


BOARD STRUCTURE AND STOCK MARKET LIQUIDITY: EVIDENCE FROM SAUDI'S BANKING INDUSTRY



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ABSTRACT

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This paper aims to explore the impact of corporate governance on banks' stock market liquidity. Specifically, we examine the influence of one of the most important corporate governance mechanisms, board structure, on the stock market liquidity of listed banks in Saudi Arabia. We mainly concentrate on four characteristics of board structure: board size, board independence, board meetings and board busyness, and their impact on bid-ask spread, trading volume, turnover ratio and number of trades (employed as proxies of stock liquidity). This study employs a pooled ordinary least squares (OLS) model to investigate this relationship. Furthermore, we use a lag approach and the generalized method of moments (GMM) estimation to test for endogeneity issues. The findings of the two models are the same as the main estimation model of the OLS. Using a sample of 108 observations representing all banks listed on the Saudi Stock Market (TASI) from 2010 to 2020, we find a positive and significant association between board size and board independence with stock liquidity. However, board busyness is negatively associated with stock liquidity. Furthermore, we examine the relationship between board structure and agency problems. The results show that board size and board independence reduce agency problems, whereas board busyness increases agency problems. The findings of this paper provide implications for Saudi regulators, banks' board of directors and banks' shareholders.

Contribution/Originality: This study provides new contributions to the stock liquidity literatures in an emerging country. To the best of our knowledge, this paper is the first to investigate the association between board structure and stock market liquidity in Saudi Arabia. In addition, the contribution is extended by investigating the financial sector. Also, we contribute to the prior studies by taking the busyness board influence on stock liquidity.

1. INTRODUCTION

Stock market liquidity is considered to be an important factor in financial markets. Creating liquidity among shareholders is essential since this is one of the main targets of capital markets (Tran, Hoang, & Tran, 2018). When shareholders invest in illiquid stocks, they require compensation (Amihud & Mendelson, 1986), which raises a firm's cost of equity (Butler, Grullon, & Weston, 2005) and hence influences its value (Fang, Noe, & Tice, 2009). Also, illiquid stocks can influence market efficiency, which might negatively impact the stability of financial markets (Chung & Hrazdil, 2010). Based on agency theory, the problems of information asymmetry between managers and shareholders can occur because of the separation between ownership and control. This problem might permit managers to serve their own interests instead of the shareholders' interests and exploit the firm's wealth (Jensen &

Meckling, 1976). The behavior of opportunistic managers as a result of asymmetric information may affect market stock liquidity (Ali, Liu, & Su, 2017). In this regard, when asymmetric information between internal and external shareholders is reduced, stock liquidity is improved (Chung, Elder, & Kim, 2010).

Prior studies have argued that corporate governance mechanisms are vital for mitigating managers' undesirable behavior, and thus help to protect shareholders' rights (Jiang, Kim, & Kuvvet, 2014). Prior studies have also indicated that corporate governance is a vital determinant of stock market liquidity (e.g., (Al-Jaifi, Al-rassas, & AL-Qadasi, 2017; Chung et al., 2010; Lei, Lin, & Wei, 2013)). For instance, Coffee Jr (1991) showed that large ownership supports corporate governance mechanisms as it enhances stock market liquidity and reduces the cost of exiting from the firm. In addition, corporate governance effectiveness improves both financial and operational transparency, which leads to mitigated information asymmetry between internal and external shareholders, thus improving stock liquidity (Ali et al., 2017; Chung et al., 2010).

Due to the uniqueness of banks' governance mechanisms (Elyasiani & Zhang, 2015; Faleye & Krishnan, 2017), regulators and shareholders of banks expect the boards of directors to be more active in monitoring banks' risk management systems and performance (Kress, 2018). In this regard, resource dependence theory stresses that monitoring and controlling by the board of directors is important for risk mitigation and effective resource allocation (Johnson, Daily, & Ellstrand, 1996). However, the complexity of financial instruments and banking transactions lead to increased information asymmetry (Tran et al., 2018), which may negatively influence stock market liquidity (Ali et al., 2017; Chung et al., 2010).

This study aims to explore the impact of board structure as an important internal corporate governance mechanism on stock liquidity in the Saudi stock market, or the Tadawul All Share Index (TASI). In particular, we concentrate on four characteristics of board structure: board size, board independence, board meetings and board busyness, and their effect on the stock liquidity of the Saudi Stock Market's banking sector. Using a sample of 108 observations, representing ten banks listed on the TASI from 2010 to 2020, we show that board size and board independence are positively and significantly related to stock market liquidity. However, board busyness is negatively and significantly associated with stock market liquidity. No relationship was found between board meetings and stock market liquidity.

This paper contributes to the previous stock liquidity literature in many ways. First of all, to the best of our knowledge, this paper is the first to test the association between board structure and stock liquidity in the TASI. Prior studies, such as that by Doidge, Karolyi, and Stulz (2007), argue that corporate governance mechanisms vary widely across firms and countries. Saudi Arabia is the largest financial market in the MENA (Middle East and North Africa) region. It is a member of the World Trade Organization (WTO), Organization of the Petroleum Exporting Countries (OPEC) and Group of Twenty (G20). The Kingdom is the 13th most economically competitive country in the world. According to the International Monetary Fund (IMF), Saudi's economy is ranked eighth among the ten top high-growth economies (Ziaur & Hazazi, 2014). Second, after reviewing the literature, it is clear that the vast majority of prior studies concentrated on the board structure and stock liquidity relationship for non-financial sectors. However, the regulatory and operating environments of financial sectors are distinct and unique from those of non-financial firms. The effects of the recent global financial crisis on the banking industry have increased complications for governance and calls for additional requirements to improve the monitoring process by the boards of directors (Körner, 2017). It is therefore important to understand how board structure influences stock liquidity in this sector. Third, after reviewing extant board structure and stock market liquidity studies, it is obvious that these studies concentrated mainly on the traditional characteristics of board structure (e.g., board size and meetings). To the best of our knowledge, this paper is one of the first studies to investigate the association between board busyness and stock liquidity.

The rest of this paper is structured as follows: Section 2 introduces the literature review and hypothesis development; Section 3 explains the data and estimation models; and finally, Section 4 discusses the main results.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

This study mainly aims to discuss the following question: Do corporate governance mechanisms determine stock market liquidity in the Saudi stock market? The question will be theoretically and empirically debated in the following section.

2.1. Corporate Governance

According to agency theory, managers may exploit a firm's resources for personal gain. Therefore, this may create a difference of interest between a firm's managers and its shareholders. Since shareholders authorize managers to manage their wealth, asymmetric information may occur since managers are more familiar with the firm than the shareholders. This gives an advantage to managers that allows them to expropriate the wealth of the firm for themselves. Nonetheless, agency theory argues that mechanisms of corporate governance are an effective solution for reducing these conflicts by monitoring managers' actions and aligning the goals of managers with those of stakeholders (Jensen & Meckling, 1976). Shleifer and Vishny (1997) describe corporate governance as the ideal way to ensure that parties in firms are controlled and monitored to make sure that they are working to maximize the shareholders' wealth. Previous studies have debated that effective mechanisms of corporate governance are a means of accuracy assurance for disclosed information, thereby lowering asymmetric information and conflicts between the firm's managers and shareholders and preventing the expropriation of small shareholders (Al-Jaifi et al., 2017; Ali et al., 2017; Lei et al., 2013).

2.2. Saudi Board Structure Regulations

As this paper concentrates on four characteristics of board composition, namely board size, board independence, board meetings and board busyness, this section describes the regulations for board structure in Saudi Arabia. Regarding board size, firms should determine the size of their board based on the size and nature of the company and its activities. More precisely, a board should not have fewer than three members and not more than eleven. In terms of board independence, the majority of the board members should be independent non-executive directors, and there should be at least two. The regulations emphasize that boards should have regular meetings to operate effectively. The board should hold at least four meetings yearly and no less than once every three months. The meeting is not valid if half of the board members are absent. With regard to board busyness, a board member should not be a director of more than five listed firms in the same year (CMA, 2021).

2.3. Review of Board Structure and Stock Market Liquidity Studies

There are two streams of studies in the literature on stock liquidity and corporate governance. The first concentrates on studying the quality of corporate governance by constructing corporate governance indices to establish whether firms are committed to the mechanisms of corporate governance (Al-Jaifi et al., 2017; Ali et al., 2017; Imasuen, Okoro, & Yahaya, 2022; Lei et al., 2013). For instance, the empirical work of Chung et al. (2010) is considered the first study to explore the relationship between corporate governance quality and stock liquidity. They carried out a study into the National Association of Securities Dealers Automated Quotations (NASDAQ), New York Stock Exchange (NYSE) and American Express (AMEX) company stocks from 2001 to 2004. They employed price impact ratio, market quality index and effective bid-ask spread as representatives for stock liquidity. Their index contains 24 governance standards taken from the ISS corporate governance guidelines. They found that corporate governance effectiveness is related to a smaller price impact, lower information asymmetry and lower bid-ask spread, i.e., good-quality corporate governance promotes stock liquidity. In addition, Lei et al. (2013) tested the impact of corporate governance quality on stock market liquidity in China between 2006 and 2008. They employed price impact ratio, bid-ask spread, and depth as representatives for stock liquidity. Their index included ten governance standards. The results showed a positive and significant relationship between corporate governance

and stock market liquidity. Moreover, [Prommin, Jumreornvong, and Jiraporn \(2014\)](#) examined the effect of quality of corporate governance on stock market liquidity in Thailand between 2006 and 2009. Their index contains nine governance standards. They found that corporate governance is positively and significantly related to stock liquidity. Using US data between 2001 and 2007, [Jiang et al. \(2014\)](#) showed that a higher corporate governance quality could decrease uncertainty and hence improve stock liquidity. A number of previous studies have also explored the correlation between the quality of corporate governance and stock market liquidity in Australia [Ali et al. \(2017\)](#), Malaysia and Bangladesh. These studies found that the quality of corporate governance in Malaysia has a positive and significant correlation with stock market liquidity.

The second stream of corporate governance and stock liquidity studies focuses directly on examining the mechanisms of corporate governance (board size, board meetings, board independence, board committees, etc.) and their relationship with stock liquidity. For example, [Foo and Zain \(2010\)](#) investigated the impacts of board meetings and independent directors on stock market liquidity in the Malaysian stock market in 2007. For stock liquidity, they used zero return proportion, trading volume and quoted depth. They found that a higher number of non-executive directors and more frequent board meetings are associated with higher stock market liquidity. [Farooq and Seffar \(2012\)](#) used the Big Four auditors, ownership concentration and analyst following as proxies of corporate governance. They found that these mechanisms have a positive correlation with stock market liquidity in the MENA region. They attributed their results to the fact that firms with better mechanisms of corporate governance mitigate the problems of adverse selection and thus are able to increase their market liquidity. Utilizing a sample of 239 non-financial corporations between 2004 and 2009, [Angelo and Frino \(2014\)](#) tested the effect of board independence on stock liquidity. They found that boards with more independent directors have lower spreads to new information. In addition, improvements in board independence over time are positively related to improvements in a firm's stock liquidity.

[Ahmed and Ali \(2017\)](#) examined corporate board structure and stock liquidity associations in Australia between 2008 and 2013. They found that gender diversity has a significant and positive association with stock market liquidity. They explained their finding with the fact that a board with gender diversity is more efficient at monitoring. This leads to enhanced market liquidity and therefore market efficiency. [Loukil, Yousfi, and Yerbanga \(2019\)](#) examined whether gender diversity affected stock market liquidity in France between 2002 and 2012. They found that stock market liquidity is positively related with the presence of women on the board. Moreover, [Bazrafshan, Marcus, and Tehranian \(2021\)](#) explored the association between board composition and stock market liquidity (measured by zero returns and Amihud illiquidity) by employing a sample of East Asian non-financial firms between 1997 and 2015. They found that the greater the gender diversification of a board, the higher the liquidity. [Daadaa \(2021\)](#) analyzed the association between governance and market liquidity in Tunisia between 2008 and 2019 and found that board size and members of financial institutions on the board have a negative association with the quoted bid–ask spread. The author suggested that firms with good corporate governance improve their stock market liquidity as it is associated with higher information disclosure.

Furthermore, [Abbassi, Hunjra, Alawi, and Mehmood \(2021\)](#) examined the impact of board composition on the stock market liquidity in South Asian countries, such as India, Bangladesh, Sri Lanka and Pakistan, from 2011 and 2020. They showed that board size, chief executive officer (CEO) duality and board independence have a positive and significant impact on stock liquidity. [Mbanyele and Wang \(2022\)](#) also tested the association between board interlocks and stock market liquidity by employing a sample of non-financial listed Brazilian firms between 2002 and 2015. Their study provided evidence that board interlocks are positively related to stock liquidity. They emphasized that this positive relationship becomes stronger if firms have poor governance. [Khan, Rehman, and Khan \(2022\)](#) investigated the effect of board composition on the stock market liquidity of non-financial Pakistani firms from 2007 to 2016. They found that directors' attendance, frequency of board meetings, the number of board sub-committees and board gender diversity positively influenced stock market liquidity.

Based on the discussions above, it is clear that studies have not yet been conducted on the TASI, and that previous studies concentrated on non-financial sectors. In addition, the question of how board busyness affects stock market liquidity has not been researched.

2.4. Board Size and Stock Market Liquidity

The integrity and quality of the information provided by the board to the shareholders is considered the most vital role of a corporate board. Two attributes that affect board effectiveness are board size and the presence of independent directors (Jensen, 1993). Size is considered a vital component of firms' corporate boards. The literature provides two points of view regarding board size. First, larger boards have more resources than smaller ones to monitor and control managerial performance. Control in this context means that directors deliberate vital corporate decisions more widely and detect matters that are important to the stakeholders. Anderson, Mansi, and Reeb (2004) and Klein (2002) indicated that larger boards have the necessary skills to form various effective committees, allocate specific tasks, and facilitate greater debating on corporate issues. This can lead to greater information transparency. In addition, Coles, Daniel, and Naveen (2008) and Baker and Gompers (2003) argued that firms characterized by complicated business require larger boards due to the difficulties involved in advising and monitoring such firms.

On the other hand, some researchers have pointed out that larger boards have weaknesses that affect their effectiveness. Concentrating on free riding and social loafing, which influence large boards, Jensen (1993) indicated that if a board has more than seven directors, the CEO can easily monitor it. That is, large boards could increase the agency problems between external shareholders and the CEO, leading to a reduction in the disclosure of information. This could give managers a greater chance of increasing their own benefits. In line with this idea, Yermack (1996) found that corporations with large boards could have a price discount. Moreover, Lipton and Lorsch (1992) advised limiting the number of members on a board due to issues related to free riding and social loafing. Supporting these studies, the Institutional Shareholder Services (ISS) recommend small boards.

Regarding the board size and stock market liquidity associations, Daadaa (2021) showed that board size has an adverse relationship with bid-ask spread. That is, board size is positively correlated with stock liquidity. Abbassi et al. (2021) also indicated that board size has a positive effect on stock liquidity. Based on the arguments above, the following hypothesis is developed:

H1: Board size improves stock liquidity.

2.5. Board Independence and Stock Market Liquidity

Independent directors are seen as a vital mechanism for monitoring firm management and providing information to the shareholders (Fama & Jensen, 1983; Weisbach, 1988). This is apparent as they are most likely nominated to work for the shareholders' interests (Rosenstein & Wyatt, 1990). They are also seen as effective defenders of minority shareholders against inappropriate executives (Weisbach, 1988) and they are willing to protect the interests of shareholders (Duchin, Matsusaka, & Ozbas, 2010). Based on agency theory, a higher number of independent non-executive directors on the board may assist with aligning managers' interests with shareholders and hence enhance the firm's value (Eisenhardt, 1989; Fama & Jensen, 1983; Jensen & Meckling, 1976). In addition, independent non-executive directors are more dominant because of their experience, reputation and ability to provide and share ideas from outside the firm (Kesner & Johnson, 1990). In this regard, Jaggi, Leung, and Gul (2009) indicated that a higher percentage of independent non-executive directors is related to a higher reported earnings quality.

Empirically, Foo and Zain (2010) found that a higher number of independent non-executive directors is related to higher stock liquidity. Angelo and Frino (2014) also found that boards with more independent non-executive directors have lower spreads to new information and hence lower stock liquidity. In addition, they indicated that improvements in the board's independence over time are positively related to improvements in the firm's stock

liquidity. Moreover, Abbassi et al. (2021) indicated that board independence has a positive impact on stock liquidity. Based on the arguments above, the following hypothesis is developed:

H2: Board independence improves stock liquidity.

2.6. Board Meetings and Stock Market Liquidity

Prior studies have emphasized that the frequency of board meetings is a vital mechanism employed to enhance the board's effectiveness. Furthermore, board meetings are a vital channel that allows board members to obtain and provide firm-specific information, exercise control, and implement their duties efficiently for the shareholders' benefit (Adams & Ferreira, 2009; Conger & Lawler, 2009). In this regard, Francis, Hasan, Koetter, and Wu (2012) showed that corporations with weak attendance at board meetings perform negatively compared with firms with good attendance at board meetings, especially during a financial crisis. Similarly, Ntim and Osei (2011) found that corporations with more frequent board meetings tend to have better financial performance. Foo and Zain (2010) argued that board meetings are important in terms of monitoring managers' activities and therefore mitigating agency problems, which, in turn, reduces asymmetric information through the greater disclosure of information. Empirically, they showed that more frequent board meetings are related to higher stock liquidity. Khan et al. (2022) also found that board meeting frequency is positively and significantly associated with stock market liquidity. Based on the arguments above, the following hypothesis is developed:

H3: Frequent board meetings improves stock liquidity.

2.7. Board Busyness and Stock Liquidity

The literature on board structure provides two different views regarding the role of busy directors on a board. The first view is that busy members who have multiple directorships in many boards enhance the decision making of the board since they have better business connections and experience (called the reputational impact). The second view is that busy members are usually too busy to pay attention to the business, leading to agency problems and non-optimal corporate decisions (called the busyness impact).

Supporting the concept of the reputational effect, busy directors can enhance monitoring functions and the board's advisory role (Loderer & Peyer, 2002; Mace, 1986) and improve acquisition performance (Harris & Shimizu, 2004). On the other hand, busy members may become overcommitted when they hold multiple seats on several firms' boards, leading them to be unable to provide significant managerial monitoring (Core, Holthausen, & Larcker, 1999; Falato, Kadyrzhanova, & Lel, 2014; Shivdasani & Yermack, 1999). They are also associated with weaker corporate governance and lower firm value (Fich & Shivdasani, 2006; Jiraporn, Davidson, DaDalt, & Ning, 2009). Based on the arguments above, the following hypotheses are developed:

H4a: Board busyness improves stock liquidity.

H4b: Board busyness reduces stock liquidity.

3. DATA AND METHODOLOGY

3.1. Data Sample

This paper is conducted on the Saudi stock market and the sample comprises all the banks listed on the TASI from 2010 and 2020. The initial sample was twelve banks; however, two exclusion criteria were applied. First, banks with missing board composition or stock liquidity data for at least three years were removed from the sample (Aljughaiman & Salama, 2019). Second, banks that were the subject of mergers during the entire period of the study were dropped from the sample (Hannan & Robin, 1998). Table 1 presents the final sample of ten banks (with a total of 108 observations).

Several databases were employed for the data collection. Specifically, financial and liquidity data (dependent and control variables) were obtained from the Datastream database. Board structure data (board size, board

independence, board meetings, and board busyness) were manually gathered from banks' websites and annual reports. To avoid any effect of extreme values due to outliers in the data, this study winsorized all the continuous variables to lie lower than 1% and above 99%.

Table 1. Study sample.

No.	Bank Name	Bank Code	Number of Observations
1	The Saudi National Bank	1180	11
2	Alinma Bank	1150	10
3	Bank Albilad	1140	11
4	Al Rajhi Bank	1120	11
5	Arab National Bank	1080	11
6	Saudi British Bank	1060	11
7	Banque Saudi Fransi	1050	11
8	Saudi Investment Bank	1030	11
9	Bank AlJazira	1020	10
10	Riyad Bank	1010	11

3.2. Measures

3.2.1 Liquidity Variables

To examine the impact of board structure on stock market liquidity, we follow [Stoll \(2000\)](#) and employ two dimensions of stock market liquidity, namely informational friction and real friction. Informational friction is the possibility of liquidity traders making a loss when they trade against informed (insider) investors, while real friction is defined as the real resources used up in the process of liquidity provision. Prior studies have indicated that the bid–ask spread is expanded and the depth is decreased by market makers when informed investors trade, which reduces stock market liquidity ([Copeland & Galai, 1983](#); [Glosten & Milgrom, 1985](#); [Kyle, 1985](#)). Nevertheless, [McInish and Wood \(1992\)](#) found that trading activity has a negative relationship with bid–ask spread. Therefore, we use the quoted bid–ask spread as a representative for informational friction variables, whereas trading volume, turnover ratio and number of trades are used for real friction variables. We employ the following equations to measure a firm's stock liquidity:

First: bid–ask spread:

$$MQ = \frac{(AP + BP)}{2} \quad (1)$$

$$BAS = \frac{(AP - BP)}{MQ} \quad (2)$$

Where: MQ is the midpoint of quote, BAS is the bid–ask spread, AP is the asking price, and BP refers to the bid price.

Second, trading volume (TVM) is the total number of shares exchanged among shareholders of a stock on a given day in thousands.

Third, turnover ratio (TR) is measured by dividing trading volume by the number of outstanding shares of firms.

$$TR = \frac{TVM}{NOS} \quad (3)$$

Where: TR is the turnover ratio, TVM is the trading volume, and NOS is the number of outstanding shares.

Last, the number of trades (NTs) is defined as the aggregate number of times a firm's shares were exchanged or traded in a day.

3.2.2. Explanatory Variables

Following the literature, board size (*Bsize*) is described as the total number of members on the board (e.g., Cheng (2008)) and board independence (*Bind*) is described as the number of independent members divided by the total number of directors on the board (e.g., (Chen & Zhang, 2014; Guest, 2010)). Board meetings (*Bmeet*) is described as the total number of formal meetings held by the firm's board during the year (e.g., Foo and Zain (2010)), and board busyness is measured as the number of members who serve on multiple boards divided by the total number of board of directors (e.g., Trinh, Elnahass, Salama, and Izzeldin (2020)).

3.2.3. Control Variables

Following previous studies in the literature (Chung et al., 2010), several firm characteristics are included as control variables – firm size, firm age, share price, return volatility and book-to-market ratio. Bank size (*SIZE*) is the market value of equity measured by multiplying the aggregate number of shares outstanding by share price. Generally, small banks tend to have lower stock market liquidity since they disclose less public information, which increases asymmetric information and reduces stock market liquidity (Stoll, 2000). Bank age (*AGE*) is the number of years since the bank was incorporated. Generally, younger banks have a smaller shareholder base, which may lead to reduced stock market liquidity (Ding & Hou, 2015). Share price (*SHP*) is the closing price. To avoid the effects of

the constraints of tick-size-induced binding, this paper uses the opposite function of bank share price as follows: $\frac{1}{SHP}$

(see (Al-Jaifi et al., 2017; Ali et al., 2017; Chung et al., 2010)). Share price also can be used to represent risk since it may control for the discreteness effect (Stoll, 2000). According to Amihud and Mendelson (1986) and Jegadeesh and Subrahmanyam (1993), share price is adversely associated with the quoted spread, hence it is likely to be related to raised stock market liquidity.

Return volatility (*RV*) is calculated as the daily standard deviation of returns. Prior studies indicate that less volatile stock has less uncertain costs for shareholders, and lower inventory risks are enforced on informed shareholders by market makers due to decreased asymmetric information. This may lead to a lower bid–ask spread and higher stock market liquidity (Jegadeesh & Subrahmanyam, 1993). Furthermore, lower volatility leads to lower uncertainty (Stoll, 2000) and hence lower asymmetric information (Dierkens, 1991). The book-to-market ratio (*BMR*) is measured by dividing the book value by the market value. The inclusion of *BMR* assists with controlling for firm performance (Hagendorff & Vallascas, 2011). Last, the year fixed effect is employed to control for both market-wide factors and cross-sectional dependence (Poon, Rockinger, & Stathopoulos, 2013). Thus, this study includes a year dummy variable to obtain a robust estimation model. Table 2 shows the definitions of the variables used in this study and the calculation of each.

3.3. Estimation Models

The pooled ordinary least squares (OLS) regression is employed as the main model using different stock liquidity measures in addition to the control variables and year dummy. To address the issue of heteroscedasticity, robust standard errors are employed in the model. We also employ both the lag approach and the generalized method of moments (GMM) system as a robustness check to address endogeneity issues (i.e., dynamic endogeneity, omitted variables bias and reverse causality). We also test whether board structure mitigates agency problems as an additional test. The following model is employed to test the hypotheses (H1–H4):

$$Liquidity_{it} = \beta_0 + \beta_1 Bsize_{it} + \beta_2 Bind_{it} + \beta_3 Bmeet_{it} + \beta_4 Busy_{it} + \beta_5 SIZE_{it} + \beta_6 AGE_{it} + \beta_7 SHP_{it} + \beta_8 RV_{it} + \beta_9 MBR_{it} + \varepsilon_{it} \quad (4)$$

Where *Liquidity_{it}* represents the informational friction (bid and ask spread) and real friction (trading volume), turnover ratio (*TR*) and number of trades (*NTs*); *Bsize_{it}* represents board size; *Bind_{it}* represents board

independence; $Bmeet_{it}$ represents board meeting frequency; and $Busy_{it}$ represents board busyness. The control variables include $SIZE_{it}$, AGE_{it} , SHP_{it} , RV_{it} , and BMR_{it} (bank size, bank age, share price, return volatility, and book-to-market value, respectively), and ε_{it} represents the error terms.

Table 2. Measurements and data sources for the variables.

Variables	Measurements	Sources
Dependent variables		
Bid-ask spread (BAS)	BAS is measured as the ask price minus the bid price, and then the result is divided by the midpoint of the quote.	Author's calculation
Trading volume (TVM)	TVM is the total number of shares exchanged among shareholders of a stock on a given day in thousands.	Datastream
Turnover ratio (TR)	TR is measured by dividing trading volume by the number of a firm's outstanding shares.	Author's calculation
Number of trades (NTs)	NTs is defined as the aggregate number of times a firm's shares were exchanged or traded in a day.	Datastream
Independent variables		
Board size (Bsize)	Bsize is the total number of members on the board.	Annual reports & banks' websites
Board independence (Bind)	Bind is the number of independent members divided by total number of directors on the board.	Annual reports & banks' websites
Board meetings (Bmeet)	Bmeet is the total number of formal meetings held by the firm's board during the year.	Annual reports & banks' websites
Board busyness (Busy)	Busy is the number of members who serve on multiple boards divided by the total number of board of directors.	Annual reports & banks' websites
Control variables		
Bank size (SIZE)	SIZE is measured by multiplying the aggregate number of outstanding shares by the share price.	Datastream
Bank age (AGE)	AGE is the number of years since the bank was incorporated.	Banks' websites
Share price (SHP)	SHP is a share's closing price.	Datastream
Return volatility (RV)	RV is calculated as the daily standard deviation of returns.	Author's calculation
Book-to-market ratio (BMR)	BMR is measured by dividing the market value by the book value.	Datastream

4. RESULTS

4.1. Descriptive Statistics and Correlations

Table 3 indicates the descriptive statistics of the different stock liquidity measures, board structure characteristics and controlling variables. With regard to stock liquidity variables, the average values and standard deviations are as follows: Bid-ask spread (BAS), trading volume (TVM), turnover ratio (TR) and number of trades (NTs) exhibit mean values of 0.021%, 0.562%, 863 (million), and 201,725, respectively, with standard deviations of 0.020%, 1.183%, 780 (million), and 313,537, respectively. For the main explanatory variable, Bsize has an average of 8.18 and a standard deviation of 1.66; the minimum value is 5 and the maximum value is 12. In addition, the average proportion of Bind is 0.62%, with a standard deviation of 0.10%; the minimum proportion is 0.40% and the maximum proportion is 0.75%. Moreover, Bmeet has an average of 6.37, with a standard deviation of 2.04; the minimum value is 4 and the maximum value is 10. Furthermore, the average proportion of Busy is 0.84%, with a standard deviation of 0.10%; the minimum proportion is 0.30% and the maximum proportion is 0.83%. Regarding the control variables, the average bank size (SIZE) is 38.29 (in millions), with a standard deviation of 0.30. The

average age of a TASI bank (AGE) is 8.5 years, with the oldest firm having reached 66 years since its incorporation. The minimum–maximum value of TASI banks' share prices (SHP) is 7.01–65.4, with an average of 22.52 (in Saudi riyals). The average of return volatility (RV) is 0.31% and its standard deviation is 0.20%. Furthermore, TASI banks have a BMR average of 0.923%, with a minimum–maximum proportion of 0.0009%–1.816%, respectively.

Table 3 describes the data for the study period (2010 to 2020) for TASI banks, where BAS (bid and ask spread), TVM (trading volume), TR (turnover ratio), and NTs (number of trades) are the dependent variables; Bsize (board size), Bind (board independence), Bmeet (board meetings) and Busy (board busyness) are the independent variables; SIZE (bank size), AGE (bank age), SHP (share price), RV (return volatility) and BMR (book-to-market ratio) are the control variables; and Obs (number of observations), AVG (average value), STDs (standard deviations), Min (minimum value) and Max (maximum value) are also included in the table.

Table 3. Descriptive statistics.

Variables	Obs.	AVG	STD	Min.	Max.
BAS	104	0.021	0.020	0.003	0.095
TVM	104	863	780	59	7
TR	108	0.562	1.183	0.046	4.71
NTs	104	201,725	311,537	16,394	1,195,701
Bsize	108	8.18	1.66	5	12
Bind	108	0.62	0.10	0.40	0.75
Bmeet	108	6.37	2.04	4	10
Busy	108	0.48	0.10	0.30	0.83
SIZE	108	8.15	0.30	7.32	8.70
AGE	108	38.29	16.56	5	66
SHP	104	22.52	11.56	7.01	65.4
RV	103	0.31	0.20	0.08	0.75
BMR	108	0.923	0.461	0.0009	1.816

Note: BAS is bid–ask spread, TVM is trading volume, TR is turnover ratio, NTs is number of trades, Bsize is board size, Bind is board independence, Bmeet is board meetings, Busy is board busyness, SIZE is bank size, AGE is bank age, SHP is share price, RV is return volatility, and BMR is book-to-market ratio.

Tables 4 and 5 show both the Pearson correlation matrix and the variance inflation factors (VIF) to check if the study variables have any multicollinearity issues. Based on the Pearson matrix, the highest association between the explanatory variables is between bank size (SIZE) and bank age (AGE) (76%). That is, older banks tend to have higher market capitalization. The association between bank size (SIZE) and share price (SHP) is the second highest correlation with 70%. This is to say that larger banks have higher share prices. In addition, the association between bank size (SIZE) and board size (Bsize) is 65%. That is, larger banks tend to have more board members. Regarding the VIFs (see Table 5), all values are less than 10, which means that the models have no multicollinearity issues.

Table 4. Correlation matrix for the association between board structure and stock market liquidity.

Variable	BAS	TR	TVM	NTs	Bsize	Bind	Bmeet	Busy	SIZE	AGE	SHP	RV	BMR
BAS	1.000												
TR	0.090	1.000											
TVM	0.098	0.987*	1.000										
NTs	0.016	0.905*	0.923*	1.000									
Bsize	-0.1070	0.075	0.133	0.261*	1.000								
Bind	-0.319*	0.117	0.043	0.110	0.262*	1.000							
Bmeet	-0.272*	0.156	0.153	0.215*	0.513*	0.605*	1.000						
Busy	-0.244*	0.056	0.077	0.041	-0.557*	-0.439*	-0.482*	1.000					
SIZE	-0.102	-0.170	-0.126	-0.0301	0.656*	-0.023	0.153	-0.262*	1.000				
AGE	-0.124	-0.497*	-0.427*	-0.313*	0.473*	-0.163	0.143	-0.237*	0.764*	1.000			
SHP	-0.061	-0.154	-0.147	0.075	0.553*	0.124	0.235*	-0.016	0.701*	0.510*	1.000		
RV	-0.170	0.062	0.055	0.101	0.178	0.191	0.186	-0.171	-0.085	-0.071	0.159	1.000	
BMR	0.063	0.011	-0.050	-0.193*	-0.362*	-0.106	-0.340*	-0.052	-0.082	-0.188	-0.400*	-0.229*	1.000

Note: BAS is bid-ask spread, TVM is trading volume, TR is turnover ratio, NTs is number of trades, Bsize is board size, Bind is board independence, Bmeet is board meetings, Busy is board busyness, SIZE is bank size, AGE is bank age, SHP is share price, RV is return volatility, and BMR is book-to-market ratio.

* Indicates significance at the 5% level.

Table 5. Variance inflation factors (VIF).

Variable	(VIF)			
	BAS	TVM	TR	NTs
SIZE	5.61	5.25	5.42	5.25
Bsize	3.62	3.53	3.66	3.53
SHP	3.28	3.00	3.02	3.00
AGE	2.70	2.77	2.66	2.77
Bmeet	2.60	2.42	2.57	2.42
Busy	2.18	2.11	2.21	2.11
Bind	2.15	1.84	2.14	1.84
BMR	1.79	1.83	1.80	1.83
RV	1.09	1.24	1.20	1.24
Mean VIF	2.78	2.67	2.75	2.67

Note: BAS is bid-ask spread, TVM is trading volume, TR is turnover ratio, NTs is number of trades, Bsize is board size, Bind is board independence, Bmeet is board meetings, Busy is board busyness, SIZE is bank size, AGE is bank age, SHP is share price, RV is return volatility, and BMR is book-to-market ratio.

4.2. Multivariate Analyses

4.2.1. Board Structure and Stock Market Liquidity

Table 6 presents the regression results for the board structure and stock liquidity association. First, Bsize is positively and significantly related to TVM, TR, and NTs at 1%, 10% and 1% significance levels, respectively. This indicates that the higher the board size, the higher the stock market liquidity. This is consistent with the findings of Daadaa (2021) and Abbassi et al. (2021), and is also in line with the debate that larger boards have more resources to monitor managerial performance and have skills to form various effective committees, allocate specific tasks, and facilitate greater debating on corporate issues. This can lead to greater information transparency (Anderson et al., 2004; Klein, 2002).

Bind also has a negative and significant association with BAS at the 5% significance level, but a positive and significant association at the 1% significance level with the rest of the stock liquidity variables. This finding implies that board independence positively influences trading activity, i.e., increases stock liquidity. Foo and Zain (2010) and Angelo and Frino (2014) also reported the same result. This positive association is consistent with the idea that more independent directors on the board may help to align the interests of managers with those of shareholders and hence enhance the value of the firm (Eisenhardt, 1989; Fama & Jensen, 1983; Jensen & Meckling, 1976). Independent directors are considered to be more influential because of their experience, reputation and ability to provide and share ideas from outside the firm (Kesner & Johnson, 1990). In addition, it was found that board meeting frequency (Bmeet) has no relationship with any of the stock liquidity variables. Board busyness (Busy) is positively and significantly associated with BAS at the 10% level and is negatively associated with TVM, TR, and NTs at the 1%, 5% and 5% significance levels, respectively. That is, board busyness has a negative correlation with stock market liquidity. This negative finding is in line with the busyness effect point of view, i.e., that busy members are usually too busy to pay attention to the business, leading to agency problems and non-optimal corporate decisions, and they are overcommitted when they hold seats on multiple firm boards. This hinders their ability to provide sufficient managerial monitoring, which weakens a firm's value (Core et al., 1999; Falato et al., 2014; Shivdasani & Yermack, 1999). Regarding the controlling variables, the banks' market values of equity (SIZE) are positively associated to all stock liquidity variables. In contrast, bank age (AGE) is negatively related to the stock market liquidity variables. Share price (SHP) has a positive relationship with TVM, TR, and NTs at the 1% significance level, but a negative correlation with BAS at the 5% significance level. This is to say that stocks with a higher share price exhibit higher stock liquidity. No relationship was found between return volatility and stock liquidity measurements. Finally, BMR shows a positive association with BAS at the 10% significance level, but a negative association with TVM and NTs at the 1% significance level. This finding suggests that BMR is negatively associated with stock market liquidity.

Table 6. Impacts of board structure on stock market liquidity.

Variable	(1) BAS	(2) TVM	(3) TR	(4) NTs
Bsize	0.300 (0.100)	0.444*** (0.138)	0.288* (0.165)	0.485*** (0.126)
Bind	-3.724** (1.771)	4.187*** (1.458)	8.023*** (1.912)	3.907*** (1.306)
Bmeet	0.100 (0.100)	0.122 (0.086)	0.041 (0.121)	0.063 (0.083)
Busy	2.025* (1.515)	-0.826*** (0.263)	-3.708** (1.691)	-0.531** (0.259)
SIZE	-21.52* (12.62)	46.99*** (8.235)	54.55*** (10.65)	32.73*** (7.243)
AGE	0.100 (0.606)	-0.059*** (0.012)	-0.100*** (0.016)	-0.051*** (0.010)
SHP	-10.13** (5.291)	64.46*** (8.503)	39.41*** (12.33)	42.06*** (7.666)
RV	0.163 (0.172)	0.962 (0.766)	1.242 (1.075)	0.632 (0.710)
BMR	0.294** (0.157)	-1.971*** (0.303)	0.488 (0.527)	-1.924*** (0.287)
Constant	4.044* (2.252)	-8.294*** (1.694)	-11.24*** (2.206)	-6.060*** (1.487)
Observations	101	103	103	103
R-squared	0.568	0.625	0.619	0.633
Years Effect	YES	YES	YES	YES

Note: *, ** and *** denote significance levels of 10%, 5% and 1%, respectively.

Robust standard errors are in parentheses.

BAS is bid-ask spread, TVM is trading volume, TR is turnover ratio, NTs is number of trades, Bsize is board size, Bind is board independence, Bmeet is board meetings, Busy is board busyness, SIZE is bank size, AGE is bank age, SHP is share price, RV is return volatility, and BMR is book-to-market ratio.

4.2.2. Board Structure and Stock Liquidity (Robustness Check)

Tables 7 and 8 re-examine the association between board structure and stock market liquidity after controlling for endogeneity using the lag approach and GMM estimation, respectively. The findings are the same as the main estimation model in Table 6. That is, board size and independence positively influence stock liquidity, whereas board busyness negatively affects stock liquidity.

Table 7. Controlling for endogeneity using the lag approach (robustness check).

Variable	(1) BAS	(2) TVM	(3) TR	(4) NTs
Bsize	0.200 (0.108)	0.476*** (0.147)	0.218 (0.158)	0.531*** (0.127)
Bind	-4.545*** (1.142)	4.693*** (1.533)	7.833*** (1.930)	4.142*** (1.365)
Bmeet	0.101 (0.101)	0.061 (0.090)	0.005 (0.134)	0.0436 (0.090)
Busy	2.602** (1.201)	-0.938*** (0.294)	-3.780** (1.567)	-0.671** (0.291)
SIZE	-14.36 (14.93)	45.94*** (8.484)	56.04*** (11.88)	31.75*** (7.701)
AGE	-0.411 (0.682)	-0.059*** (0.013)	-0.102*** (0.017)	-0.051*** (0.011)
SHP	-10.10* (5.525)	67.61*** (8.610)	39.33*** (12.05)	44.53*** (7.721)

Variable	(1) BAS	(2) TVM	(3) TR	(4) NTs
RV	-0.114 (0.168)	1.016 (0.788)	1.498 (1.125)	0.821 (0.743)
BMR	0.171 (0.164)	-2.121*** (0.311)	0.388 (0.519)	-1.997*** (0.287)
Constant	3.431 (2.268)	-8.096*** (1.755)	-11.51*** (2.479)	-5.870*** (1.597)
Observations	91	93	93	93
R-squared	0.682	0.643	0.618	0.660
Years Effect	YES	YES	YES	YES

Note: *, ** and *** denote significance levels of 10%, 5% and 1%, respectively.

Robust standard errors are in parentheses.

BAS is bid-ask spread, TVM is trading volume, TR is turnover ratio, NTs is number of trades, Bsize is board size, Bind is board independence, Bmeet is board meetings, Busy is board busyness, SIZE is bank size, AGE is bank age, SHP is share price, RV is return volatility, and BMR is book-to-market ratio.

Table 8. Controlling for endogeneity using GMM (Robustness check).

Variable	(1) BAS	(2) TVM	(3) TR	(4) NTs
Dy(t-1)	0.490 (0.305)	0.001 (0.001)	-0.125 (0.112)	-0.860* (0.391)
Bsize	-1.449 (1.355)	1.534* (0.818)	-4.262 (2.510)	3.645** (1.560)
Bind	-3.317* (1.751)	4.491* (2.269)	5.900* (2.928)	2.296** (0.928)
Bmeet	4.590 (3.008)	-2.875 (1.640)	2.417 (1.359)	3.431 (1.210)
Busy	2.413* (1.264)	-2.919 (1.986)	-5.898* (3.112)	-2.102* (0.987)
SIZE	-6.741* (3.217)	4.340 (12.28)	20.88* (1.136)	11.50** (4.435)
AGE	5.029* (2.443)	-0.236 (0.176)	-0.146 (0.090)	-3.386** (1.399)
SHP	18.66 (10.66)	17.23 (9.545)	19.55 (11.53)	-19.39* (8.918)
RV	0.020 (0.040)	4.461 (2.738)	7.066 (4.089)	-16.31** (6.790)
BMR	1.754** (0.771)	-3.909 (2.368)	-3.700 (2.598)	18.34** (8.224)
Constant	12.16* (5.773)	-6.743 (2.474)	-41.03* (22.30)	-23.06** (9.533)
Observations	91	93	93	93
Years Effect	Yes	Yes	Yes	Yes
AR(1) test (p-value)	0.000	0.000	0.000	0.000
AR(2) test (p-value)	0.351	0.154	0.450	0.177
Hansen test of over-identification (p-value)	0.132	0.126	0.131	0.104

Note: * and ** denote significance levels of 10% and 5%, respectively.

Robust standard errors (in parentheses).

BAS is bid-ask spread, TVM is trading volume, TR is turnover ratio, NTs is number of trades, Bsize is board size, Bind is board independence, Bmeet is board meetings, Busy is board busyness, SIZE is bank size, AGE is bank age, SHP is share price, RV is return volatility, and BMR is book to market ratio.

4.2.3. Board Structure and Agency Problems (Additional Test)

The enhanced stock liquidity of a bank can be attained when board structure reduces agency problems. Nevertheless, an ineffective board may carry out limited monitoring and therefore engage in ineffective decision-making processes, increasing agency costs. This section provides additional analysis by investigating the relationship between board structure and agency problems (see Table 9). Following Farag, Mallin, and Ow-Yong

(2018) and Trinh et al. (2020), bank agency cost is measured by dividing cash into total assets. A high value implies higher agency costs. The results show that board size and board independence lower agency problems, whereas board busyness increases agency problems.

Table 9. Impact of board structure on agency problems (additional analysis).

Variable	(1) AGENCY	(2) AGENCY
Bsize	-0.136*** (0.036)	-0.058 (0.057)
Bind	-0.460** (0.228)	-0.595** (0.279)
Bmeet	-0.042 (0.031)	-0.033 (0.039)
Busy	0.653* (0.359)	1.398* (0.736)
SIZE		5.650* (3.017)
AGE		-0.007 (0.004)
SHP		1.476 (3.448)
RV		-0.123 (0.387)
BMR		-0.005 (0.026)
Constant	2.985*** (0.545)	-8.977 (6.104)
Observations	108	103
R-squared	0.144	0.133
Years Effect	NO	YES

Note: *, ** and *** denote significance levels of 10%, 5% and 1%, respectively.

Robust standard errors are in parentheses.

BAS is bid-ask spread, TVM is trading volume, TR is turnover ratio, NTs is number of trades, Bsize is board size, Bind is board independence, Bmeet is board meetings, Busy is board busyness, SIZE is bank size, AGE is bank age, SHP is share price, RV is return volatility, and BMR is book-to-market ratio.

5. CONCLUSIONS

The main objective of this paper is to explore the link between board structure and stock market liquidity of TASI banks from 2010 to 2020. Thus far, this topic with regard to the Saudi stock market has not been investigated. Moreover, this research is considered one of first studies on the association between board busyness and stock market liquidity. Regarding methodology, the study employs four characteristics of board structure: board size, board independence, board meetings and board busyness, with four measurements of stock market liquidity (quoted bid-ask spread, trading volume, turnover ratio and number of trades). In addition, the pooled OLS is employed as the estimation model of this study. We also use both lag estimation and system GMM to address any possible endogeneity problems.

Regarding the findings of the OLS estimation and the lag and system GMM, a positive and significant association was found between the board size of banks and stock liquidity. This implies that a bank with more directors on the board tends to exhibit higher stock liquidity. Furthermore, board independence is also positively and significantly associated with stock liquidity. That is, independent directors assist in aligning managers' interests with those of the shareholders. Moreover, a negative relationship was found between board busyness and stock market liquidity. That is, busy directors may become overcommitted when they have seats on multiple firms' boards, leading them to be unable to monitor the behavior of opportunistic managers and therefore negatively affects stock liquidity and firm value. Lastly, this study conducts an additional test to investigate whether an

effective board carries out high monitoring and therefore engages in effective decision-making processes, decreasing agency costs. The results show that both board size and board independence lower agency problems, whereas board busyness increases agency problems.

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