The impact of mandatory adoption of XBRL on firm's stock liquidity: a cross-country study

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Abstract

Purpose- The purpose of this paper is to examine the impact of the mandatory adoption of eXtensible Business Reporting Language (XBRL) on firm's stock liquidity.

Design/methodology/approach– Using a random effects model, this study examines the impact of the mandatory adoption of XBRL on firm's stock liquidity of 980 companies pertaining to 13 countries for a period from 2000 to 2016.

Findings– We find that the mandatory adoption of XBRL enhances firm's stock liquidity. In addition, we find that the impact of the mandatory adoption of XBRL on firm's stock liquidity is more pronounced in civil law countries than in common law countries.

Originality/value– This paper contributes to the literature on the economic consequences of XBRL especially for the civil law countries by examining the impact of the mandatory adoption of XBRL on firm's stock liquidity.

Keywords: XBRL, cross-country analysis, liquidity, civil law, common law.

Paper type- Research paper

Introduction

Financial reporting is crucial to ensuring the long-term success of a business or institution (Perri and Allko, 2015). A high quality accounting information is essential and strategically vital to the development of listed companies and the development of investment in the capital market (Zeghal and Mhedhbi, 2006). The companies publish their financial information on the Web since the mid-1990s (Debreceny and Gray, 2001). The different digital formats vary from Microsoft Word, Excel, PDF, TXT, HTML or in special formats produced by different software (Gostimir, 2015).

However, to date, there has been a problem with the effectiveness of communicating accurate and unambiguous financial information over the Internet (Faboyede *et al.*, 2016). The content of corporate information on the web is not very different from the financial information provided on paper-based documents (Yoon, Zo and Ciganek, 2011).

Moreover, with the incredible amount of information in the annual reports, it is difficult for users to analyse all information (Kaya, 2014). When it is difficult to produce, interpret, compare and analyse financial information, negative consequences can be observed, such as:

the investor may abandon the investment, the banks may not give loans, an auditor may not view financial statements as credible (Grosu *et al.*, 2010). According to Debreceny and Gray (2001), stakeholders are not fully satisfied with Web-based data and there is still a high demand for information from traditional third-party information intermediaries. Companies that seemed perfectly healthy from a financial point of view suddenly had to announce they had solvency problems and collapsed in a few months or weeks (Espinosa, Tapia and Trombetta, 2005).

The recent corporate bankruptcies and the rapid change of business world have highlighted the need for transparency and call for a change in the way of dissemination of financial information. The loss of accuracy is an increasingly apparent risk. Regulators seek to improve the quality of financial reporting (PriceWaterHouseCoopers, 2003; Zehri and Chouaibi, 2013). In addition, with the old presentation format of financial information, it is costly to retrieve, manipulate and use that information. Companies spend billions of dollars to present and transfer data (Kloeden, 2006). Companies around the world are seeking to increase the transparency of their financial reports while reducing the regulatory burden (Sudalaimuthu and Haraiharan, 2011). To meet the needs of shareholders in terms of speed and transparency, companies must implement more effective means of communication (PriceWaterHouseCoopers, 2003).

Stakeholders require transparent, easily accessible and timely information. These stakeholders often choose the Internet as the preferred means of communication and want as much information as possible to be placed on the firm's Web site (Burnett, Friedman and Murthy, 2006).

The introduction of XBRL for financial reporting has been a major change in recent years (Li, Lin and Ni, 2012). The acronym XBRL stands for eXtensible Business Reporting Language. XBRL is a language for electronic communication of business and financial data, which is revolutionizing corporate reporting around the world. It provides major benefits in the preparation, analysis and reporting of corporate information. It offers cost savings, greater efficiency, and increased accuracy and reliability for everyone involved in the provision or use of financial data. The data will be cheaper, better and faster (Apostolou and Nanopoulos, 2009; Kloeden, 2006; PriceWaterHouseCoopeers, 2003). XBRL can be considered as a bar code for financial statements (Manmohan and Pk, 2014). It is a programming language independent of any software or platform, facilitates the preparation and exchange of business information (Dhingra, Singh and Magu, 2014; Lim and Perrin, 2014).

Regulators and government agencies in many countries are now using XBRL for regulatory submissions. XBRL has become the global standard for financial reporting. It is implemented in more than 60 countries around the world (Taylor and Dzuranin, 2010; Bai, Sakaue and Takeda, 2014; Cormier *et al.*, 2019).

However, although XBRL has several advantages, several problems can limit its adoption (Ball, 2006; Brands, 2013; Boritz and No, 2008; Debreceny *et al.*, 2010; Dhole *et al.*, 2015; Roohani and Zheng, 2013). For example, XBRL allows firms to create their own taxonomy extensions. The use of extensions can be a challenge and may decrease the comparability between companies, thus eliminating one of the primary goals of XBRL (Boritz and No, 2008). Dhole *et al.* (2015) find that financial statement comparability of US firms declined after the XBRL mandate. In addition, the adoption and implementation of XBRL must be carefully managed and monitored. Robust and rigorous internal controls governing the application of XBRL need to be designed, implemented and maintained. XBRL requires considerations from those who prepare and maintain XBRL reports, such as, the completeness and accuracy of tagging, the application of appropriate taxonomies, the need for and nature of extensions, and the relationships between reported elements (Ball, 2006).

Several studies including Felo, Kim and Lim (2018), Li, Ni and lin (2012), Hao, Zhang and Fang (2014), Luo *et al.* (2017) find that the adoption of XBRL improves the accuracy of analysts' forecasts, improves firms' stock liquidity and reduces the cost of equity capital. In contrast, Blankespoor, Miller and White (2014), Liu, Yao, *et al.* (2014), Liu, Luo, *et al.* (2014) find contradictory results. Other research also shows that there is a lack of knowledge of XBRL in multiple countries and by multiple users (Steenkamp and Nel, 2012; Perri and Allko, 2015). Therefore, the economic consequences of the mandatory adoption of XBRL are not obvious. According to Shan, Troshani and Richardson (2015), there has been little research on the effects of XBRL. In this context, we propose in our study to determine the impact of the mandatory adoption of XBRL on firms' stock liquidity. Blankespoor, Miller and White (2014) and Liu, Luo, *et al.* (2014) find that XBRL increases information asymmetry and reduces the firm's stock liquidity. Yoon, Zo and Ciganek (2011), Li, Ni and lin (2012), Tzu-Yi *et al.* (2016) and Liu, Luo and Wang (2017) find that the information asymmetry is reduced after the adoption of XBRL and the firm stock's liquidity is improved. The explanation of their different findings is the use of different methodologie. They examine different period of time and use different sample.

Previous studies indicate also that the differences in firms' stock liquidity derive from the legal protection and the nature of the information environment. The civil law system generates less investor protection and shareholder rights than the common law system, which leads to higher investor demand for activities that reduce information uncertainty and company risk (Abdolmohammadi *et al.*, 2017). Therefore, we will also determine the effect of the legal system on the relationship between the mandatory adoption of XBRL and firms' stock liquidity.

In our study, we conducted an empirical analysis using a sample of 980 firms from 13 countries for a period from 2000 to 2016. We find that the mandatory use of XBRL positively impacts the firm's stock liquidity measured by the Amihud's (2002) illiquidity ratio. We also find that the legal system moderates the association between the mandatory adoption of XBRL and firm's stock liquidity. The mandatory adoption of XBRL positively impacts the firm's stock liquidity both in civil law countries and in common law countries. However, the impact of the mandatory adoption of XBRL is more pronounced in civil law countries.

To the best of our knowledge, this is the first cross-country study that investigates the impact of mandatory adoption of XBRL on firm's stock liquidity. We use a number of firms from different countries and from different legal system. The majority of research that has examined the relationship between XBRL and liquidity is focused on one country. In addition, studies have focused on developed countries especially the case of United-States. In our study, we use different countries, developed and developing countries, with a long period of time. Our study enriches the investigation of the consequences of the use of XBRL. We confirm the positive consequences of XBRL in general and especially for civil law countries.

Understanding the economic consequences of XBRL is an important issue for companies, regulators, investors and XBRL International organization. Companies that need to know if the benefits of XBRL outweigh the costs of its adoption. Our study can help companies to better understand the factors that may affect stock liquidity. The results of our study provide insights on the positive benefits of XBRL. Companies have to provide investors with better presentation of information in order to reduce information asymmetry and thus improve stock market liquidity. Countries that mandate the adoption of XBRL seem to be more attractive to investors. The findings confirm previous works that suggest that the mandatory adoption of XBRL benefits investors and especially small investors. For example, our study confirms the results of Blankespoor (2019) that finds that firms in United-States increase their quantitative footnote disclosures upon implementation of XBRL detailed tagging requirements. According

the Blankespoor (2019), for firm to receive the benefits of disclosure, market participants must process the information disclosed. Thus, when processing costs prevent participants from fully responding to disclosure, the extent of disclosure benefits could be muted and firm disclosure choices affected. XBRL helps to reduce processing costs for users. For example, XBRL enables market participants to do additional processing of the information by allowing them to receive more information at a lower cost, with saved time and resources and by allowing more detailed comparisons (Blankespoor, 2019). Hence, we posit that the adoption of XBRL helps to reduce the cost of external finance and contributes to the development of the stock market.

For regulators, the results demonstate that the adoption of XBRL helps to improve the value relevance of disclosure. Therefore, regulators that do not yet mandate the use of XBRL in their jurisdictions should think about making XBRL mandatory. Given the benefits of XBRL, investor will be motivated to request the adoption of this mean of disclosure especially in civil law countries.

Furthermore, our study increases the awareness about XBRL. It helps XBRL International organization that oversees the development of XBRL and encourages its adoption in its mission by improving the level of knowledge about this language and about its benefits.

The rest of this paper is structured as follows: Section 2 presents the background and hypotheses development. Section 3 provides the research methodology. Section 4 reports the empirical analysis and results and Section 5 concludes the paper.

2. Background and hypotheses development

2.1. Background

Information asymmetry occurs when some economic agents have more information than the others. Information asymmetry takes the form of adverse selection and/or moral hazard (Akerlof, 1970; Jensen and Meckling, 1976; Bahmani, 2014; Rodrigues and Galdi, 2017). It has different adverse outcomes, such as transaction costs, low liquidity market and increasing cost of capital. Management is encouraged to reduce this asymmetry and disclose more voluntary information (Bahmani, 2014; Inchausti, 1997). According to Ragothaman (2012), one way to mitigate the information asymmetry problem is to improve disclosures through the adoption of XBRL. When a firm provides financial reports in a high-quality, in a standard format (XBRL), it is likely to be regarded as less risky by investors. This favorable perception could decrease the cost of capital for the firm and its stock price could go up.

Presenting financial reporting via XBRL is a good decision in terms of transparency, timeliness and relevance of financial reporting information. Regulators have made XBRL financial reporting mandatory, so that they can monitor business performance and thereby reduce fraud (Manmohan and Pk, 2014).

XBRL provides a format that facilitates access and reuse of information. Its adoption makes it easier to analyze, compare and reuse of information. As a result, overall transparency will be improved (PriceWaterHouseCoopers, 2003). A more reliable financial reporting system can improve the corporate transparency, which can help the market to better oversee the firm, and attract foreign investors (Wang, Wen and Seng, 2014). The adoption of XBRL facilitates communication between market participants and improves the quality of decisions of stakeholder and if a company provides financial reports in a high quality, standard format, investors are likely to evaluate the company as less risky (Talebnia, 2016). According to Hao, Zhang and Fang (2014), there are at least three reasons to explain the effect of XBRL on the reduction of the cost equity capital. First, XBRL may reduce capital cost through "improved information transparency". XBRL has the potential to improve comparability and consistency of information, enhances accessibility and usability to financial and nonfinancial information, and increase financial disclosure. Second, XBRL may "reduce transaction cost". Implementing XBRL may incur additional costs at the beginning of such adoption. In the long run, however, XBRL will lower the cost of producing information. Third, adopting XBRL may "increase liquidity" and "decrease firm risk".

XBRL helps stakeholders to easily and quickly access the information that is available. Thereby, allowing them to focus more on analyses of the data rather than on data compilation or gathering. It can help investors with limited resources (Peng, Shon and Tan, 2011; Wallace, 2001).

XBRL has several advantages for financial analysts. For example, according to Liu, Wang and Yao (2014), XBRL allows analysts to save more time for more analysis in order to increase forecast accuracy by reducing manual tasks or waiting time for additional data from data intermediaries (e.g., information consolidators). Many studies find that the adoption of XBRL has a positive impact on both analyst following and forecast accuracy (Li, Lin and Ni, 2012; Zhang, Riordan and Weinhardt, 2013; Liu, Wang and Yao, 2014; Felo, Kim and Lim, 2018). For example, Zhang, Riordan and Weinhardt (2013) find that the number of analysts following a firm's stock increased after the voluntary introduction of XBRL using a sample of

92 US companies during the period 2005 and 2009. The number of analysts who follow a company is important because it represents the asymmetry of information between investors and companies (Zhang, Riordan and Weinhardt, 2013). Financial analysts provide a means of ensuring that all of the company's information is presented to stock market participants (Farooq and Satt, 2014). Consequently, financial analysts help to reducing information asymmetries (Lakhal, 2007; Farooq and Satt, 2014; Yao and Liang, 2019). They can resolve inefficiencies in governance mechanisms by providing new information to stock market participants (Farooq and Satt, 2014).

XBRL benefits also to auditors. XBRL enables continuous auditing. It allows auditors to generate reports in much shorter time than the traditional model. Short timelines during the audit can trigger corrective actions in a much more useful way than traditional audits (Reyes, Rodríguez and Dolado, 2007). Audit is a way to reduce information asymmetry and agency costs (Almutairi, Dunn and Skantz, 2009).

Several authors show that the economic consequences of information disclosure vary depending on the country's legal regime and the level of investor protection (Brockman and Chung, 2003; Wang, Liao and Deng, 2003; Chhabra, Ferris and Sen, 2009; Farooq and Derrabi, 2012, 2013; Chebaane and Ben Othman, 2014; Shi *et al.*, 2015; Tang and Chang, 2015; Chen, Lobo and Chen, 2016; Persakis and Iatridis, 2017). In general, the legal systems come from two main traditions: common law which is of English origin and civil law which comes from Roman law and which is subdivided into three main families, namely French civil law, Germanic civil law and Scandinavian civil law. The civil legal tradition is the oldest, the most influential and the most frequently applied in the world (La Porta et al. 1997; La Porta *et al.*, 2000; La Porta, Lopez-de-silanes, and Shleifer, 2008).

Some prior research finds also that the extent of benefits of XBRL depend to the country's legal system (Shan, Troshani and Richardson, 2015; Abdolmohammadi *et al.*, 2017). For example, Shan, Troshani and Richardson (2015) find that the effect of the mandatory use of XBRL on agency costs is greater in the United States (a common law country) than in Japan (a non-common law country).

2.2. Hypotheses development

Voluntary disclosure of information is a way to mitigate information asymmetry and agency conflicts and deters managers from opportunistic behavior (Loukil and Yousfi, 2012). According to Guidara, Khlif and Jarboui (2014), the timeliness and the extent of voluntary

disclosure represent two essential mechanisms of corporate transparency. Reliable and transparent corporate disclosure will lead to greater investor confidence (Tamara and Hutagaol, 2013). Greater and high quality information disclosure improves information transparency and reduces investors' uncertainty and risk with regard to the future performance of a company which in turn increases demand for a firm's securities and enhance market liquidity (Hao, Zhang and Fang, 2014). In contrast, when there is a risk of information due to a lacks of transparency in financial information, investors seek to protect themselves against the expected risks, which result a higher cost of capital for the firm (Chen *et al.*, 2015).

According to Abdullah and Ismail (2008), voluntary disclosure is becoming more important to the business community in making decisions in line with the increasing sophistication of business operations. Disclosure of information to market can provide companies with advantages over their competitors (Jullobol and Sartmool, 2013). It can reduce information asymmetry, improve stock liquidity and reduce the firm's cost of capital (Welker, 1995; Botosan, 1997; Poshakwale and Courtis, 2005; Petersen and Plenborg, 2006; Lakhal, 2008; Haddad, AlShattarat and Nobanee, 2009; Kuo and Lin, 2014; Guidara, Khlif and Jarboui, 2014; Akrout and Ben Othman, 2015). For example, Petersen and Plenborg (2006) find a negative relationship between voluntary disclosure and different proxies for information asymmetry in the case of Denmark. According to Petersen and Plenborg (2006), if firms focus on improving the level of disclosure, they get the attention of investors. As a result they may experience lower cost of capital and more efficient prices on shares. Haddad, AlShattarat and Nobanee (2009) find the same result using a sample of Jordanian non-financial companies. Kuo and Lin (2014) find a positive association between disclosure levels and stock market liquidity in Taiwan.

In addition, with the development of the Web as a means of information disclosure, several empirical studies have examined the utility and the effect of the information disclosed of the website (Al-Htaybat, 2011; Abdi *et al.*, 2018; Abdi and Omri, 2020; Al-Sartawi and Reyad, 2019; Gajewski and Li, 2015; Ben Saada *et al.*, 2010). For example, Gajewski and Li (2015) and Ben Saada *et al.* (2010) find that Internet disclosure reduces the level of information asymmetry and improves the stock market liquidity in France. According to Abdi and Omri (2020) and Abdi, Kacem and Omri (2018), the use of the Web to disseminate information allows providing immediate, up-to-date and relevant information to users and consequently, it allows a more transparent disclosure and leads to improve firm's transparency. Internet disclosure allows a diffusion of information worldwide and facilitates the availability of information.

The use of XBRL is more advantageous than the traditional web format. XBRL does not intend to modify any of the Generally Accepted Accounting Principles (GAAP) but to present them (Reyes, Rodríguez and Dolado, 2007). The financial reporting under XBRL format is not intended to provide new information other than that reported in the traditional format (Peng, Shon and Tan, 2011).

The adoption of XBRL ensures the quality of the information disclosed and allows users to trust the data communicated. The higher is the quality of information, the stronger is the corporate governance and the less important is the information asymmetry. Managers will have less incentive to hide information. As a consequence, companies with stronger governance, less information asymmetry should have high stock liquidity (Peng, Shon and Tan, 2011; Yoon, Zo and Ciganek, 2011; Liu, Luo and Wang, 2017; Birt, Muthusamy and Bir, 2017). In Korea, Yoon, Zo and Ciganek (2011) compare the period before and after the mandatory adoption of XBRL, from December 2006 to August 2007 and from December 2007 to August 2008 to investigate the association between the adoption of XBRL and the information asymmetry. Yoon, Zo and Ciganek (2011) find that XBRL reduces information asymmetry in the capital market. In Belgium, Liu, Luo and Wang, (2017) find that the adoption of XBRL is associated with a significant increase in liquidity and decrease in information asymmetry during the period 2005-2010. In United-States, Li, Lin and Ni (2012) find the same result.

Furthermore, the use of XBRL shows that the country is up to date, modern and uses the latest technology than the old methods. XBRL enables to improve the firm´s reputation in the capital markets (Bonsón, Cortijo et Escobar, 2009). According to Ra and Lee (2018), if the investors view XBRL adoption as good news, then they are willing to pay a higher price for shares of firms under the XBRL system. Therefore, we hypothesise:

H1: The mandatory adoption of XBRL has a positive impact on firm's stock liquidity

Companies in countries with strong investor protection have more disclosure and a high level of transparency (Ben Othman and Zeghal, 2008; Ben Othman and Zeghal, 2010; Gruszczyński, 2010; Chebaane and Ben Othman, 2014). According to Huang *et al.* (2014), outside investors are only willing to trade stocks if they know that the returns on their investments are well protected by laws and will return to them than being entrenched by corporate managers. In this sense, strong investor rights stimulate financial market participation.

The key mechanism of protecting outside investors, whether they are shareholders or creditors, is the legal system, including both laws and their enforcement. When investor rights such as the voting rights of the shareholders and the reorganization and liquidation rights of the creditors are extensive and well enforced by regulators or courts, investors are willing to finance firms. In contrast, when the legal system does not protect outside investors, corporate governance and external finance do not work well (La Porta *et al.,* 2000). Better legal protection assures investors that in addition to their original investment, more of the firm's profits will come back to them in the form of dividends and interest, and this assurance motivates them to pay more for the financial assets offered by the entrepreneur (Anderson and Gupta, 2009).

According to Brockman and Chung (2003), the legal / regulatory environment largely determines the quantity and reliability of publicly available information, particularly at the firm level. Insufficient regulations and institutions facilitate the presence of informed investors (Hanousek and Podpiera, 2003). According to Haidar (2009), when laws fail to stop self-dealing, the concentration of ownership becomes greater. La Porta, Lopez-de-silanes, *et al.* (1997) investigate the link between the legal environment and the capital markets using a sample of 49 countries. They find that the legal environment, measured by both the legal rules and the quality of law enforcement, has an important effect on the ability of companies in different countries to obtain more external funding. They find that common law countries have the best protection for investors and benefit from better access to external financing than civil law countries, and in particular French civil law countries.

The legal environment has a strong influence on the business activities of a country, as investors will tend to look for places where contracts are enforced. Poor compliance with contracts can have an influence on investor's willingness to commit their wealth to fund projects (Gomez, 2016). In common law countries, managers have less flexibility to exercise their discretion over published results (Kobeissi, 2005). Investments tend to be low in countries with high risk of expropriation and low property rights (Gomez, 2016).

Therefore, the benefits of the introduction of XBRL will help more civil law countries than common law countries. XBRL enables companies to improve their investor relations by providing more transparent and user-friendly information (Financial Reporting Council, 2009). XBRL makes information more easily accessible. It serves as a signal for better corporate governance and innovation. It helps also to mitigate the increased risk of information when there is high complexity in the information environment (Zhang, Riordan and Weinhardt, 2013; Kim, Lim and No, 2012).

Therefore, we believe that the impact of the mandatory adoption of XBRL on stock liquidity in civil law countries is more pronounced than in common law countries. Based on these arguments, we hypothesise that:

H2: The effect of the mandatory XBRL adoption on firm's stock liquidity is higher in civil law countries than in common law countries

3. Research Methodology

3.1. Sample selection and data

We use companies in countries requiring the adoption of XBRL. We use all countries that have mandated the adoption of XBRL for its listed firms and which the data is available (please refer to Table 1). We eliminate financial firms from the sample because they face specific regulations in comparison to other companies (Ibrahim and Samad, 2011; Tang and Chang, 2015).

The countries that have mandated XBRL and included in our analysis are the following: India, United-States, Singapore, Israel, China, Chile, South Korea, Japan, Spain, Belgium, United Arab Emirates, Saudi Arabia and Denmark. Taiwan has adopted XBRL in 2010, however, we dropped it due to the unavailability of data at country-level. Our final sample consists of 980 companies from 13 countries. We randomly choose our sample. Our sample represents 34 industries.

Our study covers a period of 17 years, from 2000 to 2016. We start in 2000 to ensure that the period preceding the mandatory adoption of XBRL is sufficiently long. The first country that mandated the adoption of XBRL is China in 2004. Our sample consists of 16,592 observations.

The data relating to our dependent and control variables are collected from Datastream, Worldscope, WorldBank and Thomson One. We collected the data about the legal system from factbook. For the independant variable, the mandatory adoption of XBRL is collected from different sources like the website of XBRL International (https://www.xbrl.org/), research papers (such as Yoon, Zo and Ciganek, 2011; Peng, Shon and Tan, 2011; Liu, Luo and Wang, 2017; Bai, Sakaue and Takeda, 2014) and reports published by members of the XBRL International organization (such as O'Kelly, 2010; Rønmos, 2015). We also used the website of the Ministry of Corporate Affairs of India (www.mca.gov.in/XBRL) (please refer to Table 1 and 2).

Insert Table 1 here

3.2. Model development

$$
\begin{aligned}
&\boldsymbol{LIQUIDITY_{it}} \\
&\quad = \boldsymbol{\alpha + \beta_1 ADOPXBRL_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 VOLU_{it} + \beta_5 PRIC_{it}} \\
&\quad + \boldsymbol{\beta_6 RVOL_{it} + \beta_7 TANG_{it} + \beta_8 AGE_{it} + \beta_9 BETA_{it} + \beta_{10} DEV_{it}} \\
&\quad + \boldsymbol{\beta_{11} INFL_{it} + \beta_{12} LENF_{it} + YEAR\ EFFECT + INDUSTRY\ EFFECT} \\
&\quad + \boldsymbol{COUNTRY\ EFFECT + \varepsilon_{it}}
\end{aligned}
$$

Dependant variable

In our study, we measure our dependant variable, LIQUIDITY, by the Amihud's illiquidity ratio (ILLIQ) (see Table 2 for variables definition).

Several studies use the Amihud's illiquidity measure (ILLIQ) (e.g. Espinosa, Tapia and Trombetta, 2005; Tang and Wang, 2011; Ascioglu *et al.*, 2012; Al-Jaifi, 2017; Al-Jaifi, Al-rassas and AL-Qadasi, 2017). This measure was proposed by Amihud (2002). It is calculated as follows:

$$ILLIQ_{iy} = \frac{1}{D_{iy}} \sum_{t=1}^{Diy} \times \left|R_{iyd}\right| / VOLD_{iyd}$$

The illiquidity ratio is the daily ratio of absolute stock returns to trading volume (in dollars), averaged over a certain period (Amihud, 2002).

With: D_{iy} is the number of days for stock i in year y, R_{iyd} is the return on stock i in day d in year y, and $VOLD_{iyd}$ is the respective daily trading volume in dollars. It can be interpreted as the daily stock price reaction to a dollar of trading volume (Amihud, 2002; Espinosa, Tapia and Trombetta, 2005; Tang and Wang, 2011). When a particular stock has a high ILLIQ value, it indicates that the price fluctuates greatly in reponse to trading volume and, therefore, the security is considered illiquid (Espinosa, Tapia and Trombetta, 2005). The ILLIQ captures the depth and resilience of stocks, by dividing the absolute value of the stock return by the dollar value of the trading volume. This gives an estimate of the magnitude of the stock price movement generated by a given level of equity trading volume (Al-Jaifi, 2017).

Independent variable

The mandatory adoption of XBRL (ADOPXBRL) is a dummy variable. It takes the value of 0 if the period is before the mandatory adoption of XBRL, and 1 if the period is after the mandatory adoption of XBRL.

Control variables

This study uses some control variables that may affect the firm's stock liquidity. We include firm size (SIZE), which is the natural logarithm of total assets (Liu, X. (Robert) Luo, *et al.*, 2014; Shiri, Salehi and Radbon, 2016; Nagata and Nguyen, 2017). Prior research shows that there is a positive correlation between a firm's extent of disclosure and its size (Jaworska and Matusiewicz, 2015) and there is a positive association between SIZE and firm's stock liquidity (Tang and Wang, 2011; Iskandrani, 2016). Therefore, we expect a positive correlation between SIZE and liquidity.

The variable leverage is also included. Several studies find a significant relationship between leverage (LEV) and corporate liquidity (e.g. Bai, Sakaue and Takeda, 2014; Al-Jaifi, Al-rassas and AL-Qadasi, 2017). It is defined as the ratio of total debt divided by total assets at the end of the year (Tang and Wang, 2011; Rodrigues and Galdi, 2017). Previous studies that examine the link between stock liquidity and capital structure find that firms with lower stock liquidity tend to be more leveraged (Lipson and Mortal, 2009; Udomsirikul, Jumreornvong and Jiraporn, 2011). A negative correlation is expected between LEV and liquidity.

Then, the variable trading volume (VOLU), we measured it by the annual average of daily trading volume (Ascioglu *et al.*, 2012; Frino *et al.*, 2013; Ghorbel and Omri, 2013; Shiri, Salehi and Radbon, 2016; Ajina and Habib, 2017). We anticipate a negative relationship between trading volumes and the Amihud's illiquidity ratio.

The price (PRIC), return volatility (RVOL), asset tangibility (TANG), firm age (AGE) and Beta (BETA) are also included.

Price (PRIC): is measured by the average of daily closing prices of each year (Ascioglu *et al.*, 2012; Frino *et al.*, 2013; Ajina, Lakhal and Sougné, 2015; Iskandrani, 2016; Shiri, Salehi and Radbon, 2016). We expect a negative relationship between share price and the Amihud's illiquidity ratio. Stocks with low prices tend to be more risky (Gajewski and Li, 2015). For

example, in France, Ajina and Habib (2017) find that stock price significantly improves the liquidity.

Return volatility (RVOL) is measured by the standard deviation of daily stock returns (Roulstone, 2003; Iskandrani, 2016; Ajina and Habib, 2017; Al-Jaifi, 2017; Al-Jaifi, Al-rassas and AL-Qadasi, 2017; Gajewski and Li, 2015). This variable reflects information uncertainty or risk in the capital market (Yoon, Zo and Ciganek, 2011; Loukil and Yousfi, 2012; Iskandrani, 2016; Gajewski and Li, 2015). Most studies show that high volatility stocks are riskier and consequently less liquid (Dumontier and Maghraoui, 2006; Ben Saada *et al.*, 2010; Ajina, Lakhal and Sougné, 2015; Al-Jaifi, 2017). We expect the relationship between liquidity and volatility to be negative.

Asset tangibility (TANG), is the net property, plant, and equipment divided by total assets (Prommin, Jumreornvong and Jiraporn, 2014; Al-Jaifi, Al-rassas and AL-Qadasi, 2017). Tangible asset payoffs are easier to observe, which leads to a weak information asymmetry (Al-Jaifi, 2017; Al-Jaifi, Al-rassas and AL-Qadasi, 2017). Therefore, we expect a positive association between asset tangibility and liquidity.

Firm age (AGE) corresponds to the number of years since the company is listed (Almutairi, Dunn and Skantz, 2009; Prommin, Jumreornvong and Jiraporn, 2014). According to Claessens *et al.* (2002), older firms have better disclosure, more liquid trading, more attention from analysts, and more diversified activities leading to lower risk of financial distress. Kaya (2014) states that older firms have more experience with financial reporting and improve their financial reporting practices over time. On the other hand, younger and smaller firms may have more growth opportunities. Ouimet and Zarutskie (2014) find that young companies employ more young workers and exhibit higher growth. Therefore, we estimate a significant association between firm age and liquidity.

Beta (BETA) is included to control for systematic risk (Petersen and Plenborg, 2006; Haddad, AlShattarat and Nobanee, 2009; Barus and Siregar, 2014). According to Barus and Siregar (2014), higher beta indicates higher risk, which will increase investors' required return, consequently, increase cost of equity. Hence, it is expected to be positively associated with the the Amihud's illiquidity ratio.

In addition to firm-specific variables, we use country-level variables that may affect liquidity. We use market development (DEV)[1] measured by market capitalization divided by real country GDP (Gupta, Krishnamurti and Tourani-rad, 2018; Archambault and Archambault, 2003). We include also inflation (INFL) (Zhu, 2014; ElBannan, 2017). We use the annual change in inflation. Finally, we include the variable law enforcement (LENF). This variable is measured by the mean score (index)[2] across the assessment of regulatory quality, rule of law, and control of corruption (Ben Othman and Zeghal, 2008; Zhu, 2014).

The year effect, industry effect and country effect are included as dummy variables to capture possible variations.

Insert Table 2 here

4. Results and discussion

4.1. Descriptive statistic

The descriptive statistics for the total sample in Table 3 (Panel A) reveal that the average of the Amihud's illiquidity ratio is 3.504 before the mandatory adoption of XBRL and 4.248 after the mandatory adoption of XBRL. It varies widely among the 980 firms with a minimum of 0.00001and a maximum of 93.262.

The variables are compared between the pre-mandatory adoption and the post-mandatory adoption periods of XBRL using the Mann–Whitney test. In general, this test is used to compare the average rank of a given variable in two groups of observations (Kolsi and Zehri, 2013). It examines the statistical significance level of difference between two average ranks. We applied the Mann-Whitney test because our variables are non-normal. We used the Shapiro-Wilk test to check the normality. The results of the Mann-whitney test show a significant difference for all the variables.

For the independant variable, the mandatory adoption of XBRL (Table 3, Panel B), 49.72 percent represents firm-year observations where XBRL is mandatory for listed

[1] For this variable, we find a lot of missing values, therefore, we use the linear interpolation method to estimate the missing values.

[2] We used the Principal Component Analysis (PCA) to group the variables regulatory quality, rule of law, and control of corruption into a single variable which is the law enforcement. The law enforcement is calculated as the mean score of three mentioned variables because we observed high correlations between these variables. The Kaiser-Meyer-Olkin (KMO) is 0.7846 > 0.5 (A limit that indicates that the data is adequate to use the PCA).

companies. In contrast, 50.28 percent represents firm-year observations where XBRL is not mandatory and is not adopted.

Insert Table 3 here

Table 4 reports the descriptive statistics by country of the dependents and control variables used in the empirical analysis. From Table 4, we find controversial results of our variables. For example for our dependant variable, we find that ILLIQ, decreased after the mandatory adoption of XBRL for some countries and increased for some other countries. For example, for United-States, we find that ILLIQ decrease. The mean of the ILLIQ for the post-adoption period (3.305) is lower than that for the pre-adoption period (3.835), which confirms our hypothesis H1. In contrast, for Singapour and United Arab Emirates for example, we see that the ILLIQ increase after the mandatory adoption of XBRL, which is in conflict with hypothesis H1.

Insert Table 4 here

4.2. Correlation analysis

The correlation of variables is presented in Table 5. Pearson correlation coefficients among independant variables are all below 0.6. Therefore, we do not observe any high correlations that may affect our regression results. In addition, the values of the variable inflation factor (VIF) and the tolerance values indicate the absence of a serious problem of multicollinearity (Table 6). As a rule of thumb, there is a problem of multicollinearity between a model's independent variables when VIF values exceed 5 and the tolerance values are lower than 0.1 (Groebner *et al*., 2008).

Insert Table 5 here

Insert Table 6 here

4.3. Regression analysis

In this study, we eliminated the fixed effects model because our model contains time invariable variables which are the dichotomous variables: the industry effect and the country effect and the variable Beta. The objective of controlling the dichotomous variables is to

eliminate any possible effect that could bias the result.We winsorized also all continuous variables at the 1st and 99th percentile to moderate the possible effects of extreme outliers.

Then to check whether or not there are individual effects, we carried out the "Breusch-Pagan Lagrangian Multiplier" test. The ''Breusch-Pagan Lagrangian Multiplier'' test helps us to choose between a random effects regression and ordinary least squares regression. The null hypothesis of this test is that the variances across entities are zero. There is no significant difference across units (the absence of individual effect). The result of this test shows a significant chi-square (Prob> Chi2 = 0.000). This allows us to confirm the existence of individual effects and thus to retain the random effects model. In addition, according to Baltagi (2005) and Ascioglu *et al.* (2012), the random effects model is the appropriate specification if companies are randomly selected from a larger population.

Then, the heteroskedasticity of our model was tested using the Breusch-Pagan test under the null hypothesis that the variance of residuals is homogenous. The test returns a $\chi 2$ statistic of 46776.91 and a Prob. > $\chi 2$ = 0.000. The Breusch–Pagan heteroscedasticity test is significant for our model indicating the presence of a heteroscedasticity problem. In addition to heteroskedasticity, we test for the presence of serial correlation. This test verifies the hypothesis that, the error terms are uncorrelated. Since the observations have a panel structure, we use the Wooldridge autocorrelation test for panel data. For our model, the test is significant at the 1% level indicating the presence of a problem of autocorrelation (Prob> F is less than 0.05). Therefore, to make the necessary corrections and as we are in case of short panel data, we use the random effects regression with the "cluster" option.

The results for our fist hypothesis (H1) reported in Table 7 show that the coefficient of the mandatory adoption of XBRL is negative and is significantly related to the Amihud's illiquidity proxy (ILLIQ) at the 5% level. Therefore, we confirm that the mandatory adoption of XBRL improves the firm's stock liquidity, which supports hypothesis H1. This finding is consistent with the view that an increase of the information quality and transparency reduce information asymmetry and increase firm's stock liquidity (Botosan, 1997; Haddad, AlShattarat and Nobanee, 2009; Ascioglu *et al.*, 2012; Prommin, Jumreornvong and Jiraporn, 2014). Investors react positively to the quality of the disclosed information (Ajina and Habib, 2017). Our result shows the benefits from the adoption of XBRL and confirms the studies that show that investors benefit from its using (Blankespoor, 2019; Tzu-Yi *et al.*, 2016; Yoon, Zo and Ciganek, 2011; Peng and Shon, 2011; Bai, Sakaue and Takeda, 2014; Felo, Kim and Lim, 2018;

Hao, Zhang and Fang, 2014; Hodge, Kennedy and Maines, 2004; Kim, Lim and No, 2012; Birt, Muthusamy and Bir, 2017; Ra and Lee, 2018). For example, according to Peng and Shon (2011), as XBRL provides investors with greater accessibility to more precise information in a timely manner, investors can better scrutinize reported information for accounting irregularities.

For the firm-level variables, the coefficient for firm size is significant at the level of 1% and negative. This result indicates that larger firms exhibit higher stock liquidity. The coefficient indicates that 1 point increase on the firm size will lead to an estimated 0.662 decrease in the Amihud's illiquidity ratio. This result is consistent with previous studies (Bai, Sakaue and Takeda, 2014; Liu, Luo, *et al.*, 2014; Prommin, Jumreornvong and Jiraporn, 2014; Al-Jaifi, 2017). For the variable trading volume, it is significant at 1% and negative. Ajina, Lakhal and Sougné (2015) find also the same result in France. Hence, we can conclude that when the intention of selling and buying tends to increase, firm's stock liquidity increase. For the return volatility, it is negative and significant at 5% level. The cofficients of return volatility indicates that 5% increase in the volatility of return will lead to an increase of 0.004 of the illiquidity. The cofficients is small but also significant. This result is consistent with Prommin, Jumreornvong and Jiraporn (2014), Hakim and Omri (2010), Ajina, Lakhal and Sougné (2015) and inconsistent with Kanagaretnam, Lobo and Whalen (2007), Ben Saada *et al.* (2010). Firm age is significant at 1% and positive which is in line with the result of Prommin, Jumreornvong and Jiraporn (2014). Therefore, when the firm becomes older, its liquidity becomes less. The coefficient indicates that 1 point increase of age, significantly increase the illiquidity by 0.250 point. The variable beta is negative and significant at the 0.01 level. Hence, firms with high betas experience a lower Amihud's illiquidity ratio, which is contrary to our expectations.

For the country-level variables, we find a positive and significant relationship at 5% between the law enforcement and the Amihud's illiquidity ratio. Previsous literature confirms usually that better law enforcement has a positive effect and improves firm's stock liquidity. Our result contradicts previous studies (Persakis and Iatridis, 2017; Gomez, 2016; Shi *et al.*, 2015).

Insert Table 7 here

In our second hyothesis (H2), we examine whether the effect of the mandatory adoption of XBRL is more significant for firms listed in civil law countries than in common law

countries. The results presented in table 8 indicate that the effect of the mandatory use of XBRL is significant for both common law and civil law countries. However, the effect is more prononced for civil law countries. We find a negative and significant at the level of 5% association between the mandatory adoption of XBRL in civil law countries and the Amihud's illiquidity ratio. In contrast, we find that the effect of XBRL in common law countries is slightly. We find negative and significant association at 10% level between the mandatory use of XBRL and the Amihud's illiquidity measure. Therefore, our second hypothesis (H2) is accepted. Usually, civil law countries are characterized by low level of disclosure and low investor protection compared to common law countries (La Porta, Lopez-De-Silanes, *et al.*, 1997; Archambault and Archambault, 2003; Brockman and Chung, 2003; Chung, 2006; Ben Othman and Zeghal, 2008; Haidar, 2009; Gruszczyński, 2010). Therefore, the adoption of XBRL is a way to reassure investors about the quality of information. A lot of studies indicate that XBRL improves the quality of firm disclosures (Efendi, Park and Subramaniam, 2010; Peng, Shon and Tan, 2011; Birt, Muthusamy and Bir, 2017; Ra and Lee, 2018). According to Ra and Lee (2018), firms suffering from high information asymmetry are more likely to experience a greater benefit when the XBRL system is introduced. A decrease in information asymmetry and an improvement in the quality of information improve firm's stock liquidity (Ascioglu *et al.*, 2012; Ajina and Habib, 2017; Al-Jaifi, 2017). According to Kim, Lim and No (2012), XBRL is more effective communication tools, which enables firms to improve their relations with investor by providing more transparent and user-friendly information. Therefore, we can state that the adoption of XBRL benefits more the firms listed in civil law countries than firms in common law countries.

For control variables, we find that size, trading volume, return volatility, age, beta and law enforcement affect significantly firm's stock liquidity in common law countries. For civil law countries, firm liquidity is affected significantly by age and beta.

Insert table 8 here

Additional Analysis

According to ElBannan (2017), emerging countries have different characteristics from developed countries. Emerging countries have less developed capital markets and financial institutions, high information asymmetry, and less sophisticated financial markets dominated by banks as main sources of financing. For this, the impact of the mandatory adoption of XBRL on firm's stock liquidity may differ from developed and developing countries.

Therefore, we separate our sample into developed and developing countries and we examine the effect of the mandatory use of XBRL on stock liquidity. Table 9 displays the results. The mandatory adoption of XBRL affects negatively and significantly at the 1% level the Amihud's illiquidity ratio in developed countries. In contrast, we find no significant relationship between the mandatory adoption of XBRL and the Amihud's illiquidity ratio in developing countries. Therefore, XBRL mandatory adoption improves firm's stock liquidity in developed countries. The implementation of XBRL does not add value to developing countries and investors are still viewing developed countries are more transparent. The adoption of XBRL does not mitigate existing problems in developing countries. Developing countries often face problems. For example, underdeveloped and illiquid stock markets, economic uncertainties and frequent government intervention (Tsamenyi, Enninful-adu and Onumah, 2007).

Insert table 9 here

5. Conclusion

This study investigates the relationship between the mandatory adoption of XBRL and the firm's stock liquidity using a sample of 980 firms across 13 countries. We find that the mandatory adoption of XBRL improves firm's liquidity. Whence, we can confirm the advantage of using XBRL. According to Kim, Lim and No (2012), XBRL as a standardized business reporting format is an essentiel tool for market participants due to its ability to improve accessibility and transparency. In addition, we find that the positive effect of XBRL on firm's stock liquidity is significant for civil and common law countries but it is more pronounced in civil law countries.

Our results are potentially important for countries that have not yet mandated the adoption of XBRL, for companies, investors, researchers and professionals. Our findings could encourage countries to adopt or to mandate XBRL. Our study could improve users' knowledge on the benefits of XBRL. Our result could help also companies to find a way to improve investor confidence, and then, improve stock liquidity and reduce the cost of capital.

This paper is subject to the following limitations. This study uses a relatively small sample size of companies. Future studies can repeat our work using a larger sample. In addition, this study does not consider all the aspects of liquidity and uses only one measure of liquidity. Future studies could extend this study and use other proxies for liquidity.

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Table 1: Countries mandating the adoption of XBRL

Table 2 : Variables definition

Country	Legal system	Source	The date of the obligation of XBRL	Source
India	common law	Factbook	From 2011	www.mca.gov.in/XBRL www.xbrl.org
United-States	common law	Factbook	From 2009	www.xbrl.org
Singapore	common law	Factbook	2007	O'Kelly (2010) www.xbrl.org
Israel	common law	Factbook	2008	www.xbrl.org
China	civil law	Factbook	2004	O'Kelly (2010) www.xbrl.org Peng, Shon et Tan (2011)
Chile	civil law	Factbook	2010	O'Kelly (2010) www.xbrl.org
South Korea	civil law	Factbook	2007	O'Kelly (2010) Yoon, Zo et Ciganek (2011) www.xbrl.org
Japan	civil law	Factbook	2007	Bai, Sakaue et Takeda (2014) O'Kelly (2010) www.xbrl.org
Spain	civil law	Factbook	2005	O'Kelly (2010) www.xbrl.org
Belgium	civil law	Factbook	2007	Liu, Luo et Wang (2017) www.xbrl.org
United Arab Emirates	civil law	Factbook	2014	www.xbrl.org
Saudi Arabia	civil law	Factbook	2015	www.xbrl.org
Denmark	civil law	Factbook	From 2012	Rønmos (2015) www.xbrl.org

Variable	Definition	Source
ILLIQ	The Amihud's (2002) illiquidity ratio	Datastream
ADOPXBRL	The mandatory adoption of XBRL takes the value of 0 if the period is before the mandatory adoption of XBRL, and 1 if the period is after the mandatory adoption of XBRL	Please refer to Table 1
SIZE	The natural logarithm of total assets	Worldscope
LEV	Leverage is the ratio of total debt divided by total assets	Worldscope
VOLU	Trading volume is measured by the annual average of daily trading volume	Datastream

PRIC	Price is measured by the average of daily closing prices of each year	Datastream
RVOL	Return volatility is measured by the standard deviation of daily stock returns	Datastream
TANG	Asset tangibility measured by the net property, plant, and equipment divided by total assets	Worldscope
AGE	Number of years a firm has been listed	Datastream
BETA	Beta estimated via the market model	Thomson one
DEV	Market development measured by market capitalization divided by real country GDP	WorldBank
INFL	Inflation measured by the annual change in inflation	WorldBank
LENF	Law enforcement measured by the mean score (index) across the assessment of regulatory quality, rule of law, and control of corruption	WorldBank

Table 3: Descriptive statistics for the total sample

Panel A: distributional statistics of dependent and control variables				
Before the mandatory adoption of XBRL				
Variable	Mean	Std Dev	Minimum	Maximum
ILLIQ	3.504***	11.472	0.00001	93.262
SIZE	12.816***	1.939	8.714	17.997
LEV	0.258*	0.197	0	0.865
VOLU	1341.649***	4261.121	0.190	47057.26
PRIC	15.602***	32.697	0.020	259.837
RVOL	58.789***	208.694	0.004	1766.824
TANG	0.366***	0.233	0.002	0.897
AGE	11.861***	8.124	1	42
BETA	0.947**	0.579	-0.31	2.79
DEV	90.080***	41.785	19.627	258.551
INFL	2.667***	2.384	-1.120	10.907
LENF	0.025***	1.695	-3.126	2.426
After the mandatory adoption of XBRL				
ILLIQ	4.248	13.853	0.00001	93.262
SIZE	13.272	2.011	8.714	17.997
LEV	0.255	0.198	0	0.865
VOLU	3198.955	8311.735	0.190	47057.26

PRIC	18.262	35.526	0.020	259.837
RVOL	80.766	259.541	0.004	1766.824
TANG	0.324	0.229	0.002	0.897
AGE	18.264	8.804	1	42
BETA	0.964	0.575	-0.31	2.79
DEV	97.816	50.870	19.627	259.271
INFL	2.313	2.308	-1.120	10.907
LENF	-0.022	1.701	-3.126	2.408

Panel B : descriptive statistics of the independant variable : The mandatory adoption of XBRL

		Number of firm-year	Percentage of firm-year
ADOPXBRL	0	8343	50.28
	1	8249	49.72

Variables definition :

ILLIQ : The Amihud's (2002) illiquidity ratio ; ADOPXBRL: The mandatory adoption of XBRL takes the value of 0 if the period is before the mandatory adoption of XBRL, and 1 if the period is after the mandatory adoption of XBRL; SIZE : The natural logarithm of total assets; LEV: Leverage is the ratio of total debt divided by total assets; VOLU: Trading volume is measured by the annual average of daily trading volume ; PRIC : Price is measured by the average of daily closing prices of each year ; RVOL: Return volatility is measured by the standard deviation of daily stock returns ; TANG : Asset tangibility measured by the net property, plant, and equipment divided by total assets ; AGE : Number of years a firm has been listed; BETA: Beta estimated via the market model; INFL : Inflation measured by the annual change in inflation; LENF : Law enforcement measured by the mean score (index) across the assessment of regulatory quality, rule of law, and control of corruption

*,** and*** indicate difference significant at 10% level, 5% level and 1% level as per Mann–Whitney test.

Table 4: Descriptive statistics by country

Pre XBRL adoption														
Variable	Mean *United States*	Mean *Chile*	Mean *Spain*	Mean *Belgium*	Mean *Denmark*	Mean *Japan*	Mean *Singapore*	Mean *India*	Mean *South Korea*	Mean *China*	Mean *Taiwan*[3]	Mean *Israel*	Mean *United Arab Emirates*	Mean *Saudi Arabia*
ILLIQ	3.835	0.536	3.483	18.294	2.076	0.025	8.398	5.021	0.00827	0.161	0.120	6.285	2.638	0.044
SIZE	13.406	12.871	13.433	12.976	12.155	13.005	11.923	12.086	12.595	12.274	11.827	12.426	13.292	13.401
LEV	0.262	0.241	0.260	0.271	0.247	0.252	0.272	0.297	0.253	0.245	0.260	0.326	0.171	0.210
VOLU	1152.577	2261.841	2303.491	167.025	288.799	244.084	1681.233	1250.776	473.010	5144.386	1913.832	79.417	3618.531	2367.702
PRIC	26.092	9.224	14.658	31.537	27.255	14.047	2.932	1.948	17.873	0.720	0.777	29.452	1.405	13.124
RVOL	176.2356	0.689	45.517	175.182	53.171	0.242	22.843	9.346	0.083	7.808	0.926	25.821	6.911	10.972
TANG	0.328	0.499	0.355	0.303	0.322	0.354	0.338	0.426	0.377	0.340	0.425	0 .320	0.326	0.479
AGE	13.849	13.041	9.449	13.775	15.982	14.548	11.434	11.605	9.520	6.345	6.866	9.513	4.840	5.501
BETA	1.065	0.729	0.841	0.600	0.743	0.759	0.926	1.132	1.086	1.200	0.828	0.690	0.559	1.031
DEV	125.270	101.414	78.594	70.704	68.698	75.217	171.232	67.110	54.623	42.896		71.901	74.736	91.277
INFL	2.894	3.368	3.233	2.131	2.176	-0.322	0.789	6.026	3.027	0.365		1.518	2.664	2.713
LENF	1.401	0.962	0.805	0.839	2.355	0.469	1.981	-2.542	-0.517	-3.022	-1.014	0.015	-0.609	-2.073

Please refer to Table 3 for the definition of the variables

[3] We included Taiwan just in the descriptive statistics by country due to the unavailability of data for county-level variables

Post XBRL adoption														
Variable	Mean *United States*	Mean *Chile*	Mean *Spain*	Mean *Belgium*	Mean *Denmark*	Mean *Japan*	Mean *Singapore*	Mean *India*	Mean *South Korea*	Mean *China*	Mean *Taiwan*	Mean *Israel*	Mean *United Arab Emirates*	Mean *Saudi Arabia*
ILLIQ	3.305	1.322	4.484	14.112	2.777	0.038	14.600	6.106	0.006	0.092	0.112	9.795	3.853	0.027
SIZE	13.941	13.664	14.104	13.494	12.288	13.306	12.495	12.437	12.860	13.350	12.368	12.504	13.810	13.757
LEV	0.270	0.237	0.322	0.253	0.221	0 .208	0.207	0.286	0.238	0.257	0.244	0.309	0.207	0.248
VOLU	1466.033	2162.35	2586.563	159.270	201.296	369.1461	2603.983	1142.161	406.524	14608.23	1528.205	204.985	3116.448	1258.52
PRIC	29.082	12.321	17.066	44.764	31.954	17.054	2.222	3.487	28.093	1.110	1.197	29.024	1.945	10.961
RVOL	232.892	1.561	91.806	242.827	72.957	0.270	56.093	10.697	0.173	18.660	1.327	43.892	7.633	8.728
TANG	0.325	0.414	0.322	0.286	0.282	0.349	0 .236	0.397	0.325	0.324	0.348	0.260	0.363	0.507
AGE	21.012	20.673	16.699	19.337	23.095	22.286	18.438	19.205	16.261	13.531	13.460	14.78	10.28	10.659
BETA	1.065	0.729	0.841	0.600	0.743	0.759	0.926	1.136	1.086	1.200	0.828	0.690	0.559	1.031
DEV	126.598	104.076	80.434	64.141	104.561	76.973	226.696	67.157	87.675	54.814		71.481	57.317	66.974
INFL	1.372	3.200	1.787	1.880	0.890	0.333	2.430	7.702	2.337	2.814		1.851	2.677	1.638
LENF	1.067	0.986	0.206	0.992	2.246	0.877	2.124	-2.752	-0.255	-2.967	1.304	0.181	-0.016	-1.799

Please refer to Table 3 for the definition of the variables

Table 5 : Pearson correlation

Variable	ADOPXBRL	SIZE	LEV	VOLU	PRIC	RVOL	TANG	AGE	BETA	DEV	INFL	LENF
ADOPXBRL	1.000											
SIZE	0.114***	1.000										
LEV	-0.008	0.198***	1.000									
VOLU	0.137***	0.259***	0.045***	1.000								
PRIC	0.038***	0.205***	-0.021***	-0.116***	1.000							
RVOL	0.046***	0.255***	-0.021***	0.035***	0.151***	1.000						
TANG	-0.092***	0.188***	0.310***	0.057***	0.028***	-0.058***	1.000					
AGE	0.352***	0.251***	-0.022***	0.0003	0.125***	0.397***	-0.024***	1.000				
BETA	0.014*	0.027***	0.046***	0.117***	-0.106***	-0.042***	-0.049***	-0.088***	1.000			
DEV	0.082***	-0.0005	-0.033***	-0.068***	0.035***	0.121***	-0.093***	0.170***	0.007	1.000		
INFL	-0.075***	-0.066***	0.036***	0.011	-0.098***	-0.046***	0.079***	-0.101***	0.108***	-0.120***	1.000	
LENF	-0.014*	0.046***	-0.037***	-0.300***	0.205***	0.170***	-0.104***	0.213***	-0.172***	0.539***	-0.405***	1.000

Variables definition :
ADOPXBRL: The mandatory adoption of XBRL takes the value of 0 if the period is before the mandatory adoption of XBRL, and 1 if the period is after the mandatory adoption of XBRL; SIZE : The natural logarithm of total assets; LEV: Leverage is the ratio of total debt divided by total assets; VOLU: Trading volume is measured by the annual average of daily trading volume ; PRIC : Price is measured by the average of daily closing prices of each year ; RVOL: Return volatility is measured by the standard deviation of daily stock returns ; TANG : Asset tangibility measured by the net property, plant, and equipment divided by total assets ; AGE: Number of years a firm has been listed ; BETA: Beta estimated via the market model; INFL: Inflation measured by the annual change in inflation; LENF: Law enforcement measured by the mean score (index) across the assessment of regulatory quality, rule of law, and control of corruption

*and ***Statistical significant at 10 and 1 percent levels

Table 6: The variance inflation factor (VIF) test

	ADOPXBRL	SIZE	LEV	VOLU	PRIC	RVOL	TANG	AGE	BETA	DEV	INFL	LENF	Mean VIF
VIF	1.21	1.36	1.15	1.32	1.14	1.30	1.18	1.46	1.08	1.60	1.37	2.37	1.38
Tolerance	0.823	0.734	0.868	0.756	0.879	0.767	0.849	0.686	0.927	0.626	0.728	0.421	

Please refer to table 5 for the definition of the variables

Table 7: Regressions based on the total Sample

Variable	ILLIQ	
	Coefficient	P-Value
ADOPXBRL	-0.669	0.015**
SIZE	-0.662	0.001***
LEV	0.548	0.579
VOLU	-0.00004	0.001***
PRIC	0.001	0.685
RVOL	-0.004	0.031**
TANG	-0.621	0.665
AGE	0.250	0.000***
BETA	-3.148	0.000***
DEV	-0.001	0.747
INFL	0.037	0.584
LENF	1.309	0.042 **
Constant	19.640	
Year-effect	Included	
Industry -effect	Included	
Country-effect	Included	
R^2	0.1901	
Wald chi2(64)	300.97	
Prob > chi2	0.000	

Variables definition :

ILLIQ : The Amihud's (2002) illiquidity ratio ; ADOPXBRL: The mandatory adoption of XBRL takes the value of 0 if the period is before the mandatory adoption of XBRL, and 1 if the period is after the mandatory adoption of XBRL; SIZE: The natural logarithm of total assets; LEV : Leverage is the ratio of total debt divided by total assets; VOLU: Trading volume is measured by the annual average of daily trading volume ; PRIC: Price is measured by the average of daily closing prices of each year ; RVOL : Return volatility is measured by the standard deviation of daily stock returns ; TANG : Asset tangibility measured by the net property, plant, and equipment divided by total assets ; AGE: Number of years a firm has been listed; BETA: Beta estimated via the market model; INFL: Inflation measured by the annual change in inflation; LENF: Law enforcement measured by the mean score (index) across the assessment of regulatory quality, rule of law, and control of corruption

The **, and *** significant at 5, and 1 percent levels

Table 8: Regressions based on separate samples of common law and civil law countries

Variable	Sub-sample of common law countries	Sub-sample of civil law countries
	Coefficient (P-Value)	Coefficient (P-Value)
ADOPXBRL	-1.145*	-0.433**
	(0.078)	(0.019)
SIZE	-1.191***	- 0.344
	(0.000)	(0.190)
LEV	0.893	0.371
	(0.609)	(0.636)
VOLU	-0.0001***	0.00000722
	(0.000)	(0.463)
PRIC	0.001	0.007
	(0.714)	(0.144)
RVOL	-0.002**	-0.009
	(0.045)	(0.152)
TANG	0.684	-0.868
	(0.802)	(0.392)
AGE	0.252***	0.264***
	(0.004)	(0.007)
BETA	-3.489***	-2.430***
	(0.000)	(0.000)
DEV	-0.008	0.004
	(0.394)	(0.306)
INFL	0.104	-0.005
	(0.378)	(0.875)
LENF	11.131***	-1.091
	(0.000)	(0.157)
Constant	12.508	21.106
Year-effect	Included	Included

Industry -effect	Included	Included
Country-effect	Included	Included
R^2	0.2136	0.2357
Wald chi2(64)	213.76	191.71
Prob > chi2	0.000	0.000

Please to Table 7 for the definition of the variables

The *, **, and *** significant at 10, 5, and 1 percent levels, respectively

Table 9: Regressions based on separate samples of developed and developing countries

Variable	Sub-sample of developed countries	Sub-sample of developing countries
	Coefficient (P-Value)	Coefficient (P-Value)
ADOPXBRL	-1.443***	0.427
	(0.001)	(0.247)
SIZE	-0.593*	-0.470***
	(0.098)	(0.003)
LEV	0.568	-0.071
	(0.679)	(0.956)
VOLU	-0.0001***	0.00001
	(0.007)	(0.121)
PRIC	0.0007	0.003*
	(0.871)	(0.066)
RVOL	-0.004**	-0.001
	(0.027)	(0.485)
TANG	-1.723	0.252
	(0.517)	(0.793)
AGE	0 .271***	0.083
	(0.000)	(0.132)
BETA	-4.708	-1.001
	(0.000)	(0.078)

DEV	0.002	-0.001
	(0.789)	(0.448)
INFL	-0.546***	0.199***
	(0.000)	(0.002)
LENF	3.359***	-1.104
	(0.000)	(0.132)
Constant	16.565	2.012
Year-effect	Included	Included
Industry -effect	Included	Included
Country-effect	Included	Included
R^2	0.2040	0.1875
Wald chi2(64)	213.87	148.90
Prob > chi2	0.000	0.000

Please refer to table 7 for the definition of the variables

The *, **, and *** significant at 10, 5, and 1 percent levels, respectively