

Illiquidity on Eurozone countries during the 2007-08 financial crisis

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ABSTRACT

Using a sample of 11 Eurozone countries, we evaluate the impact of the financial crisis, on (il)liquidity of stock markets. We analyse some indicators of liquidity, like the bid-ask spread, turnover rate and Amihud Illiquidity measure.

The financial crisis of 2007/2008 was one of the greatest financial crises since Great Depression and restructured the world of finance. There were many events during financial crisis, but was in September 2008, that crisis hit its most critical period. We use the 15th of September of 2008, the day that Lehman Brothers filed for Chapter 11 bankruptcy protection, to separate two periods of the financial crisis. It is assumed that was after the bankrupting of the Lehman Brothers, that the stock markets fall deeper.

We examine countries in deeper trouble (Portugal, Ireland, Italy, Greece and Spain - PIIGS) versus the other countries in the Eurozone.

We concluded that the liquidity is more related with the size of the market than the fact of the country belongs to PIIGS or the others Eurozone countries.

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JEL classification: G10, G14

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1. INTRODUCTION

A stock is liquid if it can be traded quickly and in a big quantity, at a lower price and with a few impacts in price. The stocks with little liquidity have a bigger transaction costs and to be more attractive should offer a bigger return.

In periods of crises and instability, the level of trust in market will decrease making a significant impact in liquidity of the stocks. Traders will allocate their resources in assets more liquid, making a decreasing in market liquidity.

Any investor needs to consider the liquidity risk in their decision and in periods of financial crisis, most of the emergent countries and some developed countries show stock markets decreasing and low liquidity, compromising the stock trades (Pasquariello, 2008).

To measure liquidity, we consider three alternative proxies for liquidity. The first one is the most popular measure of liquidity that has been used in other studies, the Bid-ask spread. We use directly observable trading activity variables to calculate the relative bid-ask spread in a basis day by day. The others two proxies is the turnover rate - the total number of shares traded over a period divided by the average number of shares outstanding for the period, and the Amihud illiquidity measure - the average between the absolute returns and its trading volumes for a certain stock over a time period.

We use a database of the prices, spreads, turnover and market value of the stocks of eleven Eurozone countries (Portugal, Ireland, Italy, Greece and Spain – PIIGS, and German, France, Netherlands, Austria, Belgium and Finland – Others countries) between 14th March of 2008 and 15th March of 2009. We assumed that the day that Lehman Brothers filed for Chapter 11 bankruptcy protection, 15th of September of 2008, is the separate day of the period before and after the stock markets fall deeper during the financial crisis.

Our main research question is whether the effect of liquidity is stronger in times of crises and if stock markets of the countries known as PIIGS had more problems of liquidity then the others Eurozone countries.

We expect an illiquidity strong effect after the 15th September 2008, when the crisis of stock market started on financial crisis 2007-08, the capital constraints became binding and inventory holding costs and search costs rose dramatically for all market participants.

The next section reviews some of the relevant literature on liquidity in periods of crisis. Section three presents the data and preliminary findings and section four describes the results. Section five presents the conclusions.

2. Literature Review

In finance, the bid-ask spread is related with liquidity and information asymmetry. Higher information asymmetry and lower liquidity imply bigger spread. Demsetz (1968) was one of the first researchers to investigate the bid-ask spread. He considered that analysing bid-ask spread is similar to analysing the immediate supply and demand. Demsetz argued that a trader can pay a price for immediacy, so the bid-ask spread reflects total trading cost that trader will pay for transacting.

Amihud and Mendelson (1986) developed a model to analyze the relationship between return and risk (beta) and bid-ask spread. They demonstrated that return is an increasing function of risk and illiquidity. The greater the difference between the ask price and the bid price, the greater the illiquidity, indicating a premium requested from the seller to execute the order immediately. The increased liquidity of stocks traded, allows its holders sell them at a higher price. They also found that in equilibrium, liquidity is correlated with the frequency of trading.

Amihud and Mendelson (1989) found evidence that the return is negatively correlated with spread, and is affected by the size of the firm, January effect and by the sensitivity of the variations of the market index. Eleswarapu (1997) tested if abnormal returns of NASDAQ stocks were negative correlated with spread. He divided the stocks in 49 portfolios and used the Fama-Macbeth regression and SUR (seemingly unrelated regression). He found a negative correlation between spread and returns.

In another article Amihud and Mendelson (1991), analyzes the decrease in liquidity of the stocks during the stock market crash in New York in 1987, and they showed that there was also a reduction in prices. They found that the bid-ask increased during the crisis and liquidity and prices decrease. After the crisis, with decreased of bid-ask spread, the prices increased, corroborating the hypothesis that liquidity affects prices positively.

Cao and Petrasek (2013) studied what factors affect the relative performance of stocks during liquidity crises. In an event-study they used some market liquidity measures to identify the liquidity crisis. They concluded that abnormal stock returns during liquidity crises are strongly negatively related to liquidity risk, measured by the co-movement of stock returns with market liquidity.

Chordia, Sarkar and Subrahmanyam (2003) studied the commonality in liquidity for stocks and bonds markets. They concluded that the correlation between stock and bond market liquidity sharply increases during periods of crises and that the loss of liquidity in times of crisis is systemic. Tinic and West (1972), Stoll (1978) and Jegadeesh and Subrahmanyam (1993) find that spreads are correlated negatively with the price, volume and the number of market makers, and positively with volatility. Atkins and Dyl (1997), Glosten and Harris (1988), and Menyah and Paudyal (2000), showed that factors that determine the bid-ask spread are trading volume, volatility and market value.

Datar, Naik and Radcliffe (1998) use another proxy to measure the liquidity - turnover rate (stocks traded by stocks outstanding). They used non-financial firms listed in NYSE between 1963 and 1991 and they found that the returns are negative related with turnover rate, confirming the hypothesis that illiquidity stock offer bigger returns. They provided evidence for a negative correlation between liquidity and stock returns. Chordia *et al.* (2001), Marshall and Young (2003), Chan and Faff (2003) and Jun *et al.* (2003) also used the turnover rate to measure the liquidity and the conclusions are identical do Datar *et al.* (1998).

Brennan, Chordia and Subrahmanyam (1998) used as proxy of liquidity the volume in money to identify the determinants of abnormal returns of stocks. They studied if returns are explained by characteristics of the firm like book value/market value, size,

dividend and liquidity. They observed a significant and negative relation between return and volume in money for the stocks of NYSE and NASDAQ that is consistent with the liquidity premium in asset pricing. Chordia, Subrahmanyam and Anshuman (2001) made a similar study to Brennan, Chordia and Subrahmanyam (1998) but included another proxy – turnover rate.

Amihud (2002) studied the relation between illiquidity and return. He developed a measure to compare the absolute return with the volume in dollars. He concluded that illiquidity has a significant and positive effect over the expected returns.

Liu (2006) developed a model that incorporates the liquidity in CAPM. He used as a liquidity *proxy* the turnover standardized and adjusted for the number of days without negotiation. He shows that this model catches a liquidity premium that CAPM can't catch, and he also notes that the greatest liquidity declines in American stock market occur during the greatest economic and financial shocks.

Chen and Poon (2008) used the measure propose by Amihud in 2002 and they studied the liquidity in 37 countries. They concluded that periods of high volatility drives to situations of illiquidity. They also show that in periods of financial crises the illiquidity rises.

Duffie, Garleanu, and Pedersen (2007) show that in crisis period, liquidity have a bigger role, because inventory holding costs is higher. The investors more risk averse could shift their portfolio from illiquid to liquid assets.

Koutmos and Martin (2011) evaluate the impact of the Asian crisis on bid-ask spread of 21 emerging and developed country currencies. They concluded that for Asian emerging markets the spread widened instead the developed countries that spread narrowed. They detect incremental spread effects for smallest markets that could be attributed to an environment characterized by information asymmetries stemming from unstable economies.

Poon et al (2013) studies the effect of institutional investors trading on the liquidity characteristics of S&P 1500 stock during the 2007-2008 financial crisis. The mean quoted spread firms was 50% higher than for the three years preceding the crisis. There was a switch from buy position during the pre-crisis period to sell position during the crisis.

3. Data and preliminary findings

The Eurozone currently consists in 18 European Union (EU) countries that have adopted the euro (€) as their common currency. On January 1, 1999 the euro was officially launched with 11 countries (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain) and the Greece joined on January 1, 2001. The member countries replace their national currencies for euros on January 1, 2002.

The monetary policy of each Eurozone country is submitted to the European Central Bank (ECB). There were some rules to maintain the stability of euro that was imposed to the countries. Some countries such as Greece, Portugal, Ireland, Italy, and Spain (often referred to as “PIIGS”) have more problems than the Others Eurozone Countries (OEC) during the Eurozone Crisis. We want to understand if the liquidity of stock markets of these countries (PIIGS) had different behaviour than the others Eurozone countries, on financial crisis of 2008. For this study we included 11 of the countries that start with the euro on January 1, 2002 (we only excluded the Luxembourg).

The data of the eleven countries was collected on Datastream for the period of 15th March 2008 until 15th March 2009 (252 days). We collected data of the 10 biggest firms of each country (we do not included firms quoted in stock exchange but not belong’s of the stock exchange’s country) and we calculate the market capitalization by country only for the 10 firms. We also calculate the average return, volatility and volume in 000€ to compare the differences between countries.

Table 2.1. Mean of Return, Market Capitalization, Volatility and Volume in €

Country	Return	Market Cap.	Volatility	Volume in
	15/03/08 to 15/03/09	(M€) 15/03/08 to 15/03/09	15/03/08 to 15/03/09	000€ 15/03/08 to 15/03/09
PIIGS				
Portugal	-0.001878	37,489	0.401374	18,418
Spain	-0.002243	298,499	0.433914	411,416
Italy	-0.003136	278,922	0.466487	360,824
Ireland	-0.002954	30,738	0.657425	23,565
Greece	-0.003291	43,898	0.538908	14,311
OEC				
Germany	-0.001737	335,276	0.487647	322,083
Netherlands	-0.002287	268,275	0.509538	215,028
France	-0.001438	412,066	0.487093	275,829
Finland	-0.003069	104,839	0.516268	227,164
Belgium	-0.002439	99,730	0.565210	50,373
Austria	-0.002442	43,348	0.599535	23,908

Source: author’s own estimation based on Datastream data.

The return in all countries are negative during the period studied and the volatility is high. Table 2.1 demonstrate that there are big and small stock markets on PIIGS and Others Eurozone Countries. We can designate Portugal, Ireland, Greece and Austria as Small Stock Exchanges, Finland and Belgium as Medium Stock Exchanges, and Spain, Italy, Germany, France and Netherlands as Large Stock Exchanges.

3.1. Liquidity proxies

For this research, we use three liquidity proxies. The bid-ask spread (BAS), turnover rate and Amihud Illiquidity Ratio.

The bid-ask spread was calculated relative to its midpoint:

$$BAS_i = \frac{ask_i - bid_i}{(ask_i + bid_i)/2} \times 100 \quad (2.1)$$

where ask_i is the closing ask price in Euros at day i , and bid_i is the closing bid price in Euros at day i .

There are many calculations of the bid-ask spread (effective, quoted, proportional), but we prefer the relative bid-ask spread because it is the most liquidity measure studied because it makes spreads of different stocks comparable to each other.

Table 2.2 reports the relative bid-ask spread mean for the entire examination period and for two sub-periods. The first sub-period, 15th March 2008 to 14th September 2008 and the second sub-period, 15th September 2008 to 15th March 2009.

Table 2.2. Relative Bid-Ask Spread Mean

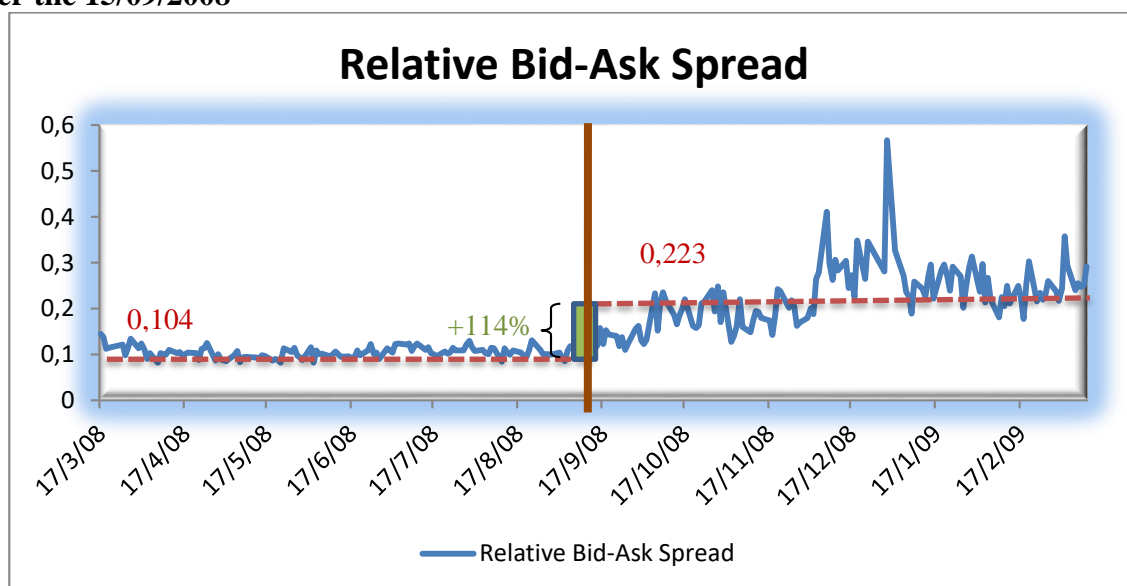
Country	Full Period	Pre	Post	Variation Pre - Post
	15/03/2008 15/03/2009	15/03/2008 14/09/2008	15/09/2008 15/03/2009	
PIIGS				
Portugal	0.324839	0.290533	0.359695	23.81%
Spain	0.109668	0.086677	0.133028	53.47%
Italy	0.310851	0.069697	0.555864	697.54%
Ireland	0.689344	0.543850	0.837167	53.93%
Greece	0.780319	0.637296	0.925630	45.24%
OEC				
Germany	0.093460	0.061998	0.125424	102.30%
Netherlands	0.086484	0.067761	0.105507	55.70%
France	0.068324	0.055352	0.081505	47.25%
Finland	0.141775	0.110023	0.174035	58.18%
Belgium	0.207688	0.139726	0.276738	98.06%
Austria	0.470776	0.262277	0.682612	160.26%
All	0.163317	0.104211	0.223369	114.34%

Source: author's own estimation based on Datastream data.

It can be seen in Table 2.2 that all BAS increases in the second sub-period, after the Lehman Brothers bankrupting. This is consistent with the theory that in periods of crisis, the bid-ask spread increases.

On Figure 2.1, we demonstrate for all 11 countries the rise of the BAS after the 15th September 2008. The variation between the two sub-periods was more than 114%.

Figure 2.1. Relative bid-ask spread of all 11 countries of Eurozone, before and after the 15/09/2008



Source: author's own estimation based on Datastream data.

The Turnover Rate is calculated by dividing the total number of shares traded over a period by the average number of shares outstanding for the period. We used the logarithmic of Turnover Rate like Datar et al (1998) had used. In Table 2.3

$$\text{Turnover Rate}_t = \frac{\# \text{shares traded in } t}{\# \text{shares outstanding in } t} \quad (2.2)$$

Table 2.3. Turnover Rate Mean

Country	Full Period	Pre	Post	Variation
	15/03/2008 15/03/2009	15/03/2008 14/09/2008	15/09/2008 15/03/2009	
PIIGS				
Portugal	0.00373	0.004121	0.003334	-19.11%
Spain	0.009684	0.008951	0.010429	16.52%
Italy	0.008708	0.009301	0.008105	-12.87%
Ireland	0.004065	0.003851	0.004282	11.19%
Greece	0.003148	0.002995	0.003304	10.30%
OEC				
Germany	0.009012	0.008537	0.009494	11.21%
Netherlands	0.006172	0.005545	0.006810	22.82%
France	0.005549	0.005055	0.006051	19.71%
Finland	0.006650	0.006366	0.006938	8.99%
Belgium	0.003832	0.003099	0.004577	47.69%
Austria	0.003607	0.003516	0.003699	5.21%
ALL	0.007130	0.006754	0.007513	11.24%

Source: author's own estimation based on Datastream data.

The largest stock markets have a bigger turnover rate which demonstrates they have more liquidity. Only in Portugal and Italy the turnover rate decreases in the second sub-period.

Amihud (2002) proposed a liquidity proxy based on Kyle (1985) measure. The Amihud illiquidity measure relates the return to the trade volume measure in dollars (in this case, euros). The Amihud illiquidity measure is defined as the average between the absolute returns (r_j) and its trading volumes (v_j), a t day for a certain stock over a time period with N observed, i.e.,

$$Amihud_t = \frac{1}{N_t} \sum_{j=1}^{N_t} \frac{|r_j|}{v_j} \quad (2.3)$$

A higher Amihud illiquidity measure means that trading a stock causes its price to move more in response to a given volume of trading, in turn, implying lower liquidity. We use the daily volume and daily price to generate the returns and calculate the Amihud illiquidity measure on a day-by-day basis.

Table 2.4. Amihud Illiquidity Measure Mean

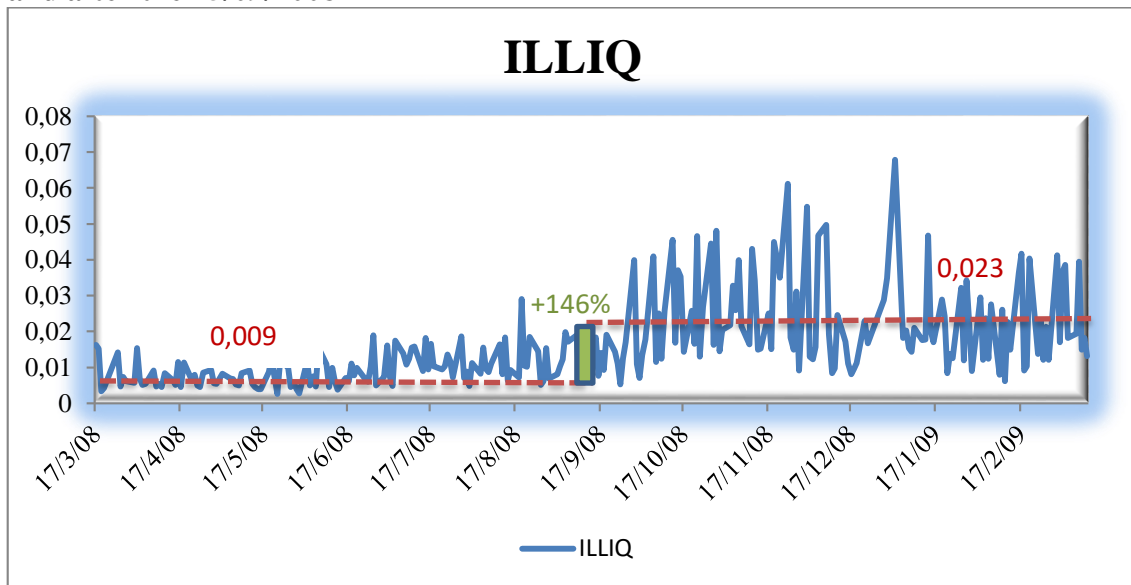
Country	Full Period	Pre	Post	Variation
	15/03/2008 15/03/2009	15/03/2008 14/09/2008	15/09/2008 15/03/2009	Pre - Post
PIIGS				
Portugal	0.088977	0.053504	0.125018	133.66%
Spain	0.004817	0.003203	0.006457	101.61%
Italy	0.006630	0.002742	0.010581	285.88%
Ireland	0.116244	0.102134	0.130580	27.85%
Greece	0.074904	0.045316	0.104965	131.63%
OEC				
Germany	0.005634	0.002483	0.008835	255.80%
Netherlands	0.009984	0.004463	0.015593	249.40%
France	0.006915	0.004118	0.009757	136.91%
Finland	0.010427	0.004995	0.015946	219.21%
Belgium	0.045628	0.027665	0.063878	130.90%
Austria	0.143747	0.044848	0.244227	444.56%
ALL	0.016059	0.009324	0.022903	145.63%

Source: author's own estimation based on Datastream data.

Table 2.4 show us that in small markets the Amihud illiquidity measure is bigger (less liquidity) and after 15th September 2008 the Amihud illiquidity measure increase significantly in all countries. This is consistent with the theory that in periods of crisis, the illiquidity increases.

In Figure 2.2, we demonstrate for all 11 countries the rise of the Amihud illiquidity measure after the 15th September 2008. The variation between the two sub-periods was more than 146%.

Figure 2.2. Amihud Illiquidity Measure of all 11 countries of Eurozone, before and after the 15/09/2008



Source: author's own estimation based on Datastream data.

3.2. Sample correlations

Table 2.5 presents a summary of the time-series average of cross-sectional correlation between all variables used in regressions. Some features are worthy of mention. In most of countries, the BAS is negative correlated with the return, what is consistent with other studies. The variable more correlated with the BAS and Amihud illiquidity measure is the Market Value. For the full period, this correlation is always negative, but in the two sub-periods is not consistent.

Most of the variables have small correlation between them and there are no significant differences in results between PIIGS and the others Eurozone countries.

Table 2.5. Correlations between variables

	Full Period							Pre							Post							
	15-03-2008 to 15-03-2009							15-03-2008 to 15-03-2009							15-03-2008 to 15-03-2009							
Portugal																						
	baspor	retpor	ilpor	Inturnpor	Invopor	Involatpor	Inmvpor	baspor	retpor	ilpor	Inturnpor	Invopor	Involatpor	Inmvpor	baspor	retpor	ilpor	Inturnpor	Invopor	Involatpor	Inmvpor	
baspor	1,0000							1,0000							1,0000							
retpor	-0,1746	1,0000						0,0584	1,0000						-0,2467	1,0000						
ilpor	0,3145	-0,1339	1,0000					0,0735	-0,0905	1,0000					0,2638	-0,1449	1,0000					
Inturnpor	0,1422	-0,0088	-0,1228	1,0000				0,1280	0,0113	-0,0547	1,0000				0,3079	-0,0337	0,0215	1,0000				
Invopor	0,0889	0,0143	-0,1236	0,9494	1,0000			0,0833	-0,0023	-0,0336	0,9396	1,0000			0,2867	0,0068	0,0617	0,9519	1,0000			
Involatpor	0,3203	0,0081	0,3372	0,0785	0,0221	1,0000		0,3490	0,1639	0,1918	0,1445	0,1109	1,0000		0,1640	-0,0203	0,1408	0,3731	0,3692	1,0000		
Inmvpor	-0,2692	-0,0419	-0,4357	0,3613	0,4267	-0,4899	1,0000	-0,2765	-0,0466	-0,4390	-0,0153	0,0568	-0,5034	1,0000	0,0782	-0,2194	-0,0467	0,4427	0,4302	0,2412	1,0000	
Spain																						
	basspa	retspa	ilspa	Inturnspa	Invospa	Involatspa	Inmvspa	basspa	retspa	ilspa	Inturnspa	Invospa	Involatspa	Inmvspa	basspa	retspa	ilspa	Inturnspa	Invospa	Involatspa	Inmvspa	
basspa	1,0000							1,0000							1,0000							
retspa	-0,1022	1,0000						-0,1782	1,0000						-0,0823	1,0000						
ilspa	0,4356	-0,0518	1,0000					0,2637	-0,0540	1,0000					0,2227	-0,0325	1,0000					
Inturnspa	0,1661	-0,0395	0,1290	1,0000				-0,0943	0,0518	-0,0505	1,0000				0,0731	-0,0652	0,0989	1,0000				
Invospa	-0,3187	0,0547	-0,1600	0,5626	1,0000			-0,1494	0,0786	-0,0182	0,6223	1,0000			-0,0595	0,0273	-0,0208	0,7585	1,0000			
Involatspa	0,5800	0,0175	0,4483	0,3254	-0,1188	1,0000		0,1286	0,1269	0,2984	0,0847	0,1324	1,0000		0,0046	0,0693	0,2264	0,3762	0,3587	1,0000		
Inmvspa	-0,7642	0,0978	-0,4312	-0,1058	0,4328	-0,6691	1,0000	-0,2675	0,0848	-0,3919	0,0498	0,1153	-0,4925	1,0000	-0,4345	0,1253	-0,1223	0,1954	0,3502	0,1970	1,0000	
Italy																						
	basita	retita	ilita	Inturnita	Invoita	Involatita	Inmvita	basita	retita	ilita	Inturnita	Invoita	Involatita	Inmvita	basita	retita	ilita	Inturnita	Invoita	Involatita	Inmvita	
basita	1,0000							1,0000							1,0000							
retita	-0,0441	1,0000						-0,1397	1,0000						0,0146	1,0000						
ilita	0,4351	-0,0836	1,0000					0,2254	-0,0717	1,0000					0,1678	-0,0436	1,0000					
Inturnita	-0,4085	-0,0581	-0,2171	1,0000				-0,1185	0,0162	-0,2781	1,0000				-0,4551	-0,1132	-0,0992	1,0000				
Invoita	0,0298	-0,0603	0,2768	0,4138	1,0000			0,0832	-0,0254	0,1275	0,4048	1,0000			-0,4118	-0,0343	0,1004	0,6759	1,0000			
Involatita	0,4061	-0,0125	0,5604	-0,2659	0,4109	1,0000		0,3490	0,1416	0,2652	-0,1384	0,1263	1,0000		-0,3518	0,1091	0,2734	-0,1564	0,1930	1,0000		
Inmvita	-0,7228	0,0946	-0,5136	0,3121	-0,2806	-0,7234	1,0000	-0,5265	0,0838	-0,2979	0,3180	-0,0254	-0,3758	1,0000	-0,5124	0,0335	-0,1152	0,2308	0,2404	0,2346	1,0000	

	Full Period							Pre							Post							
	15-03-2008 to 15-03-2009							15-03-2008 to 15-03-2009							15-03-2008 to 15-03-2009							
Ireland	basire	retire	ilire	Inturnire	Invoire	Involatire	Inmvire	basire	retire	ilire	Inturnire	Invoire	Involatire	Inmvire	basire	retire	ilire	Inturnire	Invoire	Involatire	Inmvire	
basire	1,0000							1,0000							1,0000							
retire	0,1136	1,0000						0,1435	1,0000						0,1461	1,0000						
ilire	0,2170	-0,2448	1,0000					0,1592	-0,1377	1,0000					0,1788	-0,3143	1,0000					
Inturnire	0,1617	0,0900	-0,0872	1,0000				0,1038	0,1211	-0,1552	1,0000				0,1435	0,0714	-0,0592	1,0000				
Invoire	-0,0008	-0,0458	-0,0470	0,4379	1,0000			-0,1603	0,0772	-0,2298	0,2878	1,0000			0,1558	-0,1418	0,1161	0,6122	1,0000			
Involatire	0,5011	0,0484	0,3205	0,1756	-0,1782	1,0000		0,3075	0,1127	0,4362	0,0868	-0,4722	1,0000		0,2970	0,0375	0,1425	0,2599	0,3089	1,0000		
Inmvire	-0,5192	0,0338	-0,2151	-0,0384	0,2208	-0,6841	1,0000	-0,2181	0,0442	-0,4289	-0,1338	0,4431	-0,7349	1,0000	-0,0523	0,0359	0,0365	0,5047	0,3720	0,4041	1,0000	
Greece	basgre	retgre	ilgre	Inturngre	Invogre	Involatgre	Inmvgre	basgre	retgre	ilgre	Inturngre	Invogre	Involatgre	Inmvgre	basgre	retgre	ilgre	Inturngre	Invogre	Involatgre	Inmvgre	
basgre	1,0000							1,0000							1,0000							
retgre	-0,1212	1,0000						-0,0478	1,0000						-0,0836	1,0000						
ilgre	0,2721	-0,1342	1,0000					0,0468	-0,1170	1,0000					0,0593	-0,0947	1,0000					
Inturngre	0,1149	-0,0014	-0,1180	1,0000				0,0343	0,1845	-0,0389	1,0000				0,1810	-0,1604	-0,2847	1,0000				
Invogre	0,0808	-0,0940	-0,2043	0,3465	1,0000			0,2395	-0,0675	0,1054	0,2921	1,0000			-0,0055	-0,1192	-0,3893	0,4497	1,0000			
Involatgre	0,4046	-0,0496	0,2726	0,1913	0,1284	1,0000		0,2189	0,1572	0,0637	0,0403	0,2654	1,0000		-0,0313	-0,0236	-0,0340	0,4142	0,1124	1,0000		
Inmvgre	-0,5291	0,1104	-0,4472	0,0332	0,1072	-0,5986	1,0000	-0,2675	0,2394	-0,2180	0,1384	-0,1366	-0,0180	1,0000	0,0634	-0,0774	-0,1662	0,4173	0,6110	0,1656	1,0000	

	Full Period							Pre							Post							
	15-03-2008 to 15-03-2009							15-03-2008 to 15-03-2009							15-03-2008 to 15-03-2009							
Germany																						
	basger	retger	ilger	Inturnger	Invoger	Involatger	lnmvger	basger	retger	ilger	Inturnger	Invoger	Involatger	lnmvger	basger	retger	ilger	Inturnger	Invoger	Involatger	lnmvger	
basger	1,0000							1,0000							1,0000							
retger	-0,1496	1,0000						0,0531	1,0000						-0,1652	1,0000						
ilger	0,4045	0,0023	1,0000					-0,0004	-0,1188	1,0000					0,0780	0,0586	1,0000					
Inturnger	0,3676	-0,0591	0,1402	1,0000				0,3115	0,0186	0,1742	1,0000				0,4529	-0,0745	0,1017	1,0000				
Invoger	0,2952	-0,0703	0,1275	0,4979	1,0000			0,1862	0,1191	-0,1166	0,3573	1,0000			0,3161	-0,1277	0,1009	0,5910	1,0000			
Involatger	0,6507	0,0252	0,5561	0,1893	0,2456	1,0000		0,2428	0,1916	0,0811	0,2059	0,0035	1,0000		0,3250	0,1115	0,2529	0,1902	0,3289	1,0000		
lnmvger	-0,5771	0,0611	-0,5853	0,0235	-0,0947	-0,7682	1,0000	-0,1333	0,1529	-0,1560	-0,1532	0,1178	0,1033	1,0000	0,0299	0,0017	-0,2280	0,3730	0,1331	-0,2256	1,0000	
Netherlands																						
	basnet	retnet	ilnet	Inturnnet	Invonet	Involatnet	lnmvnet	basnet	retnet	ilnet	Inturnnet	Invonet	Involatnet	lnmvnet	basnet	retnet	ilnet	Inturnnet	Invonet	Involatnet	lnmvnet	
basnet	1,0000							1,0000							1,0000							
retnet	-0,0737	1,0000						-0,0568	1,0000						-0,0494	1,0000						
ilnet	0,4666	-0,0245	1,0000					0,2581	-0,0679	1,0000					0,3355	0,0155	1,0000					
Inturnnet	0,1858	-0,1039	0,0925	1,0000				-0,0305	-0,1259	-0,0527	1,0000				0,1331	-0,0884	-0,0416	1,0000				
Invonet	0,2892	-0,0712	0,1880	0,8380	1,0000			-0,0594	-0,0792	-0,0545	0,7600	1,0000			0,2570	-0,0491	0,0415	0,8666	1,0000			
Involatnet	0,4620	-0,0112	0,4848	0,3363	0,4508	1,0000		0,0946	0,0663	0,1384	0,2486	0,1058	1,0000		0,2015	0,0839	0,1533	0,2361	0,4083	1,0000		
lnmvnet	-0,4060	-0,0154	-0,4688	-0,1676	-0,2539	-0,8181	1,0000	-0,1710	-0,0304	-0,1652	-0,2643	-0,1200	-0,8656	1,0000	0,0508	-0,2140	-0,0390	0,3470	0,2634	-0,0801	1,0000	
France																						
	basfra	retfra	ilfra	Inturnfra	Invofra	Involatfra	lnmvfra	basfra	retfra	ilfra	Inturnfra	Invofra	Involatfra	lnmvfra	basfra	retfra	ilfra	Inturnfra	Invofra	Involatfra	lnmvfra	
basfra	1,0000							1,0000							1,0000							
retfra	0,0803	1,0000						0,0598	1,0000						0,1130	1,0000						
ilfra	0,4604	-0,0042	1,0000					0,2747	0,0132	1,0000					0,3905	0,0252	1,0000					
Inturnfra	0,0406	0,0335	0,1098	1,0000				0,0146	0,1094	0,1623	1,0000				-0,0466	0,0277	-0,0267	1,0000				
Invofra	-0,0355	-0,0161	0,0705	0,8994	1,0000			-0,0383	0,0192	0,1299	0,8676	1,0000			-0,1503	-0,0106	-0,0888	0,9097	1,0000			
Involatfra	0,3130	0,0118	0,4424	0,2974	0,3171	1,0000		0,0113	0,2008	0,2209	0,2030	0,2173	1,0000		0,0983	0,0853	0,1179	0,2427	0,2492	1,0000		
lnmvfra	-0,2997	-0,0311	-0,4207	-0,0976	-0,0788	-0,6839	1,0000	-0,0647	-0,1045	-0,2538	-0,3528	-0,2585	-0,5150	1,0000	-0,0528	-0,1474	-0,0704	0,3262	0,3747	0,2554	1,0000	

	Full Period							Pre							Post							
	15-03-2008 to 15-03-2009							15-03-2008 to 15-03-2009							15-03-2008 to 15-03-2009							
Finland																						
	basfin	retfin	ilfin	Inturnfin	Invofin	Involatfin	Inmvfin	basfin	retfin	ilfin	Inturnfin	Invofin	Involatfin	Inmvfin	basfin	retfin	ilfin	Inturnfin	Invofin	Involatfin	Inmvfin	
basfin	1,0000							1,0000							1,0000							
retfin	-0,0917	1,0000						-0,1975	1,0000						-0,0368	1,0000						
ilfin	0,3523	-0,0666	1,0000					0,1221	0,0047	1,0000					0,0840	-0,0558	1,0000					
Inturnfin	-0,0610	-0,0465	-0,0432	1,0000				-0,1101	-0,0706	-0,0621	1,0000				-0,2164	-0,0237	-0,1712	1,0000				
Invofin	0,0170	0,0319	0,0923	0,6912	1,0000			-0,0584	-0,0219	0,0139	0,5733	1,0000			-0,1965	0,0758	-0,0481	0,7842	1,0000			
Involatfin	0,3964	0,0306	0,3496	0,2415	0,2980	1,0000		-0,0727	0,1178	-0,1272	0,2252	-0,0048	1,0000		-0,0395	0,0999	-0,0011	0,2015	0,3209	1,0000		
Inmvfin	-0,5623	0,0783	-0,5059	-0,0408	-0,0879	-0,5240	1,0000	-0,1068	0,1194	-0,1710	0,0853	-0,0785	0,3902	1,0000	-0,1087	0,0528	-0,1429	0,2548	0,4716	0,5339	1,0000	
Belgium																						
	basbel	retbel	ilbel	Inturnbel	Invoebel	Involatbel	Inmvbel	basbel	retbel	ilbel	Inturnbel	Invoebel	Involatbel	Inmvbel	basbel	retbel	ilbel	Inturnbel	Invoebel	Involatbel	Inmvbel	
basbel	1,0000							1,0000							1,0000							
retbel	-0,1147	1,0000						-0,1375	1,0000						-0,1099	1,0000						
ilbel	0,3709	-0,1318	1,0000					0,0679	-0,0186	1,0000					0,2416	-0,1501	1,0000					
Inturnbel	0,3383	-0,0664	0,1765	1,0000				-0,0057	-0,0710	0,0383	1,0000				0,1660	-0,0509	-0,0225	1,0000				
Invoebel	0,0582	-0,0471	0,0507	0,3570	1,0000			-0,0946	0,1245	-0,0894	0,1913	1,0000			0,0726	-0,1487	0,0802	0,5286	1,0000			
Involatbel	0,5467	0,0127	0,4639	0,5199	0,0098	1,0000		0,0000	0,1135	0,4002	0,1872	-0,2051	1,0000		0,3716	0,0644	0,2642	0,2894	0,0224	1,0000		
Inmvbel	-0,5396	-0,0528	-0,4224	-0,4503	0,0295	-0,8897	1,0000	-0,0342	-0,0591	-0,4654	-0,2517	0,2488	-0,8143	1,0000	-0,2898	-0,2375	-0,1263	0,0321	0,1916	-0,4751	1,0000	
Austria																						
	basaus	retaus	ilaus	Inturnaus	Invoaus	Involataus	Inmvaus	basaus	retaus	ilaus	Inturnaus	Invoaus	Involataus	Inmvaus	basaus	retaus	ilaus	Inturnaus	Invoaus	Involataus	Inmvaus	
basaus	1,0000							1,0000							1,0000							
retaus	-0,1828	1,0000						-0,0277	1,0000						-0,2349	1,0000						
ilaus	0,5559	-0,0759	1,0000					-0,1436	-0,2115	1,0000					0,2622	-0,0384	1,0000					
Inturnaus	-0,0272	0,0241	-0,1938	1,0000				-0,0587	-0,0459	0,0116	1,0000				-0,0507	0,0478	-0,3123	1,0000				
Invoaus	0,4707	0,0646	0,3716	0,1684	1,0000			0,0243	-0,0589	-0,1049	0,4515	1,0000			0,0078	0,1832	0,0232	0,1014	1,0000			
Involataus	0,6978	-0,0286	0,6053	0,0431	0,4868	1,0000		-0,0960	-0,0100	0,1443	0,1699	-0,1675	1,0000		0,2322	0,0745	0,2842	0,0206	-0,1512	1,0000		
Inmvaus	-0,6770	0,0584	-0,5818	0,0485	-0,5742	-0,8388	1,0000	0,3111	0,1313	-0,1766	-0,1892	0,2484	-0,4413	1,0000	0,0378	-0,0784	-0,1551	0,5439	-0,0444	0,2166	1,0000	

4. Methodology and Results

To analyse the illiquidity effects we use three liquidity proxies, the bid-ask spread, turnover rate and Amihud illiquidity measure. To explain those proxies, we use two variables that was more common in literature – return (Ret) and logarithmic volume (LnVol), and we use also the logarithmic market value (LnMV) and logarithmic volatility (LnVolat) that was used in less studies. We calculated the results for all sample and for the two sub-periods.

Furthermore, before employing the variables in econometric modeling, we check the stationarity condition for the time series of stock returns, trading volume and bid-ask spreads using the augmented Dickey-Fuller (ADF) test. Our results (not shown here) reveal that all three time series can be considered stationary.

We use a multiple regression for the three proxies.

$$BAS_t = \beta_0 + \beta_1 Ret_t + \beta_2 LnVolat_t + \beta_3 LnVol_t + \beta_4 LnMV_t + \varepsilon_t \quad (2.4)$$

$$Turnover Rate_t = \beta_0 + \beta_1 Ret_t + \beta_2 LnVolat_t + \beta_3 LnVol_t + \beta_4 LnMV_t + \varepsilon_t \quad (2.5)$$

$$Amihud Illiquidity_t = \beta_0 + \beta_1 Ret_t + \beta_2 LnVolat_t + \beta_3 LnVol_t + \beta_4 LnMV_t + \varepsilon_t \quad (2.6)$$

Tables 2.6 to 2.14 show us the results of the equation 2.4 to 2.6.

Table 2.6. Results of equation 2.4 (BAS) for full period (15/03/2008 to 15/03/2009)

	# Observ.	R ²	Return	LnVol	LnVolat.	LnMV	Constant
PIIGS							
Portugal	252	0,1841	-1,1317 (-1,59)	0,0540 *** (3,42)	0,0618 ** (2,35)	-0,1592 *** (-3,52)	1,5757 *** (3,93)
Spain	252	0,5942	-0,0455 (-0,62)	-0,0009 (-0,25)	0,0102 ** (2,07)	-0,1054 *** (-10,46)	1,4529 *** (12,97)
Italy	252	0,5700	0,4089 * (0,52)	-0,1676 ** (-2,25)	-0,1519 ** (-2,54)	-1,3515 *** (-15,81)	1,8866 *** (14,49)
Ireland	252	0,3391	1,0160 ** (2,12)	0,1027 *** (2,81)	0,2055 *** (4,00)	-0,3266 *** (-5,44)	3,0598 *** (4,76)
Greece	252	0,3080	-0,6538 (-0,74)	0,0597 ** (2,27)	0,0974 (1,37)	-0,3781 *** (-6,92)	4,3927 *** (8,44)
OEC							
Germany	252	0,4823	-0,2693 ** (-2,13)	0,0183 *** (2,86)	0,0473 *** (4,49)	-0,0428 *** (-2,74)	0,5468 *** (2,69)
Netherlands	252	0,2308	-0,0896 (-0,66)	0,0132 (1,32)	0,0279 ** (2,47)	-0,0194 (-1,16)	0,2294 *** (1,03)
France	252	0,1314	0,1048 (0,82)	-0,0147 (-1,03)	0,0251 *** (2,79)	-0,0294 (-1,58)	0,6049 ** (2,11)
Finland	252	0,3388	-0,1174 (-1,04)	-0,0118 ** (-1,23)	0,0326 *** (2,95)	-0,0945 *** (-8,87)	1,3571 *** (9,01)
Belgium	252	0,3334	-0,6588 * (-1,72)	0,0197 (1,3)	0,0941 ** (2,03)	-0,1242 * (-1,82)	1,5032 ** (2,00)
Austria	252	0,5522	-1,4956 *** (-2,91)	0,0709 *** (2,73)	0,2935 *** (4,85)	-0,1584 ** (-2,45)	1,8147 ** (2,43)

***, **, * denotes significance at 1%, 5% and 10% respectively. Robust t statistic in parenthesis

Table 2.7. Results of equation 2.4 (BAS) for pre-period (15/03/2008 to 14/09/2008)

	# Observ.	R ²	Return	LnVol.	LnVolat.	LnMV	Constant
PIIGS							
Portugal	127	0,1392	0,0444 (0,09)	0,0121 (0,85)	0,0936 ** (2,47)	-0,1171 (-1,44)	1,5435 * (1,79)
Spain	127	0,1104	-0,1345 * (-1,79)	-0,0040 (-1,06)	0,0039 (0,64)	-0,0352 ** (-2,05)	0,5771 *** (2,72)
Italy	127	0,3223	-0,1207 (-1,58)	0,0018 (0,54)	0,0137 ** (2,55)	-0,0671 *** (-5,54)	0,9225 *** (5,86)
Ireland	127	0,1017	0,7938 (0,95)	-0,0203 (-0,41)	0,1462 ** (2,39)	-0,0082 (-0,04)	0,9491 (0,55)
Greece	127	0,141	-0,0755 (-0,08)	0,0574 ** (1,77)	0,1784 ** (1,92)	-0,4696 *** (-3,01)	0,5472 *** (3,23)
OEC							
Germany	127	0,1266	0,0093 (0,08)	0,0078 *** (2,87)	0,0173 *** (2,99)	-0,0618 ** (-2,10)	0,8268 ** (2,18)
Netherlands	127	0,0507	-0,1149 (-0,66)	-0,0072 (-0,93)	-0,0348 (-1,01)	-0,1191 * (-1,80)	1,6063 * (1,94)
France	127	0,0111	0,0837 (0,60)	-0,0041 (-0,50)	-0,0040 (-0,32)	-0,0343 (-0,91)	0,5366 (1,08)
Finland	127	0,0511	-0,2853 (-2,15)	-0,0072 (-0,77)	-0,0028 (-0,17)	-0,0312 (-0,89)	0,5374 (1,21)
Belgium	127	0,0267	-0,3335 (-0,99)	-0,0080 (-0,83)	-0,0129 (-0,38)	-0,0299 (-0,47)	0,5542 *** (0,79)
Austria	127	0,1075	-0,4996 (-0,87)	-0,0206 (-0,62)	0,0337 (0,56)	0,2932 (3,35)	-2,7773 *** (-2,94)

***, **, * denotes significance at 1%, 5% and 10% respectively. Robust t statistic in parenthesis

Table 2.8. Results of equation 2.4 (BAS) for post-period (15/09/2008 to 15/03/2009)

	# Observ.	R ²	Return	LnVol.	LnVolat.	LnMV	Constant
PIIGS							
Portugal	125	0,1618	-1,5921 (-1,81)	0,1033 *** (3,34)	0,0290 (0,88)	-0,2094 (-1,27)	1,6357 (1,00)
Spain	125	0,2035	-0,0238 (-0,27)	0,0048 (0,81)	0,0063 (0,77)	-0,1071 *** (-5,23)	1,4245 *** (5,77)
Italy	125	0,3916	0,4657 (0,54)	-0,3650 *** (-2,69)	-0,2869 *** (-3,92)	-1,1236 *** (-6,18)	1,8150 *** (9,30)
Ireland	125	0,1665	1,2430 ** (2,15)	0,1280 ** (2,07)	0,4956 *** (3,45)	-0,5890 *** (-3,1)	5,5048 *** (3,2)
Greece	125	0,016	-0,8341 (-0,78)	-0,0413 (-0,74)	-0,0455 (-0,53)	0,2072 (0,94)	-0,9143 (-0,46)
OEC							
Germany	125	0,1873	-0,2649 ** * (-2,06)	0,0229 *** (2,04)	0,0448 ** (2,92)	0,0299 (1,03)	-0,3923 (-1,05)
Netherlands	125	0,0797	-0,0588 (-0,4)	0,0251 (1,5)	0,0179 (1,28)	-0,0015 (-0,06)	-0,1024 (-0,33)
France	125	0,052	0,1369 (0,90)	-0,0228 (-0,99)	0,0255 (1,94)	-0,0021 (-0,06)	0,3330 (0,9)
Finland	125	0,041	-0,0426 (-0,31)	-0,0279 (-1,5)	0,0133 (0,46)	-0,0163 (-0,27)	0,6107 (1,04) *
Belgium	125	0,1896	-0,7814 (-1,47)	0,0353 (1,1)	0,1785 *** (3,16)	-0,2004 (-1,63)	2,2281 (1,68)
Austria	125	0,1284	-1,6441 ** * (-2,71)	0,0445 (1,32)	0,2733 *** (2,82)	-0,0916 (-0,42)	1,3384 (0,59)

***, **, * denotes significance at 1%, 5% and 10% respectively. Robust t statistic in parenthesis

Table 2.9. Results of equation 2.5 (Turnover Rate) for full period (15/03/2008 to 15/03/2009)

	# Observ.	R ²	Return	LnVolume	LnVolatility	LnMV	Constant
PIIGS							
Portugal	252	0,9056	-0,4798 (-1,51)	0,8462 *** (42,73)	0,0494 * (1,77)	-0,0551 (-0,97)	-12,5914 *** (-24,85)
Spain	252	0,5012	-0,7090 (-1,17)	0,4728 *** (12,15)	0,1973 *** (4,84)	-0,3705 *** (-3,83)	-4,0598 *** (-3,82)
Italy	252	0,4271	-0,5960 (-1,26)	0,6623 *** (10,77)	-0,2638 *** (-5,04)	0,3293 *** (4,00)	-1,6208 *** (-14,01)
Ireland	252	0,2695	1,3624 (1,92)	0,6165 *** (5,97)	0,3772 *** (3,87)	0,0755 (0,76)	-12,7319 *** (-9,66)
Greece	252	0,1551	0,6015 (0,33)	0,3347 *** (3,64)	0,4636 *** (4,45)	0,2347 (2,17)	-10,6713 *** (-6,74)
OEC							
Germany	252	0,294	-0,7550 (-0,72)	0,3712 *** (3,58)	0,2323 *** (3,39)	0,4880 *** (4,45)	-13,3981 *** (-9,99)
Netherlands	252	0,7065	-0,4878 (-1,2)	0,7961 *** (14,78)	-0,0212 (-0,48)	0,0311 (0,44)	-12,8458 *** (-14,2)
France	252	0,8118	0,5993 (1,55)	0,8835 *** (23,51)	-0,0093 (-0,28)	-0,0676 (-0,73)	-12,5724 *** (-11,54)
Finland	252	0,4869	-0,9637 (-1,11)	0,6750 *** (14,52)	0,0900 (1,35)	0,0801 (1,04)	-11,8416 *** (-14,22)
Belgium	252		-0,7801 (-1,1)	0,3232 *** (6,09)	0,4455 *** (4,87)	-0,0194 (-0,15)	-8,2163 *** (-5,1)
Austria	252	0,0828	-0,1462 (-0,15)	0,1797 *** (3,51)	0,2267 *** (2,59)	0,4228 *** (3,69)	-11,3325 *** (-7,91)

***, **, * denotes significance at 1%, 5% and 10% respectively. Robust t statistic in parenthesis

Table 2.10. Results of equation 2.5 (Turnover Rate)for pre-period (15/03/2008 to 14/09/2008)

	# Observ.	R ²	Return	LnVol.	LnVolat.	LnMV	Constant
PIIGS							
Portugal	127	0,8877	0,2371 (0,03)	0,8178 *** (27,56)	0,0083 (0,14)	-0,2362 * (-1,79)	-10,4448 *** (-8,34)
Spain	127	0,388	0,1200 (0,12)	0,4245 *** (7,63)	-0,0185 (-0,19)	-0,1038 (-0,37)	-7,3095 (-2,1)
Italy	127	0,2772	0,3296 (0,19)	0,4454 *** (6,2)	-0,1480 (-1,04)	1,1602 *** (2,77)	-24,3713 *** (-4,72)
Ireland	127	0,1814	1,4981 (1,40)	0,5786 *** (3,07)	0,1158 (0,71)	-0,7925 ** (-2,6)	-3,3410 (-0,92)
Greece	127	0,1512	0,7650 ** (2,00)	0,4340 ** (2,34)	-0,2829 (-1,26)	0,9556 (1,57)	-19,9888 ** (-2,53)
OEC							
Germany	127	0,219	-0,9702 (-0,49)	0,2761 *** (2,07)	0,2962 *** (2,92)	-1,3643 *** (-2,99)	11,2283 * (1,8)
Netherlands	127	0,6152	-1,6715 (-1,43)	0,7130 *** (8,09)	0,1705 (0,85)	-0,4008 (-1,04)	-6,3818 (-1,35)
France	127	0,782	1,7736 (2,06)	0,8405 *** (13,74)	-0,1295 ** (-2,09)	-0,8570 (-4,07)	-2,0097 *** (-0,69)
Finland	127	0,3907	-1,622 (-0,6)	0,713 *** (8,52)	0,376 (2,31)	0,253 (0,73)	-13,935 (-3,38)
Belgium	127	0,1479	-1,8643 (-1,45)	0,1789 *** (3,15)	-0,0324 (-0,21)	-0,8341 *** (-2,81)	2,2419 (0,65)
Austria	127	0,3183	0,3861 (0,26)	0,5030 *** (4,29)	0,2597 * (1,79)	-0,5880 *** (-3,31)	-2,4427 (-1,32)

***, **, * denotes significance at 1%, 5% and 10% respectively. Robust t statistic in parenthesis

Table 2.11. Results of equation 2.5 (Turnover Rate)for post-period (15/09/2008 to 15/03/2009)

	# Observ.	R ²	Return	LnVol.	LnVolat.	LnMV	Constant
PIIGS							
Portugal	125	0,909	-0,5507 (-1,69)	0,8672 *** (3,78)	0,0245 (0,80)	0,1288 (1,00)	-14,6907 *** (-1,20)
Spain	125	0,6019	-0,8371 (-1,34)	0,5500 *** (11,16)	0,1467 (2,06)	-0,2258 (-1,40)	-6,5424 *** (-3,32)
Italy	125	0,5629	-0,5931 (-1,24)	0,8347 *** (8,77)	-0,3880 *** (-5,69)	0,3490 (1,78)	-18,3522 *** (-8,71)
Ireland	125	0,4822	1,6512 (2,16)	0,6433 *** (5,48)	-0,0853 *** (-0,54)	1,1812 (4,28)	-24,1901 *** (-8,81)
Greece	125	0,3653	-1,7403 (-1,14)	0,2602 *** (3,27)	0,6352 *** (5,08)	0,5445 * (1,80)	-13,1941 *** (-4,81)
OEC							
Germany	125	0,445	-0,2371 (-0,22)	0,4849 *** (6,61)	0,1112 *** (1,40)	1,0186 (4,50)	-20,8725 *** (-7,62)
Netherlands	125	0,7775	-0,1216 (-0,30)	0,8427 *** (12,84)	-0,1344 *** (-2,88)	0,2587 ** (2,39)	-16,0968 *** (-13,93)
France	125	0,8294	0,3653 (0,82)	0,8894 *** (17,75)	0,0238 (0,41)	-0,0461 (-0,31)	-12,8916 *** (-7,54)
Finland	125	0,6387	-0,8476 (-1,47)	0,7585 *** (14,2)	0,0288 (0,36)	-0,3521 *** (-2,69)	-7,7482 *** (-6,22)
Belgium	125	0,3627	0,2889 (0,37)	0,5121 *** (5,74)	0,4811 *** (4,26)	0,2077 (1,14)	-12,5445 *** (-6,19)
Austria	125	0,3248	0,7904 (0,92)	0,0713 (1,04)	-0,1528 *** (-1,27)	2,1702 (7,40)	-28,5016 *** (-9,29)

***, **, * denotes significance at 1%, 5% and 10% respectively. Robust t statistic in parenthesis

Table 2.12. Results of equation 2.6 (Amihud Illiquidity) for full period (15/03/2008 to 15/03/2009)

	# Observ.	R ²	Return	LnVolume	LnVolatility	LnMV	Constant
PIIGS							
Portugal	252	0,2338	-0,6183 (-1,06)	0,0073 (0,71)	0,0344 ** (2,00)	-0,1533 *** (-6,22)	1,6676 *** (7,01)
Spain	252	0,234	-0,0053 (-0,37)	-0,0003 (-0,46)	0,0030 *** (3,33)	-0,0043 ** (-2,21)	0,0644 *** (2,95)
Italy	252	0,3445	-0,0145 (-0,48)	0,0013 (1,04)	0,0060 *** (4,05)	-0,0064 *** (-2,72)	0,0785 ** (2,55)
Ireland	252	0,1715	-0,8259 *** (-2,87)	-0,0011 (-0,06)	0,1030 *** (4,24)	0,0135 (0,48)	0,0360 (0,12)
Greece	252	0,2379	-0,356 (-1,31)	-0,026 *** (-2,99)	0,016 (0,95)	-0,082 *** (-4,41)	1,163 *** (5,46)
OEC							
Germany	252	0,3716	0,0050 (0,22)	0,0004 (0,63)	0,0028 (2,42) **	-0,0099 (-4,09) ***	0,1310 (4,41) ***
Netherlands	252	0,2515	-0,0093 (-0,24)	-0,0003 (-0,12)	0,0076 *** (2,65)	-0,0087 (-1,91)	0,1266 ** (2,12)
France	252	0,2239	-0,0035 (-0,16)	-0,0008 (-0,58)	0,0046 *** (3,31)	-0,0079 ** (-2,37)	0,1199 *** (2,79)
Finland	252	0,2674	-0,0146 (-0,38)	0,0007 (0,31)	0,0043 * (1,75)	-0,0175 *** (-6,13)	0,2089 *** (5,35)
Belgium	252	0,2371	-0,2403 (-1,4)	0,0050 (0,79)	0,0441 *** (2,88)	-0,0120 (-0,59)	0,1637 (0,68)
Austria	252	0,3889	-0,3045 (-0,64)	0,0183 (0,78)	0,1582 *** (3,76)	-0,0955 (-1,88)	1,1198 (1,79)

***, **, * denotes significance at 1%, 5% and 10% respectively. Robust t statistic in parenthesis

Table 2.13. Results of equation 2.6 (Amihud Illiquidity) for pre-period (15/03/2008 to 14/09/2008)

	# Observ.	R ²	Return	LnVol.	LnVolat.	LnMV	Constant
PIIGS							
Portugal	127	0,2054	-0,3096 (-0,96)	-0,0006 (-0,08)	-0,0031 (-0,19)	-0,1850 *** (-5,02)	2,0336 *** (5,33)
Spain	127	0,1703	-0,0069 (-0,44)	0,00001 (0,02)	0,0017 * (1,77)	-0,0093 *** (-3,56)	0,1244 *** (3,62)
Italy	127	0,1317	-0,0144 (-0,67)	0,0008 (1,15)	0,0026 ** (2,25)	-0,0068 ** (-2,17)	0,0845 ** (2,11)
Ireland	127	0,2420	-0,5486 (-1,24)	0,0055 (0,25)	0,0834 *** (2,63)	-0,1114 ** (-2,12)	1,2777 ** (2,42)
Greece	127	0,0603	-0,1556 (-0,63)	0,0037 (0,87)	0,0102 (0,66)	-0,0651 ** (-2,18)	0,7364 ** (2,24)
OEC							
Germany	127	0,0547	-0,0179 (-0,83)	-0,0004 (-1,27)	0,0010 (1,42)	-0,0059 * (-1,79)	0,0821 * (1,95)
Netherlands	127	0,0392	-0,0202 (-0,68)	-0,0009 (-0,68)	-0,0001 (-0,03)	-0,0081 (-1,01)	0,1161 (1,14)
France	127	0,0796	-0,0063 (-0,25)	0,0006 (0,6)	0,0020 (1,3)	-0,0096 * (-1,85)	0,1257 * (1,75)
Finland	127	0,0345	0,0062 (0,29)	0,0000 (0,03)	-0,0014 (-0,86)	-0,0072 (-1,4)	0,0885 (1,35)
Belgium	127	0,2218	-0,0704 (-0,47)	0,0019 (0,49)	0,0077 (0,56)	-0,0828 *** (-3,1)	0,9898 *** (3,26)
Austria	127	0,0802	-0,3737 (-1,72)	-0,0077 (-0,83)	0,0166 (0,91)	-0,0213 (-0,81)	0,3473 (1,27)

***, **, * denotes significance at 1%, 5% and 10% respectively. Robust t statistic in parenthesis

Table 2.14. Results of equation 2.6 (Amihud Illiquidity) for post-period (15/09/2008 to 15/03/2009)

	# Observ.	R ²	Return	LnVol.	LnVolat.	LnMV	Constant
PIIGS							
Portugal	125	0,0579	-0,6917 (-0,9)	0,0164 (0,81)	0,0399 * (1,67)	-0,1581 * (-1,73)	1,6427 * (1,83)
Spain	125	0,0848	-0,0043 (-0,25)	-0,0007 (-0,71)	0,0044 *** (3,14)	-0,0059 * (-1,67)	0,0887 ** (2,2)
Italy	125	0,1211	-0,0157 (-0,47)	0,0024 (0,99)	0,0088 *** (4,43)	-0,0120 *** (-2,72)	0,1367 *** (2,76)
Ireland	125	0,1238	-0,9396 ** (-2,44)	0,0102 (0,36)	0,0897 (1,65)	-0,0249 (-0,31)	0,2914 (0,39)
Greece	125	0,1798	-0,4789 (-1,43)	-0,0848 *** (-4,7)	-0,0010 (-0,04)	0,0719 (1,33)	0,0285 (0,06)
OEC							
Germany	125	0,1006	0,0091 (0,36)	0,0011 (0,78)	0,0033 * (1,73)	-0,0100 ** (-2,45)	0,1267 *** (2,76)
Netherlands	125	0,0245	-0,0012 (-0,03)	-0,0006 (-0,15)	0,0067 * (1,9)	-0,0021 (-0,29)	0,0494 (0,62)
France	125	0,0333	-0,0001 (0)	-0,0019 (-0,84)	0,0046 ** (2)	-0,0045 (-0,86)	0,0877 (1,49)
Finland	125	0,0318	-0,0223 (-0,43)	0,0006 (0,16)	0,0070 (1,26)	-0,0179 ** (-2,07)	0,2152 *** (2,64)
Belgium	125	0,1031	-0,288 (-1,27)	0,009 (0,65)	0,055 *** (2,64)	-0,021 (-0,66)	0,226 (0,63)
Austria	125	0,1434	-0,4662 (-0,87)	0,0303 (0,84)	0,2790 *** (3,91)	-0,4362 *** (-3,49)	4,5470 *** (3,46)

***, **, * denotes significance at 1%, 5% and 10% respectively. Robust t statistic in parenthesis

The results of testing equation 2.4 (BAS) applied to the entire sample (Table 2.6) demonstrate that for most of the countries, returns is significant and is negative, consistent with the theory. Only Italy, Ireland and France had a positive impact. Market Value in all countries presents a negative impact and Volatility presents a positive impact (except Italy). The variable Volume is not consistent in all countries. Volume and Volatility present a small significance.

Table 2.7 and 2.8 show us the results of equation 2.4 before and after the 15th September of 2008 (crisis) for BAS. The impact of the return and Market Value increases in most of the cases after the crisis and is negative significant in majority. Volatility and Volume also increases after the crisis. We cannot distinguish some standard between PIIGS and the others Eurozone countries. For example, the impacts of Returns is more significant in small stock exchanges with less liquidity, like Portugal, Ireland and Greece (PIIGS) and Austria (OCE).

For the second proxy, Turnover Rate, Table 2.9 to 2.11 present the results of equation 2.5. The Volume is the variable with more impact and is significantly positive. Returns, in most of the cases had a negative impact. Volatility and Market Value are not consistent. When we compare the pre and post period we do not find a standard for the countries in any variable.

The results of equation 2.6 (Amihud Illiquidity Measure) are shown in Table 2.12, 2.13 and 2.14. For the entire period, the variable return had a bigger impact and is negative (except Germany), that is consistent with the theory. The Return had more impact in countries with less liquidity, like Portugal, Greece and Ireland (PIIGS) and Austria (OCE). Volume and Volatility had a small impact and Market Value had a negative impact and is higher for the small stock exchanges. Comparing the pre and post crisis period, we can found some evidence that the impact of the variables are higher.

For all the three proxies, there is not a difference of behaviour of the PIIGS countries and the other Eurozone countries. The difference is between the countries with big stock exchanges (more liquid) and the countries with small stock exchanges (less liquid) that liquidity have more impact after the crisis.

5. CONCLUSION

This study presents first evidence of the impact of Eurozone Stock Exchanges in financial crisis of 2008, essentially before and after the 15th September 2008, when the crisis of stock market started. We separate the Eurozone countries in two: the countries who had bigger problems later on Eurozone crisis (PIIGS) and the other Eurozone countries, to understand if the liquidity of stock markets of these countries (PIIGS) had different behaviour than the others.

We found an evidence of illiquidity effect after the 15th September 2008, for all the 11 countries, but this illiquidity is stronger for the countries with small stock exchanges (Portugal, Ireland, Greece and Austria). The size of the market is more important to the liquidity of the stock exchange.

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