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Sergio Mayordomo
University of Navarra

Juan Ignacio Peña
Universidad Carlos III de Madrid

María Rodríguez-Moreno
European Central Bank

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ABSTRACT

This study presents robust empirical evidence suggesting the existence of significant liquidity commonalities in the corporate Credit Default Swap (CDS) market. Using daily data for 438 firms from 25 countries in the period 2005-2012 we find that these commonalities vary over time, being stronger in periods in which the global, counterparty, and funding liquidity risks increase. However, commonalities do not depend on firm's characteristics. The level of the liquidity commonalities differs across economic areas being on average stronger in the European Monetary Union. The effect of market liquidity is stronger than the effect of industry specific liquidity in most industries excluding the banking sector. We document the existence of asymmetries in commonalities around financial distress episodes such that the effect of market liquidity is stronger when the CDS market price increases. The results are not driven by the CDS data imputation method or by the liquidity of firms with high credit risk and are robust to alternative liquidity measures.

Sergio Mayordomo
School of Economics and Business Administration
University of Navarra
smayordomo@unav.es

Juan Ignacio Peña
Department of Business Administration
Universidad Carlos III de Madrid
ypenya@eco.uc3m.es

María Rodríguez-Moreno
European Central Bank
maria.rodriguez_moreno@ecb.int

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Sergio Mayordomo[a], Juan Ignacio Peña[b], María Rodríguez-Moreno[c]

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[a] University of Navarra, School of Economics and Business Administration; Edificio Amigos; 31009 Pamplona, Spain; smayordomo@unav.es
[b] Department of Business Administration; Universidad Carlos III de Madrid C/ Madrid 126, 28903 Getafe (Madrid, Spain); ypenya@eco.uc3m.es
[c] European Central Bank; Neue Mainzer Strasse 66, 60311Frankfurt am Main (Germany); maria.rodriguez_moreno@ecb.int

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Abstract

This study presents robust empirical evidence suggesting the existence of significant liquidity commonalities in the corporate Credit Default Swap (CDS) market. Using daily data for 438 firms from 25 countries in the period 2005-2012 we find that these commonalities vary over time, being stronger in periods in which the global, counterparty, and funding liquidity risks increase. However, commonalities do not depend on firm's characteristics. The level of the liquidity commonalities differs across economic areas being on average stronger in the European Monetary Union. The effect of market liquidity is stronger than the effect of industry specific liquidity in most industries excluding the banking sector. We document the existence of asymmetries in commonalities around financial distress episodes such that the effect of market liquidity is stronger when the CDS market price increases. The results are not driven by the CDS data imputation method or by the liquidity of firms with high credit risk and are robust to alternative liquidity measures.

Keywords: Credit Default Swap, Liquidity Commonalities, Global Risk, Funding Liquidity Risk, Counterparty Risk

JEL codes: G12, G15

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1. Introduction

One of the key issues highlighted by the ongoing financial crisis is the role of the shortage of liquidity in financial markets. In this period we have witnessed severe episodes of liquidity shortage in many markets being this shortage especially noticeable in the Credit Default Swap (CDS) market because of the uncertainty about the net amount, the structure, and the counterparty risk of such exposures. As a consequence, many firms have had difficulties to timely manage their credit risk exposures. This situation posed important challenges at the individual level but also from a global stability perspective. These facts point out the importance of considering the extent to which the shortage of liquidity has spread over the different contracts traded in the CDS market, and the factors that affect such scarcity.

This paper focuses on factors that may affect this shortage in market liquidity, and specifically the extent to which liquidity commonalities in the CDS market are of material importance in this regard. Liquidity commonalities can be defined as the co-movement of individual liquidity measures with market- and industry-wide liquidity. The objective of this paper is to provide new evidence on the co-movement in liquidity for the CDS market, which was firstly documented by Pu (2009), from a threefold perspective: first, the analysis of the time-varying behavior of the commonalities putting special emphasis on the financial crisis events; secondly, the use of different economic areas and industries for the analysis of such commonalities; and, thirdly the analysis of the factors influencing this co-movement at both aggregate and firm levels.

The typology of the participants in the CDS market, the high degree of concentration, and the role of credit derivatives during the financial crisis affecting both the financial sector and real economy make the analysis of the existence and the behavior of liquidity commonalities in the CDS market a topic of special relevance for regulators, risk managers, and investors. The fact that the main participants in the CDS market are systemically important financial

institutions (SIFIs) facilitates that any shock affecting credit derivatives could revert directly on these institutions and could have implications in terms of financial stability. In this line, Rodriguez-Moreno et al. (2012) show that the holdings of credit derivatives by U.S. banks affected their contributions to systemic risk, such that these derivatives behaved as shock absorbers before the financial crisis but changed their role to shock issuers during the crisis. It is worth mentioning that the liquidity risk derived from the typology of the banks participating in the CDS market could be exacerbated by the high degree of concentration of the market activity in the hands of a few SIFIs acting as market participants.[1] This high degree of market concentration may have implications in terms of the impact of large shocks on market liquidity. In fact, Mayordomo and Peña (2012) show that liquidity commonalities have significant effects on the pricing of the CDS of European non-financial firms and on the co-movements among CDS prices during the recent financial crisis.

The analysis of the determinants of the commonalities in liquidity is also certainly a timely topic because, as remarked by Dewatripont et al. (2010), developing a better understanding of what drives illiquidity at the individual and aggregate levels should stand high on the agenda of economists and policy makers alike.

We contribute with several findings to the empirical literature on liquidity commonalities. We document the existence of significant co-movements between single-name CDS liquidity and market-wide liquidity. Market commonalities are stronger than industry commonalities in most industries, with the exception of the banking sector. The liquidity commonalities are

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[1] According to a survey of U.S. firms by Fitch (2009), 96% of credit derivative exposures at the end of the first quarter of 2009 were concentrated in 5 firms (JPMorgan, Goldman Sachs, Citigroup, Morgan Stanley, and Bank of America). According to the Bank of International Settlements reports, globally the ten largest dealers account for 90% of trading volume by gross notional amount, 30% of the global activity is generated by just one bank (JP Morgan) and in the US five banks account for more than 90% of the gross notional.

still present when we analyze separately the CDSs of companies located in different economic areas, but the degree of commonality differs across them. Moreover, the liquidity commonalities are time-varying and increase in times of financial distress characterized by high counterparty, global, and funding liquidity risks but they do not depend on firms' specific characteristics. In this line, we find that the Lehman Brothers collapse and the Greek bailout requests triggered a significant increase in commonalities. In fact, the results suggest the existence of asymmetries in commonalities around these episodes of financial distress, such that the effect on market liquidity is stronger when the CDS market price increases. Finally, we find that liquidity commonalities provide additional information relative to the three aforementioned aggregate risks around these periods. All these results are robust to alternative liquidity measures and are not driven by the CDS data imputation method or by the firms with the highest CDS prices.

The rest of this article is organized as follows. Section 2 presents a literature review. In Section 3 we describe the liquidity measures and the methodology. Section 4 describes the data. Section 5 reports the empirical findings regarding the existence of liquidity commonalities. Section 6 reports the results of the determinants of these commonalities. In Section 7 we present some robustness tests, and we conclude in Section 8.

2. Literature Review

The Acharya and Pedersen's (2005) liquidity-adjusted Capital Asset Pricing Model (CAPM) yields three effects, besides the covariance between the asset's return and the market return, that provide a characterization of the liquidity risk of a security. The first of these effects on expected returns is due to the covariance between a security's expected return and the market liquidity. The second effect on expected returns is due to the co-variation between a security's illiquidity and the market return. The third of these effects is that the return

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increases with the covariance between the asset's illiquidity and the market illiquidity given that investors want to be compensated for holding a security that becomes illiquid when the market in general becomes illiquid. This last component is the common factor in liquidity or liquidity commonalities documented in the stock market by Chordia et al. (2000), Hasbrouck and Seppi (2001), and Huberman and Halka (2001).

Our paper belongs to the growing literature on liquidity risk and follows the Chordia, et al.'s (2000) methodology to study the time-varying nature and the determinants of the liquidity commonalities in the CDS market. Thus, the other two liquidity risk components and the effect of the liquidity commonalities on the CDS premium are beyond the scope of this paper.

Several methodologies have been used to study the existence of liquidity commonalities.[2] A detailed comparison of the different estimators can be found in Anderson et al. (2010). These authors distinguish two classes of methodologies for the estimation of systematic liquidity: (1) weighted average estimators based on concurrent liquidity shocks (the one employed in our study), and (2) principal component estimators based on both concurrent and past liquidity shocks. Their results show that the two types of estimators are largely equivalent because the simpler estimators give, in most cases, similar results to the complex estimators under different evaluation criteria and liquidity measures. Following Chordia et al. (2000), we use cross-sectional equally weighted averages to construct the market liquidity measure employed for the estimation of liquidity commonalities.

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[2] There is a wide array of variables to measure liquidity but one of the most common liquidity measures employed in the fixed-income and the CDS literature is the bid–ask spread. In fact, Fleming (2003) finds that the bid–ask spread is the best measure of liquidity in the bond market. For this reason, the primary liquidity measure employed in our baseline analysis focuses on the bid–ask spread.

The existence of liquidity commonalities has been documented for many assets independently of the dimension of liquidity and the geographical area analyzed. The foremost market in which liquidity commonalities have been documented is the stock market (see Chordia et al., 2000; Hasbrouck and Seppi, 2001; Huberman and Halka, 2001; Brockman and Chung, 2002; Domowitz et al., 2005; Kamara et al., 2008; Kempf and Mayston, 2008; or Korajczyk and Sadka, 2008; among others). Liquidity commonalities across different stock markets located in different countries have also been documented by previous literature (see for instance Brockman et al., 2009; Karolyi et al., 2009; or Zhang et al., 2009).

There are also several examples of analysis of liquidity commonalities for other markets in addition to the stock market. Thus, Chordia et al. (2005) and Goyenko (2009) document the commonality in liquidity for stocks and bonds in the United States (U.S.) market. Liquidity commonalities are also documented by Marshall et al. (2010) in the commodities markets and by Cao and Wei (2010) in the options market. Cao and Wei (2010) find strong commonalities in the option market but these commonalities are lower than those of the stock market.

However in the case of the CDS market this topic has been barely addressed. Pu's (2009) is the first paper that considers explicitly the commonalities in the CDS market. This author finds a strong commonality across all liquidity measures in the CDS market and also in the bond market using monthly data from 2002 to 2005 for a sample of non-financial U.S. firms. The method employed by Pu (2009) to extract the common factors from each liquidity measure is an asymptotic principal component analysis.

Liquidity commonalities in the CDS market are also treated indirectly in other papers such as Bongaerts et al. (2011) and Jacoby et al. (2009). Bongaerts et al. (2011) derive and estimate a model for the pricing of liquidity in the CDS market. Among the variables considered is the level of liquidity commonalities that is obtained from a principal component analysis across CDS portfolios. The first factor of this analysis explains 16.6% of the liquidity variation.

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Jacoby et al. (2009) analyze the existence of liquidity spill-over shocks across the CDS, corporate bond, and equity markets and find a dominant first principal component in the CDS market for the CDS liquidity measures considered. Other papers that study the determinants of bid-ask spread use market liquidity as an additional driver of individual CDSs' liquidity (e.g. Meng and ap Gwilym, 2008; or Tang and Yan, 2008).

The aim of this paper is not to study the effect the determinants of bid-ask spreads but to estimate the effect of market liquidity on the individual CDS liquidity according to the standard methodology of liquidity commonalities. We share some of the objectives pursued by Pu (2009) but in contrast to her analysis, our study is carried out using daily data that covers the recent financial crisis and documents both the time varying behavior of liquidity commonalities and their determinants during this crisis. Additionally, our paper exploits a much more extensive database which allows us to deal explicitly with the differences in terms of commonalities of the different economic areas besides the US, and also to include firms from all sectors.

Besides documenting the existence of commonalities in liquidity, other stream of the literature analyzes the drivers of such commonalities. In one of these papers, Coughenour and Saad (2004) find that the individual stock liquidity co-varies with specialist portfolio liquidity given that the specialist firms that participate in the stock market provide liquidity for more than one common stock. This co-variation increases with the risk of providing liquidity. The role of capital constraints on stock market liquidity commonality is documented by Comerton-Forde et al. (2010) and Brunnermeier and Pedersen (2009).

Brunnermeier and Pedersen (2009) find that the effect of funding constraints is particularly important during market downturns. Situations of market stress have also been found to affect liquidity commonalities. Thus, Kempf and Mayston (2005) find that the commonality in the stock market is much stronger in falling markets than in rising markets. Brockman and Chung

(2008) find that commonality in order-driven markets (in their case the Hong Kong Stock Exchange) increases during periods of market stress.

As Anderson et al. (2010) suggest, the degree and variation of commonality in liquidity could also be affected by the concentration of market makers and the type of trading. In fact, Kamara et al. (2008) find that increases in institutional ownership are associated with increases in stocks' sensitivity to systematic liquidity shocks. These authors show that during the period 1963–2005 commonality in liquidity increased significantly for large-cap stocks, in which institutional investing and index trading were more concentrated, but declined significantly for small-cap stocks.

In the best of our knowledge ours is the first paper documenting the determinants of liquidity commonalities in the CDS market at both aggregate and firm levels. We find that the level of liquidity commonalities is related to a large extent to global risk factors and therefore this level seems to be a potentially useful instrument to monitor global risk.

3. Liquidity Measures and Methodology

3.1. Liquidity Measures

Our baseline liquidity measure is the relative quoted spread (RQS), for a given firm j at time t defined as:

$$RQS_{j,t} = \frac{Ask_{j,t} - Bid_{j,t}}{\frac{(Ask_{j,t} + Bid_{j,t})}{2}} \tag{1}$$

This measure has been widely employed in the previous literature and avoids any bias in the results due to the dependence on the level of the CDS premium or the degree of risk as could be the case when one uses the bid–ask CDS spread in absolute terms. However, to ensure that the results do not depend solely on the liquidity specification we use other liquidity measures:

- The absolute bid–ask spread (AQS) defined as the difference between CDS ask and bid prices without rescaling by the mid spread as in the RQS (equation (1)).

- Number of contributed quotes in a given day, which represents the depth of the consortium liquidity.

- Number of contributors: the number of contributors providing quotes, which represents the breadth of the consortium coverage.

- The gross and net weekly traded notional CDS amount outstanding and the number of contracts outstanding.[3]

3.2. Estimation Methodology of Liquidity Commonalities

3.2.1. Baseline market model

As in Chordia et al. (2000), we use the following "market model" time series regression that is estimated by means of Ordinary Least Squares (OLS):

$$DL_{j,t} = \alpha_j + \beta_{1j} DL_{M,j,t-1} + \beta_{2j}DL_{M,j,t} + \beta_{3j} DL_{M,j,t+1} + \beta_{4j}DS_{M,j,t-1} + \beta_{5j}DS_{M,j,t} + \beta_{6j}DS_{M,j,t+1} +$$

$$\beta_{7j}DS_{j,t}^2 + \varepsilon_{t,j} \quad for\ j = 1,\dots,438 \tag{2}$$

where $DL_{j,t}$ represents the daily percentage changes of the relative quoted spread for firm j ($RQS_{j,t}$). $DL_{M,j,t}$ and $DS_{M,j,t}$ are the percentage changes of the contemporaneous market liquidity and market CDS premium, respectively, and are obtained as an equally weighted average of the individual percentage changes in the liquidity measure ($DL_{j,t}$) and in the CDS prices ($DS_{j,t}$) of all the firms with the exception of firm j:[4]

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[3] For a single reference entity, the gross notional values are the sum of CDS contracts bought (or equivalent sold) for all warehouse contracts and the net notional values present the sum of the net protection bought by net buyers (or equivalently net protection sold by net sellers).

[4] The exclusion of one CDS avoids constraints on the average coefficients. If one uses all the CDS to compute the equally weighted average, the cross-sectional mean of the coefficients is constrained to exactly a unit. The potential effects of cross-sectional dependence on the estimated coefficients due to the use of each individual liquidity measure as a component of the explanatory variables for all the other regressions are investigated in the robustness test section.

$$DL_{M,j,t} = \frac{\sum_{i=1\ i\neq j}^{n} DL_{i,t}}{n-1} \text{ and } DS_{M,j,t} = \frac{\sum_{i=1\ i\neq j}^{n} DS_{i,t}}{n-1} \quad for\ j = 1,\dots,438 \tag{3}$$

We use one lag and one lead of the market liquidity percentage changes ($DL_{M,j,t-1}$ and $DL_{M,j,t+1}$) and the market CDS premium percentage changes ($DS_{M,j,t-1}$ and $DS_{M,j,t+1}$). These leads and lags are used to capture any lagged spurious dependence induced by an association between returns and spread measures. Finally, $DS_{j,t}^2$ denotes the square of the CDS premium return for firm j and it is employed to proxy for single-firm volatility.[5] The use of percentage changes rather than levels is due to two reasons: (i) our interest lies in testing whether liquidity co-moves and (ii) liquidity levels are more likely to follow non-stationary processes.

We estimate equation (2) at two levels. On the one hand, we estimate the annual coefficients using daily information for every calendar year such that we have annual estimations of the commonalities from 2005 to 2011. On the other hand, we estimate the daily coefficients using 1-year rolling windows such that we obtain a daily measure of commonalities on the basis of the one year ago observations.

Additionally, we estimate equation (2) by OLS with a new definition of the market liquidity and credit risk variables using value weighted averages instead of equally weighted averages as it was done in equation (3):

$$DL_{j,t} = \alpha_j + \beta_{1j}\,DL_{WM,j,t-1} + \beta_{2j}DL_{WM,j,t} + \beta_{3j}\,DL_{WM,j,t+1} + \beta_{4j}DS_{WM,j,t-1} + \beta_{5j}DS_{WM,j,t} +$$

$$\beta_{6j}DS_{WM,j,t+1} + \beta_{7j}DS_{j,t}^2 + \varepsilon_{t,j} \quad for\ j = 1,\dots,438 \tag{4}$$

where $DL_{WM,j,t}$ and $DS_{WM,j,t}$ represent the percentage changes in the value weighted market liquidity and market CDS premium variables. For every firm, the weights are proportional to its market value relative to the sum of market values of the 437 firms that form the

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[5] The average correlation between the square of the CDS premium return and the percentage changes of the relative quoted spread is 0.03 what confirms that the volatility measure is not related to liquidity.

considered market. As we are using firms from different countries the market values are uniformly defined in U.S. Dollars.[6]

The 438 reference entities employed in this paper correspond to 25 countries that we assign to 5 economic areas. Due to their heterogeneity, we alternatively construct the market liquidity and market CDS premium measures at economic area level (i.e., using only the firms that belong to the same economic area of firm j in equation (3)). Then, we use these new measures as explanatory variables to estimate the liquidity commonalities by OLS according to the specification of equation (5).

$$DL_{j,t} = \alpha_j + \beta_{1j} DL_{M,i,j,t-1} + \beta_{2j} DL_{M,i,j,t} + \beta_{3j} DL_{M,i,j,t+1} + \beta_{4j} DS_{M,i,j,t-1} + \beta_{5j} DS_{M,i,j,t} +$$

$$\beta_{6j} DS_{M,i,j,t+1} + \beta_{7j} DS_{j,t}^2 + \varepsilon_{t,j} \quad for\ j = 1, \dots, 438\ and\ i = 1, \dots, 5 \tag{5}$$

where $DL_{M,i,j,t}$ and $DS_{M,i,j,t}$ represent the percentage changes in the equally weighted market liquidity and market returns variables of economic area i.

3.2.2. Market model with asymmetries in liquidity commonalities

We next split up the contemporaneous effect of the market liquidity variable into two effects depending on whether the market CDS returns have a positive or negative sign. For such aim, we use two interaction variables obtained as the product of the percentage changes in market liquidity and two different dummy variables: (i) a dummy $\left(d_t^{up}\right)$ that takes value one when the market CDS premium is going up at a given date; and (ii) a dummy $\left(d_t^{down}\right)$ that takes value one when the market CDS premium is going down. We use the same methodology as in equation (2) but excluding the lagged and lead values of the changes in market liquidity from the estimation such that the new equation is defined as follows:

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[6] Market values converted to the common currency are directly downloaded from Datastream. This database uses the corresponding daily exchange rate to convert the market value in the domestic currency to US Dollars.

$$DL_{j,t} = \alpha_j + \beta_{1j} \, d_t^{up} DL_{M,j,t} + \beta_{2j} d_t^{down} DL_{M,j,t} + \beta_{3j} \, DS_{M,j,t-1} + \beta_{4j} DS_{M,j,t} + \beta_{5j} DS_{M,j,t+1} +$$

$$\beta_{6j} DS_{j,t}^2 + \varepsilon_{t,j} \quad for \, j = 1, \dots, 438 \tag{6}$$

3.2.3 Two variations of the standard market model

We first examine in more detail the effect of liquidity commonalities using both market and industry equally weighted liquidity measures. We add lagged, contemporaneous, and leading industry liquidity variables to equation (2):

$$DL_{j,t} = \alpha_j + \beta_{1j} DL_{M,j,t-1} + \beta_{2j} DL_{M,j,t} + \beta_{3j} DL_{M,j,t+1} + \beta_{4j} DS_{M,j,t-1} + \beta_{5j} DS_{M,j,t} + \beta_{6j} DS_{M,j,t+1} +$$

$$\beta_{7j} DS_{j,t}^2 + \beta_{8j} DL_{I,j,t-1} + \beta_{9j} DL_{I,j,t} + \beta_{10j} DL_{I,j,t+1} + \varepsilon_{t,j} \quad for \, j = 1, \dots, 438 \quad (7)$$

where $DL_{I,j,t}$ is the percentage change in the industry liquidity, obtained using only the firms that belong to the same industry that firm j in equation (3). We consider 28 out of 41 industries distinguished by the Industry Classification Benchmark (ICB), which is available from Datastream.[7]

We then test the hypothesis that the reference entities with the highest credit risk could be the ones causing the commonality effect. For this reason, we add to the explanatory variable group collected in equation (2) the percentage changes of the contemporaneous ($DL_{C,j,t}$), lagged ($DL_{C,j,t-1}$), and leading ($DL_{C,j,t+1}$) high credit risk firms' liquidity measure that is constructed using only the firms that belong to the top quartile according to their level of CDS prices in equation (3):[8]

$$DL_{j,t} = \alpha_j + \beta_{1j} DL_{M,j,t-1} + \beta_{2j} DL_{M,j,t} + \beta_{3j} DL_{M,j,t+1} + \beta_{4j} DS_{M,j,t-1} + \beta_{5j} DS_{M,j,t} + \beta_{6j} DS_{M,j,t+1} +$$

$$\beta_{7j} DS_{j,t}^2 + \beta_{8j} DL_{C,j,t-1} + \beta_{9j} DL_{C,j,t} + \beta_{10j} DL_{C,j,t+1} + \varepsilon_{t,j} \quad for \, j = 1, \dots, 438 \quad (8)$$

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[7] No information on CDS is available for the firms of the remaining 13 sectors in the ICB classification system.

[8] The classification of a given firm among the firms in the top quartile according to the CDS premia is performed on an annual basis. Alternatively we could use credit ratings instead of CDS premia. Both measures should give an equivalent stratification. Nevertheless, we use CDS prices because according to previous literature (see Hull et al., 2004, among others), the CDS premia seem to anticipate the rating announcements.

3.3. Estimation Methodology of the Determinants of Liquidity Commonalities

We study the determinants of liquidity commonalties at aggregate and firm levels. To proceed with the former analysis we first estimate the individual monthly liquidity commonalities using daily information for every calendar month where the market model is a variation of equation (2) in which we do not include the leads and lags of any variable:

$$DL_{j,t} = \alpha + \beta_{1,j} DL_{M,j,t} + \beta_{2,j} DS_{M,j,t} + \beta_{3,j} DS_{j,t}^2 + \varepsilon_{t,j} \quad \text{for } j = 1,\dots,438 \qquad (9)$$

We next construct the monthly aggregate beta as the median of the firm's betas referring to the contemporaneous market liquidity ($\beta_{1,j}$ in equation (9)). Finally, we conduct the following analysis:

$$Median(\beta_1)_m = \eta_0 + \eta_1 \, Risk \, Factor_m + \varepsilon_m \quad (10)$$

in which we regress the aggregate betas for every month m on the monthly averages of three risk factors: global risk, global liquidity/ funding costs, and counterparty risk in the CDS market. We use a robust to heteroscedasticy OLS methodology to estimate the effect of the above variables.

The analysis of the determinants of the market liquidity on individual liquidity is carried out on the basis of the daily liquidity commonalities estimated in equation (2) using 1-year rolling windows. Concretely, we use the sum of the betas for the lagged, contemporaneous and lead market liquidity measures as the dependent variable. As the liquidity commonalities are based on overlapping information, we run a Fama-MacBeth cross-sectional regression for every day in the sample to avoid time series dependencies and to exploit the cross-sectional dimension. The standard errors are corrected for autocorrelation using the Newey-West methodology.[9]

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[9] The number of lags employed in the Newey-West regressions must grow with the sample size to ensure consistency when the moment conditions are dependent. We use a lag length determined by the widely employed method of the number of observations raised to the power of 1/3 that is equal to 12 lags.

$$Sum\ Betas_{i,t} = \delta_0 + \delta_1 Firm\ Info_{i,t} + \delta_2 Country\ Info_{i,t} + \varepsilon_i \quad where\ t = 1, \dots, 1625 \quad (11)$$

Among the determinants of the co-variation between the CDS and market illiquidity measures we use firm and country specific variables. Among the former variables, we use proxies for the firm size, leverage, level of credit risk, and firm shares' squared returns (volatility). Among the variables referred to the country of origin of the firm, we use proxies for the volatility of the stock indexes and 3-month interbank interest rate.

4. Data

The data consist of daily 5-year CDS information for 438 listed firms from 25 countries and span from 1 January 2005 to 31 March 2012.[10] Due to the variety of countries and to ensure a minimum number of firms in subsequent analysis we group them into 5 economic areas: the U.S. (236 firms), the European Monetary Union (E.M.U., 108 firms), the United Kingdom (U.K., 41 firms), Japan (15 firms), and Others (28 firms).

CDS information is obtained from Credit Market Analysis (CMA), an independent CDS data provider that is part of the Chicago Mercantile Exchange. CMA sources its CDS data from a consortium consisting of around 40 members of the buy-side community (hedge funds, asset managers, and major investment banks) who are active participants in the CDS market. CMA is found to be one of the more reliable CDS data sources by Mayordomo et al. (2010).

The information reported by CMA includes: (i) bid/mid/ask CDS premia for the 0.5 to 10 year maturities; (ii) an observed/derived indicator, which indicates whether the published

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[10] The sample does not include sovereign or unlisted reference entities. The use of the 5-year maturity CDS contracts is due to the higher liquidity in these contracts. The reference entities belong to the following countries (the number of firms in each country in brackets): the United States (236), the United Kingdom (41), France (35), Germany (24), Japan (15), Canada (11), Italy (9), the Netherlands (9), Switzerland (7), Australia (6), Finland (6), Spain (6), Sweden (6), Hong Kong (5), South Korea (4), Belgium (3), Malaysia (3), Portugal (3), Ireland (2), Singapore (2), Austria (1), Denmark (1), Greece (1), New Zealand (1), and Norway (1).

level was observed in the market or implied through a model using recently observed quotes;[11] (iii) the number of contributors, which is the number of contributors providing quotes; (iv) contributed quotes, which reports the number of contributed quotes on a given day. The number of contributors and quotes is only available from June 2008. The nature of the CMA data supposes an advantage for the use of the bid–ask spread as a measure of liquidity, in addition to the other measures employed in the robustness test, because of the use of information from the buy–sell sides.

The information for the gross and net notional CDS amount and the number of contracts outstanding for each reference firm is obtained from the Depository Trust and Clearing Corporation's (DTCC). These data are only available for 399 of the 438 firms since November 2008 and with a weekly frequency.

Next, we briefly describe the information employed to construct the remaining variables and their sources. Information referring to global risk, which is proxied by the implied volatility index (VIX), is obtained from Reuters.[12] Due to the difficulty in obtaining data on institutional-level funding constraints, we proxy the funding costs by means of the difference between the 90-day U.S. AA-rated commercial paper interest rates for the financial companies and the 90-day U.S. T-bill which should be a proxy for the funding cost faced by AAA-rated financial investors. Both rates jointly with the 3-month interbank rate and the country stock indexes are obtained from Datastream. As in Arce et al. (2012), we compute the proxy for counterparty risk by means of the first principal component obtained from the CDS premium of the main banks acting as dealers in the market. The information on the

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[11] CMA considers a CDS price as observed when they receive three different prices from at least two members of its consortium. The CDS prices that do not fulfill this principle become derived prices.

[12] According to Lustig et al. (2011) "the VIX seems like a good proxy for the global risk factor. The VIX is highly correlated with similar volatility indices abroad".

banks CDSs is obtained from CMA. The first principal component series should reflect the common default probability that is an aggregate measure of counterparty risk.[13] The information on the firms' stock prices, market capitalization, total debt and total assets is obtained from Datastream.

Table 1 summarizes the most salient features of the descriptive statistics for related information to the sample of CDS contracts. For the sake of brevity we focus on the annual cross-sectional average of the mean, median and standard deviation (SD) from 2005 to 2011. We also provide information about 2012 which refers to the first quarter of that year. Looking at the CDS premium levels, we observe a gradual increase in the levels and their volatilities from 2005 to 2009 and this behavior is common in both the total sample and in the economic areas. In 2010 CDS prices perform on average a generalized drop. Average CDS prices increase again in all economic areas apart from the U.S. in 2011 as a consequence of the deterioration of the economic situation worldwide and especially in Europe.

Focusing on the bid-ask spreads, measured in basis points, their behavior is in line with the CDS premium levels. Looking at the relative bid-ask spread, measured in percentage over average price, we observe a gradual decrease in levels and volatilities from 2005 to 2011. It implies that the liquidity in the CDS market tends to increase and its volatility to decrease what is consistent with the market growing in size over time. Table 1 also contains the squared of the CDS returns, which is used as a proxy of the individual volatility. We observe that the higher average volatility is achieved in 2007 and 2008.

< Insert Table 1 here >

Regarding additional properties of the daily percentage changes of the relative bid-ask spreads ($DL_{j,t}$) employed in equation (2), this variable is equal to zero (no changes in the

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[13] We use the 14 main banks acting as dealers in the CDS market. The first PC for the series of CDS prices of the previous dealers explains 90% of the total variance.

level of liquidity) for around 10% of the total number of observations. This occurs mainly at the beginning of the sample coinciding with the early stages of the CDS market. This figure supports the idea that results are not driven by the level of persistence in $DL_{j,t}$. In fact, the average autocorrelation of $DL_{j,t}$ is around -0.3 which suggests that autocorrelation is hardly a relevant issue in our analysis.

5. Empirical Findings

5.1. Basic Empirical Evidence

We first test the co-variation between single-name CDS liquidity and CDS market-wide liquidity per calendar year. Table 2 reports the results for the estimation of equation (2) showing the cross-sectional averages of the slopes of the contemporaneous, lagged, and leading market liquidity measures and the t-statistics over the 438 firms in our sample.[14] The table also includes the proportion of individual positive slopes and the proportion of individual positive and significant (critical value 5%) coefficients. Finally, we report the "sum" and "median", which refer to the cross-sectional average and median of the sum of the contemporaneous, lead, and lag betas, respectively. The coefficients are estimated year by year from 2005 to 2011.[15]

The results show a positive and significant contemporaneous effect of the CDS market liquidity variables on the individual liquidity measure, while the magnitude of the lagged and leading coefficients is much lower and the number of significant coefficients only exceeds

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[14] Given that the individual disturbances in equation (2) are probably not normally distributed it is safer to concentrate on the average cross-sectional results, the distribution of which is probably close to Gaussian under some mild conditions.

[15] We do not estimate the commonalities in liquidity for 2012 because we only have information for the first quarter. However, we use the information of year 2012 in the later rolling windows estimation.

11% in 2010.[16] The contemporaneous effect reaches its maximum values in 2007 and 2008 (0.82 and 0.86, respectively), both of them being highly significant. High significant values are also found in 2010 and 2011 (0.78 and 0.79, respectively). On the other hand, the minimum effect of the liquidity commonality occurs in 2005 (0.57) and 2006 (0.59).

On the basis of the sum of the three coefficients we find a positive and significant effect of the CDS market liquidity on the individual liquidity measures over the eight years of the sample. The median follows the same trend but the estimated levels are lower. The explanatory power as measured by the R-squared is not very high, ranging from 4% in 2005 to 9% in 2010, but it is in line with other papers using the same methodology, such as Chordia et al.'s (2000) analysis of the stock market commonalities. This fact suggests that there are additional explanatory variables that this methodology is not identifying. An interesting result is the trend observed in the liquidity commonalities which seem to evolve over time according to the economic conditions. It suggests that liquidity commonalities could be state-dependent as it is documented in Figure 1, which contains the cross-sectional median of the sum of the contemporaneous, lead and lag daily coefficients using 1-year rolling windows. Note that in the subsequent analysis we use the median to avoid any potential extreme betas, although the correlation between the median and average betas obtained in the baseline analysis is equal to 0.95.

< Insert Table 2 here >

Panel A of Figure 1 shows the median of the sum of liquidity commonalities from 2006 to 2012 obtained using the baseline methodology (equation (2)) and an alternative methodology

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[16] In some years such as 2005, 2006, and 2009 only 19, 14, and 28% of contemporaneous coefficients are positive and significant, respectively. The maximum level of significance is achieved in 2008 (70%). Nevertheless, this significance is not the one that determines the level of significance of liquidity commonalities but the one referred to the aggregate ("Sum") effect whose t-statistic is shown at the bottom of this Table 2.

in which market measures are constructed by means of value weighted averages by firm capitalization (equation (4)). The first comment that applies is that both methods for computing the market measures give similar trends given that the correlation between the two measures is 0.94. The baseline methodology gives systematically stronger liquidity commonalities before January 2008. After this date, the commonalities are larger under the equally weighted specification but the differences are smaller than before January 2008. After the Greek's bailout requests, both methodologies provide very similar levels. A potential explanation is that the liquidity of some large firms is not representative of the market liquidity, especially before the main episodes of high risk, and so the co-variation of other CDS contracts with the new market liquidity measure decreases.

Looking at the baseline specification we observe that the lowest levels of liquidity commonalities occur during year 2006, which is a tranquil period. During the whole year 2007 there is a monotonic increasing trend. The high liquidity commonalities reached by the end of 2007 persist until summer 2009 when there is a decrease that persists until the end of the year. The levels of commonalities remain relatively constant until March 2010. From this date commonalities exhibit a remarkable increase that reaches its maximum value around May 2010, coinciding with the Greek rescue, and remains high until March 2011 when there is a significant drop. A new increase is observed by June-July 2011 coinciding with the European Council of 21st July in which there was a failure to arrive at a clearly articulated and adequately funded agreement to guarantee the viability of Greece's public finances. Liquidity commonalities remain around this level until the end of the sample.

In view of the pattern of the commonalities in liquidity, we next study whether there are significant changes around two relevant events related to the so-called subprime crisis (Lehman Brothers' collapse on September 15th, 2008) and sovereign debt crisis (Greek's bailout requests on April 23rd, 2010); on the basis of the liquidity commonalities obtained in

the baseline analysis (equation (2)). For such aim, we carry out a mean test comparing the average of the liquidity commonalities one month before and after the relevant event. We find significant increases in liquidity commonalities after the two considered events supporting the idea that co-movements in liquidity strengthen around global shocks.

We next check whether the liquidity commonalities depend on several firm dimensions such as the size, the level of credit risk and the leverage. For such aim we stratify the liquidity commonality effects (the sum of the lagged, contemporaneous, and leading betas) in quartiles on the basis of the level of the three previous dimensions and check whether there are differences across the different stratified groups. Results are summarized in Panels B to D of Figure 1. We do not find a clear relation between the firm's total assets defined in USD (size) and the degree of liquidity commonality (see Panel B). Thus, the evidence does not support the hypotheses that the largest or the smallest firms have different liquidity commonalities. As in the case of size stratification, Panel C shows that there is not a clear relation between the level of credit risk and the effect of market liquidity. The firms with a stronger dependence on market liquidity do not necessarily exhibit higher levels of CDS prices. The same result is obtained in Panel D when firms are stratified according to their leverage defined as the ratio of total debt relative to total assets.

< Insert Figure 1 here >

5.2. Empirical Evidence by Economic Area

Due to the heterogeneity of countries (25 in total), we alternatively construct the market liquidity and CDS premium measures at economic area level. The countries are then grouped into 5 economic areas. The cross-sectional median of the aggregate liquidity commonalities for each economic area are reported in Figure 2. Liquidity commonalities are still present when the analysis is carried out at economic area level but the degree of co-movement varies across economic areas. The highest level of liquidity commonalities in U.S. and U.K.

corresponds to the first quarter of 2008 and May 2010 while the highest levels in the E.M.U. are reached after summer 2011 coinciding with the one of the hardest stages in the European sovereign debt crisis. In Japan the highest commonalities are reached in summer 2008 while in Others we do not observe a remarkable strength in commonalities.

As in the baseline estimation, we test whether there are significant changes in the liquidity commonalities at economic area level around the Lehman Brothers' and Greek's episodes through a test of means. After the Lehman Brothers' collapse the liquidity commonalities in the U.S., E.M.U. and U.K. significantly increase while there are not significant impacts on Japan and the Others economic areas. After the Greek's bailout requests, the level of commonalities increases significantly in the U.S. and U.K. from 0.4 to 1. This event also affects significantly to the level of commonalities in the E.M.U area but the increase was of a lower magnitude, mainly because liquidity commonalities were much higher there than in other economic areas prior to this event. The effect of this event on Japanese firms is also positive and significant. Summing up, liquidity commonalities at economic area level significantly react to the main episodes of the subprime and sovereign crisis. The U.S. economic area seems to be the most sensitive to the events.

< Insert Figure 2 here >

5.3. Asymmetries in Liquidity Commonalities

In this section we test the existence of asymmetries in liquidity commonalities. Concretely we study whether the level of liquidity commonalities depends on the upward or downward trend of the CDS prices. Results are shown in Figure 3. This figure shows that liquidity commonalities when the market CDS premium increases are larger around certain specific events. The first date for which this behavior is observed is December 2006 – March 2007. The second episode around which this phenomenon is found is the collapse of Lehman Brothers. The two most significant episodes in which we find this asymmetric effect in

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commonalities are around May 2010 and July 2010, coinciding with the rescue of Greece and the European Council of 21st July. These results suggest the existence of asymmetries in commonalities around financial distress episodes such that the effect of market liquidity is stronger when the CDS market price increases, meaning that commonalities based on the information for these dates could be more informative around specific risky events.[17]

< Insert Figure 3 here >

5.4. Industry and high CDS firms effects

We first differentiate market liquidity from industry liquidity commonalities according to equation (7). Table 3 reports the annual results referring to the liquidity commonalities to be compared with those obtained in Table 2. We find that the market commonality is stronger than the industry commonality but lower than in the baseline analysis because it is split up into the market and industry effects. Attending to the sum of the lagged, current, and leading coefficients, the industry commonality remains almost constant from 2005 to 2007 and increases in 2008 to remain almost invariable up to 2011. However, we find a significant increase in the market commonality from 2005 to 2007 and a decrease in 2008 and 2009 that are consistent with those obtained in Table 2. We obtain a new increase in the effect of market liquidity commonalities in 2010 followed by a decrease in 2011.

< Insert Table 3 here >

We also test whether this pattern is common for all industries by stratifying the results at industry level and find that the banking industry is the only sector in which industry liquidity

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[17] We check the correlations between the variable for the market returns and the two market liquidity measures that represent both types of asymmetries and find that they are 0.40 and -0.45 for the up and down market returns references, respectively. Thus, there are not problems of collinearity derived from the joint use of market returns and the asymmetric liquidity measure.

is significantly stronger than market liquidity for all the considered years. This finding could be explained by a strong effect of potential determinants of liquidity commonalities (such as global, liquidity or counterparty risks) that are specific of this sector. In fact, the main players in the CDS market are banks.[18]

We also study this effect over time in Figure 4, which contains the cross-sectional median of the sum of the contemporaneous, lead and lag daily coefficients of market and industry liquidity measures using 1-year rolling windows for all firms and for the banking and real estate sectors. In line with the previous finding we observe that market liquidity commonalities are stronger than the industry commonalities but the spread narrows from 2011 on. As obtained in the annual analysis, industry commonalities in the banking sector are stronger than market commonalities for the whole sample with the exception of some weeks around summer 2011. The effect of the real estate industry liquidity commonality is also interesting. In 2006 the commonality is driven by the market but this relation changes in 2007 and especially in 2008, coinciding with the subprime crisis, such that the industry commonality is significantly higher than the market commonality. This stronger effect of the industry liquidity could be related to the collapse of the U.S. housing bubble.

We next check whether the level of liquidity commonalities is influenced by a certain number of influential CDS single names. Our hypothesis is that the reference entities with the highest credit risk could be causing the commonality effect such that liquidity is conditioned by the firms with the highest CDS premia. We study this variation over time in Figure 5, which contains the median of the cross-sectional average of the sum of the contemporaneous, lead and lag daily coefficients of market and high CDS liquidity measures, as estimated in equation (8), using 1-year rolling windows. The results suggest that liquidity commonalities

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[18] Results are not reported for brevity but are available upon request.

are not driven by the liquidity of the reference entities with the highest CDS prices because it is close to zero during the whole sample.

< Insert Figure 5 here >

6. Determinants of CDS Liquidity Commonalities and their Role as Indicators of Global Risk

6.1. Determinants of Liquidity Commonalities at Aggregate Level

In Figure 6 we depict the time series relation between the cross-sectional median of the individual monthly commonality betas (equation (9)) and the monthly average global (Panel A), counterparty (Panel B), and funding liquidity (Panel C) risks. Each panel contains two figures showing the risk measures in levels (left) and in first differences (right). The liquidity betas on the one hand, and the global, counterparty, and funding liquidity risks proxies either in levels or first differences on the other hand; are closely related. In fact, the correlation between the liquidity commonalities and the global risk expressed in levels and first differences are 0.42 and 0.43, and look similar to the ones with the counterparty risk (0.24 and 0.43). The funding liquidity risk in levels also shows a high correlation with the commonalities (0.45) but it is much lower in first differences (0.03). Panel D reports the daily series for the three global variables in levels and the daily median betas obtained using 1-year rolling windows. This figure reinforces the strong relation between the liquidity commonalities and the other variables. The correlations of daily betas with global, counterparty and liquidity risks are 0.50, 0.56, and 0.35, respectively.

< Insert Figure 6 here >

After documenting the close relation between the commonalities in liquidity and the previous risks variables, we next analyze formally their relation according to equation (10). We first check the order of integration of the above variables. The monthly averages of the global and counterparty risks are integrated of order one while the global funding costs and the betas

series do not exhibit a unit root. Thus, we use the first difference of the global and counterparty risk proxies as the explanatory variables. Panel A of table 4 reports the results. The first three columns include the effects of the three potential determinants of the liquidity commonalities individually. We observe that the liquidity commonalities' betas are well explained by the economy-wide variables. The first column confirms that the global risk has a positive and significant effect on the estimated betas. This variable has explanatory power as the R-squared of 25% suggests. One possible explanation is that the CDS market participants are strongly and homogenously affected by the shocks to the global economy, given the high degree of concentration of the market participants in this market. This result could also reflect the higher sensitivity of the CDS market to the global market factors. This result is in line with the findings of Kempf and Mayston (2005), among others, for the stock market in the sense that they find that commonality is much stronger in falling markets than in rising markets.

We next test how counterparty risk affects the degree of co-movement. The increase in counterparty risk could make it more difficult to find a counterparty to sell/buy protection, which lowers liquidity. The results of the second column show that as counterparty risk increases, liquidity commonalities also increase. The explanatory power of this variable is lower than the one of global risk but it is not negligible (16%).

Another potential global effect to consider as a determinant of liquidity commonalities is the role of capital constraints. The effect of such constraints on stock market liquidity commonality is documented by Comerton-Forde et al. (2010) and Brunnermeier and Pedersen (2009). We consider the capital constraints as a dimension of liquidity related to the overall funding constraints which should affect the investments in CDS. We find a positive and significant effect of the funding costs variable defined in levels. This variable has explanatory power (0.13) but lower than the ones for the two previous factors. The previous

empirical evidence implies that as the funding cost increases, and as a consequence the liquidity risk also increases, so do the liquidity commonalities.

In the fourth column we use the three variables at the same time as explanatory variables and find similar results in terms of the degree of significance and the R-squared increases to 0.32. The results are also robust to other specifications.[19]

< Insert Table 4 here >

6.2. Determinants of Liquidity Commonalities at Firm Level

In this section we study whether market liquidity has a different effect depending on firm characteristics or whether it is mainly determined by global factors. To do that, we study the determinants of liquidity commonalities in terms of firm level characteristics (leverage, credit-risk, volatility and size) and global levels of risk. The results for the estimation of equation (11) are shown in Panel B of Table (4).

The firm's size measured as the log of market capitalization does not have a significant effect. Chordia et al. (2000) find that liquidity commonalities in the stock market are stronger in large firms, arguing that this pattern could be due to greater prevalence of institutional investors in large firms. On the contrary, participants in the CDS market are institutional investors what could explain that the effect of the CDS market liquidity on single-name CDS is not significantly higher for large firms.

We also study the effect of leverage, defined as the ratio of total debt to total assets, and the level of credit risk, proxied by the CDS premium. The joint use of these two variables allows

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[19] Similar results are obtained when we use another global risk proxy as the VDAX index. We also repeat the analysis using the mean betas instead of the median and we find that the economic variables have positive and significant signs, although the estimated R-squared are lower. We repeated the regression using quarterly instead of monthly betas and obtained similar results.

us to control by the fact that the investors might focus on either the market information or the balance-sheet information to infer the risk or distance to default of a firm. The results show that the leverage and CDS premium do not affect significantly the relation between the CDS liquidity and the market liquidity.

Finally, we find that the volatility in the stock prices measured by the squared of the stock returns does not affect significantly the individual betas. Thus, a larger volatility does not make the firm CDS liquidity more dependent on market liquidity. In sum, there are not significant effects of the firm specific variables in line with the results shown in Figure 1.

There are many potential global risk variables to consider in the cross-sectional regression analysis. Our aim is to consider the effects of the three global variables employed in Section 6.1. Nevertheless, we can only include variables that are country specific being the effect of all other omitted global risk variables, such as counterparty risk, collected by the constant term. The same applies to the global risk variable. However, in this case we can use the standard deviation of the country stock indexes to take into account the effect of the country risk premium. Regarding the global funding costs referred to the constraints that global investors may face, we use the 3-month interbank rate for each country given that there is no information on the commercial paper for most of the countries forming the sample.

As expected in view of the results obtained in Section 6.1, we find positive significant effects for the two global variables employed in our regression. Additionally, the constant term is also positive and highly significant suggesting that other global risk variables lead to a larger exposition of CDS single-names liquidity to market liquidity. Thus, a change in the risk premium equal to one standard deviation would lead to an increase of 0.248 units of the beta referred to the commonalities. This increase is equal to 30.4% of the average level of beta. An increase of one standard deviation in the interbank rate would lead to an increase of 0.093 units of beta, or equivalently 11.5% of its average level. Similar changes in the firm specific

variables have a more limited effect that never goes beyond 1.5% of the average level of liquidity commonalities.

6.3. Liquidity Commonalities as Indicators of Global Risk

We next check whether the cross-sectional median of the individual liquidity commonalities provides additional informational with respect to the aggregate risk measures around the two most relevant periods of financial distress (Lehman and Greek events) by means of a Granger causality test. This test enables us to examine whether past information of liquidity commonalities helps to explain the current behaviour of the risk measures and vice versa. The results of Section 5.3 suggest that the asymmetric commonalities referred to the increases of CDS market prices perform particularly well around stress periods. Using an interval of three months before and after the previous events, we first run a Granger causality test between the baseline and the asymmetric commonalities and find that asymmetric commonalities Granger-cause the other measure around the two events.[20]

Using this asymmetric commonalities measure, we perform the same analysis with respect to the global, counterparty, and funding liquidity risks and find that commonalities Granger-cause the three risk measures around the Lehman Brothers' collapse but only the funding liquidity risk around the Greek's bailout requests. This result reinforces the role played by the CDS around the Lehman's collapse as shock issuers (see Rodriguez-Moreno et al., 2012) and suggests a lower effect of this market around the Greek episode.

7. Robustness Test

7.1. Alternative Definitions of Market Liquidity

The quoted bid-ask spreads suffer from well-known problems such as thin trading in the CDS market. It is not possible to use measures such as effective spreads as we do not have

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[20] Results are robust to longer intervals.

transaction level information but there are some additional measures of liquidity that we employ in this section to estimate equation (2). Moreover, we use other methods to define the market liquidity rather than the relative spreads.[21] Individual CDS and market-wide liquidity measures are constructed under the specification of equation (1).

Figure 7 reports the cross-sectional median of the sum of the lagged, contemporaneous, and leading liquidity commonality coefficients for the different liquidity specifications using 1-year rolling windows. In Panel A we consider the number of contributors and quotes used to form the CDS prices as liquidity measures. Due to data availability, the sample spans from June 2009 to March 2012. We observe that the alternative liquidity measures provide very similar commonalities and in comparison to the baseline analysis they show even stronger commonalities apart from the interval between May 2010 and April 2011.

In Panel B we use as liquidity measures the DTCC information about the weekly traded gross and net nominal values and the number of contracts. Due to the data limitations the estimated measures span from October 2010 to March 2012 on weekly basis. We observe that these alternative liquidity measures provide similar commonalities among them but they are systematically stronger than the ones in the baseline analysis and this difference widens at the end of the sample.[22]

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[21] Given that intraday data are not available and our interest is to exploit the daily frequency, we do not consider the measures of liquidity that are based on the co-variations in prices. For the same reason, we cannot use as an alternative liquidity measure the days without changes in the CDS price within a given month as in Pu (2009).

[22] Additionally, we take advantage of these measures of trading activity and estimate the baseline specification using only the more active firms according to the average gross amount outstanding of each single-name CDS over the period November 2008 – March 2012. Concretely, we repeat our analysis for the firms whose average gross amount outstanding is above the median and hence, the number of firms decreases to 219. The trend of the new liquidity commonalities measure is in line with the ones obtained using the baseline liquidity measure and

In Panel C liquidity commonalities are obtained from (i) the absolute bid-ask spread and (ii) the first differences of the daily relative bid-ask spread instead of the percentage changes. Results are shown in Panel C. Up to July 2007 there is no difference between liquidity commonalities using the relative or absolute bid-ask spread. Then, the baseline liquidity measure exhibits stronger commonalities. Using the first difference of the relative bid-ask spread, the liquidity commonalities are systematically lower before 2008 and become stronger mainly during 2009 and at the end of 2011. Summing up, we estimate liquidity commonalities using alternative liquidity measures and in spite of some differences in levels, the results are in line to the baseline estimation: strong liquidity commonalities that are sensitive to the periods of global financial distress.

< Insert Figure 7 here >

7.2. The effect of the derived quotes on liquidity commonalities

Depending on the intraday market activity CMA denotes the prices as observed or derived. Observed prices reflect idiosyncratic liquidity but derived prices could be influenced by market or industry liquidity. The reason is that when there is no information on a specific company CMA uses information from the firm's peer group, which is constructed according to the firm's industry and rating. The percentage of derived prices over the total number of prices observed for the 438 firms and 8 years (823,878 observations) is 14.7%. We test whether the "derived" liquidity measures, which correspond to the derived prices, have any influence on the liquidity commonalities. For this aim, we exclude the information referred to the derived quotes such that we only use the data points that were observed and repeat the

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the level of the commonalities is on average larger than the one under the baseline specification. In the sake of brevity, we do not report the results of this analysis but they are available upon request.

baseline estimation as in equation (2). Results are shown in Figure 8. The average level of liquidity commonalities for the whole sample period when using observed quotes is 0.63 while the average liquidity commonality in the baseline analysis is 0.76. The difference between these two figures is not significantly different from zero. This difference can be explained by the imputed values for the non-observed CDS quotes on the basis of industry/market liquidity measures that could reflect a more general dimension of liquidity rather than firm specific liquidity but also to the use of a lower number of observations.

7.3. Reliability of the t-statistics

As Chordia et al. (2000) state, the reliability of the *t-statistics* depends on the estimation error being independent across the equations, which is a presumption equivalent to not having omitted a significant common variable. The standard deviations of the average β corresponding to the liquidity commonality variable are obtained under the assumption that the estimated errors in β are independent across the regressions and we now test the reliability of such an assumption. We check this following Chordia et al.'s (2000) method on the basis of the residuals obtained in equation (2). According to this method, we regress the adjacent time series of the residuals (i.e. we regress the residuals for firm *2* on the ones for firm *1*, the residuals for firm *3* on the ones for firm *2,* and so successively). The two firms to be used in each regression are selected by alphabetical order, such as they appear in our sample. Thus, we run 437 regressions for 437 alphabetically ordered pairs of the total 438 firms as follows:

$$\varepsilon_{j+1,t} = \gamma_{j,0} + \gamma_{j,1}\varepsilon_{j,t} + \xi_{j,t} \quad for\, j = 1,\dots,437 \tag{12}$$

where $\varepsilon_{j,t}$ is the residual obtained in the baseline estimation for firm j while $\varepsilon_{j+1,t}$ is the residual corresponding to firm $j+1$, which is the next in alphabetical order to j, $\gamma_{j,0}$ and $\gamma_{j,1}$

are the estimated coefficients, and $\xi_{j,1}$ is an estimated disturbance. The t-statistic for parameter $\gamma_{j,1}$ is the one that determines the existence of cross-equation dependence.

As it is observed in Table 5, we do not find evidence of cross-equation dependence given that the parameter $\gamma_{j,1}$ is not significantly different from zero. Given that the correlations between errors are very close to zero on average, the adjustment for cross-equation dependence should not materially affect the conclusions.

< Insert Table 5 here >

8. Conclusions

Corporate CDS individual liquidity measures co-move with the aggregate liquidity in the corporate CDS market. We present extensive empirical evidence based on data for the period 2005–2012 in support of this claim. The liquidity commonalities are still present when we analyze the co-movement of firms located in the same economic area, but the degree of commonality differs across them being the E.M.U. the region with the average stronger commonalities during the whole sample period. Regarding the effect of market and industry commonalities, the effect of the market is usually stronger than the one of the industry in most industries but there are some exceptions as the banking industry.

The liquidity commonalities are time-varying and increase in times of financial distress characterized by high counterparty, global, and funding liquidity risks. Nevertheless, the co-movement of the firm's liquidity with the market liquidity does not depend on firm's characteristics such as size, leverage, credit risk, or equity volatility but on global risk factors as the aforementioned. In this line, we find that the Lehman Brothers collapse and the Greek's bailout requests trigger a significantly increase in commonalities. In fact, the results suggest the existence of asymmetries in commonalities around these episodes of financial distress such that the effect of market liquidity is stronger when the CDS market price

increases. Finally, we find that liquidity commonalities provide informational efficiencies relative to the three previous aggregate risks around periods of financial distress originated or amplified by the CDS market such as Lehman Brothers collapse. All these results are robust to alternative liquidity measures and they are not driven by the CDS data imputation method (derived versus observed) or by the firms with high credit risk.

Some implications for traders, investors, and regulators follow. First, our results are consistent with inventory risk being the main source of the commonalities in liquidity. Second, the CDS market has a high probability of suffering sudden changes in aggregate liquidity. Third, and given that the degree of commonality differs across economic areas, the expected returns on CDSs of otherwise similar companies located in different countries might differ. Given that the expected returns before costs are related to trading costs; the higher the trading costs, the higher the expected returns. The more sensitive an asset is to the liquidity commonality component, the greater its expected return must be. Finally, regulators should consider whether the standardization of the CDS contracts and the implementation of a Central Counterparty Clearing House would alleviate the CDS market's relative propensity for abrupt changes in liquidity.

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Table 1: Descriptive statistics

Table 1 summarizes the annual cross-sectional average of the mean, median and standard deviation (SD) of liquidity and credit risk measures for the whole sample of CDS contracts employed in our analysis from 2005 to 2012. It is divided into six categories: Total, U.S., E.M.U., U.K., Japan and Others, where the former refers to the 438 sample firms and the remainder categories refer to the firms belonging to that economic area (the exact number of firms is in brackets in the first column). Column (1) shows the individual CDS prices, Column (2) the quoted spreads, Column (3) the relative quoted spreads, and Column (4) the squared CDS premium return. The CDS quoted spread (relative quoted spread) is obtained as the CDS bid–ask spread (as the ratio of the CDS bid–ask spread to the CDS mid-price).
*Information relating to 2012 refers to the first quarter of that year.

		CDS Premium			Bid-Ask Spread			Relative Bid-Ask Spread			Squared CDS Return		
		Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Total (438)	2005	74.1	73.2	16.6	7.4	7.1	2.8	0.15	0.15	0.05	0.003	0.001	0.01
	2006	65.0	64.3	12.2	5.2	5.1	1.7	0.15	0.14	0.05	0.002	0.000	0.01
	2007	73.7	64.2	27.5	6.0	5.1	2.5	0.14	0.14	0.04	0.004	0.000	0.02
	2008	250.0	201.7	136.1	19.9	13.8	16.4	0.09	0.09	0.03	0.004	0.001	0.01
	2009	328.2	286.4	151.8	21.3	19.0	10.0	0.09	0.09	0.03	0.002	0.000	0.01
	2010	201.9	194.1	52.3	11.1	10.5	3.3	0.08	0.07	0.02	0.001	0.000	0.01
	2011	220.5	186.5	78.9	13.0	10.4	5.8	0.07	0.07	0.02	0.001	0.000	0.01
	2012*	257.9	256.2	34.4	15.6	15.4	2.9	0.09	0.09	0.01	0.001	0.000	0.00
U.S. (236)	2005	90.5	89.7	20.7	9.0	8.8	3.4	0.15	0.15	0.05	0.003	0.001	0.01
	2006	80.2	79.6	14.6	6.0	5.7	1.9	0.14	0.13	0.05	0.002	0.000	0.01
	2007	95.4	84.3	35.4	7.2	6.1	3.1	0.14	0.13	0.04	0.004	0.000	0.02
	2008	316.2	254.6	173.4	24.5	16.8	21.7	0.08	0.08	0.03	0.003	0.001	0.01
	2009	421.7	364.6	200.6	23.8	21.1	10.8	0.09	0.09	0.02	0.002	0.000	0.01
	2010	254.8	241.8	72.5	13.0	12.3	3.7	0.08	0.07	0.02	0.001	0.000	0.01
	2011	244.7	206.4	91.6	13.1	10.6	5.4	0.08	0.07	0.02	0.001	0.000	0.01
	2012*	289.3	291.3	37.7	15.8	15.7	2.8	0.09	0.09	0.01	0.001	0.000	0.00
E.M.U. (99)	2005	53.2	52.5	11.2	5.0	4.8	1.9	0.14	0.13	0.05	0.002	0.000	0.01
	2006	46.5	45.9	9.0	3.8	3.7	1.2	0.13	0.13	0.04	0.002	0.000	0.01
	2007	48.8	40.2	19.3	3.9	3.3	1.7	0.12	0.12	0.04	0.003	0.000	0.02
	2008	178.8	144.6	98.8	13.1	9.2	9.9	0.08	0.08	0.03	0.004	0.001	0.01
	2009	243.9	226.7	96.7	16.8	15.6	8.0	0.08	0.08	0.02	0.001	0.000	0.00
	2010	167.3	165.7	38.1	9.1	8.6	3.2	0.06	0.06	0.01	0.002	0.000	0.00
	2011	248.0	207.5	89.9	15.2	11.7	7.6	0.06	0.06	0.02	0.002	0.000	0.01
	2012*	287.5	277.6	41.2	16.9	16.8	3.4	0.07	0.07	0.01	0.001	0.000	0.00
U.K. (41)	2005	62.4	62.3	12.6	6.0	5.7	2.2	0.15	0.14	0.06	0.003	0.000	0.01
	2006	52.4	50.6	10.2	4.7	4.6	1.6	0.16	0.15	0.06	0.002	0.000	0.00
	2007	57.9	50.0	20.7	4.9	4.3	2.1	0.13	0.13	0.04	0.003	0.000	0.01
	2008	182.4	147.6	96.3	14.5	10.6	10.0	0.09	0.08	0.03	0.003	0.001	0.01
	2009	212.0	186.5	97.6	18.6	15.4	10.1	0.10	0.09	0.03	0.001	0.000	0.00
	2010	130.6	127.8	25.1	8.8	8.6	2.4	0.07	0.07	0.01	0.001	0.000	0.00
	2011	149.2	135.0	33.5	10.5	8.7	4.2	0.08	0.07	0.02	0.001	0.000	0.01
	2012*	153.9	152.7	20.8	13.3	13.2	2.5	0.10	0.10	0.02	0.001	0.000	0.00
Japan (15)	2005	40.0	34.0	18.2	7.1	5.3	5.1	0.26	0.25	0.07	0.004	0.000	0.01
	2006	35.2	33.8	8.8	6.0	5.5	2.2	0.23	0.22	0.07	0.002	0.000	0.01
	2007	31.0	27.7	9.4	6.3	5.5	2.3	0.29	0.29	0.07	0.005	0.000	0.03
	2008	122.5	95.1	74.5	20.8	15.6	14.2	0.22	0.20	0.09	0.007	0.001	0.02
	2009	197.6	141.0	118.9	33.7	27.5	20.1	0.22	0.21	0.08	0.003	0.000	0.01
	2010	87.3	85.7	17.9	9.9	9.3	3.1	0.12	0.12	0.03	0.001	0.000	0.01
	2011	103.7	94.0	28.4	10.6	8.8	4.4	0.11	0.10	0.03	0.002	0.000	0.01
	2012*	125.8	124.3	14.3	13.1	12.8	1.9	0.11	0.11	0.01	0.002	0.000	0.01
Others (47)	2005	56.9	55.9	10.4	5.9	5.5	2.0	0.17	0.16	0.06	0.003	0.001	0.01
	2006	48.6	48.0	9.9	4.9	4.7	1.5	0.16	0.15	0.05	0.002	0.000	0.01
	2007	45.2	37.7	17.0	5.1	4.6	1.9	0.17	0.16	0.05	0.004	0.000	0.02
	2008	167.4	137.0	82.3	15.1	11.1	9.8	0.10	0.10	0.03	0.005	0.001	0.02
	2009	179.8	153.0	80.8	16.8	16.1	7.2	0.11	0.11	0.03	0.001	0.000	0.00
	2010	108.1	107.1	15.9	7.9	7.7	2.2	0.09	0.08	0.02	0.001	0.000	0.00
	2011	141.1	116.8	47.9	10.9	8.4	5.4	0.09	0.08	0.02	0.001	0.000	0.00
	2012*	175.0	171.0	22.1	14.8	14.0	3.4	0.10	0.10	0.02	0.001	0.000	0.00

Table 2 reports the effect of market liquidity on firm-specific liquidity. This table summarizes the cross-sectional averages of the slopes of the contemporaneous, lagged, and leading market liquidity measures that are estimated by Ordinary Least Squares (OLS) and the t-statistic. The table also reports the proportion of individual positive slopes and the proportion of individual positive and significant slopes (critical value 5%). "Sum" refers to the cross-sectional average of the sum of the contemporaneous, lead, and lag betas. We report the t-statistic for "Sum". "Median" refers to the cross-sectional median of the sum of the contemporaneous, lead, and lag betas.

	2005	2006	2007	2008	2009	2010	2011
Contemporaneous	0.57	0.59	0.82	0.86	0.68	0.78	0.79
t-statistic	12.65	14.41	21.68	26.36	17.96	24.68	21.73
% Positive	76.48	76.94	88.58	95.43	80.82	90.87	86.50
% Positive & Significant	18.72	14.38	44.75	69.63	28.08	53.20	57.21
Lag	-0.02	0.02	0.08	0.00	0.02	0.04	0.02
t-statistic	-0.49	0.56	2.93	0.07	0.49	1.61	0.75
% Positive	48.40	48.86	53.20	50.46	48.40	53.88	52.63
% Positive & Significant	3.20	7.99	9.36	7.99	6.62	15.75	11.90
Lead	-0.03	0.02	0.07	0.02	0.03	0.07	0.05
t-statistic	-0.60	0.44	2.52	1.04	0.94	2.25	1.90
% Positive	47.26	47.95	54.11	52.05	51.60	59.13	52.86
% Positive & Significant	6.16	6.39	8.22	7.53	5.48	11.64	8.47
Sum	0.52	0.63	0.97	0.88	0.73	0.89	0.86
t-statistic	8.29	10.15	24.09	28.16	13.06	24.50	23.74
Median	0.46	0.56	0.89	0.86	0.62	0.87	0.78
Mean R-squared	0.04	0.04	0.05	0.08	0.06	0.09	0.08

Table 3: Market and industry liquidity commonalities

This table reports the effect of market and industry liquidity on firm-specific liquidity. This table summarizes the cross-sectional averages of the slopes of the contemporaneous, lagged, and leading market liquidity measures; the contemporaneous, lagged, and leading industry liquidity measures; and the t-statistic. The slopes are estimated by Ordinary Least Squares (OLS). We also report the proportion of individual positive slopes and the proportion of individual positive and significant slopes (critical value 5%). "Sum" refers to the cross-sectional average of the sum of the contemporaneous, lead, and lag betas. We report the t-statistic for "Sum". "Median" refers to the cross-sectional median of the sum of the contemporaneous, lead, and lag betas.

	2005		2006		2007		2008		2009		2010		2011	
	Market	Industry	Market	Industry	Market	Industry	Market	Industry	Market	Industry	Market	Industry	Market	Industry
Contemporaneous	0.35	0.24	0.36	0.26	0.59	0.24	0.60	0.28	0.40	0.30	0.51	0.28	0.46	0.32
t-statistic	8.03	12.05	8.86	13.97	15.89	14.56	16.57	14.47	9.95	15.51	15.10	12.16	12.33	16.11
% Positive	0.66	74.66	0.68	76.94	0.79	74.20	0.83	76.03	0.70	81.05	0.79	74.43	0.75	81.46
% Positive & Signif.	0.11	33.56	0.09	34.93	0.28	28.31	0.45	42.69	0.16	40.64	0.36	36.99	0.34	42.56
Lag	0.00	-0.02	0.04	-0.03	0.08	0.00	-0.02	0.02	0.03	0.00	0.00	0.03	-0.01	0.02
t-statistic	0.10	-1.60	0.94	-2.10	2.74	-0.19	-0.96	1.91	0.69	-0.13	0.01	0.89	-0.20	1.89
% Positive	50.00	41.55	48.63	42.69	53.65	50.00	49.54	52.28	49.77	49.32	52.74	50.46	51.26	51.03
% Positive & Signif.	4.57	3.88	8.68	5.25	8.68	6.85	5.48	6.85	7.31	6.85	12.33	6.62	10.07	8.92
Lead	0.00	-0.02	0.06	-0.03	0.08	-0.01	0.00	0.02	0.04	-0.01	0.06	0.01	0.01	0.03
t-statistic	0.04	-1.48	1.35	-2.54	2.74	-0.61	-0.20	2.20	1.07	-0.50	2.08	0.59	0.55	1.61
% Positive	49.09	43.84	50.68	44.98	53.20	48.63	50.00	53.42	50.23	48.86	55.25	49.77	50.57	51.72
% Positive & Signif.	6.85	3.42	7.31	4.79	7.99	6.16	5.25	5.71	5.02	4.11	10.05	6.85	9.84	7.09
Sum	0.35	0.20	0.46	0.21	0.75	0.23	0.57	0.32	0.46	0.29	0.57	0.32	0.47	0.38
t-statistic	5.39	7.30	7.47	7.48	16.69	9.32	16.40	12.55	7.94	10.88	9.84	5.42	11.41	9.85
Median	0.31	0.12	0.36	0.16	0.65	0.17	0.53	0.29	0.41	0.22	0.64	0.21	0.49	0.34
Mean R-squared	0.07		0.07		0.08		0.11		0.09		0.12		0.11	

Table 4: Determinants of liquidity commonalities

This table reports the analysis of the determinants of liquidity commonalities at aggregate and firm levels. Panel A reports the effect of aggregate factors where we regress monthly aggregate betas on the monthly average of global, counterparty and funding cost risk, separately (columns I to III) and jointly (column IV), using OLS robust heteroscedasticy. Panel B reports the effect of individual factors where we run cross-sectional regressions by OLS for every date (1625) in the sample and calculate the average coefficient which is reported in the first column. The standard errors reported in brackets are the corrected for autocorrelation using the Newey-West methodology. These errors are obtained after regressing with Newey-West standard errors adjustment the loadings on each factor, which are shown in the first column, on a constant. The second column shows the change in the dependent variable after a change in the explanatory variable of one standard deviation (SD). The SD is obtained as the mean SD of the variable across all the firms. The third column is the ratio between the effect on the dependent variable of a change one SD in each regressor and the average beta across all the firms and over the whole sample. *** (** and *) indicates that the estimated coefficient is significant at a level of 1% (5% and 10%, respectively).

Panel A: Determinants of liquidity commonalities at aggregate level

	I	II	III	IV
ΔGlobal Risk	0.020*** (0.00)			0.013*** (0.00)
ΔCounterparty Risk		0.091*** (0.03)		0.048** (0.02)
Global Funding Costs			0.155*** (0.06)	0.092** (0.04)
Constant	0.369*** (0.02)	0.361*** (0.02)	0.306*** (0.03)	0.326*** (0.02)
Number of Observations	84	84	85	84
F(1,82)	26.59	11.18	7.9	20.8
Prob > F	0.00	0.00	0.01	0.00
R-Squared	0.25	0.16	0.13	0.32

Panel B: Determinants of liquidity commonalities at individual level

	Coefficient	1 SD change	1 SD change relative to
Size	-0.005 (0.00)	-0.002	-0.002
Leverage	0.035 (0.05)	0.001	0.002
CDS premium	0.000 (0.00)	0.009	0.011
Volatility stock price	3.523 (5.85)	0.012	0.014
3-month interbank rate	0.049*** (0.01)	0.093	0.115
Volatility stock index	32.939*** (5.38)	0.248	0.304
Constant	0.323*** (0.06)		
Average R-squared	0.03		

Table 5: Reliability of the t-statistics

This table reports the results of the test on the existence of cross-equation dependence, which affects the reliability of the t-statistics. We check this on the basis of the residuals obtained in equation (2). We run 437 regressions for 437 pairs of the total 438 firms. The firms to be included in each regression are selected by alphabetical order, such as they appear in our sample. For each pair of residuals we regress the residual of firm *j+1* against the residuals of firm *j*. The t-statistic of the slope of this regression is the one that determines the existence of cross-equation dependence. The first row reports the average correlation coefficient between the pairs of residuals. The second and third rows show the sample mean and median t-statistics of the regression slope coefficient. The last two rows show the frequency of absolute t-statistics (for the slope) exceeding the 5% and 2.5% critical values. Due to the existence of two tails, double critical values (10% and 5%, respectively) are used.

*Information relating to 2012 refers to the first quarter of that year.

	2005	2006	2007	2008	2009	2010	2011	2012*
Average Correlation	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00
Mean t-statistic	0.13	0.14	0.07	0.09	0.06	0.10	0.11	0.03
Median t-statistic	-0.01	0.04	-0.06	0.02	-0.08	0.05	0.08	-0.03
|t|>1.645 (%)	16.48	16.70	17.62	27.46	17.62	18.54	16.02	16.70
|t|>1.96 (%)	9.38	11.21	11.21	19.45	12.81	12.59	10.30	9.38

Figure 1 reports the daily effect of market liquidity on firm-specific liquidity using 1-year rolling windows (i.e., cross-sectional median of the sum of the contemporaneous, lead and lag market liquidity effects). Panel A contains the baseline methodology in which market liquidity and returns are obtained using equally weighted averages and an alternative methodology where measures are weighted by market capitalization. Vertical lines refer to the Lehman Brothers (September 15th, 2008) collapse and Greek's bailout requests (April 23rd, 2010). In Panels B to D we stratify the liquidity commonality effects of the baseline analysis in quartiles according to the size, level of credit risk and leverage.

Panel A: Equally Weighted vs. Weighted by Market Capitalization Market Liquidity

Panel B: Size

Panel C: Level of Credit Risk

Panel D: Leverage
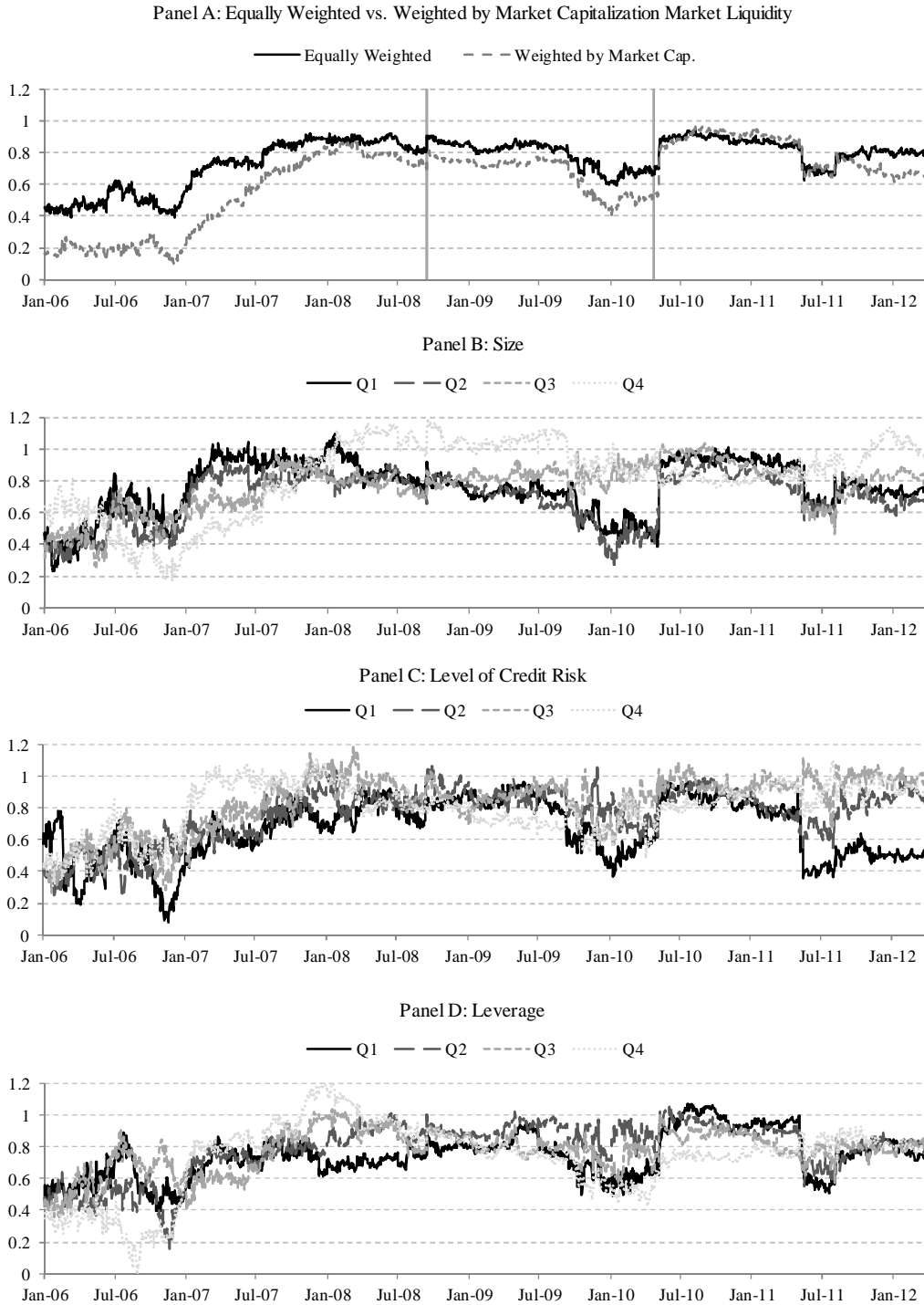
Figure 2: Daily liquidity commonalities by economic area

Figure 2 reports the daily effect of market liquidity on firm-specific liquidity using 1-year rolling windows (i.e., cross-sectional median of the sum of the contemporaneous, lead and lag market liquidity effects) being the market liquidity defined by economic area. Panel A depicts the cross-sectional median for all sample firms and Panel B to F depicts the cross-sectional median for firms belonging to the corresponding economic areas (United States, the European Monetary Union, the United Kingdom, Japan, and Others, respectively). Vertical lines refer to the Lehman Brothers (September 15th, 2008) collapse and Greek's bailout requests (April 23rd, 2010).

Panel A: All

Panel B: U.S

Panel C: E.M.U

Panel D: U.K

Panel E: Japan

Panel F: Other
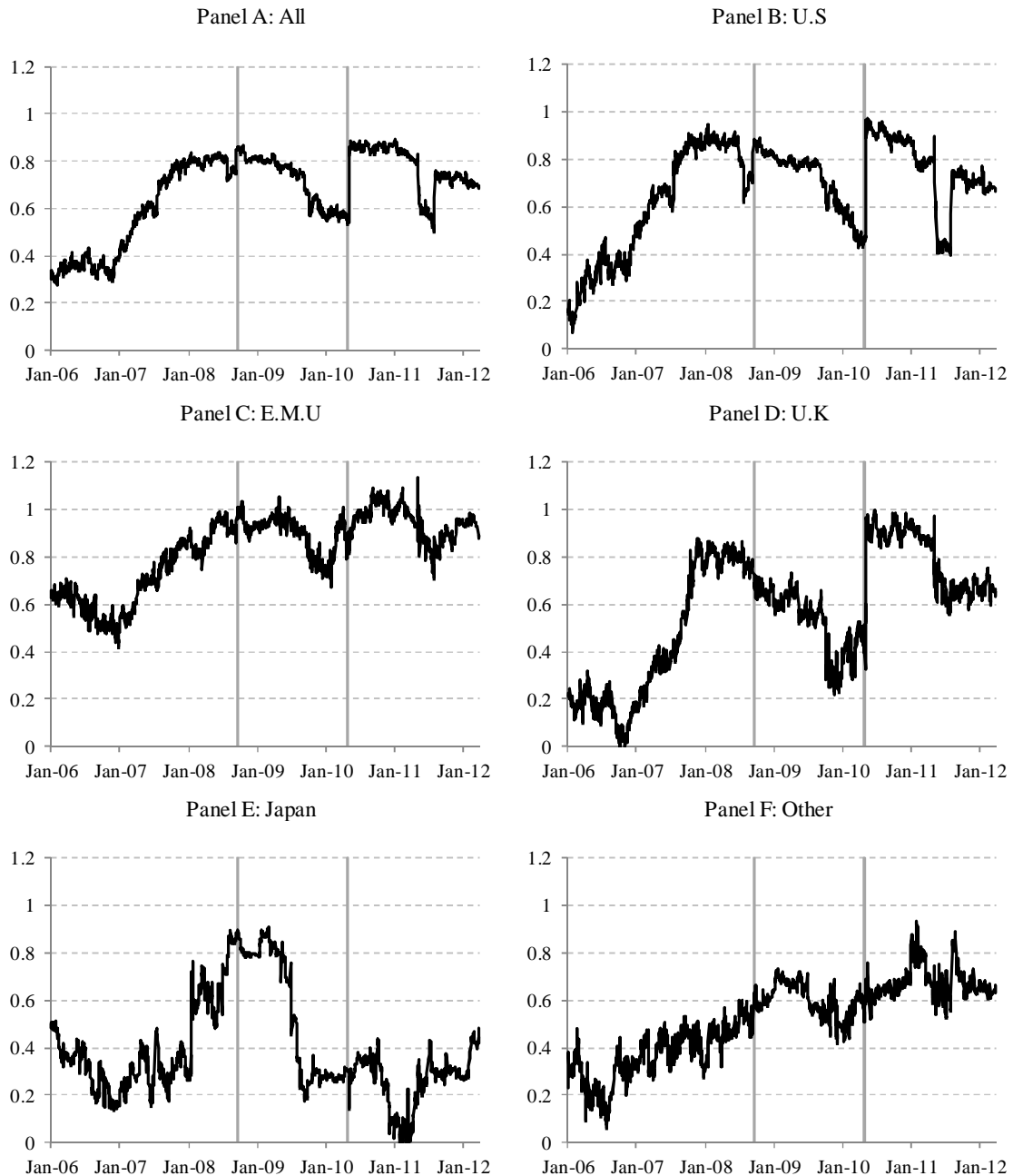
Figure 3: Analysis of Asymmetries

Figure 3 reports the daily effect of market liquidity on firm-specific liquidity using 1-year rolling windows (i.e., cross-sectional median of the contemporaneous market liquidity effect) in which we split up the contemporaneous effect into two depending on whether the market CDS returns have a positive or negative sign. We use the baseline specification and interact the market liquidity measure with a dummy for positive changes in the CDS market returns and on the other hand with a dummy for negative changes in the CDS market returns. We also exclude the lagged and lead values of the changes in market liquidity.
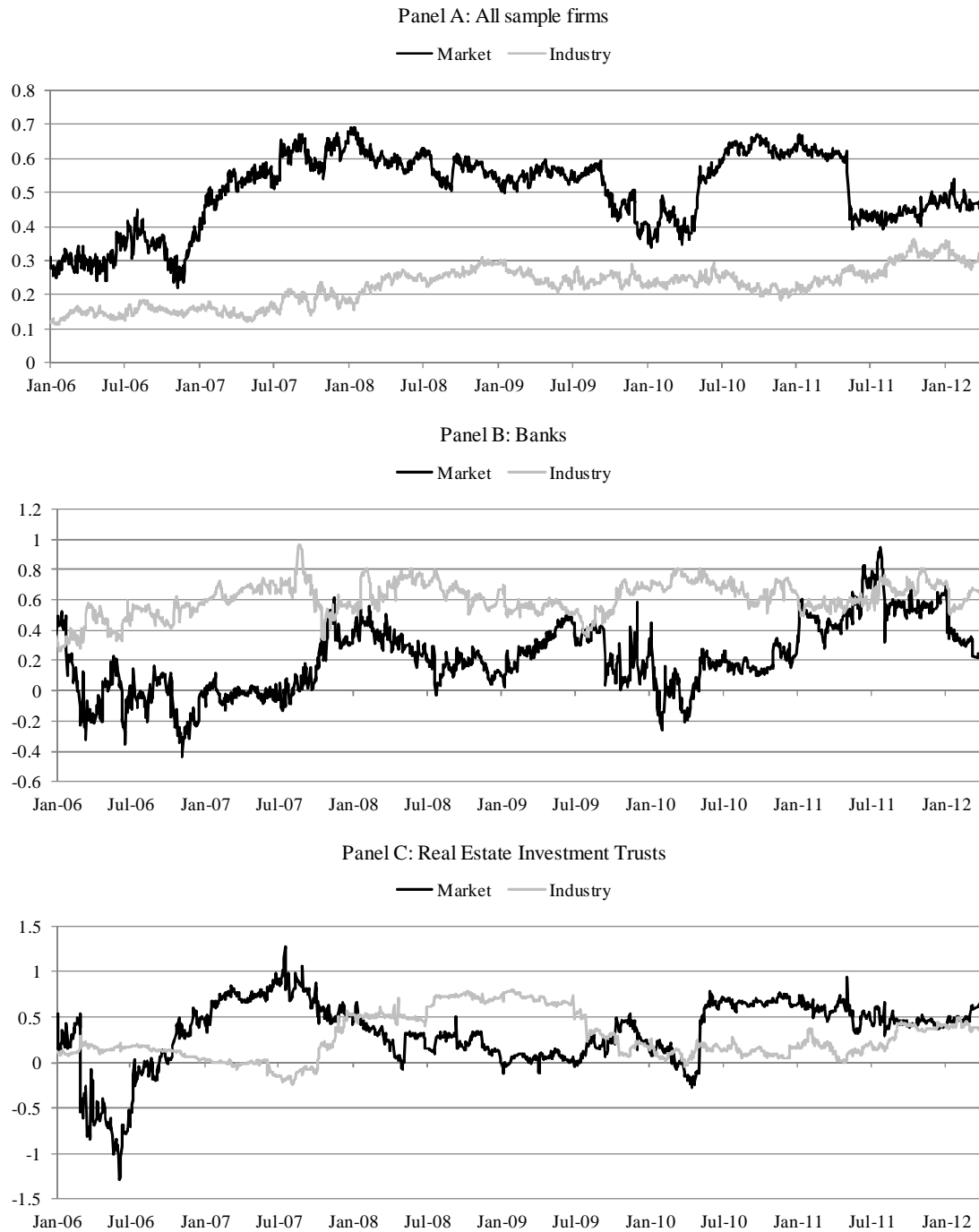

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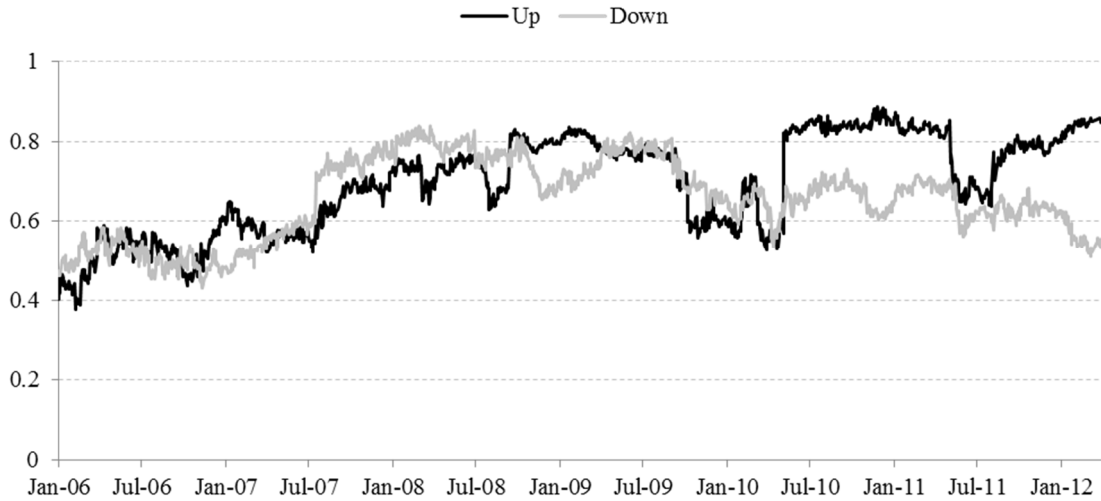
Figure 4: Market vs. Industry Daily Liquidity Commonalities

Figure 4 depicts the daily effect of market and industry liquidity on firm-specific liquidity using 1-year rolling windows (i.e., cross-sectional median of the sum of the contemporaneous, lead and lag liquidity effects) where industry liquidity measure is constructed as an equally weighted average of the relative bid-ask spreads for firms belonging to the same industry. Panel A reports the cross-sectional median of all sample firms and Panels B and C refer to banks and real estate investment trusts firms, respectively.

Panel A: All sample firms

Panel B: Banks

Panel C: Real Estate Investment Trusts

Figure 5: Market vs. High CDS Daily Liquidity Commonalities

Figure 5 depicts the daily effect of market and high CDS liquidity on firm-specific liquidity using 1-year rolling windows (i.e., cross-sectional median of the sum of the contemporaneous, lead and lag liquidity effects) where high CDS liquidity measure is constructed as the equally weighted average of the relative bid-ask spreads of firms belonging to the top quartile according to their level of CDS prices.
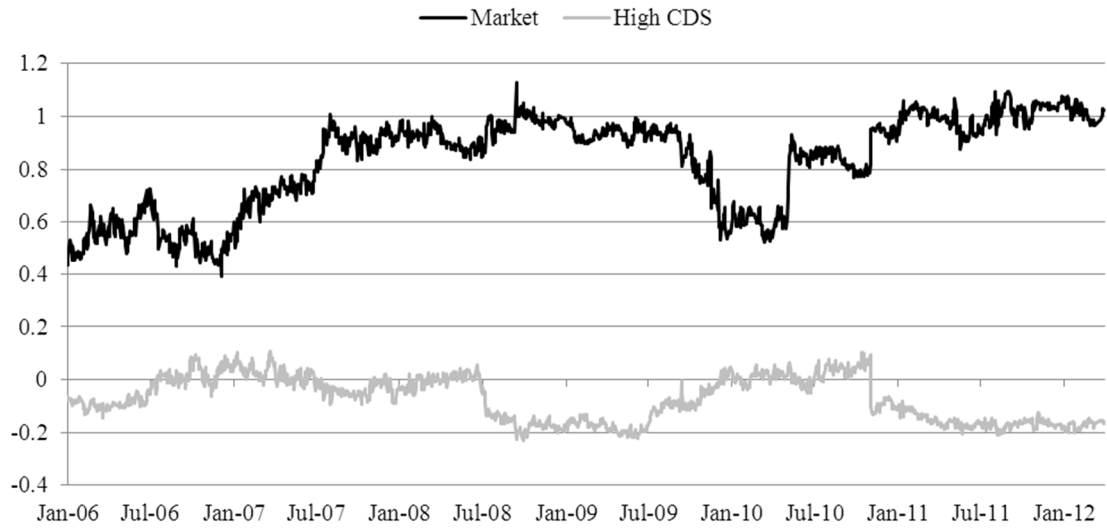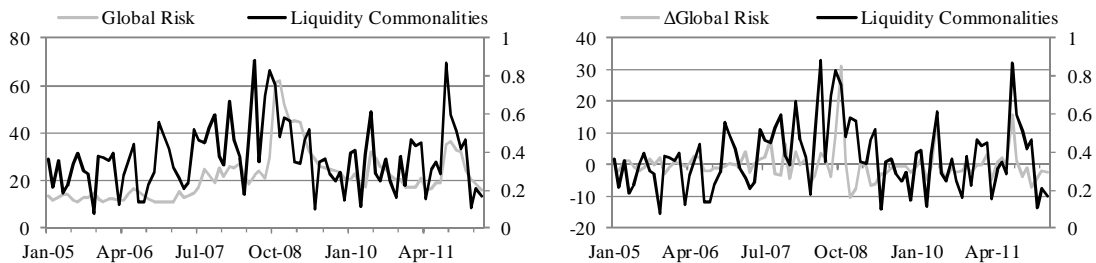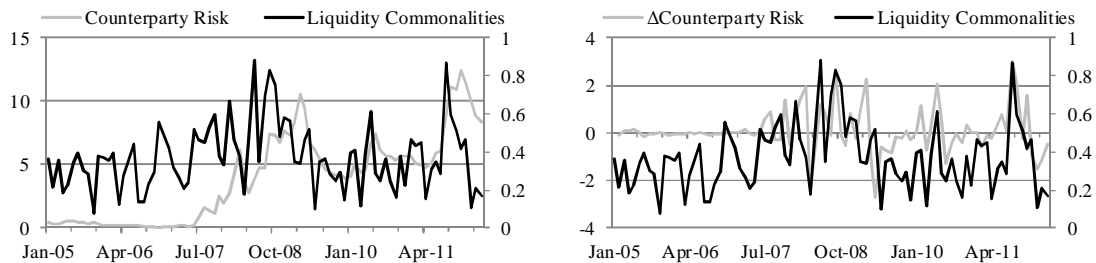
Figure 6: Firm's betas and global, counterparty and funding liquidity risks

This figure depicts the series of liquidity commonalities and global, counterparty and funding liquidity risks. The right hand side axis of the figures in Panels A, B, and C refers to the monthly liquidity commonalities (i.e., cross-sectional median of the individual betas for each month) and the left hand side axis refers to the monthly average of global, counterparty and funding liquidity risks, respectively. Each panel contains two figures, on the left, risk variables are considered in levels and on the right in first differences. Finally and regarding Panel D, the right hand side axis of the three figures refers to the daily liquidity commonalities (i.e., cross-sectional median of the sum of the contemporaneous, lead and lag liquidity effects) and the left hand side axis refers to the global, counterparty and funding liquidity risks in levels. Daily and monthly betas are estimated according to equations (2) and (9), respectively. Global risk is proxied with the VIX; counterparty risk is computed as the first principal component obtained from the CDS premia of the main banks that act as dealers in such a market; funding liquidity is defined as the difference between the 90-day U.S. AA-rated commercial paper interest rates for the financial companies and the 90-day U.S. T-bill.
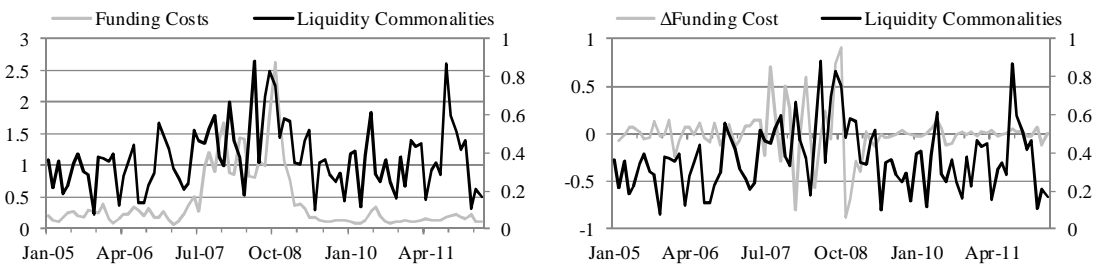
Panel A: Monthly Liquidity Commonalities vs. Global Risk

Panel B: Monthly Liquidity Commonalities vs. Counterparty Risk

Panel C: Monthly Liquidity Commonalities vs. Funding Liquidity Risk

Panel D: Daily Liquidity Commonalities vs. Global, Counterparty and Funding Liquidity Risks
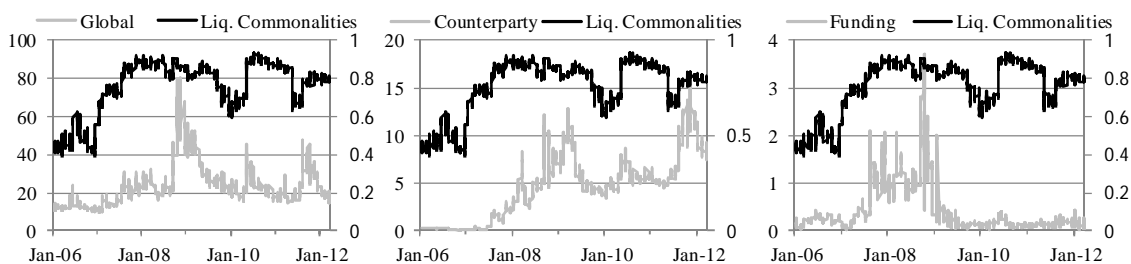
Figure 7: Alternative Liquidity Measures

Figure 6 contains the effect of market liquidity on firm-specific liquidity using 1-year rolling windows (i.e., cross-sectional median of the sum of the contemporaneous, lead and lag market liquidity effects) for different liquidity measures. For comparability reasons, the baseline liquidity measure (relative bid-ask spread) is also depicted in all panels. In Panel A daily liquidity measures are based on additional information provided by CMA about the daily number of contributors and quotes used to form the CDS prices. In Panel B weekly liquidity measures are based on the DTCC information about the weekly traded gross and net nominal values and the number of contracts. In Panel C daily liquidity measures are based on the absolute bid-ask spread (absolute) and on first difference of the relative bid-ask spread (incremental). Sample length depends on the data availability.

Panel A: CMA Additional Information

Panel B: DTCC Information
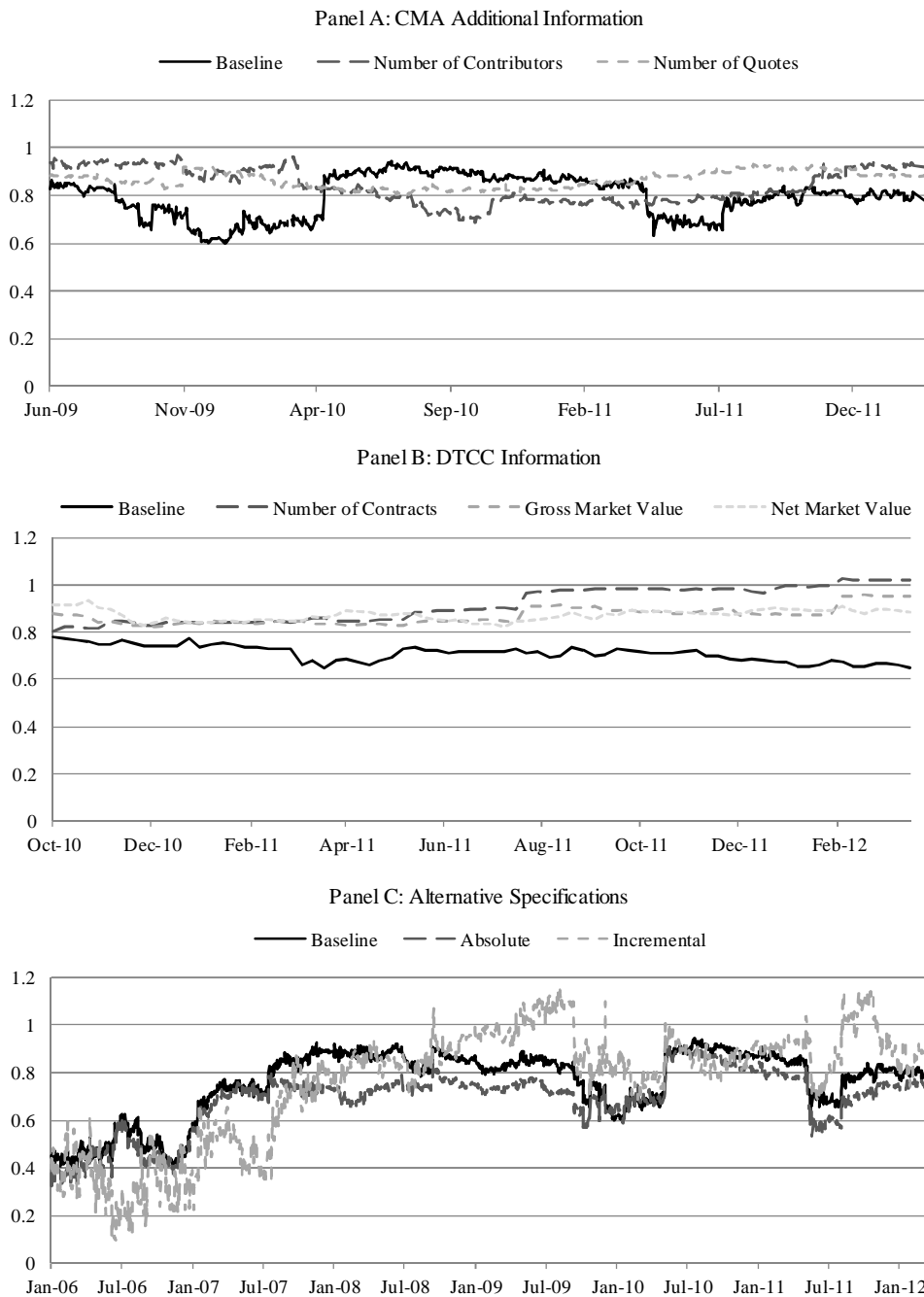

Panel C: Alternative Specifications

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Figure 8: Observed vs. Derived Quotes

Figure 6 reports the daily effect of market liquidity on firm-specific liquidity using 1-year rolling windows (i.e., cross-sectional median of the sum of the contemporaneous, lead and lag market liquidity effects) using the baseline methodology where both, observed and derived are employed and alternative methodology where we exclude the information referred to the derived quotes.