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Firm's information environment and stock liquidity: evidence from Tunisian context

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Abstract

This paper analyzes the relationship between public disclosure, private information and stock liquidity in the Tunisian market. We use a sample of 41 listed firms in the Tunis Stock Exchange in 2007. First, we find no evidence that there is a relation between public and private information. Second, Tunisian investors do not trust the information disclosed in both annual reports and web sites, consequently it has no effects on stock liquidity, in contrast with private information.

Key words: corporate information disclosure, private information, stock liquidity, emergent market.

JEL classification: M41, G10, G14, O55

1. Introduction

It is commonly known that information asymmetry problems lead to the agency conflicts between managers and outside investors, which consequently decrease the volume and number of transactions in capital market (Akerlof, 1970). Voluntary disclosure of information has double role. First, it is a way to mitigate information asymmetry and consequently agency conflicts. In fact, investors use disclosed information to choose profitable projects. Second, even when the project is carried out, information disclosure deters also managers from opportunistic behavior. For example, they cannot take excessive risky

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decisions to expropriate the investors' wealth (Bushman and Smith, 2003). Moreover, Myers and Majluf (1984) argue that disclosure reduces agency costs and even the cost of outside financing (the pecking order theory). Since, "good" managers will be encouraged to disclose more voluntary information, which is, in turn, considered as a good signal of the quality of corporate governance (Chen et al., 2007).

In the last years, corporate information disclosure has received considerable attention: many empirical studies argue that voluntarily disclosure in developed markets which are strongly regulated reduces capital cost³ and improves stock liquidity⁴.

However, in emerging markets, empirical studies are divided and their results are not conclusive: Hassan et al. (2009), Wang et al. (2008) and Chen et al. (2009) show that there is no significant effect of the corporate information disclosure neither on the firm's value nor on financing cost (debt and equity). Gana and Chemli (2008) find that stock liquidity decreases with the level of information disclosure. However, Mattoussi et al. (2004) and Haddad et al. (2009) find a positive relationship between stock liquidity and disclosure level.

Notice that the main source of information in these studies is the information publicly and voluntarily disclosed in annual reports. However, the firm's information environment consists of public information disclosed in annual reports, web sites and conference calls, and private information disseminated through informed trading.

Financial literature on information disclosure argues that public and private information are substitutes (Verrecchia, 1982 and Diamond, 1985) or complement (Kim and Verrecchia, 1991 and McNichols and Trueman, 1994).

In this paper, we raise the question: what is the impact of the informational environment on stock liquidity in the Tunisian market?

To answer this question, we examine how Tunisian investors make investment decisions and if there is a relationship between public and private information. In contrast with Mattoussi et al. (2004) and Gana and Chemli (2008) who were interested only in public information (disclosed in annual reports), we consider both public and private information in annual reports, web sites and order flows.

In Tunisia, the law No 94-117 has fixed mandatory information, the conditions and the timing of disclosure. In addition, the Financial Market Council (CMF) set some rules about information disclosure and fixed the content of annual report. In 2008, the CMF reformed the content of the annual reports and presented a detailed reference model. However, it does not punish firms that did not publish mandatory information; consequently, firms are not constrained to disclose more information.

In this sense, Fitch Ratings (2009) argues that Tunisian market is poorly regulated. This is why it suffers from transparency problem. In the Doing Business reports⁵ over the period 2006-2009, the Tunisian market is assigned a disclosure index equal to 0.

The current study has three main results. First, find no relationship between between private information and the information voluntarily disclosed by firms. This finding implies that public information does not reduce adverse selection problems as signaling theory predicts.

³ See among others, Botosan and Plumlee (2002), Hail (2002).

⁴ See among others Welker (1995), Heflin et al. (2005 and 2007) Brown and Hillegeist (2007) and Chen et al. (2007).

⁵ The extent of disclosure index is yearly index provided by Doing Business. It varies between 0 and 10, with higher values reflecting greater disclosure. This index includes 5 components: 1) What corporate body provides legally sufficient approval for the transaction; 2) Immediate disclosure to the public and/or shareholders; 3) Disclosures in published periodic filings; 4) Disclosures by controlling shareholder to board of directors; 5) Requirement that an external body review the transaction before it takes place.

Second, in contrast with prior Tunisian studies (Mattoussi and al., 2004; Gana and Chemli, 2008), we find that voluntary information disclosure in annual reports and on websites has no significant effect on stock liquidity. Our results show that information disclosure does not solve information asymmetry and that Tunisian investors do not rely on it to make their investment decisions.

Third, it seems that Tunisian investors are overconfident: they rely only on their private information even when there is an arrival of new flow of information. They did not update their beliefs and traded aggressively (Daniel et al., 1998). This may decrease stock liquidity.

The remainder of this paper is organized as follows. Section 2 reviews the literature and provides hypothesis. The sample and the methodology are presented in Section 3. Section 4 interprets and discusses the results. Section 5 concludes the paper.

2. Survey of the literature

Adverse selection models (Bagehot, 1971; Kyle 1985; Glosten and Milgrom, 1985) are based on the assumption that market makers establish a large spread to minimize potential losses due to informed trading and simultaneously to maximize potential gains due to uninformed trading. Hence, adverse selection risk induces a high cost of transaction.

Even under the absence of market makers, as in order-driven market, it is shown that adverse selection problems have effects on trading process and stock liquidity. Handa and Schwartz (1996) show that liquidity suppliers, who can be considered as market makers, prefer limit orders to compensate the losses of informed trading with the gains of uninformed trading. Later, Handa et al. (2003) find that high spread is explained by adverse selection problems.

In order to diminish information asymmetry, traders substitute private information for public information. Collecting private information is too costly, which encourages them to rely only on the public information. This is supposed to improve the market conditions: homogenize investors' opinions and reduce speculative positions (Verrecchia, 1982; Diamond, 1985). This is why more information disclosure is supposed to reduce information asymmetry, and therefore to improve stock liquidity and to reduce capital cost (Amihud and Mendelson, 1986, and Diamond and Verrecchia, 1991). Furthermore, Brown and Hillegeist (2007) point out that information disclosure improves the firm's visibility.

In contrast, the investors' expectation, in terms of future public disclosures in pre-announcement period, leads investors to collect more private information. Thus, public disclosures may lead to the increase of information asymmetry (Kim and Verrecchia 1991; McNichols and Trueman, 1994).

Most of empirical studies were conducted on developed markets, particularly in the American market. They show that improving disclosure leads to a decrease of the spread (Welker, 1995; Healy et al. 1999; Heflin et al. 2005; Chen et al. 2007) and consequently the compensation of market makers. In such conditions, they noticed that many market makers leave their job because of the low quoted depth (Heflin et al., 2005). These results are also consistent with those of Brown and Hillegeist (2007), who find that the disclosure's quality is negatively related to the level of information asymmetry.

In other stock markets, Madrid stock exchange for example, Espinosa et al. (2008) join previous papers and highlight the positive relation between stock liquidity and disclosure level. In contrast, in Jordanian stock market, Haddad et al. (2009) highlight a negative relation between spread and disclosure level, but lower than in developed countries.

Mattoussi et al. (2004) test the relationship between disclosure level and stock liquidity using a Tunisian data in 2001. Their results show that good disclosures diminish quoted spread and increase quoted depth.

Later, Gana and Chemli (2008) study the impact of disclosure level on spread using a sample of listed firms in the period 2001-2004. In contrast with Mattousi et al., they show a positive and significant effect of voluntary disclosure on spread. One explanation is that Tunisian investors have no confidence on the disclosed information in annual reports and do not use it to make their decisions.

Thus, private information can increase adverse selection problems and lead consequently to a decrease of stock liquidity. Based on these findings, we state two hypotheses:

H1: the level of private information disclosure is negatively related to stock liquidity.

In addition, voluntary information disclosure may solve adverse selection problems and discourage collecting private information and improves stock liquidity. Consequently, we suggest the following hypothesis:

H2: the level of voluntary disclosure is positively related to stock liquidity.

3. Data and methodology

3.1. Data

First, we consider common stocks of firms listed in the Tunisian Stock Exchange in 2007. The initial sample contains 50 firms in both financial and non-financial sectors. Second, we eliminate stocks recently introduced in 2007 and non common ordinary stocks. Third, we exclude firms missing annual reports. Hence, 41 firms remain in our sample.

Annual reports of these firms were collected through both the Financial Market Council (CMF) and personal visits to brokerage firms. In order to examine disclosure on websites, data were gathered from firms' websites.

For other variables, the data are provided by the Tunisian Stock Exchange and they contain daily trading data details (price, trading volume, best ask and best bid).

Table 1. Sample composition

Initial sample	
Shares listed in 2007	50
New listed shares	2
Non common ordinary shares	2
	46
Shares by industry	
Banks	10
Other financial firms	11
Services	7
Manufacturing firms	18
Annual reports not available	5
Final sample	41

3.2. Liquidity measure

In contrast with prior empirical studies using one-dimensional liquidity measures such as spread and depth (Mattoussi et al. 2004; Gana and Chemli, 2008), we choose a multidimensional measure: the turnover-adjusted number of non trading days. According to Liu (2006), this measure captures three dimensions of liquidity: potential delay for executing an order, the cost and the quantity of transaction. The Liu's measure is the standardized turnover-adjusted number of zero daily trading volumes which is supposed to be more appropriate to assess liquidity risk than average spread and illiquidity ratio of Amihud (2002) when the sample includes shares with high trading activity and shares with low trading activity. Indeed, the average spread and Amihud's ratio cannot be calculated in non trading days, while Liu's measure includes the effect of non trading on liquidity risk.

$$LIUM = \left[NoZV + \frac{1/TURN}{Deflator} \right] \times \frac{252}{NoTD}$$

where NoZR is the number of zero-volume trading days and NoTD is the total number of trading days in the market over the year. Because this number can vary from one year to another, the factor $\frac{252}{NoTD}$ is used to standardize it to 252 days (average number of trading days in one year) to make this measure comparable over time; Deflator⁶ is chosen arbitrary for all stocks, such that

$$0 < \frac{1/TURN}{deflator} < 1$$

3.3. Voluntarily information disclosure level

In order to measure the level of information publicly disclosed, previous studies advance that annual reports are more “informative” than short-term reports and other sources of information (Lang and Lundholm, 1993; Botosan 1997). However, these studies were conducted in developed economies and consequently cannot be generalized to emerging economies.

We consider, in addition to annual reports, another information source: firms' websites. To our knowledge there are no empirical studies on the relationship between stock liquidity and information published in websites in both emerging and developed markets.

⁶ We use a deflator of 3500 000 in constructing LIUM

For this reason, we establish two indexes. The first one is an extension of the index of Botosan (1997). This index assesses the volume of information voluntarily published by firms in annual reports. Items of this index reflect five types of information: 1) background information (management's objectives, business strategy, principal products, etc.); 2) historical summaries of annual financial results; 3) non-financial information such as market share and average compensation per employee; 4) forecasted information such as forecast of profits and forecast of cash flows, and 5) management discussion and analysis that include year-to-year changes that is not recoverable from financial statement.

This index, initially constructed for non financial American firms, was adapted by Mattoussi et al. (2004) in financial sector. In this paper, we readjusted this index according to the regulation of the Financial Market Council Tunisian. We construct another index to evaluate the level of information extracted from the firms' websites.

Voluntary information disclosure is beyond required disclosure. This kind of disclosure is encouraged but is not subject to special requirements. Disclosure level, referring to the volume and the quality of information, is difficult to assess since it cannot be measured directly (Cooke and Wallace, 1989).

In prior studies⁷ on voluntary disclosure, two categories of disclosure index are used. The first one is published by specialized agencies, like Corporate Information Committee of the Financial Analysts Federation (FAF), the Association of Investment Management and Research Corporation Information Committee (AIMR) and Standard & Poor's (S&P). This category of indexes contains all the information provided by firms (annual, quarterly, semester, half-yearly and other written information and investors' relations). However, these agencies are dealing only with large firms. The second category measures the level of disclosure on annual reports (Botosan, 1997; Eng and Mak, 2003; Wang et al. 2008). These indexes depend significantly on subjective criteria, for example the researcher's judgment (Marston and Shrives, 1991).

Inspired by their indexes, we constructed two indexes to evaluate information voluntarily published on annual reports and on firms' websites because of the absence of such agencies in Tunisia.

Disclosure level in annual reports (BOTS)

The first step consists in fixing preliminary information items that firms may disclose voluntarily. To do this, first, we review disclosure index used by prior studies. We focus in this study, in particular, on the index of Botosan (1997).

Botosan (1997) choose items included in the index according to the recommendations provided in the Jenkins report (AICPA, 1995). The Botosan' scoring procedure consists on assigning one point for qualitative information and an additional point for quantitative information. The score is the total points awarded to firm divided by the highest score.

This index, constructed for US firms, has proved his validity as a measure of disclosure extent. Later, many researchers construct their own indexes based upon this index for different institutional setting, such as: Gul and Leung (2004) for Hong Kong listed firms; Patelli and Prencipe (2007) for Italians firms; Alsaeed (2006) for Saudi firms, Mattoussi et al. (2004) and Gana and Chemli (2008) for Tunisian firms.

The second step is to adapt these items to Tunisian firms. We compare preliminary items with required elements according to the Financial Market Council's regulation (CMF). Particularly, the adjustment of the index is focused on the category of information: historical

⁷ See among others Chen et al. (2007), Botosan (1997) and Eng and Mak (2003)

financial results. According to the CMF's regulation, the firm must publish the evolution of its performance over the past 5 years. Thus, beyond the past 5 years, the information disclosure is voluntary. However, indexes used in previous studies set the threshold of 2 years (Mattoussi et al., 2004; Gana and Chemli, 2008).

In the third step, we adjust our index to disclosure practice followed by Tunisian firms. We apply items list to annual reports to exclude irrelevant items, such as: 1) not disclosed by any firm and 2) disclosed by all firms.

Our final index includes 36 items: general information (12 items); summary of historical financial results (3 items), non-financial information (5 items), forecasting information (7 items) and analysis and discussion of the management (9 items).

The final step is to test the reliability of this constructed index. For this we use Cronbach's coefficient alpha that is commonly used to assess the internal consistency. Cronbach's coefficient indicates that the disclosure index shows a satisfactory internal consistency (Cronbach Alpha = 0,650).

Disclosure level in firm' websites (SWEB)

Information Disclosure using Internet has become a common practice in many companies. It is a way among others to reduce disclosure's costs (Healy and Palepu, 2001). It provides valuable information to investors who would like to invest in the firm. The corporate governance's principles of the OECD (2004) and the guide of good governance practices in Tunisian companies (2008) encourage the use of the Internet as a means to reveal information.

We scrutinize websites to identify the main information, which is supposed to be helpful in making decision process. We retain six kinds of information: financial information not included in the annual report, availability of downloadable annual report, availability of downloadable annual reports of previous years, access to press releases; access to press articles such as interviews with CEO (some press articles are downloadable) and availability of corporate governance data. This helps us to assign an index to each website.

Table 2. Frequency of items identified in Tunisian firms' site web

	Frequency	Percentage
Existence of a website	31	67%
Financial information	9	19%
Availability of annual report	10	22%
Availability of annual reports of previous years	5	11%
Access to press releases	6	13%
Access press articles	2	43%
Availability of governance data	6	13%

Only 67% of our firms have web sites, such as Amen bank, ASSAD, BIAT and TUNISAIR. Their web sites contain annual report of the current year and the financial information not included in the annual report. However, information element, less available, is press articles. It seems that the disclosed information in the firms' websites is not useful for investors and the firms' shareholders, but it is addressed to customers and suppliers.

Scoring procedure consists to assign one point for each available item. The web index is the sum of points attributed divided by the maximum index (7 points).

Test of its reliability reveal a good internal consistency (Cronbach Alpha = 0,738).

3.4. Private information production

We use the percentage of informed trading as a measure of private information production, the average absolute value of imbalance order (**AIMO**). Easley et al. (1996) argue that uninformed investors submit buying and selling orders with equal probabilities. However, informed ones submit more purchase orders if they receive positive information signal and more sales orders if they receive negative information signal. Therefore, the difference between the two kinds of orders measures the information asymmetry.

Hmaied et al. (2006) find that Tunisian investors have different behavior. In fact, buyers use private information to decide in contrast with sellers who use only public information. Thus, they conclude that buyers submit more orders than sellers.

According to Aktas et al. (2007), the probability of informed trading **AIMO** can be measured by:

$$AIMO = |(QB - QS)/(QB + QS)|$$

where QB and QS represent respectively demand quantity and offer quantity.

3.5. Control variables

In the current study, we retain the following control variables: volatility (**VLAT**), firm size (**SIZE**), and book to market ratio (**BTMK**).

To measure stock return volatility, we use the standard deviation of daily returns. It captures total risk of stocks. Most of the studies⁸ find that stocks with high volatility are riskier and consequently less liquid. In contrast, Kyle (1985) and Admati and Pfleiderer (1988) advance that volatility is positively associated with stock liquidity. Indeed, informed traders attempt to hide their trading among transactions of liquidity traders' transactions, leading to a more volatile market and more liquid one. Hence, an increase of volatility increases the liquidity in the market.

Merton (1987), Stoll and Whaley (1990) and Amihud and Mendelson (1986) find that the firm size, defined by logarithm of the firm's capitalization, increases with stock market liquidity.

According to Fama and French (1993), book to market ratio captures the firm's risk, and investors ask for high premium to compensate them for the risk of holding their stocks. This is why, we include book to market ratio in order to control the effect of firm risk on stock liquidity.

Table 3. Definition of variables

<i>Variables</i>	<i>Abbreviations</i>	<i>Indicators</i>	<i>Expected signs</i>
Liquidity	LIUM	The standardized turnover-adjusted number of zero daily trading volumes	
Characteristics of information environment	BOTS	Botosan (1997) index modified	(+)
	SWEB	Site web index	(+)
	AIMO	The average absolute value of imbalance order	(-)
Control variables	SIZE	Market value of equity	(+)
	BTMK	A ratio of the book value of a assets to its market value	(-)
	VLAT	Standard deviation of the daily stock returns	(-)

⁸ See among others, Stoll (1978), Amihud and Mendelson (1980) and Ho and Stoll (1981)

4. Empirical findings and discussions

4.1. Descriptive statistics

The table 4 reports descriptive statistics: stock liquidity, the characteristics of information environment and control variables.

The Panel A shows that potential delay in executing an order is on average 56 days. There is a big deviation for this variable (67 days), which implies that our sample includes high and low frequently traded stocks. In addition, we notice that the parameter of the firm's size is on average 129 millions (Ms) of TND⁹, which varies between 6 Ms TND and 784 Ms TND. One explanation of the high dispersion of the firm's size is that our sample contains 10 of the largest firms¹⁰ (66% of market share).

Table 4. Descriptive statistics

A. descriptive statistics of liquidity and other stock characteristics				
	LIUM	BTMK	SIZE (MD)	VLAT
N	46	46	46	46
Mean	56.791	0.800	129	0.032
Median	26.313	0.815	52	0.015
Std. Deviation	68.987	0.292	174	0.046
Skewness	1.477	0.720	2.323	2.741
Kurtosis	1.266	2.680	5.761	7.445
Minimum	0.001	0.256	6	0.005
Maximum	243.067	1.800	784	0.223

Legend:
 BTMK=book-to-market ratio; SIZE= market capitalisation; VLAT=standard deviation daily returns; LIUM= standardised turnover-adjusted number of zero daily trading volume;

B. Descriptive statistics of information environment								
	IGEN	HIST	INFI	PREV	GEST	BOTS	SWEB	AIMO
N	41	41	41	41	41	41	46	46
Mean	0.089	0.004	0.038	0.026	0.079	0.222	0.211	46.342
Median	0.080	0.000	0.043	0.022	0.087	0.217	0.143	40.073
Standard deviation	0.027	0.011	0.023	0.029	0.032	0.058	0.225	18.562
Skewness	1.486	2.951	-0.310	0.880	-0.361	0.391	1.150	14.48
Kurtosis	2.119	8.052	-0.532	-0.089	-0.510	0.303	0.684	15.07
Minimum	0.057	0.000	0.000	0.000	0.000	0.103	0.000	25.158
Maximum	0.174	0.043	0.087	0.109	0.130	0.348	0.857	99.998

Legend
 IGEN= General information; HIST= summary historical financial results; INFI= non financial information; PREV=forecasting information; MANG= analysis and discussion of the management; BOTS= disclosure index of annual reports; SWEB =website disclosure index; AIMO= absolute value of imbalance order.

⁹ 1TND≈0,69665 USD

¹⁰ These firms are SFBT, Tunisair, BT, BIAT, BH, UBCI, ATB, STB, Attijari Bank and Amen Bank

The average stock return volatility is high (3%) and it varies between 22.3% and 0.5%. The ratio of book to market is on average 80%, which implies that stocks are overvalued.

Statistics indicates that the average percentage of informed trading, which captures private information, is high (46%) and may reach a maximum level of 99%.

The average disclosure index of annual reports is 22.2%, and varies between 10.3% and 34.8%. Its average deviation is 5.8%. This means that the level of information disclosure does not vary significantly among Tunisian firms. They prefer reporting voluntarily more information related to management objectives, business strategy and the change of management activity, and little financial and forecasting information. The disclosure index on web sites is on average 21.1% and its deviation is 22.5%, which suggests that the content of web sites varies significantly from one firm to another: (1) 15 firms have no sites, (2) 14 firms use websites as customer interface and do not disclose any information to investors¹¹, and (3) 17 firms disclose useful information for investors.

4.2. Correlation analysis

Table 5 reports that liquidity depends neither on voluntary disclosure on annual reports nor on websites. In contrast, the percentage of informed trading is positively correlated with the timing of executing an order. This implies that stock liquidity is decreasing with private information.

The information environment proxies (disclosure index on annual reports, disclosure index on web sites and imbalance order) are not correlated between them, which is not consistent with the assumption that private and public information are not related.

Table 5. Spearman's correlation between informational environment of firms and control variables

	BOTS	SWEB	AIMO	LIUM	BTMK	VLAT	SIZE
BOTS	1,000						
SWEB	0.071	1,000					
AIMO	0.029	-0.022	1,000				
LIUM	-0.077	-0.226	0.829**	1,000			
BTMK	-0.127	0.163	-0.013	-0.056	1,000		
VLAT	-0.079	0.043	-0.201	-0.162	0.013	1,000	
SIZE	0.071	0.421**	-0.264	-0.406**	-0.271	-0.176	1,000

Legend:
 BTMK=book-to-market ratio; SIZE= market capitalization; VLAT=standard deviation daily returns; LIUM= standardized turnover-adjusted number of zero daily trading volume; BOTS= disclosure index on annual reports; SWEB= disclosure index on website; AIMO=absolute value of imbalance order. *, **: statistically significant for the threshold values of 5% and 1% respectively.

In fact, the policy of Tunisian firms in terms of corporate information disclosure does not add valuable information to investors; consequently, they do not rely on such information to make decisions. One explanation is that usually Tunisian investors did not rely on disclosed information: they prefer traditional ways to collect the information they need. Indeed, Dellagi et al. (2001) advance that Tunisians invest based on information provided by friends and relatives. Some of them are suspicious and do not trust these reports.

We notice a positive correlation between web sites disclosure and the firm's size. This result shows that only the largest firms, particularly banks, disclose information through their websites.

¹¹ Tunisair, SIAME, Elmazraa and UBCI.

4.3. Regression analysis

Hereafter, we test the following model to study the relation between the stock liquidity and the variables describing the informational environment of the firm.

$$LIUM_i = \delta_0 + \delta_1 AIMO_i + \delta_2 BOTS_i + \delta_3 SWEB_i + \delta_4 VLAT_i + \delta_5 BTMK_i + \delta_6 SIZE_i + \varepsilon_i$$

Table 6. Relationship between firms' information environment and stock liquidity

	LIUM
AIMO	3.296 (6.73)**
BOTS	-89.922 (0.98)
SWEB	-39.697 (1.92)
VLAT	1.296 (0.24)
SIZE	-2.430 (0.55)
BTMK	28.667 (1.39)
Constant	-40.623 (0.44)
Observations	41
Adjusted R2	0.79
Legend	
BOTS= disclosure index on annual reports; SWEB= disclosure index on website; AIMO=absolute value of imbalance order; BTMK=book-to-market ratio; SIZE= market capitalization; VLAT=standard deviation daily returns.	
*, **: statistically significant for the threshold values of 5%, and 1% respectively.	

The model's estimation enables us to retain the hypothesis H1 and reject the hypothesis H2. Indeed, we report a positive effect of percentage of informed trading on Liu measure. Accordingly, private information increases adverse selection risk and consequently reduces stock liquidity.

In addition, we show that the level of information disclosure, proxied by Botosan index has no effect on liquidity. This result is similar to that of Hassan et al. (2009), who find no effect of voluntary information disclosure on Egyptian firms' value.

The current study provides slight different results from previous empirical studies on Tunisian context of Gana and Chemli (2008) and Mattoussi et al. (2004). The latter study demonstrates that information voluntarily disclosed in annual reports reduces information asymmetry and improves stock liquidity, while the first one finds the opposite effect.

One explanation of their different findings is the use of different research method. They examine different periods using dynamic and static approaches.

In contrast with the indexes they used, we constructed a new index adapted to the Tunisian framework. Indeed, we have excluded from the Botosan (1997) index used by Mattoussi et al. (2004) and Gana and Chemli (2008) some items that we consider as mandatory items. Hence, the significant effect of disclosure level on stock liquidity reported in previous studies may be due to mandatory elements included in indexes.

Therefore, the disclosed information is not too useful and valuable for the Tunisian investors to make their decisions. This information is disclosed only for respecting the regulation and still limited. Indeed, the disclosed information in annual reports is too standard in the sense that all the Tunisian firms provide the same information.

Our results provide strong evidence that there is no valuable information disclosed in web sites. Accordingly, we deduce that the information disseminated via the Internet is not considered as a source of information for Tunisian investors.

We conclude that voluntary disclosure does not enable us to mitigate information asymmetry. Indeed, in Tunisia as in other Arabic countries (for example Egypt and Jordan), firms do not disclose enough information to investors because of social and cultural characteristics, such as tendency towards secrecy (Hassan et al. 2006; Haddad et al., 2009).

For instance, investors do not rely on the firm to obtain the information they need but prefer gathering and collecting private information themselves. Consequently, adverse selection risk increases significantly and discourages liquidity traders to negotiate, which decreases stock liquidity.

Moreover, we can explain the decisions of Tunisian investors by psychological biases. According to Daniel et al. (1998), investors' overconfidence bias leads to overreaction in the market. Hence, investors' response to public information is limited. The adjustment of investors' decision is too little even if public information contradicts their private information.

Indeed, the survey of Zaiane and Abaoub (2010) confirms that Tunisian investors are overconfident. They find that 66.4% of respondents have confidence in their intuitions while 32.4% of respondents hold their stocks less than three months. This leads overconfident investors to trade aggressively. Their results show that 55.2% of respondents use more than one source of information (Internet, newspapers and advice of brokers) because they think that they will never get all the hidden information. Hence, they conclude that Tunisian investors overestimate the quality of information and their ability to interpret it.

5.4. Robustness tests

5.4.1. Bootstrap approach

In small samples, a bootstrap approach might be preferred. This approach consists on simulating new samples obtained by sampling with replacement from the original sample. Results given by this approach are the same found with OLS regression. Hence, we confirm the robustness of previous results.

5.4.2. Other liquidity proxies

To check for robustness of results, we replace the Liu's measure with other liquidity measures. We test whether the previous results depend on the choice of liquidity measures or not. We have two sets of measures capturing two liquidity dimensions: cost and quantity.

For assessing the cost of transaction, we rely on 1) bid ask spread (BASQ) frequently used in prior studies¹² as a measure of immediat cost; 2) Amihud illiquidity ratio (ILIQ) which captures the price impact¹³; and 3) the proportion of zero returns (PZER) which represents the total cost of transaction¹⁴.

In order to measure the transaction volume, we introduce two measures: 1) turnover ratio (TURN) reflecting trading frequency; and 2) market depth¹⁵ (DEPH) employed as a measure of transaction volume. The following table presents the robustness results.

¹² Mattoussi et al. (2004); Gana and Chemli (2008) and Haddad et al. (2009).

¹³ Espinosa et al. (2008).

¹⁴ Lesmond et al. (1999).

¹⁵ Mattoussi et al. (2004).

Table 7. Relationship between firms' information environment and other liquidity proxies

	BASQ	PZER	ILIQ	DEPH	TURN
AIMO	0.021 (2.02)	1.115 (8.43)**	0.057 (4.17)**	-0.019 (3.85)**	-0.064 (3.82)**
BOTS	-3.441 (1.50)	-42.930 (1.25)	0.666 (0.19)	4.271 (3.26)**	0.291 (0.08)
SWEB	-0.589 (1.50)	-11.544 (1.19)	-0.336 (0.52)	0.232 (0.63)	0.951 (1.18)
VLAT	-0.032 (0.29)	-0.371 (0.14)	0.289 (1.48)	0.208 (2.08)*	-0.129 (0.59)
SIZE	-0.208 (2.41)*	-0.314 (0.16)	-0.699 (5.57)**	0.016 (0.22)	-0.378 (2.62)*
BTMK	0.403 (0.70)	14.070 (1.89)	1.034 (1.52)	0.897 (3.18)**	-1.507 (1.70)
Constant	3.918 (1.87)	-2.928 (0.07)	11.805 (4.66)**	5.909 (3.95)**	6.745 (2.22)*
Observations	41	41	41	41	41
Adjusted R2	0.52	0.75	0.71	0.60	0.47

Legend
BTMK=book-to-market ratio; SIZE= market capitalization; VLAT=standard deviation daily returns; LIUM= standardised turnover-adjusted number of zero daily trading volume; BOTS= disclosure index on annual reports; SWEB= disclosure index on website; AIMO=absolute value of imbalance order.
*, **: statistically significant for the threshold values of 5%, and 1% respectively.

Results show that voluntary information disclosure has no effect on transaction cost. Hence, corporate disclosure is not enough to diminish asymmetric information and to improve stock liquidity. In contrast, we detect positive and significant effect of private information on the measures of cost of transaction. Indeed, when there is an arrival of large number of informed investors into the market, information asymmetry is more severe, consequently the cost of transaction increases. These results indicate the robustness of those found using Liu's measure.

Moreover, private information reduces the frequency of activity and market depth. In addition, we report that public information published in annual reports improves the market depth. These results indicate that information voluntarily disclosed (BOTS) improves the absorption of shares without affecting both frequency and cost of transaction. These results confirm also, that the Tunisian investors do not consider public information disseminated by the company when they measure transaction cost.

6. Conclusion

In this study, we raised the question of the effect of informational environment of the firm on stock liquidity in Tunisian market, which includes information voluntarily disclosed and private information. Our results show that there is no relationship between private and public information. We find also that only private information influences stock liquidity, and that Tunisian investors do not rely only on information voluntarily disclosed in annual reports and firms' websites.

Contrary to previous empirical findings in emerging market (Mattoussi et al. 2004; Haddad et al., 2009), our study does not support the signaling theory predictions but confirms the predictions of behavioral finance theory.

These results may help also to understand the informational environment of Tunisian listed firms. Despite the Tunisian regulation's efforts made to improve the firms' transparency, this is not enough to constrain Tunisian firms to disclose more information and to discourage private information collection.

In fact, Tunisian regulators need to incite Tunisian listed companies to disclose more information voluntarily by fiscal advantages and subventions. In addition, the CMF should control the information disseminated and impose penalties for nondisclosure of mandatory information (other than financial statement) in annual report.

Our study presents some limitations. First, we consider a static approach since we consider only firms listed in 2007. Second, we have neglected other sources of information, such as meetings with financial analysts and media representatives. Indeed, this practice has been increasingly adopted by the Tunisian firms as a means of voluntary disclosure, particularly following the outbreak of the global financial crisis.

In 2008, 20 listed companies held 31 meetings with analysts, 17 of which were held during the market downturn because of the financial crisis¹⁶. Some companies have held more than one meeting in 2008, for example, Alkimia has organized 4 meetings. Thus, it would be interesting to see the effect of this new communication means on the behavior of Tunisian investors in future study.

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¹⁶ Tunis Stock Exchange annual report (2008)

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