An analysis of liquidity skewness for European sovereign bond markets

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ABSTRACT

We examine liquidity skewness by providing an analysis of bid-ask spreads for a comprehensive high-frequency dataset comprising Eurozone countries' sovereign bonds. European sovereign bond markets exhibited increasing positive skewness over the sample period which was most extreme for Greece, Ireland and Portugal. We argue that positive skewness reflects decreased liquidity during volatile periods. We also report negative skewness in 2007. This can be explained by a feature of the limit-order book rubric of the MTS market where market-makers can submit limit-orders that are more competitive than the current best-price to reduce unwanted inventory without having to execute a market-order.

1. Introduction

This paper contributes to the sparse literature examining trends in the inter-temporal behaviour of liquidity, and liquidity skewness, in financial markets. Specifically, it provides an analysis of liquidity and its skewness of the bid-ask spread for high-frequency data from the Mercato dei Titoli di Stato (MTS) inter-dealer fixed-income securities platform from July 2005 to December 2011. The analysis encompasses seven key eurozone countries including Germany, France, Greece, Spain, Ireland, Italy, Portugal and Spain. Empirically and theoretically many studies have addressed equity market liquidity (Hameed et al., 2010; Garleanu and Pedersen, 2011; Degryse, 1997; Booth et al., 1999; Boehmer, 2005; Swan and Westerholm, 2004; Aitken et al., 2006). However, only a few studies specifically investigate liquidity skewness. Roll and Subrahmanyam (2010) report that bid-ask spreads for US equities have declined, on average, and have become increasingly positively skewed. A finding which was consistent across exchanges as well as size, price and volume quartiles. They attribute the emergence of positive skewness to increased competition among market makers over time. Hsieh et al. (2018) also report that over the period 1996 to 2009 UK equities' average bid-ask spreads declined and was accompanied by increasing positive skewness. They also rely on increased competition among market-makers to explain their findings. The aim of this paper is to add to this literature by examining liquidity skewness for sovereign bond markets over an important period encompassing the global financial crisis and the European sovereign debt crisis.

In the context of the eurozone, Cheung et al. (2005) examine every transaction for Italian, French, German and Belgian sovereign bonds traded on the MTS platform from January 2001 until May 2002. They find that liquidity indicators such as bid-ask spread and effective spread are related to the maturity of the instruments. Dunne et al. (2007) study the determinants of execution costs and the role of transparency in the European government bond market for select months during 2003 to 2005. They find that execution quality is related to issuer size, technique and imposed obligations. Darbha and Dufour (2013) analyse liquidity on MTS before and

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during the crisis using data from January 2004 to July 2010. They report that liquidity did not provide a significant incremental explanatory contribution to time-series dynamics of yields before the crisis, but did become significant during the crisis. Further, they find that liquidity played an important role in explaining yield spreads both before and during the crisis. Petrella and Resti (2016) perform an empirical analysis of eurozone government bonds over the period 2005 to 2012. They find that characteristics such as duration, rating, and issue size affect liquidity, and that these variables help identify resilient bonds under stressed conditions. More recently, Pelizzon et al. (2016) investigate the relation between credit risk and liquidity for the Italian sovereign bond market during the Eurozone crisis and the impact of subsequent European Central Bank (ECB) interventions. They report that credit risk influences the liquidity of the market with this relationship exhibiting a threshold effect, becoming stronger, when the CDS spread exceeds 500 basis points (bp). And that ECB Long-Term Refinancing Operations (LTRO) interventions lead to a structural break which significantly diminished the intensity of credit-risk liquidity relationship from the onset of 2012.

We conduct the analysis on the whole yield curve for each of the seven countries and report two main findings. First, similar to equity markets, bond markets exhibited increasing positive skewness over the sample period which was most extreme for Greece, Ireland and Portugal. In contrast to the explanation of increased competition for equity markets, we argue that positive bond market skewness result reflects decreased liquidity during volatile periods. Second, we report a period of negative skewness in 2007. This can be explained by a feature of the limit-order book structure of the MTS market where market makers can submit limit-orders that are more competitive than the current best price to reduce unwanted inventory without having to execute a market-order and pay the bid-ask spread. By way of a simple stylized example we demonstrate how this result can emerge. The increase in skewness for the European sovereign debt market cannot be attributed to increased competition amongst market makers but rather a decrease in liquidity, specifically quoted depth, during volatile periods.

2. Data and methodology

The MTS data covers every transaction for French, German, Greek, Irish, Italian, Portuguese and Spanish government bonds being traded on the MTS platform from 1 July 2005 to 31 December 2011. For each instrument included in the study the limit-order book is available in aggregate format with millisecond timestamp. The direction of the trade - buy or sell - is also specified. We perform the analysis on all available instruments that were quoted on both MTS Domestic Markets and EuroMTS for the entire sample period, using snap-shot observations every 15 min from 09:00 to 16:30. Table 1 provides a breakdown of the sample.

For Germany there were 9 bonds available for the entire period, Spain 7, France 12, Greece 5, Ireland 3, Italy 10 and for Portugal there were 4. For each bond there are 49,500 observations, which, when multiplied by the number of bonds per country, results in a total number of observations for the study of 2,475,000. Similar to Antonakakis and Vergos (2013) we categorise the countries into core and periphery, but also add a third category semi-core comprising Italy and Spain in our analysis. Our analysis is conducted over three distinct sub-periods encompassing a period of pre-crisis calm, the global financial crisis and the European sovereign debt crisis. We have:

- **Pre-Crisis Period (PRE):** 1st July 2005 to 31st May 2007.
- **Global Financial Crisis (GFC): 1st** June 2007 to 31st December 2008.
  UK stopped lending to each other in July 2007 due to market fears that counterparts were exposed to the emerging US sub-prime crisis. Also, in July, Bear Sterns informed investors that they would get little, if any, money back from two hedge funds with large holdings of sub-prime mortgages. LIBOR rates spike. Following a BBC report on the 13th September, Northern Rock experienced a bank-run on the 14th. It was subsequently nationalised on 22nd February 2008.
- **European Sovereign Debt Crisis (ESDC):** 1st January 2009 to 31st December 2011.
  On 15th January 2009, the Irish government announced that it would nationalize Anglo Irish Bank. Fall 2009 Greece's budget was revised highlighting that the deficit for that year would be significantly higher than previously predicted. On May 2nd, 2010 the EU endorsed the IMF announce an €85bn first European financial rescue plan for Greece. Problems persisted and Greece and a second rescue package was negotiated with Greece in 2011. On 28th November 2010 the Trokia (European Commission, European Central Bank and International Monetary Fund agreed an €85bn bailout deal with the Irish Government. On 5th May 2011 Portugal agrees with the EU and IMF on a €78bn bailout in exchange for an austerity programme.

Table 1
Sample.

Country	Classification	Number of bonds	Observations per bond	Observations per country
Germany	Core	9	49,500	445,500
France	Core	12	49,500	594,000
Spain	Semi-core	7	49,500	346,500
Italy	Semi-core	10	49,500	495,000
Ireland	Periphery	3	49,500	148,500
Greece	Periphery	5	49,500	247,000
Portugal	Periphery	4	49,500	198,000
			Total	2,475,500