ozkan & Ozkan, 2004), our findings suggest otherwise. Finally, cash flow is found to have no impact on cash holdings. And this finding is not consistent with the Trade Off theory and Pecking Order Theory.

Robustness Test

As the main objective of this study is to examine the relationship between stock liquidity and cash holding, other proxy of stock liquidity should be considered to obtain a more robust result. A common alternative measure for stock liquidity is

the Annual Relative Effective Spread (RESPRD). RESPRD is computed as the difference between the execution price and the midpoint of the prevailing bid-ask quote, scaled by the midpoint of the prevailing bid-ask quote. As RESPRD is a negative indicator for stock liquidity, it is inverted and transformed into LOG_ RESPRD to provide a more straightforward interpretation for stock liquidity measurement. LOG_RESPRD is defined as the negative natural logarithm of RESPRD following previous literature (see for example, Fang et al., 2009; Chang et al., 2017; Chen et al., 2019):

$$LOG\_RESPRD_{i,t} = -\frac{1}{D_i}\sum_{d=1}^{D_i}log\left(\frac{|P_{i,d,n} - M_{i,d,n}|}{M_{i,d,n}}\right) \tag{3}$$

where n is the matched trade or quota, P is the trading price, M is the mean of the best ask and the best bid. The higher the LOG_RESPRD, the higher is the liquidity.

The influence of stock liquidity, measured as LOG_RESPRD, and other control variables on cash holdings was analysed using the same regression analysis employed in the previous section. After replacing LOG_AMIHUD with LOG_RESPRD in the panel data, the estimated results are exhibited in Table 3. From Table 3, the Redundant test and Hausman test suggest that the fixed effect model is the most appropriate estimating techniques, and the result interpretation is based on the results from fixed effect model.

Table 3
Regression results of OLS, fixed effects and random effects models with LOG_RESPRD as proxy variable for stock liquidity

Variable	OLS Model	Fixed Effects (FE) Model	Random Effects Model
LOG_RESPRD	0.0098***	0.0074***	0.0052***
	(0.0022)	(0.0022)	(0.0020)
FIRM_SIZE	−0.0061**	−0.0155***	0.0140***
	(0.0028)	(0.0061)	(0.0042)
MTB	0.0008**	0.0012	0.0037***
	(0.0012)	(0.0014)	(0.0013)
LEVERAGE	−0.0140***	-0.0041	−0.0116***
	(0.0045)	(0.0040)	(0.0040)
CASH_FLOW	0.0069	0.0017	0.0113
	(0.0178)	(0.0166)	(0.0165)
LIQUID_ASSET	−2.93E-09***	−5.73E-09***	−4.66E-09***
	(9.33E-10)	(1.00E-09)	(9.88E-10)
CAPEX	−0.0146	−0.0301	−0.0473
	(0.0358)	(0.0357)	(0.0354)

(*Continued on next page*)

Table 3 (*Continued*)

Variable	OLS Model	Fixed Effects (FE) Model	Random Effects Model
DIVIDEND	−0.0075**	−0.0016	−0.0093**
	(0.0035)	(0.0040)	(0.0038)
Intercept	0.0472***	0.1084***	−0.0524**
	(0.0134)	(0.0349)	(0.0232)
No. of observations	2,508	2,508	2,508
R^2	0.0187	0.4233	0.0280
Adjusted R^2	0.0156	0.3848	0.0249
Redundant fixed effect γ^2 statistics			
Cross-section effect	–	1186.5171***	–
Year effect	–	183.8471***	–
Cross-section and year effect	–	1333.2941***	–
Hausman test γ^2 statistics	–	–	24.6760***

Note: Standard errors are in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 3 presents largely similar results as Table 2, with the estimated signs of the coefficients and variables that are significant being the same for the fixed effect model. For example, stock liquidity and two control variables, firm size (FIRM_SIZE) and asset liquidity (LIQUID_ASSET) are statistically significant. The only exception is with the measurement of growth opportunity (measured by market to book value) which is significant in Table 2 but otherwise in Table 3.

Consistent with the results in Table 2, the fixed effects model shows that the alternate proxy for stock liquidity, Annual Relative Effective Spread (LOG_RESPRD), shares the same effect on cash holdings as the main proxy, Amihud Liquidity Ratio (LOG_AMIHUD), where both measurements of stock liquidity exhibit a positive and highly significant association with cash holdings at the 1% level. Thus, this paper concludes that stock liquidity has a positive impact on cash holdings.

CONCLUSIONS AND POLICY IMPLICATIONS

There are two conflicting motives of holding cash. Firstly, from the perspective of transaction cost motive for holding cash, Hu et al. (2019) argued that firms with higher stock liquidity will retain less cash. This is because a higher stock liquidity reduces the cost of raising capital, therefore providing easy access to capital market. On the other hand, the stock repurchase motive for holding cash as proposed by Nyborg and Wang (2021) stated that firms with a higher stock liquidity liquid tend to accumulate more cash so that they can repurchase their

own shares. With these two conflicting views, the main objective of the study is to examine the effect of stock liquidity on firms' cash holdings in Malaysia.

Using financial information from 132 listed companies in Malaysia from 2000 to 2018, with a total of 2,508 firm-year observations, this study employed panel data analysis to examine the cash holdings-stock liquidity relationship. Based on the estimated results, this study provides evidence that stock liquidity has a positive impact on cash holdings in Malaysia, which implies that firms with more liquid stocks (means stocks can be bought or sold easily without affecting the stock price) are more likely to hold cash to engage in stock repurchasing exercises. This finding echoes the argument of Warusawitharana and Whited (2016), which states that a firm's financial policy is more inclined to respond to equity mis-valuation than real investments.

In addition, the other determinants of cash holdings, namely firm size, growth opportunities (market-to-book ratio) and asset liquidity are found to be significantly correlated with cash holdings. While both firm size and asset liquidity showed a negative relationship with cash holdings, growth opportunities exhibited a positive correlation. The results are consistent with the predicted relationships derived from previous literature.

In short, the key empirical point in this study is, there is a positive association between stock liquidity and cash holdings. The results of this study revealed that firms with liquid stocks hold more cash. This study echoes Nyborg and Wang (2021) that a higher level of stock liquidity increases firms' incentive to take advantage of stock repurchase, therefore they hold more cash are needed to buy back their stocks.

This study offers several policy implications. For finance practitioners and managers, this study provides guidance to evaluate the benefits and opportunity costs of holding cash, therefore adjust their firms' cash ratios based on the firm's level of stock liquidity and other firm-specific factors to increase the efficiency of cash and liquid assets. Firms' management and long-term shareholders can benefit from repurchases of undervalued stock as it stabilises the firm's stock price (Peyer & Vermaelen, 2009).

Firms must hold cash as it offers financial flexibility in funding investments or preventing cash shortages when there are unexpected liquidity issues (Opler et al., 1999). For example, companies that retain more cash as a precautionary measure can prevent severe liquidity crunch arising from the downturn in global economy and stock market crash amid the novel coronavirus (COVID-19) outbreak. Moreover, a bearish stock market also poses a great opportunity for

firms with excess cash to benefit from repurchasing their own stocks. Firms with liquid stocks can benefit even more as they can buy back more undervalued stocks without driving the stock prices back to their fair value.

To increase stock liquidity, Amihud and Mendelson (2000) recommend that managers must take proactive strategies to grow the firm's investor base by implementing strategies that would appeal to retail investors. This may include stock splits to make the stock more accessible or within reach. In addition, a firm can reduce the level of information asymmetry among market participants to enhance its stock liquidity by providing transparent and accurate financial reports and updates on the firms in a timely manner. Alternatively, a firm can engage investment analysts to cover its stock. This is specifically important for small-capped firms as the level of asymmetric information is usually higher.

LIMITATIONS AND RECOMMENDATIONS FOR FUTURE STUDY

The contributions of this study come with several caveats. Firstly, this study draws on Datastream – an established international financial time series database – as the source of data collection and is hence subjected to the richness of data within this database. Specifically, the data on the various factors affecting a firm's cash holding (e.g. R&D expense and cash flow volatility) are either incomplete or insufficient within the database. The exclusion of these variables from the current study has resulted in low R-squared values in most of the analysis. While the low values may be common in extant studies on cash holding, such values provide indications that more factors impacting a firm's cash holding needs to be considered to provide greater explanatory power.

Secondly, this study examines firm-level factors and has not consider the influence of macroeconomic factors such as the GDP and inflation rate on a firm's cash holdings decision. While less ideal, such approach provides a focused understanding on firm's cash holdings. Thirdly, while examining firms in Malaysia, only the listed firms have been included and not the private firms due to the challenge of data availability for the latter. Thus, the findings are subject to weak external validity and generalisability not only on private firms but also on firms operating in other countries. Lastly, while recognising the differences across industries, this study aims to provide a wholistic view on cash holdings of the firms and has not considered the industrial classifications.

Informed by the above limitations, future studies on firm's cash holding should consider incorporating corporate governance factors. The importance of corporate governance (e.g., ownership structure, board characteristics and

shareholder rights) on cash holdings has been highlighted in previous studies such as Ozkan and Ozkan (2004), Dittmar et al. (2003) and Harford et al. (2008). Additionally, firm-specific factors such as R&D expense should be considered by future studies. Besides firm-level factors, future studies may include macroeconomic factors to strengthen the study on cash holdings in firms operating in developing countries such as Malaysia.

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