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Full Length Research Paper

Liquidity Risk and Volatility in Emerging Bonds Markets

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We investigate the relationship between liquidity, liquidity risks and volatility in the emerging bond market in the presence of other control variables. For the very largest sample, higher liquidity risk and volatility are positively with greater liquidity. We find that asymmetric information is positively associated with liquidity for this sample. Similarly, we found that the volume is negatively related to liquidity, which explains that if the volume increases, the liquidity of the bond decreases. To explain the role of liquidity risk and volatility in the liquidity crisis, we use a panel data extracted from Datastream data base. Our result shows that liquidity risk and volatility affect positively the liquidity of the bond markets.

Keywords: Liquidity, Liquidity Risk, Volatility, Bond Market

INTRODUCTION

Liquidity, which is considered an important element in the market, can be influenced by several factors such as liquidity risk and price volatility. The diversity of its characteristics, its importance in the valuation of assets and its evolution over time makes it an active area of research.

The problem of liquidity was the interest of several studies, (Kyle (1985), Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996), Chordia et al. (2000), Huberman and Halka (2001), Hasbrouck and Seppi (2001), Amihud, (2002), Lesmond and al. (2007)). However, what is less known is the relative importance of the market risk for the liquidity risk. In an attempt to shed light on this question, Acharya and Pedersen (2005) applied a symmetry model to determine the potential strait of liquidity risk. The importance of liquidity makes it an object of study in the emerging markets, such as that of Lesmond and al. (2007). These authors explained their choice by the development in several emerging countries.

In dealing with, the relationship between liquidity and volatility, several studies predict that this relationship can be either positive or negative. Stoll, (1978 a, b); Amihud and Mendelson, (1980); Ho and Stoll, (1981), (1983); Copeland and Galai, (1983); and Foster and Viswanathan, (1990) predict a negative relationship between volatility assets and liquidity in. However, Tinic (1972), Stoll (1978b, 2000), and Menyah and Paudyal (1996), all report a positive relationship between volatility and liquidity.

The rest of this paper is organized as follows: Section 2 presents the literature review. Section 3 presents the data and the methodological approach. Section 4 gives the empirical results. Section 5 concludes the paper.

Literature review

Liquidity is considered one of the difficult variables to

define, Kyle (1985). It is a wide conception that usually denotes the facility to deal with large amounts, at low cost, and without affecting the price.

Indeed, since the global financial crisis of 2008, the dynamics of the market liquidity has become one of the most important regulators in the economies whether developed or emerging.

The comovement of liquidity over time leads many authors to focus on the various conjectured sources of commonality in liquidity. Indeed, Chordia and al. (2000) showed that commonality in liquidity occurred because the macro-conditions leading to general price swinging and trading activity caused a correlated inventory, while Fujimoto (2004) and Brockman et al. (2009) suggested a co-variation in the market makers' inventory carrying the costs of asset. Well, Lee (2011), Qin (2008), and Davivongs (2010) found a strong community of liquidity in their studies on emerging markets. Most authors found the predominance of commonality within the same market, which declines when moving towards regional and global levels. Indeed, Davivongs (2011) showed that commonality in liquidity was the toughest in the emerging Asian markets, especially in China and Taiwan. However, in Lee (2011), the emerging markets required a greater premium on systematic liquidity risk.

Similarly, Martínez et al. (2005) found that the results depend on the choice of the liquidity measure used. Indeed, Acharya and Pedersen (2005) showed that the expected return of increased security in its expected liquidity and liquidity risk, and illiquid securities also had a high risk of liquidity.

However, Amihud and Mendelson (1986) and Jacoby, Fowler, and Gottesman (2000) used theoretical arguments to show how liquidity influences the financial market prices. Jones (2000) and Amihud (2002) show that liquidity predicts expected returns in the time series.

Several studies have been made on the liquidity of the U.S. bond market, thereby, Fleming (2003) studied the time series of a set of liquidity measures, Huang (2002) related liquidity to return volatility, in another context, Brandt and Kavajecz (2004) studied the relationship between liquidity, order flow, and the yield curve. Similarly, Fleming and Remolona (1997) and Balduzzi, Elton, and Green (2001) attempted to analyze the returns, spread, and trading volume in the bond markets around economic announcements.

Several empirical models have shown a negative relationship between volatility and the liquidity of assets, (Stoll (1978) Amihud and Mendelson (1980), Ho and Stoll, (1981), (1983), Copeland and Galai (1983), and Foster and Viswanathan, (1990)). Similarly, information-based liquidity models showed that the correlation between liquidity and volatility can be positive or negative. In fact, studies conducted by Admati and Pfleiderer (1988) and Barclay and Warner (1993) showed that many uninformed on the liquidity of the securities agent can lead to a positive relationship between volatility

and liquidity. On the other hand, Foster and Viswanathan (1990) intend that specialists' knowledge of the presence of informed traders can result in a negative relationship between volatility and liquidity.

On the contrary, there are various other empirical studies, such as, Tinic (1972), Stoll (1978, 1989), and Menyah and Paudyal (1996) found a positive relationship between volatility and liquidity. In the same context, Pastor and Stambaugh (2003) in their study found a negative correlation between liquidity and volatility of the global market, while Chordia et al. (2001) establish a positive relationship between volatility and overall liquidity.

More study is focusing on the importance of volatility as a systematic risk factor such as, Ang et al. (2006), and Adrian and Rosenberg (2006), while the other focuses on the systematic liquidity risk as Pastor and Stambaugh (2003), Acharya and Pedersen (2005), Chen (2005), and Sadka (2006). In other words, the existence of different measures of liquidity has led some researchers make out a common systematic liquidity factor, such as, Chordia, Roll and Subrahmanyam (2000), Hasbrouck and Seppi (2001) and Eckbo and Norli (2002). Although, several other authors focused on liquidity and volatility independently, little work has been done regarding the common pricing systematic liquidity and volatility risk.

Therefore, liquidity and volatility come from opposed economic reasons with volatility ensuing from fluctuations in asset evaluations and liquidity affected by market trading frictions. Indeed, Bandi and al. (2008) studied this question at the market level using measures of market liquidity and volatility risk derived from high frequency prices of the SPDR (a trust invested in the S&P 500). They discovered that when liquidity and volatility risk independently, they are significant risk factors. However, in the model which includes only are considered the latter is significant.

To better comprehend the various liquidity measures, Korajczyk and Sadka (2008) studied eight of them to determine whether they are confined by a common single factor underlying liquidity or there is multiple risk factor liquidity for each measurement. In fact, liquidity can be measured by the large quantities of an asset rapidly brought or sold and at a less cost. Hence, we can say that the recent financial crisis has an effect on market liquidity. This makes very low and even to disappear liquidity. There are many empirical studies that deal with the relationship between liquidity and volatility. Demsetz, 1968; Tinic, 1972; Stoll, 1978b, 2000; Menyah and Paudyal, 1996 demonstrate that volatility is considered such as a major factor that affects liquidity.

Several authors have demonstrated a positive relationship between liquidity and volatility may be induced due to the existence of a group of uninformed liquidity traders (Admati and Pfleiderer (1988) and Barclay and Warner (1993)). Inversely, Foster and Viswanathan (1990), advocate that specialist's

Table1. Statistic Descriptive

Variable	Mean	Std. Dev.	Min	Max
Liquidity	-0.0165507	0.2181199	-2.24812	1.002979
Liquidity Risk	0.0081914	0.057493	-0.5	0.3043209
Volatility	0.0052613	0.043871	-0.32	0.900574
Asymetric Information	-0.3473862	10.72863	-116.2	37
Aos	10.76112	6.219155	-1.9772	26.3722
Age	6.992832	7.055184	-10.9116	37.0422
Coupon	10.18601	5.513868	-1.9871	17.7465
Interest Rate	7.323318	10.44097	0.015	74.3

knowledge of the presence of informed traders can result in a negative relationship between volatility and liquidity.

Similarly, to explain the overall volatility liquidity relationship, the authors also examined the dominant factors that may increase the role of volatility in the market liquidity.

DATA AND METHODOLOGICAL APPROACH

Data

Table 1 summarizes the basic statistical properties of the data of 10 emerging bond markets over the period from 7/30/2009 to 12/31/2010.

Our sample consists of bonds issued by the State (sovereign bonds). These data are derived from the daily "Datastream" for the period from 30/07/2009 to 31/12/2010. Our sample contains ten emerging countries, such as Argentina, Australia, Greek, Hungary, Hong Kong, Mexico, Peru, Poland, Turkish, and Spain. In our estimation, we used an unbalanced based on the Generalized Method of Moments (GMM), which requires a lot of data panel.

Table 1 summarizes the main descriptive statistics of the variables used in our analysis.

To explain the effect of liquidity risk and volatility on the liquidity of emerging bond markets, we use a panel data regression.

Methodological approach

Variables

Liquidity

Liquidity is a variable defined in different ways. Its definition varies from one author to another. This variation depends mainly on the availability of data.

According to the literature, there are several ways of defining liquidity in the market, either in a direct or in an indirect way. Lesmond et al (2005), state that the measure of liquidity takes three forms:

The first is the direct transaction cost which results in Jain (2002) where he used the bid-ask spread (bid ask spread) is considered the best estimate of the underlying liquidity.

The second has emerged due to the difficult implementation of the first approach that has the problem of lack of information that exists in some markets. This second approach is to build on the business data and applies the theoretical and practical part. The approach includes the revenues and the extent of Amihud (2002).

The third is the indirect costs of the transaction. The advantage of this approach is that it uses only the price of the asset rather than the trading volume as a measure of liquidity such as Roll (1984) and LOT (1999).

In our case, the first class will use as a measure of this variable using the bid-ask spread and the cost of commission is expressed as follows:

$$liq = \left[((A_t - B_t) / (A_t + B_t)) + ((A_{t-1} - B_{t-1}) / (A_{t-1} + B_{t-1})) \right]$$

Liquidity Risk

Following the crises experienced in the financial markets, whether developed or emerging markets, the level of liquidity has been a great movement which makes the modeling of liquidity risk a primary objective for all research in the last decades. Since VaR represents the loss that may have a financial asset in a given time and with a probability level of 95 to 99% of. The estimate of the loss can be made by three methods: the historical method, the parametric method and the Monte Carlo method. We can therefore use the VaR as a measure of liquidity risk is theoretically based on the work made by Jarrow and Subramanian (1997), Bertsimas and Lo (1998). Other extensions made by Berkowitz (2000) and Persson Häberle (2000) and Shamroukh (2000), which

assess the liquidity risk using the fork, which is a fixed cost and the impact of price, which expresses the response of prices to the volumes exchanged. In our case we will use the price range for measuring liquidity risk since no data on the volume of transactions.

$VaR = \text{mean} + (\text{standard deviation} * \text{probability threshold of } 99\%)$.

Volatility

Considered in finance as the basis of the measurement of risk, volatility is by definition a measure of the amplitude of fluctuations in the price of a financial asset. Thus, the higher the volatility of an asset is higher and investment in this asset is considered risky and therefore more hope of gain (or risk of loss) will be important. In contrast, a risk-free asset or very low risk (eg Treasury) has very low volatility because its reimbursement is virtually certain. In fact, the volatility of a bond corresponds to the trend in response to a 1% change in interest rates.

Commonly used to refer to short-term oscillations of a financial asset, the concept of volatility for all horizons (short, medium and long term) and no worries on the direction of movement (only the range of motion is taken account).

Asymmetric Information

The information asymmetry is an explanatory variable that expresses the existing asymmetry between the seller and the buyer of a product or asset. On the credit market the banker gives loans and does not know the risks associated with loans it grants, for against, borrowers know the probability of success of their projects. This allows banks to raise interest rates to loans granted and essentially for risky borrowers. So, there are two situations, the first is the ex-ante that is adverse declares that at the time of signing the contract and the second is ex post moral hazard is that said after the purchase or signing the contract.

Amount Outstanding

This is the known (or estimated) amount of the bond currently in circulation, in the currency of issue.

Age

It is the age of the bond i at time t . It is considered one of the main characteristics of the bond. It can range from a few months to fifty years before the capital is repaid. Over

this period, the greater the risk is important because there is every chance you will be forced to sell the bond before maturity if it is remote.

Coupon

The interest is offered by the issuer to the investor as compensation for the duration of the loan. It is expressed as a percentage of per value. In principle, the amount of the coupon is more than the issuer is of lesser quality and that the loan is long-term. In contrast, an issuer of high quality short-term borrows on offer a lower coupon.

The coupon may be fixed or variable. It is mostly paid on an annual basis but bonds may pay more regular coupons on half-yearly or quarterly basis, for example. The coupon will depend on the duration of the obligation and the quality of the issuer. There are also obligations do not pay coupon during the life of the loan. This is called bonds "zero-coupon".

Interest Rate

The rate of interest is considered to be among the essential characteristics of the obligation. This is the rate used to calculate the performance of each obligation. It is usually fixed and valid for the entire duration of the loan, but some bonds are "variable rate". There are also inflation-indexed bonds: their value and return follow price trends and provide an effective safeguard against loss of purchasing power if prices soar.

A fixed-rate bond can receive a constant rate (coupon) throughout the holding period of the product. The interest rate is in the wording of the obligation and the date. By multiplying it by the amount of the nominal (that is to say, the displayed value of the bond), we get the coupon.

In the case of a floating rate note, the income received by the borrower (that is to say, the bondholder) varies quarterly, every six months or every year depending on the rate yield at the market. If these rates rise, the bondholder receives therefore a higher remuneration. If rates fall, incomes are falling.

The model to be estimated to analyze the impact of liquidity risk and credit liquidity in emerging bond markets in the presence of other variables as shown in the following model:

Model

$$Liq_{it} = \alpha_0 + \alpha_1 Lr_i + \alpha_2 Vol_i + \alpha_3 Ag_i + \alpha_4 AOS_i + \alpha_5 Coup_i + \alpha_6 AI_i + \alpha_7 IR_i + \epsilon_t$$

Where (i) refers to the obligation studied and (t) refers to the period of analysis. The dependent variable of the model is the liquidity (Liq). Elsewhere (Lr) (Vol) (Ag) (AOS) (Coup), (AI) and (IR) respectively represent liquidity risk, credit risk, the age of the obligation, the

Table 2. Panel of liquidity risk and volatility

	LR	VOLA	AI	AOS	AGE	COUP	IR
Argentine	0.004*** (0.213)	0.000*** (0.3577)	0.000*** (0.0107)	0.000*** (-0.0737)	0.000*** (0.0141)	0.000*** (0.0048)	0.000*** (-0.0262)
Australie	0.629 (0.0082)	0.641 (1.4821)	0.000*** (0.0049)	0.950 (-0.0007)	0.828 (-0.0005)	0.585 (0.0028)	0.631 (0.002)
Grec	0.000*** (0.2988)	0.000*** (-0.0641)	0.000*** (0.0145)	0.088* (0.0005)	0.387 (-0.0001)	0.000*** (0.0002)	0.003*** (0.0011)
Hong Kong	0.000*** (0.273)	0.181 (-0.014)	0.000*** (0.0071)	0.001*** (-0.0005)	0.000*** (0.0002)	0.442 (0.0003)	0.360 (-0.0004)
Hungary	0.000*** (0.641)	0.017** (0.0286)	0.000*** (0.0082)	0.004*** (-0.0002)	0.001*** (0.0001)	-	0.000*** (0.0003)
Mexique	0.050** (-10.405)	0.000*** (0.4734)	0.702 (0.0024)	0.000*** (-0.0227)	0.006*** (0.0008)	0.002*** (0.0033)	0.000*** (0.013)
Peru	0.000*** (-0.1575)	0.180 (-0.0136)	0.000*** (0.0094)	0.000*** (0.0003)	0.000*** (-0.0008)	0.000*** (0.0023)	0.000*** (0.0001)
Polanda	0.047** (0.2253)	0.066* (0.0422)	0.000*** (0.0081)	0.781 (0.0001)	0.001*** (0.0000442)	0.000*** (0.0003332)	0.173 (0.0007)
Spain	0.032** (0.0605)	0.681 (-0.0014)	0.000*** (-0.0071)	0.003*** (-0.0004)	0.013** (-0.0001)	0.001*** (0.0005)	0.519 (-9.0069)
Turque	0.580 (0.0102)	0.000*** (0.8935)	0.000*** (0.0194)	0.902 (0.0109)	0.024** (0.0597)	0.492 (0.0014)	0.000*** (-0.071)

Notes: *** indicate significance at level of 1%, ** at level of 5% and * at level of 10%.

volume of issue, coupon, information and interest rate mismatch.

We suspect endogeneity problems in the estimation related to causality exogenous variables (particularly the variable issue volume) to the dependent variable (liquidity) equation. So, traditional econometric methods as (OLS and fixed GLS generalized effect) do not enable us to obtain efficient estimates of such a model. So to solve this problem, we introduce the generalized method of moments on panel (GMM) proposed by Arellano and Bond (1991) and later developed by Arellano and Bover (1995) and Blundell and Bond (1998). According to the proponents of this method, it can provide solutions to the problems of simultaneity bias, reverse causality (especially between issue volume and liquidity) and omitted variables possible. Moreover, it controls the individual and time specific effects. Indeed, the method (GMM) is used to solve the problem of endogeneity not only at the variable issue volume, but also in the other explanatory variables by using a series of instrumental variables generated by the variable delays.

In addition, we must add that the method (GMM) panel on another advantage, it generates the instruments from

the explanatory variables which is not the case with other traditional methods such as instrumental variables (2SLS and 3SLS), which require the choice of theoretical instrumental variable correlated with the explanatory and uncorrelated variables with the residue, which is hard to find.

The implementation of GMM is performed using the procedure (XTABOND2) on software (STATA). The model will be estimated by the generalized system and two-stage times. In order to choose the best model specification, we examined several specifications according to different assumptions about the endogeneity of variables.

EMPIRICAL RESULTS

Liquidity is considered something that can be influenced by several factors such as liquidity risk and volatility. Since the 2008 financial crisis, market liquidity has become one of the important elements in the development of financial markets. Our result shows that liquidity risk affect positively the liquidity of bond market

in the majority of sample at level of 1 and 5% as shown in the table above. Concerning the relationship between liquidity risk and liquidity of bond markets, we found that the risk of liquidity positively affects market liquidity and asset liquidity. Our results show that 80% of the sample shows that the liquidity risk a significant and positive while the significance of the relationship between volatility and liquidity effect is only 60% of the sample. This explains the importance of liquidity risk in the movement of the liquidity of assets and markets. Our results confirm that liquidity risk is one of the most elements that affect the liquidity of the bond market. Similarly, the volatility of assets is considered a key element in explaining the movement of asset liquidity and financial markets. Our results show a sometimes positive and sometimes negative between volatility and liquidity which confirms the results found by the models of liquidity predict that the relationship between liquidity and volatility can be positive or negative effect. The relationship between liquidity, liquidity risk and volatility may be affected by the asymmetry of information between investors existent. This explains the significant positive effect at the 1% level between information asymmetry and liquidity of the securities in the sample. These results confirms the results found by Admati and Pfleiderer (1988), Barclay and Warner (1993), and Foster and Viswanathan (1990). Admati and Pfleiderer (1988), and Barclay and Warner (1993) show that informed stealth trading amidst a larger group of uninformed liquidity traders can lead to a positive relationship between volatility and liquidity. On the other hand, Foster and Viswanathan (1990) suggest that specialists' knowledge of the presence of informed traders can result in a negative relationship between volatility and liquidity. Our results show that the information has a significant effect on the change in liquidity of an asset, since the information asymmetry has a significant effect on the threshold of 1% in 90% of the sample. And this shows the importance of the effect of information on the behavior of investors.

Similarly, the presence of other variables may also explain the strong correlation existing between liquidity, volatility and liquidity risk. Our results also show a significant and negative relationship at the level of 1% between liquidity and volume of bond issuance (amount outstanding). That is to say, more than the issue volume increases more than the bond market becomes less liquid which is contrary to the stock market. Therefore, more than the trading volume increases more than the asset becomes more liquid.

Our results also show that there is a positive relationship between age and liquidity requirement is that the newly issued bonds are more liquid than the old. This confirms the results found by Sarig and Warga (1989), McGinty (2001) and Schultz (2001). This result explains that, the age of a bond is a standard proxy for its liquidity.

Similarly, our results show a significant at 1% for the coupon and the interest rate on the liquidity of the bond

which explains that these two variables are also considered among the popular proxy for its liquidity. Our results also showed that more than 60% of the sample is significant at 1% level.

We can say that our results have demonstrated the role of liquidity risk and volatility in explaining the problem of liquidity in the bond market, but without forgetting the role of other variables such as information asymmetry and volume bond issuance.

CONCLUSION

This paper has shown the effect of liquidity risk and volatility on the liquidity of emerging markets in the presence of other variables such as information asymmetry, the coupon, age, the interest rate and the volume of bond issuance (amount outstanding). To estimate this relation we use the panel data. The result shows that the liquidity risk and volatility have a significant effect in the evolution of liquidity in the majority of the panel. So our study showed the significant effect of information and the volume of bond issuance on liquidity. This expresses the effect of information and the volume of information on the behavior of investors in making their decisions. The existence of information asymmetry between investors can generate a significant relationship between volatility and liquidity which confirms the results found by Admati and Pfleiderer (1988), and Barclay and Warner (1993). Similarly, our results show the significant effect of the issuance volume of liquidity in the bond markets. To conclude, it should be emphasized that this research is exploratory and subject to a number of significant limitations. Essentially, the econometric methodology could be further developed to model simultaneously the relationship between liquidity, liquidity risk and volatility. Rather, the econometric methodology could be further developed to model simultaneously the relationship between liquidity, liquidity risk and volatility.

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