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## Article

# The association between upward and downward earnings management and equity liquidity: empirical evidence from non-financial firms listed in Vietnam

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## ACCOUNTING, CORPORATE GOVERNANCE & BUSINESS ETHICS | RESEARCH ARTICLE

# The association between upward and downward earnings management and equity liquidity: empirical evidence from non-financial firms listed in Vietnam

Quynh Lien Le<sup>1</sup>, Hanh Hong Ha<sup>1</sup>, Thi Minh Phuong Nguyen<sup>1\*</sup> and Thuy Duong Doan<sup>1</sup>

**Abstract:** The current study aims at examining the impact of earnings management on equity liquidity in the Vietnam stock market when considering the direction of earnings management. We used two proxies of equity liquidity, namely quoted spread and effective spread, and analyzed the data using ordinary least squares (OLS), fixed and random effect models (FEM, REM), and regression with generalized least squares (GLS) to determine the most suitable model. The findings of the study indicate that when downward earnings management increases, the quoted spread also decreases, thus the bid-ask spread is low, meaning that the liquidity is high. This can be explained by the fact that when firms conduct downward earnings management to reduce taxes, investors may expect to buy stocks from these firms at a better price, leading to an increase in trading demand on the market. Whereas upward earnings management has no impact on quoted spread. Our results also



Quynh Lien Le

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Quynh Lien Le is a lecturer at the School of Accounting and Auditing, National Economics University, Hanoi, Vietnam. Her research and teaching interests are focused on accounting, earnings management, corporate governance, corporate finance, and liquidity.

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### PUBLIC INTEREST STATEMENT

This work examines the effect of upward and downward earnings management on equity liquidity. We used data from 499 non-financial firms listed in Vietnam stock market. Quoted spread and effective spread were used as proxies for liquidity. Our results suggest that when downward earnings management increases, the quoted spread decreases, indicating that the bid-ask spread is low, and liquidity is high. This can be attributed to the expectation that investors will be able to purchase stocks from firms that engage in downward earnings management at a better price, resulting in an increase in trading demand on the market. However, upward earnings management has no effect on quoted spread. Furthermore, our findings indicate that earnings management has no impact on the effective spread. Thus, in the absence of other factors, an increase in earnings management in either upward or downward directions does not influence the difference between buying and selling prices.

showed that there is no evidence to suggest that earnings management has an impact on the effective spread. This means that, in the absence of other factors, an increase in earnings management in either upward or downward directions does not affect the difference between buying and selling prices.

**Subjects:** Corporate Finance; Financial Management; Corporate Governance

**Keywords:** earnings management; equity liquidity; earnings management and equity liquidity; non-financial firms

## 1. Introduction

Healy and Wahlen (1999) defined earnings management as the practice of managers using their discretion in financial reporting and structuring transactions to manipulate financial reports in a way that can mislead stakeholders about a company's economic performance or influence contractual outcomes that depend on reported accounting practices. This practice can compromise the quality of earnings reports and disclosure in general. Despite the strong link between accounting disclosure quality and market liquidity, existing empirical research has not firmly established a connection between earnings management and market liquidity. Therefore, it is important for regulators and investors to understand the economic consequences of a firm's disclosure practices and earnings management practices.

Earnings management has the potential to manipulate financial statements to meet targets or present a favorable financial image, potentially affecting contractual relationships. The use of the accrual basis in financial statement preparation makes it difficult to avoid this phenomenon. Managers often resort to earnings management to maximize the utility and market value of the company. Schipper (1989) states that when management intervenes in the preparation process of financial statements for external parties to flatten, raise, or lower profits, it is classified as earnings management practices. Scott (2006) defines earnings management as the accounting policies adopted by managers to achieve specific objectives. In many cases, managers engage in earnings management for their benefit. For example, Bartov and Mohanram (2004) found that managers tend to manipulate earnings to increase earnings over the duration of calling or putting the stock option. Similarly, Leuz et al. (2003) showed that companies with higher degrees of earnings management have higher liquidity costs. Earnings management can also result in lower-quality accounting information disclosure (Dechow & Dichev, 2002), decreasing the willingness of uninformed traders to trade stock. The evidence suggests that earnings management has negative effects on equity liquidity, and liquidity traders acknowledge the involvement of adverse selection costs in earnings management.

Earnings management is a widespread practice in several countries, including Vietnam, which can have an impact on financial statement users. N. H. Dang et al. (2018) found a significant positive relationship between financial information and stock prices for listed firms on the Vietnam Stock Exchange. Leuz et al. (2003) studied earnings management across different countries and found that corporate governance affects earnings management, as insiders use it to protect their interests. This study suggests that companies with higher earnings management tend to have higher market liquidity. Dechow and Dichev (2002) demonstrated that accrual quality has a positive relationship with earnings persistence, highlighting the importance of measuring accrual quality. The empirical evidence suggests that earnings management activity affects market liquidity, with higher levels of inflation leading to greater market liquidity.

Liquidity has been the central topic of numerous studies in the finance literature (Nguyen and Dao, 2022). Research has demonstrated that equity liquidity, which is unpredictable and subject to change over time, can have adverse effects on investor well-being during unfavorable periods. The liquidity of shares is based on corporate profits when the share price rises (Taha et al., 2023).

Galariotis and Giouvriss (2007) found that liquidity is correlated between various assets, while Chordia et al. (2001) suggested that monetary expansions are linked to enhancements in stock market liquidity, and fluctuations in liquidity are connected between both stock and bond markets. Pástor and Stambaugh (2003) explored the association between overall market liquidity and stock pricing and discovered that expected stock returns are positively related to how sensitive returns are to fluctuations in overall liquidity.

The influence of stock liquidity on earnings management is not only determined by its magnitude but also by its informational value, as liquidity may increase investor supervision. Nonetheless, studies indicate that actual earnings management can lead to inferior financial disclosures, resulting in increased capital costs for the company (Francis et al., 2008; Kim and Qi, 2010; Kim and Sohn, 2013). Consequently, actual earnings management may have an adverse effect on a company's long-term profitability and competitiveness, with significant implications for its future cash flow (Kothari et al., 2016). While there have been studies on equity liquidity in Vietnam, they have mainly focused on understanding the relationship between equity liquidity and capital structure. For example, L. T. Dang et al. (2019) explored this relationship without examining the impact of earnings management on equity liquidity. Therefore, this research aims to investigate the effects of downward and upward earnings management on equity liquidity in non-financial firms listed on the Vietnam stock market. The study will contribute to the literature review by examining the impact of earnings management on equity liquidity in the context of Vietnam, which is a frontier economy. The findings and recommendations of the study are likely to be relevant and applicable to firms operating in similar economic contexts. In this paper, we examine the relationship between both directions of earnings management (upward and downward earnings management) and measures of equity liquidity that are related to information asymmetry. More specifically, we address the following questions: (1) How to measure earnings management of non-financial firms listed on Vietnamese stock market? (2) How to measure equity liquidity of non-financial firms listed on Vietnam stock market? (3) What is the impact of earnings management on equity liquidity of non-financial firms listed on Vietnamese stock market?

In this study, we use a comprehensive dataset from 499 companies over the period of 2010–2020. We obtain data from Vietstock. We obtain data from Vietstock. Our two key variables are earnings management and equity liquidity. To measure a equity liquidity, we rely on two proxies commonly used in literature: When measuring liquidity, we use two proxies: quoted spread and effective spread following the model proposed by Arya et al. (2003). Liquidity measures are estimated by averaging quoted and effective spreads across all trades each day.

Some studies in the world have previously looked at earnings management, but only mentioned earnings management through accounting value without considering the absolute value of earnings management (Al-Shattarat & Ntim, 2021; Bharath et al., 2013; Edmans & Manso, 2011; Edmans, 2009; Nguyen et al., 2021, 2021). Measuring earnings management using the absolute value of discretionary accruals can provide insight into the degree of earnings management, enabling a more accurate evaluation of the impact of other factors on earnings management (Reynold and Francis, 2000; Wang, 2006; Paul Hribar & Craig Nichols, 2007; Zalata et al., 2021). Our study uses the absolute value of accruals as a proxy for earnings management according to the model of Kothari et al. (2015).

Futhermore, previous studies related to earnings management and equity liquidity Hao and Li (2022), Chen et al. (2022) without separating into 2 separate groups including upward and downward earnings management. Upward earnings management refers to firms inflating their earnings, while downward earnings management refers to deflating earnings (Le and Nguyen, 2023). Because the magnitude of risk differs between upward and downward earnings management, investors are expected to assign different weights to these forms when valuing their portfolios. Therefore, the difference between the paper and previous studies related to our topic lies in the fact that the authors separate the data set of discretionary accruals representing earnings

management into two parts: Upward and downward earnings management, then regression model with the independent variable being the absolute value of discretionary accruals for each case and the dependent variable being the equity liquidity. Our study contributes to literature in two ways. First, similar to previous study, this research adds to the existing literature by synthetic a theoretical framework, generalize fully and comprehensively on the measurement methods of earnings management and the effects of earnings management on equity liquidity. Second, the findings of the study indicate that an increase in downward earnings management leads to a decrease in the quoted spread, indicating a low bid-ask spread and high liquidity. This may be due to investors expecting to purchase stocks from such firms at a better price, thus leading to increased trading demand in the market. However, upward earnings management does not have an effect on quoted spread. Moreover, the research also found no evidence of the relationship between either upward or downward earnings management and effective spread.

The remainder of this paper is organized as follows. Section 1 indicates the background to explain why Vietnam is the appropriate context to conduct our study. Section 2 provides the theoretical literature reviews. Section 3 reviews the prior empirical literature in this area and develops the main hypotheses of the paper. Section 4 describes our data sources and the variable construction procedure. Section 5 presents empirical evidence of the impact of earnings management on equity liquidity and Section 7 sets forth our conclusion.

## 2. Background

The economic reform initiated in 1986 led to Vietnam becoming one of the fastest-growing economies in Asia. The reform was a response to saving the country from near bankruptcy after the collapse of the Soviet Union and other communist blocs, and it transformed Vietnam's economy from centrally planned to a more market-oriented one. Under the pressure of financial liberalization and globalization, the financial sector has been constantly developing towards international standards, and there have been significant advancements in the financial landscape in recent decades. Since the establishment of the first stock exchange in Ho Chi Minh City in 2000, the stock market has also experienced significant growth in terms of capitalization and liquidity.

Vietnam is a developing country with a nascent capital market and an inadequate legal framework, making its corporate sector vulnerable to information asymmetry and agency costs, which can hinder firms' ability to access capital markets. In this context, auditing services play a crucial role in ensuring the transparency, timeliness, and appropriateness of financial statements. An unqualified opinion from auditors is essential for maintaining a firm's reputation and prestige.

Earnings management has become a prevalent issue in Vietnam, with multinational companies introducing it to the country, and many domestic enterprises actively engaging in it. This practice produces unreliable accounting profit information that does not accurately represent a company's operational effectiveness. A few examples of this can be seen in Vietnam Gas Corporation (GAS), which showed a post-tax profit difference of up to 646 billion dong before and after auditing in 2018, according to Vietnam Economic Times. Another example is Hoang Anh Gia Lai Joint Stock Company (HAG), which went from a profit of 253 billion dong to a loss of 2,025 billion dong after auditing. These instances have raised concerns about the accuracy of financial reporting and the transparency of information disclosure in Vietnam.

Equity liquidity refers to the degree of ease with which an asset can be converted into cash without any significant loss of value. It measures the ability of an asset to be sold quickly and at a fair price. In the context of the stock market, liquidity refers to how easily a stock can be bought or sold, and it is influenced by various factors such as the frequency of trading, stock price fluctuations, and the time taken to execute a transaction. The liquidity of securities is influenced by various factors, such as firm performance, policies, and investor psychology. Capital markets play a crucial role in economic development by mobilizing funds from both domestic and international sources. Generally, a stock is considered to be liquid if it has a high trading volume. Stock

price fluctuations can affect liquidity, with appreciation generally improving liquidity and depreciation reducing it. The time taken to execute a transaction also plays a crucial role in determining liquidity, and the introduction of a computerized stock trading system has significantly reduced the time required to execute trades, leading to increased liquidity of shares listed on the stock exchange.

The importance of emerging equity markets for investment portfolios and international diversification has garnered significant attention in recent years. Han et al. (2014) argue that as investment in emerging markets continues to grow, studies in the emerging market context become increasingly important. Typically characterized by illiquidity and high volatility, emerging equity markets may offer a better risk-return profile for portfolio managers (Dheeriyaa & Torun, 2013). Additionally, emerging markets are considered to have lower integration with the global economy, making liquidity a crucial stock attribute that investors need to pay close attention to. However, most of the research on liquidity has primarily focused on developed markets, with limited studies on emerging stock market liquidity. Furthermore, small countries like Vietnam are often overlooked in the literature. Our research on the impact of earnings management on equity liquidity effects of the Vietnamese stock market may present a strong case because poor liquidity is suggested as one of the main reasons why foreign and institutional investors do not invest in this market.

### 3. Theoretical literature review

Accounting theory highlights the strong connection between accounting disclosure quality and market liquidity (Kim and Verrecchia 2001; Lambert et al. 2007; Leuz and Verrecchia, 2000).

#### 3.1. Information asymmetry theory

According to information asymmetry theory (Glosten & Milgrom, 1985), there is an uneven distribution of information among economic agents in the market. This leads to an increase in the degree of adverse selection in the market and a widening of the price spread. To address this issue, Charoenwong et al. (2011) suggest that reducing information asymmetry could be the basis for the decision to disclose manipulated earnings. They conducted a study on the effects of governance quality, transparency, and accurate information on adverse selection in the Singaporean context. Several published studies have revealed that high-quality information reduces information asymmetry between informed and uninformed investors, promotes investor confidence, and increases trading volume. For example, Cohen et al. (2008) argue that an information-rich environment tends to significantly narrow the bid and ask price gap. Heflin et al. (2005) also found that the publication of high-quality accounting information improves equity liquidity by reducing information asymmetry. Therefore, it can be concluded that reducing information asymmetry is crucial in promoting equity liquidity in the market. High-quality information, transparency, and accurate disclosure of financial information can improve investor confidence and reduce adverse selection costs, which in turn increases trading volume and liquidity. This suggests that firms should prioritize the disclosure of accurate and transparent financial information to maintain investor confidence and ensure a liquid market.

#### 3.2. Signaling theory

Jensen and Meckling's (1976) integration of signaling theory in business analysis demonstrates the existence of opportunistic conflicts of interest. Recent accounting scandals, as pointed out by Chung et al. (2009), demonstrate that earnings management causes significant losses to shareholders and provides a warning that managers often pursue their private interests under the guise of excuses. Earnings management undermines the quality of earnings reporting and disclosure, leading to high information asymmetries. Although information quality can affect the cost of equity, many studies have found that improved information disclosure results in a clear reduction in a firm's costs (Charoenwong et al., 2011). During times of corporate financial reporting crises, agency costs are particularly severe for companies with high discretionary accruals and information asymmetry costs. Investors may doubt the validity of available information, leading to decreased investment decisions, arbitrage, and increased transaction costs (Lesmond, 2005).

Therefore, firms should prioritize the accuracy and transparency of their financial information to maintain investor confidence, avoid opportunistic behavior by managers, and reduce agency and information asymmetry costs. By doing so, they can improve the quality of their earnings reporting and disclosure, which in turn can lead to a reduction in transaction costs and an increase in investor confidence and liquidity.

#### **4. Empirical literature review and hypothesis development**

Liquidity is a crucial element in any market, as it enables efficient trading of securities without significantly impacting prices over a short time. Equity liquidity is related to spread which refers to the difference between the bid price (the price at which a buyer is willing to purchase an asset) and the ask price (the price at which a seller is willing to sell an asset). When the spread is larger, it means that the bid and ask prices are farther apart, indicating that there is less agreement between buyers and sellers on the value of the asset. This can lead to lower trading activity and less liquidity in the market, as buyers may be less willing to buy at the higher ask price, and sellers may be less willing to sell at the lower bid price. On the other hand, when the spread is smaller, it means that the bid and ask prices are closer together, indicating that there is more agreement between buyers and sellers on the value of the asset. This can lead to higher trading activity and greater liquidity in the market, as buyers and sellers are more likely to agree on a price and execute trades.

Another perspective suggests that higher liquidity can alleviate managers' short-term focus by intensifying shareholder monitoring. Improved liquidity enables investors to purchase larger blocks of shares at more favorable prices, leading to more direct supervision by shareholders (Maug, 1998). Moreover, increased liquidity can lead to better indirect monitoring by raising the risk of investor exits, as lower transaction costs resulting from higher liquidity increase the willingness of investors to sell when managerial opportunism is detected (Bharath et al., 2013; Edmans & Manso, 2011; Edmans, 2009).

Liquidity was evaluated by quoted spread and effective spread, as suggested by the Arya et al. (2003). According to Christie et al. (1994), the quoted spread is the difference between the inside ask and inside bid prices. In contrast, the effective spread is determined by multiplying twice the absolute value of the difference between the trade price and the average of the inside bid and ask prices.

##### **4.1. Information transparency and quoted spread**

Quoted spread refers to the cost that market orders incur when they are executed at the quoted price without any improvement. During times of elevated information asymmetry, the bid-ask spread tends to widen because uninformed traders tend to pull their orders away from the market, reducing their chances of trading with informed traders (Ali et al., 2016).

Etemadi et al. (2010) define liquidity as the ability of a market to facilitate the buying and selling of large volumes of securities efficiently. Achieving liquidity requires transparency of information, as studies have consistently shown that information transparency is significantly and negatively related to information asymmetry (Diamond & Verrecchia, 1991; Kim and Verrecchia, 2001; Lambert et al., 2007; Petersen and Plenborg, 2006).

Unequal distribution of information among economic agents leads to increased adverse selection in the market and wider bid-ask spreads, which in turn, reduces liquidity (Verrecchia, 2001). Thus, disclosure policies that reduce the cost of information search result in lower transaction costs and higher trading volume, leading to reduced bid-ask spreads and increased liquidity.

Investors are interested in greater transparency because it reduces investment costs by reducing information asymmetries, leading to lower quoted spreads (Kim and Verrecchia, 2001; Lambert et al., 2007). Studies have found that earnings management increases quote spreads, leading to a decrease in equity liquidity (Arya et al., 2003). Conversely, Diamond and Verrecchia



(1991) demonstrate theoretically that high-quality disclosure reduces information asymmetry between informed and uninformed investors.

Petersen and Plenborg (2006) show that high-quality information reduces information asymmetry in the market, increases investor confidence, and thereby increases trading volume. They also find that firms with high-quality information have lower bid-ask spreads. Lafond et al. (2007) examine the relationship between earnings management, governance, and liquidity and find that better governance practices influence earnings management. They also find a negative relationship between discretionary accruals and liquidity, as measured by bid-ask spreads and trading volume.

Poor earnings quality can exacerbate information asymmetries among investors in financial markets. Cheng et al. (2006) find that companies with greater transparency and stronger shareholder rights are associated with a lower cost of equity and assets. Eaton et al. (2007) empirically link disclosure quality measures based on accounting standards with the cost of equity of internationally cross-listed firms. Research shows that increased disclosure is associated with a lower cost of equity.

In conclusion, information transparency is essential for achieving liquidity in financial markets. Disclosure policies that reduce information asymmetry and the cost of information search can result in lower transaction costs and higher trading volume, leading to increased liquidity. We have the following hypotheses:

**H1:** Upward earnings management has a positive effect on the quoted spread.

**H2:** Downward earnings management has a positive effect on the quoted spread.

#### **4.2. Information transparency and effective spread**

According to Ajina et al. (2015), the information asymmetry component is a form of compensation that emerges due to the potential loss risk faced by liquidity providers as a result of asymmetric information. Liquidity providers find it difficult to distinguish informed traders and avoid losses when trading with them. To mitigate the possibility of such losses, the effective spread should incorporate an appropriate information asymmetry component, which remunerates liquidity providers for the potential loss risk. This compensation enables liquidity providers to continue their operations even in the presence of informed trading activities. Many studies related to equity liquidity are rooted in Akerlof's (1970) idea of adverse selection, where the cost of adverse selection is reflected in bid-ask spreads in stock offerings to offset expected losses arising from trading with more informed investors. Benston and Hagerman (1974) and Glosten and Harris (1988) explore this concept.

Wasan (2006) examines the impact of information asymmetries among investors on transaction costs based on the difference between call prices and call options. Researchers have also found a relationship between the cost of information and the cost of equity and expected earnings. Amihud and Mendelson (1986) show that higher bid spreads are related to expected earnings, while M. Brennan and Subrahmanyam (1996) demonstrate that variable transaction costs are related to expected income.

Amihud (2002) notes that a measure of liquidity is reflected in expected earnings, and Pástor and Stambaugh (2003) provide evidence that information costs are considered in determining a firm's cost of equity. Lambert et al. (2007) establish a relationship between the quality of accounting information and a firm's cost of goods.

Ross (1977) provides evidence that managers use accounting options to report personal information and company performance. Earnings management is intended to improve financial statements. Regulatory authorities and financial market stakeholders may not be equally receptive to information, and managers may have better information than stakeholders. Ahmed et al. () suggest that conservative management can be used in an opportunistic approach, and manipulated accounting numbers may serve as a market signaling tool.

Arya et al. (2003) challenge the notion that earnings management reduces information transparency, leading to a decrease in equity liquidity. Overall, these studies shed light on the impact of information asymmetries on the cost of equity and the importance of transparency and accurate disclosure in financial markets. We have the following hypotheses:

**H3:** Upward earnings management has a positive effect on efficiency spread.

**H4:** Downward earnings management has a positive effect on efficiency spread.

## 5. Research design

### 5.1. Research data

Consistent with the prior literature, we focus on non-financial firms listed on the Vietnamese stock market, with 499 such firms included in the final sample after excluding financial firms from our sample because these firms are subject to special regulations on financing policies and companies with unavailable data and exceptions. Data was collected from two sets of daily and annual data: (1) daily data relating to stock prices, trading volume, and bid and ask prices, which consists of 1,333,709 observations by day over 11 years from 2010–2020, collected from the Vietstock database; (2) year-by-year data after filtering out ineligible observations, resulting in 3,859 observations for 11 years from 2010–2020.

### 5.2. Research method

To evaluate the stock liquidity, we utilized two proxies, namely the quoted spread and the effective spread, as suggested by Arya et al. (2003), Ascioğlu et al. (2012) and Bafghi et al. (2014). Earnings management was measured using one proxy, namely the absolute discretionary accrual (Kothari et al., 2015). Control variables such as trading volume, volatility, price, return and firm size were also included to ensure more accurate results (Ajina et al., 2015; Dennis & Weston, 2001; Espinosa et al., 2008).

A quantitative research method was used, with Stata 16 used to determine the regression coefficient. The least squares method was used in the Pooled-OLS model, but with panel data, unique characteristics of each entity that can affect the explanatory variable but are not observable needed to be considered. To account for this, two models were employed: fixed effect models (FEM) and random effect models (REM).

Correlation analysis was also conducted to determine the relationship between the quantitative variables in the model. The results showed that dependent variables, independent variables, and control variables were highly correlated, indicating a relationship between the variables. The analysis also helped identify any violation of the assumption of linear regression analysis, such as multicollinearity or high correlation among the independent variables. Therefore, regression analysis was carried out using generalized least squares (GLS) estimation.

Greene (2005) proposed that in models related to earnings management, there may be endogeneity issues between variables. To address the endogeneity problem, we used the System GMM model by Arellano and Bond (1991). One of the advantages of the System GMM model is that it is easier to select instrumental variables because it uses exogenous variables from different time periods or lagged

variables that can be used as instrumental variables for endogenous variables at the current time. As a result, the System GMM model provided many instrumental variables to easily satisfy the condition of an overidentified instrumental variable (Overidentification of Estimators).

### 5.2.1. Empirical models

Based on the literature and identified research gap, we constructed empirical models to investigate the impact of upward and downward earnings management on equity liquidity, presented in the following form (Table 1):

Table 1. Variables in the research model				
No	Variable name	Symbol	Measure	References
<b>I</b>				
<b>Dependent variable (ILLIQUIDITY)</b>				
1	Quoted spread	QTSP	Difference between the ask and bid quotes relative to the mid-quote	Arya et al. (2003), Ascioglu et al. (2012), Bafghi et al. (2014)
2	Effective spread	EFSP	Twice the absolute value of the difference between the transaction price and the mid-quote divided by the mid-quote	Arya et al. (2003) Ascioglu et al. (2012), Bafghi et al. (2014)
<b>II</b>				
<b>Independent variables</b>				
3	Earnings management	EM	The absolute value discretionary accrual.	Jones (1991); Dechow et al. (1995), Kothari et al., (2005)
<b>III</b>				
<b>Control variable</b>				
4	Volatility	VOLAT	The annual average standard deviation of equity return	Eaton et al. (2007), Ajina et al. (2015)
5	Trading volume	VOLM	The annual average daily trading volume	Stoll (1978), Kim and Verrecchia (2001), Ajina et al. (2015)
6	Price	PRICE	The average daily closing price of each year	Ascioglu et al. (2012), Ajina et al. (2015)
7	Return	RETURN	The mean daily returns of stock of each year	Amihud et al. (1997), M. J. Brennan et al. (1998)
8	Firm size	SIZE	The natural logarithm of total assets	Lim et al., (2008)

Source: The authors proposed

The data is categorized into two groups based on the direction of Earnings Management (EM): Positive EM denotes upward EM, while Negative EM denotes downward EM.

### 5.2.2. Equity liquidity measures

According to financial theory (Demsetz, 1968), a deep market is defined by several key characteristics: constantly quoted bid and ask prices, a low bid-ask spread, and small orders. To evaluate market liquidity, two measures are commonly used: quoted spread and effective spread. Quoted spread is the difference between the ask and bid quotes relative to the mid-quote, as shown in

Equation (1). Effective spread is calculated as twice the absolute value of the difference between the transaction price and the mid-quote, divided by the mid-quote, as shown in Equation (2). To account for the positive correlation between dollar-denominated spreads and price, we calculate relative spreads as a proportion of the price. To obtain annual liquidity measures, we first estimate daily liquidity measures by averaging quoted and effective spreads across all trades each day. Then, we average the daily measures across each firm-year, following the model proposed by Arya et al. (2003):

$$\text{Quoted spread} = \frac{\text{Askt} - \text{Bid}_t}{\frac{\text{Askt} + \text{Bid}_t}{2}} \quad (1)$$

$$\text{Effective spread} = 2 \frac{\frac{|\text{Askt} - \text{Bid}_t|}{2} - P_t}{\frac{\text{Askt} + \text{Bid}_t}{2}} \quad (2)$$

Where:

$\text{Bid}_t$ : The bid price

$\text{Ask}_t$ : The ask price

The bid and ask quotes used to estimate the liquidity proxies are based on the best bid and offer prices of the firm's market. The greater the spread, the lower the liquidity. To ensure data accuracy, we apply filters similar to those used by Huang and Stoll (1996). The dataset used in this study includes 1,333,709 observations spanning 11 years (2010–2020) and contains information on the closing price adjusted, highest matching price, lowest order matching price, the volume of shares traded, and volume of shares outstanding sourced from the Vietstock database. To obtain annual liquidity measures, we calculate the mean value of both quoted spread and effective spread for each year from 2010 to 2020.

### 5.2.3. Earnings management measures

Many studies have shown that managers use earnings management mainly to find ways to affect the difference between actual cash flow at the business and profits, creating unexpected accruals usually (DA) on the financial statements. The variable DA represents earnings management, but researchers cannot observe it directly so they estimate it through the determination of the non-discretionary accrual (NDA) (DeAngelo, 1986; Dechow et al., 1995; Healy & Wahlen, 1999).

To detect earnings management, a common approach is to estimate the total accruals (TA) and subtract non-discretionary accruals (NDA) from it.

$$\text{Total accruals (TA)} = \text{Profit after tax} - \text{Net cash flow from operating activities}$$

Total accruals (TA) are divided into 2 parts: Non-discretionary accrual (NDA) and Discretionary accrual (DA). NDA refers to accruals made according to accounting principles, while discretionary accruals (DA) are accruals created by managers to manipulate reported profits. Accruals arise because of a mismatch between the accounting profit presented in the income statement and the net cash flows from operating activities due to the use of two different accounting bases, such as the accrual basis and the cash basis. By identifying and analyzing discretionary accruals, researchers and analysts can determine if a company has engaged in earnings management.

In this research, we used the earnings management model of Kothari et al. (2005) to measure the NDA variable because this is the model that proved that when adding the ROA variable based on the Jones (1991) and adjusted Dechow et al. (1995) models will increase efficiency and help researchers draw more reliable inferences.

The regression model of the NDA variable according to TA has the following form:

$$\frac{TA_{it}}{A_{it-1}} = \beta_0' \frac{1}{A_{it-1}} + \beta_1' \frac{\Delta REV_{it} - \Delta REC_{it}}{A_{it-1}} + \beta_2' \frac{PPE_{it}}{A_{it-1}} + \beta_3' ROA_i + \varepsilon_{it} \quad (3)$$

Where:

$TA_{it}$ : Total accruals in year t of the company i

$DA_{it}$ : Discretionary accruals in year t of the company i

$NDA_{it}$ : Non-discretionary Discretionary accruals in year t of the company i

$A_{it-1}$ : Total assets of the company i in year t -1

$DtREV_{it}$ : Changes in the company's revenue in year t compared to year t-1

$DtREC_{it}$ : Changes in the company's receivables in year t compared to year t-1

$PPE_{it}$ : Tangible fixed asset costs of the company i in year t

$ROA_{it}$ : Total net profit/Total assets of the company i in year t

$\beta_0, \beta_1, \beta_2, \beta_3$ : The coefficients indicate the degree of impact of independent variables on dependent variables

$\varepsilon_{it}$ : Error in the model

Using data including 3,859 observations of 499 firms from 2010 to 2020, the study used Stata 16 software to perform regression according to the Pooled OLS, FEM, REM, and GLS model to find the most suitable model. The equation (3) after regression produced  $\beta_0', \beta_1', \beta_2',$  and  $\beta_3'$  being the estimates of the regression coefficients  $\beta_0, \beta_1, \beta_2, \beta_3$  in the most suitable model. The author replaced  $\beta_0', \beta_1', \beta_2',$  and  $\beta_3'$  in equation (4) to estimate  $NDA_{it}$ .

$$NDA_{it} = \beta_0' \frac{1}{A_{it-1}} + \beta_1' \frac{\Delta REV_{it} - \Delta REC_{it}}{A_{it-1}} + \beta_2' \frac{PPE_{it}}{A_{it-1}} + \beta_3' ROA_i + \varepsilon_{it} \quad (4)$$

- Estimating of discretionary accruals (DA)

After estimating  $NDA_{it}$ , we used Equation 5) to estimate discretionary accruals  $DA_{it}$ :

$$DA_{it} = TA_{it}/TA_{it-1} - NDA_{it} \quad (5)$$

In the research model, we used the variable EM as a representative of earnings management estimated by the absolute value of the variable DA according to Equation 6:

$$EM_{it} = Abs(DA_{it}) \quad (6)$$

#### 5.2.4. Control variable measures

Volatility is measured by the annual average standard deviation of equity return (Ajina et al., 2015; Eaton et al., 2007; Gregoriou, 2002). The variance of returns is a measure of the unfavorable risk of price fluctuations for investors. Previous studies, such as Heflin and Shaw (2000) and Chae (2005), have reported a negative association between volatility and liquidity. Trading volume: The volume of transactions is measured by the annual average daily trading volume. The impact on liquidity is

ambiguous, with Atiase and Bamber (1994) considering transaction volume a proxy of information asymmetry and Chen et al. (2007) finding a positive relationship between transaction volume and liquidity.

Price: According to the literature, there is a significant relationship between stock price and liquidity. For instance, Attig et al. (2006), Brockman and Chung (2001), and Ajina et al. (2015) have demonstrated a positive correlation between stock price and liquidity. Return: The majority of these models suggest a negative correlation between expected returns and liquidity (Amihud, 2002). In this context, liquidity refers to the liquidity of the equity market. M. J. Brennan et al. (1998) and Fiori (2000) argue that equities with higher liquidity tend to exhibit higher returns.

Firm size is a commonly used control variable in research related to earnings management and liquidity, and is typically measured by the natural logarithm of total assets (Lim et al., 2008).

## 6. Empirical results and discussion

### 6.1. Experimental results of the regression model to earnings management

Before conducting regression, we conducted correlation analysis to detect multicollinearity. The results of the correlation analysis are detailed in Table 2:

**Table 2. Analysis of the correlation matrix between the variables in the model state 1**

	$TA_t/A_{t-1}$	$1/A_{t-1}$	$(DtREV_t - DtREC_t)/A_{t-1}$	$PPE_t/A_{t-1}$	$ROA_{t-1}$
$TA_t/A_{t-1}$	1				
$1/A_{t-1}$	0.0351	1			
$(DtREV_t - DtREC_t)/A_{t-1}$	0.1435	-0.0436	1		
$PPE_t/A_{t-1}$	-0.1392	-0.0286	0.073	1	
$ROA_{t-1}$	0.1524	0.0085	0.0338	0.0824	1

The results of Table 2 show that the correlation coefficients between the independent variables in the regression model are all less than 0.5, which means that the model does not have multicollinearity.

Based on the results of the Pooled OLS model regression in Table 3, I found that 3 independent variables are statistically significant. Through the results of empirical analysis after running the Pooled OLS regression, I found that the value  $F(4, 3854) = 72.57$  (sig = 0.000000) helps us to reject the hypothesis  $H_0$  that the model has no predictive value and accept the alternative hypothesis  $H_1$  that this model exists and can predict the dependent variable ( $TA_t/A_{t-1}$ ) through the independent variables. The adjusted value of  $R^2$  (R-squared = 12.02 %) indicates that 12.02 % of the variation in Total accruals over total assets in year  $t-1$  ( $TA_t/A_{t-1}$ ) can be explained by the independent variables ( $1/A_{t-1}$ ,  $(DtREV - DtREC)/A_{t-1}$ ,  $PPET/A_{t-1}$ ,  $ROA_{t-1}$ ).

From there, I can estimate the discretionary accruals (DA) and finally use the absolute value of DA to estimate the variable EM that earnings management:

$$DA = TA_t/A_{t-1} - NDA$$

$$EM = Abs(DA)$$

**Table 3. Pooled OLS model regression results state 1**

$TA_t/A_{t-1}$	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
$1/A_{t-1}$	3.270861	0.441848	7.4	0.000	1	0.987585
$(DtREV_t - DtREC_t)/A_{t-1}$	0.052606	0.005483	9.59	0.000	1.01	0.992143
$PPE_t/A_{t-1}$	-0.03249	0.010083	-3.22	0.001	1.01	0.992291
$ROA_{t-1}$	0.487706	0.030361	16.06	0.000	1.01	0.997301
				Mean VIF	1.01	

Regression results show that the impact of all independent variables on the dependent variable is statistically significant. Finally, I get the model to estimate the non-discretionary accruals (NDA) as follows:

$$NDA = 3.270861 * 1/A_{t-1} + 0.052606 * (DtREV - DtREC)/A_{t-1} - 0.03249 * PPE_t/A_{t-1} + 0.487706 * ROA_{t-1}$$

## 6.2. Empirical results analyzing the impact of earnings management on the equity liquidity

### 6.2.1. Descriptive statistics of the variables in the model

To clarify the impact of earnings management on equity liquidity, we conducted a study of 499 non-financial firms over the 11 years from 2010 to 2020 using two datasets at both the daily and yearly levels. We conducted regression analyses using panel data with three methods: Pooled OLS, Fixed Effects Model (FEM), and Random Effects Model (REM).

First, we used statistical analysis to describe the characteristics of the variables in the model. The empirical results in Table 4 provide information on the minimum, maximum, mean, and standard deviation of the dependent variable EM, the independent variables, and the control variables.

The absolute value of the discretionary accrual (EM) has a minimum value of 0.0000203 and a maximum value of 1.633872, the mean value is 0.092276, and the standard deviation is 0.104471. Firms have two tendencies to manage earnings upward and also to manage their earnings downward to achieve their goals. In this research, I use the absolute value of the

**Table 4. Descriptive statistics of variables in the model**

Variable	Observations	Mean	Standard deviation	Min	Max
Upward Earnings management	1783	0.0969856	0.1235923	0.0000203	1.633872
Downward Earnings management	1965	-0.0880027	0.0832148	-0.9448352	-0.0000452
Earnings management	3748	0.092276	0.104471	0.0000203	1.633872
Quoted Spread	3850	0.025559	0.013523	0	0.102223
Effective Spread	3850	0.377252	0.490351	0	1.976455
Return	3850	0.00053	0.002072	-0.04054	0.011047
Volatility	3850	0.029318	0.009319	0	0.080342
Price	3850	12950.89	15099.52	119.7943	183193.4
Trading Volume	3850	225196.1	828148.5	0.003968	16400000
Firm size	3859	27.46325	1.482934	23.46185	33.67722

discretionary accrual and do not take into the direction of earnings management to accurately reflect the level of earnings management.

**Quoted Spread (QTSP)** is the first metric to measure equity liquidity. The results of the data analysis show that the minimum value of the QTSP variable is 0 and the highest value is 0.10223, the mean value is 0.025559, and the standard deviation is 0.013523.

**Effective Spread (EFSP)** is the second metric to measure equity liquidity. Through data analysis, I find that the minimum value of the EFSP variable is 0 and the highest value is 0.102223, the mean value is 0.377252, and the standard deviation is 0.490351.

**Return (RETURN)** is a measure of the average equity return. Table 4.3 shows that the minimum value of the RETURN variable is  $-0.04054$  and the highest value is 0.011047, the mean value is 0.00053, the standard deviation is 0.002072.

**Volatility (VOLAT)** was determined by the annual average of the standard deviation of equity return. Statistical results show that the minimum value of the VOLAT variable is 0 and the highest value is 0.080342, the mean value is 0.029318, and the standard deviation is 0.009319.

**Price (PRICE)** is the average of the daily closing price of each year. Table 4.3 shows that the minimum value of the PRICE variable is 119.7943 and the highest value is 183,193.4; the mean value is 12,950.89; the standard deviation is 15,099.52. The volatility of the closing price of the adjustment will likely affect the liquidity of the equity.

**Trading Volume (VOLM)** is determined by the annual average of the daily trading volume. Through data analysis, the minimum value of the VOLM variable is 0 and the highest value is 0.102223, the mean value is 0.029318, and the standard deviation is 0.013523.

**Firm Size (SIZE)** is one of the most important indicators that affect equity liquidity. The data shows that the minimum value of the SIZE variable is 23.46185 and the highest value is 33.67722, the mean value is 27.46325, the standard deviation is 1.482934. The difference in firm size is also a factor affecting equity liquidity.

#### 6.2.2. Analyze the relationship between the variables in the model

Before conducting regression, we conducted correlation analysis to detect multicollinearity. Table 5 shows that there exists a linear correlation relationship between the independent variable which is earnings management (**EM**) and the dependent variable measured by 2 different indicators (**QTSP** and **EFSP**), the control variables (**RETURN**, **VOLAT**, **PRICE**, **VOLM**, and **SIZE**). The results of Table 5 also show that the correlation coefficients between the independent variables and the control variables in the regression model are mostly less than 0.5, meaning that there is less possibility of multicollinearity.

#### 6.2.3. Regression results according to least squares Pooled OLS model

Based on the results of Pooled OLS model regression in Tables 6, we found that earnings management only affects one dependent variable which is quoted spread. Besides this, in Table 7, we did not find evidence that earnings management affects the remaining dependent variable, namely Effective spread. The value  $F(6, 3733) = 2769.76$  with  $\text{sig} = 0.0000$  and  $F(6, 3733) = 401.22$  with  $\text{sig} = 0.0000$  means that we reject the hypothesis  $H_0$  or the model has no value to predict and accept the alternative hypothesis  $H_1$  that this model exists and can predict the dependent variable (QTSP, EFSP) through the independent variables and the control variables. R<sup>2</sup>-squared values (R-squared = 0.8166 and 0.3921 indicate that 81.66% and 39.21% of the variability in dependent variable (QTSP, EFSP) can be explained by the variations of independent variables (EM) and control variables (RETURN, VOLAT, PRICE, VOLM, SIZE). After conducting OLS regression, we conducted a multicollinearity test. The VIF coefficients of all the independent and control variables are less



**Table 5. Correlation coefficient analysis**

	Quoted spread	Effective spread	Earnings management	Return	Volatility	Price	Trading Volume	Firm size
Quoted spread	1							
Effective spread	-0.0156	1						
Earnings management	0.0664	-0.0061	1					
Return	0.0543	-0.0583	0.015	1				
Volatility	0.2582	0.0567	0.0969	0.1529	1			
Price	-0.1054	-0.0902	-0.0243	0.0319	-0.194	1		
Trading Volume	0.2096	-0.0858	0.0017	0.0298	-0.0561	-0.0198	1	
Firm size	0.2984	0.0311	-0.0508	-0.0301	-0.3228	0.1894	0.4008	1

**Table 6. Pooled OLS regression results for quoted spread**

Quoted Spread	Downward earnings management			Upward earnings management			VIF
	Coef.	t	P>t	Coef.	t	P>t	
Earnings management	0.000	-0.120	0.905	0.007	2.840	0.005	1.01
Return	-0.116	-0.770	0.440	0.293	2.200	0.028	1.03
Volatility	0.374	12.320	0.000	0.278	9.050	0.000	1.18
Price	0.000	-3.940	0.000	0.000	-3.370	0.001	1.07
Trading Volume	0.000	8.120	0.000	0.000	9.390	0.000	1.21
SIZE	0.001	14.810	0.000	0.001	16.730	0.000	1.37
Number of observations	1962			1777			1.15
R-squared	0.8122			0.8227			

**Table 7. Pooled OLS regression results for effective spread**

Effective Spread	Downward earnings management			Upward earnings management			VIF
	Coef.	t	P>t	Coef.	t	P>t	
Earnings management	-0.022	-0.160	0.871	-0.084	-0.910	0.363	1.01
Return	-12.104	-2.080	0.038	-16.430	-3.130	0.002	1.03
Volatility	1.969	1.680	0.094	3.142	2.590	0.010	1.18
Price	0.000	-3.060	0.002	0.000	-4.830	0.000	1.07
TradingVolume	0.000	-4.330	0.000	0.000	-4.320	0.000	1.21
SIZE	0.013	9.190	0.000	0.014	9.470	0.000	1.37
Number of observations	1962			1777			1.15
R-squared	0.3809			0.4056			

than 2, so the model does not have multicollinearity. When performing the white test in two models with quoted spread and effective spread, the results provide the p-values = 0.0000 < 0.05. Thus, both models have heteroskedasticity. Next, we test the autocorrelation through the Wooldridge test. The results have p-values = 0.000 < 0.05. Therefore, the models have autocorrelation. We conducted a regression analysis of the data using both fixed effect models (FEM) and random effect models (REM), while considering both downward and upward earnings management. We used the Hausman test to choose between FEM and REM. However, despite considering the influence of fixed and random factors, our models still exhibited heteroskedasticity and autocorrelation. Therefore, we proceeded to use the general least squares (GLS) method to address these issues (Arellano & Bond, 1991).

#### 6.2.4. Regression results according to generalized least squares regression GLS model

Table 8 shows the results of the GLS regression model when considering the impact of earnings management on two dependent variables QTSP and EFSP as follows:

We check for the existence of the endogeneity problem caused by a simultaneous relationship between earnings management and liquidity. To do this, we use the Durbin-Wu-Hausman test of Davidson and MacKinnon (1993). The results of the endogeneity test show prob>0.1 that means earnings management is exogenous (Appendix 1). Therefore, the GLS model is the most suitable model, and the regression results are presented in Table 8.

The results in Table 8 indicate that downward earnings management has a negative effect on the quoted spread. Thus, the bid-ask spread is low, meaning that the liquidity is high. This can be explained by the fact that when firms conduct downward earnings management to reduce taxes, investors may expect to buy stocks from these firms at a better price, leading to an increase in trading demand on the market. Whereas upward earnings management has no impact on the quoted spread. This suggests that when earnings management increases in the downward direction, the quoted spread will decrease if other factors remain constant. This is contradictory to previous research that suggests lower-quality accounting information can lead to concerns among traders about the transparency of accounting information, resulting in reduced equity liquidity in firms with doubts about earnings management. This finding is also different from the research by Ascioğlu et al. (2012), which suggests that earnings management impairs the quality of earnings reporting and disclosure in general, leading to high information asymmetry or a disparity in information on the quoted price, and a consequent decrease in equity liquidity.

**Table 8. GLS regression results**

	Quoted spread		Effective spread	
	Downward Earnings management	Upward Earnings management	Downward Earnings management	Upward Earnings management
Earnings management	-0.00183*	-0.001	0.015	0.002
	[-1.72]	[-1.57]	[0.42]	[0.11]
Return	0.287***	0.364***	-3.105**	-2.886*
	[6.53]	[6.04]	[-2.05]	[-1.91]
Volatility	0.683***	0.650***	1.111**	0.776
	[47.96]	[31.13]	[2.35]	[1.56]
Price	0.000***	-0.000***	-0.000***	-0.000***
	[4.41]	[-5.99]	[-4.07]	[-4.91]
Trading Volume	0.000*	0.000***	0.000	0.000
	[1.79]	[2.73]	[0.32]	[0.77]
SIZE	0.000	0.00324***	-0.010	-0.0320***
	[0.99]	[17.98]	[-1.62]	[-4.92]
_cons	0.002	-0.0804***	0.444**	1.072***
	[0.24]	[-15.37]	[2.55]	[5.89]
N	1902	1717	1902	1717

**Note:** t statistics in brackets

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 8 indicates that there is no evidence to support a relationship between downward and upward earnings management and effective spread, indicating that there is no impact of earnings management on equity liquidity through market arbitrage. This means that, in the absence of other factors, an increase in earnings management in either upward or downward directions does not affect the difference between buying and selling prices. The regulation of bid and ask prices of stocks by the market is based on the needs of investors to buy and sell shares. Although earnings management can reduce shareholders' ability to gauge true firm performance, the relationship between earnings management and equity liquidity depends on the nature and components of the total accrual. Non-discretionary accruals reflect the fundamental characteristics of the company and increase transparency, while discretionary accruals reflect managerial caution and can create opacity. Therefore, the fact that managers engage in earnings management may not affect the effective spread between the market bid and ask prices. This finding is in contrast to Dechow and Dichev's (2002) study, which suggested a statistically significant positive relationship between earnings management and effective spread or a wider bid-ask spread created by earnings management to provide price protection, leading to a decrease in equity liquidity. Thus, comparing with the research hypotheses that have been proposed before, the results of testing the research hypotheses are presented in Table 9 as follows:

## 7. Summary and conclusion

Four proposed hypotheses have been rejected. Downward earnings management has a negative impact on the quoted spread. Therefore, investors need to be cautious when considering investing in firms with earnings management scandals or with doubts about the transparency of financial statements, as these firms may be trying to improve their financial statements or conceal their true financial situation. Moreover, the more firms engage in earnings management, the greater the information asymmetry, and investors should be even more cautious when making transactions because the information they receive may not be accurate.

**Table 9. Results of testing the research hypotheses**

No	Research hypotheses	Results
H1	Upward earnings management has a positive effect on the quoted spread	<i>Rejected</i>
H2	Downward earnings management has a positive effect on the quoted spread	<i>Rejected</i>
H2	Upward earnings management has a positive effect on the effective spread	<i>Rejected</i>
H4	Downward earnings management has a positive effect on the effective spread	<i>Rejected</i>

Although there is no evidence to confirm that earnings management in both upward and downward directions have an impact on equity liquidity, earnings management reduces investor confidence, leading to a decrease in trading volume. As such, it is recommended that listed firms prioritize long-term benefits by improving the quality of financial reporting information, promoting transparency, accurately reflecting business realities, and adhering to current regulations. Firms should avoid pursuing short-term attractive benefits that may provide false accounting information, as this can lead to a loss of investor confidence. Quoted spread increases, leading to a decrease in the quantity and quality of transactions among investors. As a result, the State Securities Commission should impose appropriate sanctions to deter businesses, individuals, and organizations that intentionally violate regulations or manipulate information on the stock market, which can lead to the loss of confidential information. They should also increase the number of instruments traded on those stock exchanges to promote liquidity (Phan and Vo, 2012). This is essential to maintain a transparent and clean stock market, protecting the interests of investors.

This study is subject to several limitations, including the use of daily data collection to avoid information overload, which may have impacted the accuracy of our analysis. The incomplete data from listed firms also reduced the reliability of our results. Moreover, our measurement methods may not have captured all aspects of each indicator. Due to limitations in time and resources, we were unable to apply multiple models to identify the most appropriate one for the Vietnam stock market. Future research could explore the impact of earnings management on equity liquidity for firms listed on the Vietnamese stock market, utilizing alternative measurement methods, such as real earnings management and M-scores. Furthermore, equity liquidity could be assessed by measuring the ratio between the number of shares being traded and the number of shares outstanding.

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### Appendix 1

We conducted the Durbin-Wu-Hausman test by running the following regression:

$$EM = \theta_0 + \theta_1 * ROE + \theta_2 * LEV + \theta_3 * CF + \theta_4 * Growth + \theta_5 * SIZE + v_t,$$

Where: ROE is the return on equity, LEV is the leverage (total debt/total assets), CF is the operating cash flow, Growth is the revenue growth rate, and Size is the firm size. Next, we predicted the residual  $EM\_res = v_t$  and ran the following regression:

$$Liquidity = \gamma_0 + \gamma_1 * EM + \gamma_2 * Return + \gamma_3 * Volatility + \gamma_4 * Price + \gamma_5 * Trading Volume + \gamma_6 * SIZE + \gamma_7 * EM\_res + u_t.$$

Finally, we tested the hypothesis  $H_0: \gamma_7 \text{ of } EM\_res = 0$ .

The p-values of the test were 0.8477 when we used Effective-spread for Liquidity and 0.5147 when we used Quoted-spread for Liquidity. As the p-values are greater than 10%, we can conclude that OLS is consistent.