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Study of liquidity in French bond markets

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Liquidity in French bond markets[1]

Summary

Bond market liquidity is a source of growing concerns within the financial community: liquidity is thought to have never recovered its pre-crisis level, while at the same time outstanding amounts of bond debt and funds have more than doubled worldwide since the outbreak of the subprime crisis. This creates the threat of massive fire sales in the event of shocks, which would severely impact market functioning and issuer financing capabilities.

At a time when some participants are considering regulations as a constraint that has caused liquidity to dry up, this article describes the first findings of an AMF analysis on liquidity in French bond markets between 2005 and 2015.

Based on trade data received by the AMF and bid-ask spreads data, a composite liquidity indicator was constructed. The results suggest that, after the two episodes of strong decline due to 2007-2009 and 2011 crisis, liquidity has improved steadily in French bond markets since beginning of 2012 albeit without recovering its pre-crisis level (2005-2007). Liquidity also tends to be more concentrated in instruments that are either least risky or that offer the greatest market depth.

However, this improvement of bond markets liquidity does not signify resilience in the event of shocks. Indeed, the factors affecting the level of liquidity seem to be primarily of a cyclical nature and in the event of a bond markets crisis, liquidity would probably dry out.

This paper is a first presentation of the AMF analysis on bond markets liquidity and constitutes a work in progress.

[1] Joint study by the AMF Market Surveillance Division and the Analysis, Strategy and Risk Division.

1. Introduction

In recent months, bond liquidity has been a source of growing concern within the financial community: liquidity is thought to have never recovered its pre-crisis level, particularly on the riskiest segments, such as corporate bonds. RBS bank (RBS (2014)), estimates that liquidity shrank by 70% in US corporate bond markets and 30% in US government bond markets between 2005 and 2014[2]. Meanwhile, the market has steadily expanded in size. This creates the threat of massive fire sales in the event of market stress, linked for example to expectations of higher interest rates or a downturn in credit quality, which could throw supply and demand out of balance and provoke a seizure not just on the secondary market but also the primary market owing to increased risk premia.

The flash rally[3] of 15 October 2014 on the US Treasuries market, which is known as one of the world's most liquid with average daily trading volume of USD 500 billion, has lent additional weight to these fears[4].

Some bond managers, such as BlackRock[5], have voiced concerns about their ability to offload large positions in the event of a downturn in market conditions, since assets under management now far exceed pre-crisis levels. This situation is exacerbated by the low level of interest rates, which has created an incentive to grow offerings on riskier and less liquid segments.

The main reason suggested for the decrease in bond liquidity is that banks are now taking a more selective approach to market making (or simply got out of the business after the financial crisis)[6]. Initially linked to cyclical factors, this shift subsequently acquired a more structural dimension, according to market participants, with the entry into force of banking regulations aimed at mitigating systemic risk.

These liquidity concerns were picked up in March 2015 by the Bank for International Settlements (BIS), which devoted a portion of its Quarterly Review to the link between market making and bond market liquidity.

Initially, most of the quantitative analysis in this area concentrated heavily on US markets because of greater data availability[7]. In Europe, owing to the lack of transparency on volumes and bank inventories, the earliest publications took an essentially qualitative approach and appeared to find similar results in terms of a decline in liquidity. For example, according to a report by the International Capital Market Association (ICMA) on the state of the European corporate bond market[8], based on interviews, banks apparently responded to the new prudential rules by cutting inventories, while at the same time seeking to increase the turnover of their remaining positions, which prompted them to concentrate on the least risky segments.

In this context, the AMF, who pays a particular attention to bond markets liquidity, has developed its own indicator, which it has used since H1 2015 to quantify the change in liquidity as part of its monitoring of financial market risks. This simple composite indicator is based on bid-ask spreads and price impact measures that are deemed suitable in the academic literature to evaluate the liquidity level of bond markets. The results show that, after the two stress episodes in 2007-2009 and 2011, liquidity has improved steadily in French bond markets since beginning 2012 albeit without recovering its pre-crisis level (2005-2007). Liquidity has also tended to be more concentrated in instruments that are either least risky or that offer the greatest market depth, as part of a bifurcation trend. However, this healthy liquidity performance does not signify that these markets will be resilient in the event of shocks such as those recently observed on US sovereign bond markets. A review of the causes of changes in liquidity suggests that the level of liquidity is essentially due to factors of a cyclical nature[9].

Since summer 2015, a series of studies have sought to shed quantitative light on the change in bond liquidity in Europe. While the findings of some reports (PwC (2015)) differ from those of our study[10], others are in line with our conclusions (GFRS (2015)).

The first section of this paper proposes a definition for liquidity and reviews the measures put forward in the academic literature. The second describes the available data and the methodology used to construct the composite liquidity indicator, while the third reports the findings for French bond markets liquidity. The final section explores the explanatory factors behind the evolution of liquidity.

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[2] *The Revolver – The credit liquidity trap*, The Royal Bank of Scotland, 23 July 2014.
[3] 2-year and 10-year US Treasuries, for example, shed 25 and 37 basis points respectively during this episode.
[4] For a detailed analysis of the flash rally on 15 October 2014, see the Joint Staff Report (2015) by US regulators or the IMF Working Paper by Bouveret et al. (2015).
[5] *Corporate bond market structure: The time for reform is now*, BlackRock, September 2014.
[6] On this question, see in particular the report by the AMF working group chaired by D. Hoenn and J-P. Pinatton on the secondary bond market (2009).
[7] The Liquid-O-Meter indicator used in RBS (2014) is based on the inventories of US banks and US trading volumes supplied by the Securities Industry and Financial Markets Association (SIFMA).
[8] *The current state and future evolution of the European investment grade corporate bond secondary market: perspectives from the market*, ICMA, November 2014.
[9] Measured by the level of risk aversion. The regulatory impact is hard to quantify but post-crisis regulations do not appear to have dramatically affected liquidity in French bond markets so far (cf. section 4).
[10] See Annex 2 for a description of the methodology used to calculate volumes in the PwC study (2015).

2. Definition and measures of bond liquidity

A financial asset is considered to be liquid if it can be bought and sold quickly in reasonable quantity relative to customary market sizes and at low cost (notably without slippage[11]). Accordingly, two key characteristics of a liquid asset are its ability to be effectively traded and the cost linked to execution. Liquidity is an essential factor in market functioning as it affects the trading costs borne by investors, which are passed on indirectly to issuers' financing costs on the primary market.

From the viewpoint of a trader, an asset's liquidity is always observed after the fact, based on the delay and cost of trading a position. But delays are impossible to measure directly on bond markets because over-the-counter (OTC) trading has such a major presence. It would also be necessary to control for demand adjustment effects, since requested quantities may be split up to obtain faster execution and/or a better price.

However, relatively simple indicators of market activity based on trading volumes and the number of transactions can be used to estimate market depth, i.e. the capacity of a given market to absorb buy and sell orders involving large quantities. Liquidity can also be gauged through measures of:
- bid-ask spreads posted by banks and brokers, which proxy the ex ante cost of executing a trade;
- price impact, which proxy the share of the execution cost linked to execution itself (i.e. post-trade).

The construction of such liquidity indicators for the bond market is additionally affected by the nature of the data used (trade data or bid-ask spreads) as well as by the frequency of available data, i.e. high-frequency (intraday) or low-frequency (daily or lower).

The use of trade data has two advantages. First, they capture the notion that the more an instrument is traded, the smaller the impact a new trade will have on price, which gives an insight into market depth. Second, it is more likely in an active market to find a counterparty within a reasonable time.
It should also be kept in mind that two price levels may be considered when looking at spreads on bond markets: contributed prices reported by data providers such as Bloomberg, which are essentially indicative, and the executable ones – with a higher reliability – available on certain trading platforms.

Estimates of transaction costs based on spreads and execution prices (price impact measure) would ideally be calculated per individual trade, which would entail having correctly time-stamped intraday data. Unfortunately, historical data on intraday spreads are not available[12] and the times of reported trades are not necessary reliable.

Accordingly, an empirical analysis of bond market liquidity raises two main questions, given the constraints associated with data availability issues:
- How to choose the most robust indicator(s)?
- Can indicators based on daily data be used in the absence of satisfactory intraday data?

Schestag et al. (2015) provide some answers to these questions. Based on data from the US bond market, the authors sought to determine the most appropriate liquidity measures when using benchmark intraday data and proxies based on daily data. The capacity of the proxies to explain changes in liquidity both at a given moment and over time was then assessed in comparison to the benchmark measures (cf. box).

The findings show that the benchmark measures are highly correlated over time, reflecting their robustness, and that most proxy indicators using daily data are capable of capturing transaction costs measured at an intraday frequency.

The authors find that measures based on spreads are extremely robust, especially spreads based on executable prices, which are deemed to be of higher quality than those based on indicative prices. Furthermore, the authors propose an analysis based on zero returns, which measures the proportion of days without trades for a given bond and which also yields good results, particularly for less liquid bonds. Price impact measures are shown to be well suited to analysing changes in liquidity over time. The use of daily data does not alter the quality of these indicators.

[11] Slippage is when an order is executed at a different price from that requested.
[12] Including from Bloomberg.

Box: The main liquidity measures tested by Schestag, Schuster, Uhrig-Homburg (2015)

The indicators tested by Schestag et al. (2015) on US bond data between October 2004 and September 2012[13] can be separated according to whether they capture the notion of liquidity through spreads (obtained from trade prices or contributed prices provided by Bloomberg) or a trade-based price impact indicator.

The benchmark indicators based on intraday data fall into two categories:

- Indicators that seek to capture the size of spreads based on prices:
    - The round-trip transaction cost estimates a dealer's market making cost through the difference between maximum and minimum prices in sequences involving a purchase from a client followed by a sale to another dealer or client (it is assumed that the presence of an opposing purchase and sale within a 15-minute window denotes this type of sequence (Feldhütter, 2012));
    - The inter-quartile range uses the difference between the 25th (p25) and 75th (p75) percentiles of the price distribution divided by the average price over the whole trading day;
    - An implicit spread measure is calculated using the autocorrelation of observed prices (Roll, 1984);
    - The difference between the trade price and bid price at the same point in time, based on Schultz (2001), can be used to estimate the transaction cost. In addition, in the regression of this difference on a trade side dummy, the estimated parameter offers a measure of the effective spread;
    - The difference between actual and theoretical prices, the latter being estimated econometrically, follows a similar line of reasoning (Edwards, Harris and Piwowar, 2007);
    - An indicator of intraday price dispersion relative to trend may also be used (Jankowitsch et al., 2011).
- Indicators seeking to measure the notion of price impact (which can be defined as the potential relationship between the size of an order and the price change caused by that order):
    - A price impact measure inspired by Amihud (2002) consists in calculating the average of the absolute values of the price changes between consecutive trades divided by volumes;
    - The lambda method consists in econometrically estimating the relationship between the return on trades and their signed volumes for all trades in a given bond on a given day.

As regards the proxy measures, in addition to measures derived from the above indicators estimated at a daily frequency, Schestag et al.(2015) propose an additional indicator based on the proportion of zero return days (i.e. days without trading) for a given bond over the month. This indicator captures the intuitive notion that zero return days are more frequent among illiquid bonds.

The authors' findings suggest that it would be appropriate to construct an indicator based both on spreads and a price impact measure to analyse bond market liquidity. The following section presents the data used to conduct this analysis on French markets and the methodology used to construct a simple composite indicator incorporating these components.

[13] The trade data are taken from the Trade Reporting and Compliance Engine (TRACE) system managed by FINRA and to which all brokers/dealers are required to report.

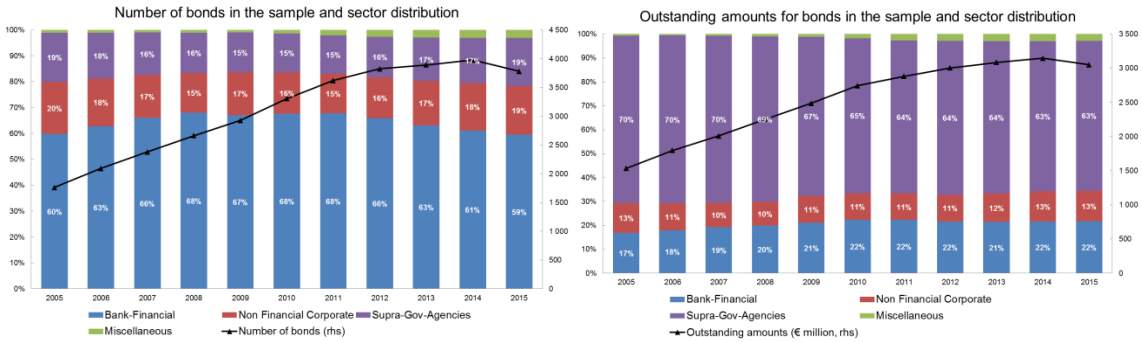
3. Data and methodology

3.1. Data

The scope used in the analysis covers listed French government and corporate (financial and non-financial) bonds on which the AMF has trade reporting data for 2005-2015[14].
Since MiFID's[15] entry into effect in 2007 and the introduction of the associated trade reporting obligations, the AMF has received information on all trades conducted in Europe in securities for which it is the competent authority. Before 2007, the AMF received reports but only from French investment services providers (ISPs). Accordingly, calculations in the period before 2007 cover trades by French ISPs only. Furthermore, note that the trade reporting obligations do not allow us to expand our analysis to encompass the bond markets of other European countries because since the AMF is not the competent authority for bonds from these countries, it cannot receive data on trades executed on these markets.

The sample used to analyse measures based on trade data thus comprises more than 6,600 bonds over the entire period. As Chart 1 shows, private sector bonds make up the greatest number, accounting for 80% of the sample. However, in terms of outstanding amounts, government bonds make up a larger proportion, accounting for between 60% and 70% of the total. Note also the sample's stable make-up over time as well as the large number of instruments available across the entire period. These two points provide justification for using an indicator based on these data.

Chart 1 – Number of bonds and outstanding amounts for bonds in the sample (Sector distribution)



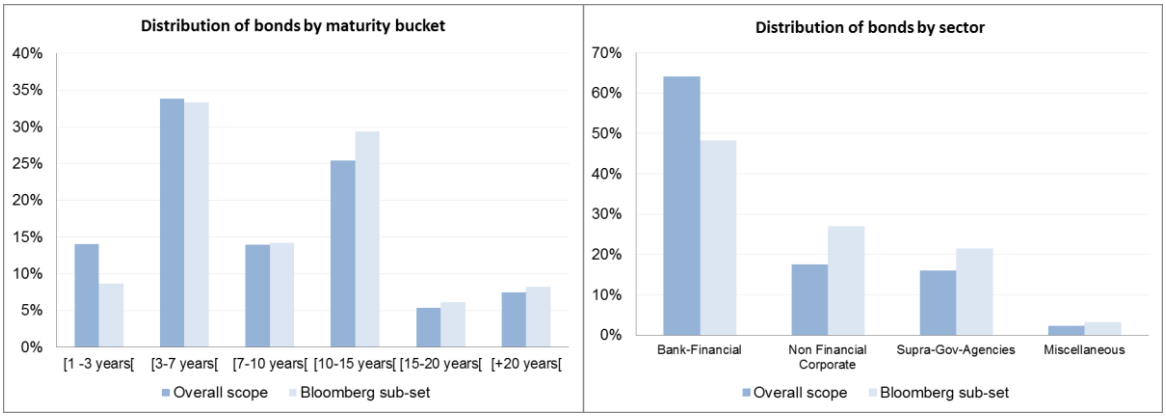
Sources: AMF, Bloomberg. The data for 2015 go to the end of September.
Note: The Miscellaneous category corresponds to Bloomberg's Special Purpose Issuer Industry category, in which it is impossible to tell directly whether a bond has been issued by a financial or non-financial issuer. For the most part (80% of cases), issues in this category are covered bonds issued by a specific bank subsidiary. The weight of this category therefore increased with the rise of covered bonds over the period.

Daily volumes were calculated using these reports after stripping out double counting[16] and trades whose nominal amount exceeds EUR 500 million[17]. In the end, the sample contained 11.5 million trades in more than 6,600 distinct bonds.

Data on bid-ask spreads were taken from the data provider Bloomberg, and were based on bid-ask price spreads contributed for a narrower sub-set of around 3,800 bonds owing to issues of data availability at the provider. These 3,800 bonds are part of the 6,600 bonds for which we have trade data. Note that this sub-set does not suffer from sector or maturity biases (cf. Chart 2) but does comprise larger issues on average because three-quarters of the bonds not included in the "Bloomberg" sub-set have outstanding amounts of below EUR 100 million.

[14] The data for 2015 go to the end of September.
[15] Markets in Financial Instruments Directive (Directive 2004/39/EC).
[16] Double counting arises from the fact that both parties must report the trade to the AMF.
[17] In addition to reporting errors, this category includes primary transactions (investment rather than trading).

Chart 2 – Distribution of bonds by maturity and sector based on selected scope (in number of bonds)



Sources: AMF, Bloomberg. The data for 2015 go to end-September.

3.2. Methodology

An analysis of trading volumes offers a first proxy of liquidity. While this indicator has its limitations, it does offer an indirect gauge of market depth.
The available data cannot be used to compare the current and pre-crisis levels of trading volumes. Between 2005 and 2007, only French ISPs were subject to reporting obligations. From November 2007, the obligations were expanded to include all European ISPs. However, since ISPs phased in compliance with the reporting system gradually over time, only data received after 2010 are considered sufficiently reliable for this indicator. Accordingly, the analysis of trading volumes concentrates on this shorter period (2010-2015).

Despite the limitations on data availability, and taking into account the academic findings described in the previous section, a simple composite indicator constructed from spread and price impact indicators is also used to capture changes in bond liquidity in French markets from 2005. Making up the composite indicator are the following:

- Bid-ask spreads indicator*:* the proposed indicator is based on contributed spreads taken from Bloomberg. Additionally, to provide a comparable basis for instruments with potentially different maturities, bid-ask spreads, which were originally expressed in price terms, were divided by the estimated residual maturity of the bonds.

- Zero return indicator*:* this indicator measures the proportion of bonds for which the best buy and sell prices remained unchanged. A day with no price change reflects a trading session where price contributions were weak, leading to a lack or scarcity of trades. Including the zero return indicator in our composite indicator makes it possible to correct the bias resulting from spreads based on contributed prices (cf. Annex 1 for an illustration).

- Price impact indicator: price impact indicators seek to measure the execution cost arising from a trade. The Amihud formula, which is taken up in the paper by Schestag et al. (2015) and which consists in dividing the absolute value of the price difference between two trades by the volume, is the best known. This measure also has the advantage to capture the effect related to trading volumes. However, the use of this indicator assumes that trades are reliably time-stamped (so that they can be put in order) and that the price variations observed after each trade can be appropriately assigned. Given the declaratory nature of the available data, the calculation proposed by Amihud[18] cannot be satisfactorily executed. However, the notion of price dispersion divided by trade volume, which is captured by Amihud's formula, can be measured using other methods that are less sensitive to the risk of error connected with reported times. One such measure, which is described as part of an analysis of the bitcoin market (Donier (2014)), consists in dividing the standard deviation of intraday returns by the square root of the sum of trading volumes. This measure is thus applied to the data[19]. The calculations are run by bond, per day and rely on transaction data received by the AMF. Note that the effect linked to the availability of trade data over a narrower sub-set before 2010 does not alter the significance of this indicator over the 2005-2010 period. Volumes are used here to weight price changes, so the measure is unaffected by sample size. It could potentially be affected by changes in the composition of the sample, but as we saw, the sample is stable over the period (cf. section 3.1).

[18] Application of this measure to a daily frequency is not satisfactory either because time-stamping cannot be used to identify with certainty the day-end trade that would act as the closing price.
[19] *Square root law for price impact: Empirical evidence and theory*, Donier, Mastromatteo, Bouchaud, March 2015.

These indicators provide measures of both ex ante and ex post transaction costs. Given that we have no reason to think that one of them outweigh the impact of others on market liquidity measurement, each component will be given the same weight in the composite indicator.

The final composite indicator (CI) is thus an equally weighted average of these three indicators, whose values are centred and reduced:

$$CI = \frac{Z(spread) + Z(zero\ return) + Z(price\ impact)}{3}$$

Where $Z(x)$ is the centred/reduced variable of x. Thus, by construction, the sum of the CIs over the period is equal to 0.

4. Change in bond liquidity measured on the French market

4.1. Trading volumes

Between 2010 and 2014, trading volumes trended upwards (+27%), while the number and outstanding amount of bonds increased more moderately (+5% and +15% respectively). As a result, the monthly turnover ratio (which divides monthly trading volumes traded by the estimated outstanding amount of bonds) rose slightly from 14% to 16% over the period. By contrast, the number of trades decreased over the period (-5%), specifically from 2012 onwards.
Given the more or less steady increase in volumes, average trade size grew from EUR 2.4 million in 2010 to EUR 3.2 million in 2014, which could point to a concentration of liquidity in the most liquid issues and/or the least risky bonds, in which it is easier to trade large quantities (cf. section 4.2). An analysis of the available data for 2015 appears to corroborate these trends.

Table 1 – Outstanding amount, trading volumes and turnover ratio

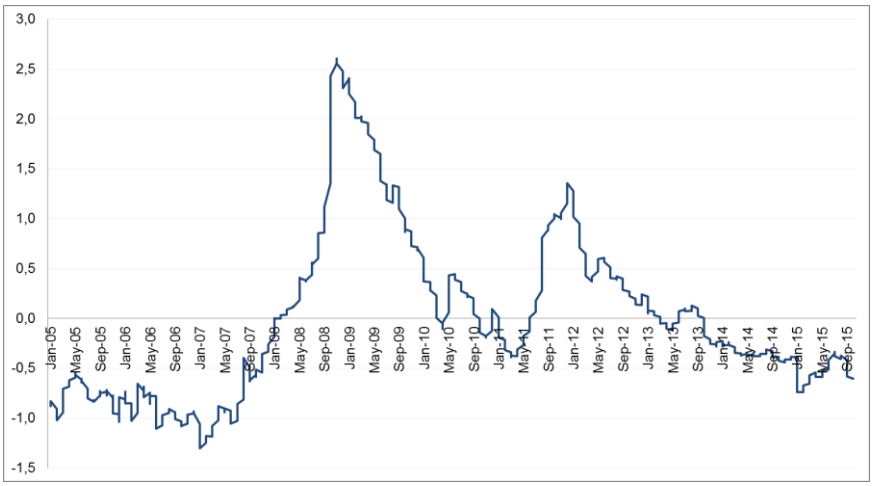
Year	Outstanding amount, French issuers (1) (€ billion)	Outstanding amount, traded bonds (2) (€ billion)	Number of bonds traded	Trading volumes (€ billion)	Number of trades (thousands)	Average trade size (€ million)	Number of trades per bond	Monthly turnover ratio
2010	3,092	2,553	2,325	4,395	1,848	2.4	795	14%
2011	3,368	2,688	2,547	5,290	1,972	2.7	774	16%
2012	3,424	2,836	2,517	5,022	2,109	2.4	838	15%
2013	3,452	2,891	2,432	5,270	1,985	2.7	816	15%
2014	3,585	2,936	2,435	5,567	1,761	3.2	723	16%
2015 (3)	3,717	2,803	2,163	3,737	1,329	2.8	614	15%

Source: AMF
(1) Outstanding year-end amount of bonds of French issuers taken from BIS statistics and converted to EUR. The data for 2015 go to end-March.
(2) This is an estimated annual outstanding amount equal to the sum of issued amounts for bonds in which a trade was reported. Note that this approach underestimates the outstanding amount of topped-up issues.
(3) The data for 2015 go to end-September.

4.2. Composite indicator of bond liquidity

Chart 3 shows the change in the composite indicator between January 2005 and September 2015. Since the variables have been centred and reduced, the more the value of the indicator increases, the less the market is liquid.
In view of the sample's composition (cf. section 3.1), this composite indicator is implicitly overweight in corporate bonds.

Chart 3 – Indicator of bond market illiquidity



Sources: AMF, Bloomberg.

According to the indicator, liquidity has not vanished from French bonds. If anything, it has improved since beginning 2012, returning to levels seen before the outbreak of the sovereign debt crisis, while remaining below those seen in the 2005-06 period. Note that the liquidity level observed before the subprime crisis does not necessarily represent the equilibrium level towards which liquidity needs to gravitate to be deemed satisfactory. According to a report by the International Capital Market Association (ICMA) on the state of the European corporate bond market based on a series of interviews, liquidity risk was probably heavily underestimated during this period owing to mispricing of risk by banks and the creation of a bubble following the development of markets in credit default swaps (CDS) and structured products.

While the overall level of liquidity looks satisfactory under “normal” market conditions, sector trends should be considered, and notably the trend towards bifurcation, which has seen liquidity become concentrated in the lowest-risk segments in recent years (GFSR(2015)).

4.3. Bifurcation

An analysis of trading volumes per sector (cf. Table 2) reveals that activity declined between 2010 and 2014 among non-financial companies, for which the number of trades per bond decreased. Despite a 22% decline in the number of trades, the turnover ratio for government bonds rose owing to increased average trade size. The data available for the recent period appear to back up these observations. This may support the notion that volumes are more heavily concentrated in the deepest markets and/or the lowest-risk securities, including within the government bond segment. Finally, the increase in the number of trades per bond in the bank/financial sector is largely attributable to the fact that volumes became concentrated in a smaller number of bonds.
The concentration of volumes on government bonds, compared to corporate bonds, seems nevertheless to be observed on the overall period (2010-2014) without strongly increasing over the recent years.

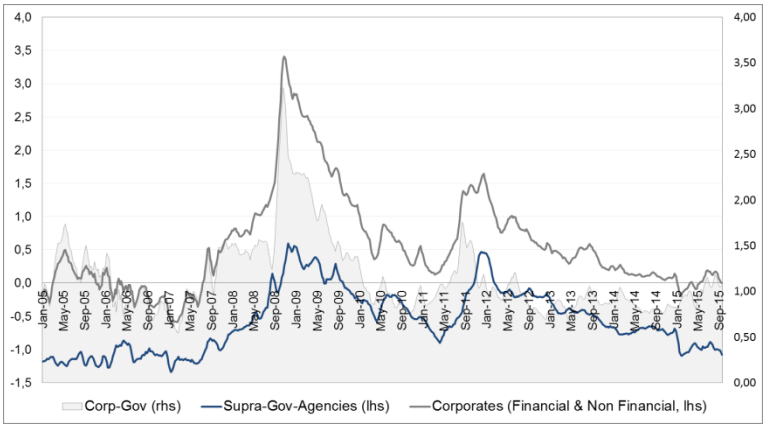
Table 2– Distribution of volumes by sector

Year	Supra-Gov-Agencies		Bank-Financial		Non Financial	
	Number of trades per bond	Monthly turnover ratio	Number of trades per bond	Monthly turnover ratio	Number of trades per bond	Monthly turnover ratio
2010	1,627	18%	426	7%	1,273	8%
2011	1,746	21%	407	8%	1,229	9%
2012	1,496	19%	484	7%	1,340	7%
2013	1,325	20%	538	6%	1,124	7%
2014	1,271	21%	482	7%	905	7%
2015 (1)	1,056	19%	456	7%	653	8%

Source: AMF.
(1) The data for 2015 go to end-September.

This trend is confirmed by an analysis of the composite indicator, which shows that liquidity followed a less favourable path among corporate bonds compared with government bonds over the recent period.

Chart 4 – Illiquidity indicator
Corporate bonds vs. government bonds



Sources: AMF, Bloomberg.

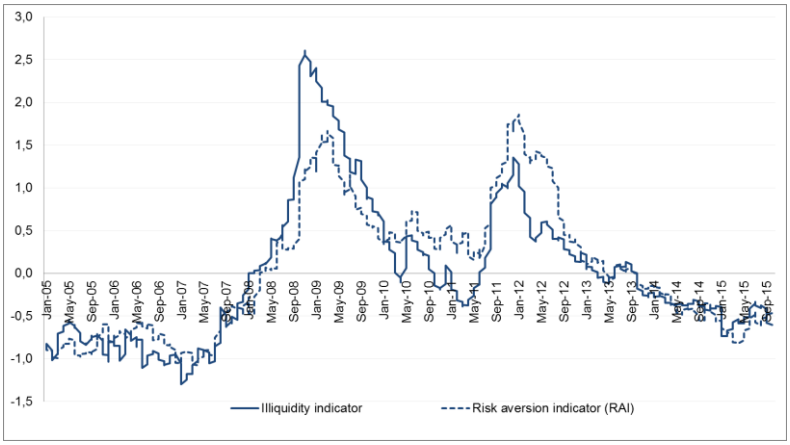
The findings show that liquidity remains high in French bond markets but has not recaptured pre-crisis levels. This healthy liquidity performance does not however signify resilience in the event of shocks such as those observed recently on US sovereign bond markets. Section 4 looks at the factors affecting changes in liquidity.

5. Factors affecting changes in liquidity

There has been widespread criticism of the way in which banking and market regulations and their adverse effect on profitability have caused traditional banks to scale back their market making activities. It is extremely hard to make a quantitative estimate of the rules' impact[20]. However, based on our analysis, which finds that liquidity levels remain satisfactory, post-crisis regulations do not appear thus far to have significantly affected liquidity in French bond markets.

The analyses conducted show, by contrast, that the change in liquidity in French bond markets is closely tied to cyclical factors, as demonstrated for example by the strong correlation between movements in the liquidity level and risk appetite.
A composite indicator of risk aversion on the bond market is calculated using credit spreads, long and short rate slopes, the France-Germany spread and the interbank spread.
Chart 5 compares the performances of the illiquidity and risk aversion indicators.

Chart 5 – Illiquidity indicator and risk aversion



Sources: AMF, Bloomberg.

[20] The impact may be evaluated by examining market makers' inventories. PwC (2015), for instance, estimates that the inventories of US primary dealers have shrunk by around 80%. Goldman Sachs (2015), however, estimates that the decline in inventories is greatly overestimated because until April 2014 inventory data reported to the Federal Reserve included mortgage-backed securities in addition to positions in plain vanilla bonds. It therefore puts the decline at approximately 40%. This type of data is not currently available for the French bond market. That being said, the International Organization of Securities Commissions (IOSCO) and the European Systemic Risk Board (ESRB) are currently working to gather data.

The chart reveals that variations in liquidity are closely matched with movements in risk aversion. This means that in the event of a crisis on bond markets, liquidity will probably dry up.

Similarly, a prolonged period of low interest rates would affect bond markets in two respects:

- on the supply side, low interest rates decrease the profitability of carrying assets on the balance sheet, thereby creating an incentive to trim the balance sheet. Furthermore, the lower the level of rates is, the lower the level of interest rate volatility will be. This eats into the margins of intermediaries, which generally use periods of heightened volatility to boost their margin;
- on the demand side, at a given spread level, the relative cost of intermediation goes up as profitability decreases, which acts as an incentive to minimise portfolio turnover ratios.

Market participants have stressed these two cyclical factors in particular[21].

These results are in line with those of the IMF (GFSR, 2015), which identified bond liquidity fragilities in the event of changes in cyclical factors. The IMF paper shows that on the corporate market, speculative bonds are more sensitive to the macroeconomic environment, while investment grade bonds are more affected by a change in monetary policy. In both cases, the likelihood of a sudden evaporation of liquidity is increased in a situation where market makers' inventories are low or where market makers are less active.

6. Conclusion

The results obtained suggest that bond liquidity has improved in France since beginning 2012, albeit without returning to levels seen before the outbreak of the subprime crisis.
Trading volumes rose overall between 2010 and 2015 and bid-ask spreads are now higher than their pre-crisis level, which is consistent with observations on other markets. It is necessary to keep in mind however that the years leading up to the crisis (2005-06) were a time when liquidity risk (and hence the bid-ask spreads evidencing the associated cost) was probably heavily underestimated because of the bubble that was forming and that burst in 2007-08[22].
Liquidity also appears to have become more concentrated in instruments offering the lowest risk or the greatest market depth.

In the end, in the event of a shock[23], the cost of liquidity will increase through spreads, as it did in the 2007-08 period, and will be borne by investors, who consequently need to ensure that they receive a fair return on their investments. In this regard, the monetary policies that have led in recent years to extremely compressed risk premia probably hinder fair remuneration for the liquidity risk of fixed income instruments. From this point of view, the prospect of monetary policy normalisation could be seen as a good thing, although it is sometimes cited as an adverse scenario for bond market liquidity.

This analysis nevertheless raises the question of how to enhance the liquidity of bond instruments, which are set to continue to grow in an environment of increasing disintermediation in Europe and hence in France. Some participants say that greater standardisation is needed[24]. However, a fundamental quality of bond markets is their heterogeneity, which allows them to cater to the individual needs of a highly diverse group of issuers. Accordingly, it seems unlikely that bond markets will converge towards a situation where products become extensively standardised.
This will probably stand in the way of a major increase in "all to all" trading systems for a broad spectrum of instruments, as called for by some market participants, even if such systems could provide additional flexibility[25]. Moreover, regardless of the type of platform, the basic problem remains that of remunerating liquidity providers. The development of trading platforms will surely be accompanied by growth in high frequency trading, as has happened on US government bond markets, with a material impact on the profitability of this business and consequences for market resilience, as shown by analyses of the flash rally in Treasuries on 15 October 2014. As a result, a move to develop trading platforms could prove even more problematic in the future than the regulation-driven decline in inventories.

The study also reveals genuine difficulties facing both regulators and market participants in assessing the level of liquidity, with the former having more granular indicators (such as trade times) but not an overall view of trading

[21] See, for example, *The current state and future evolution of the European investment grade corporate bond secondary market: perspectives from the market*, ICMA, November 2014.
[22] Meanwhile, contrary to equity instruments, bonds offer a "buy and hold" option. It is important to note that higher friction costs, i.e. an increase in the costs of accessing liquidity, for instruments that are intended to be held to maturity are not inherently a bad thing. In reality, post-crisis regulations have helped to ensure that these costs are more accurately measured by participants.
[23] This choc will necessarily lead to a decrease in liquidity related to the scissor effect between a *de facto* overestimated liquidity level and an underestimated level of risk.
[24] *Corporate bond market structure: The time for reform is now*, BlackRock, September 2014.
[25] Several initiatives are underway in France, with TradeCross (managed by TradingScreen, which launched Galaxy) and the switch to a request for quote format for BondMatch (managed by Euronext).

volumes, and the latter suffering from the reverse problems. This is an argument in favour of increased transparency in bond trading so that participants can improve their ability to assess the real liquidity level of instruments. In this regard, MiFID 2's post-trade transparency arrangements represent an advance that will come into effect in 2017.

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Annex 1: Contributed spreads and zero return indicator

- **Bid-ask spread**

The bid-ask spread, which may be used to estimate the cost of trading, is frequently used as a measure of liquidity. On bond markets, the indicator is based on prices (indicative or executable, depending on the platform) contributed by banks and brokers.

According to the results obtained by Schestag et al. (2015), daily spread data are consistent with intraday movements. The authors showed that data taken from executable quotes offered higher quality than the indicative spreads provided by Bloomberg. This is why, with a view to assessing the quality of the Bloomberg spread series used in this study, other spread series were examined over a long period for French bonds.

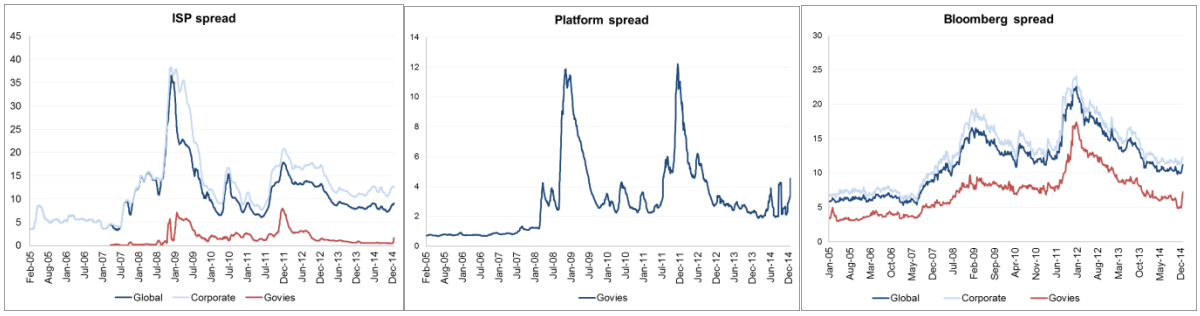
A request was therefore sent to an ISP that uses this type of data to track liquidity within the scope of its bond trading activities, while another request was sent to a platform with historical data on firm prices. The data gathered from the ISP correspond to contributions from selected banks for each bond[26] and thus, even if they are indicative prices, they are far more reliable than Bloomberg composite prices. The data collected from the platform correspond to firm, executable prices[27].

These two sources were compared over the 2005-2014 period against the weekly bid-ask spreads across a selection of 3,500 bonds. These 3,500 bonds are included in the scope of 6,300 bonds (cf. section 3.1.) and are those for which Bloomberg prices were available.

In addition, since the bid-ask spreads were expressed as prices, they were divided by the estimated residual maturity of the bonds to provide a comparable basis for instruments with different maturities. Finally, in the case of the bid-ask spreads provided by the ISP and the platform, a 20-day moving average was calculated to smooth the results and make them comparable to the weekly series obtained for the sample of 3,500 bonds.

A comparison between the spread calculated from Bloomberg data and those calculated using the other sources highlights a weaker reaction by the Bloomberg bid-ask in 2008. From 2010, the different sources converge however. The weak reaction in 2008 may be attributable to the fact that the prices are indicative and non-executable and are not updated during periods of marked stress. For this reason, the Bloomberg spreads were adjusted by including another indicator – the zero return indicator – which is described in the next section.

Chart 1 – Change in spreads by data source



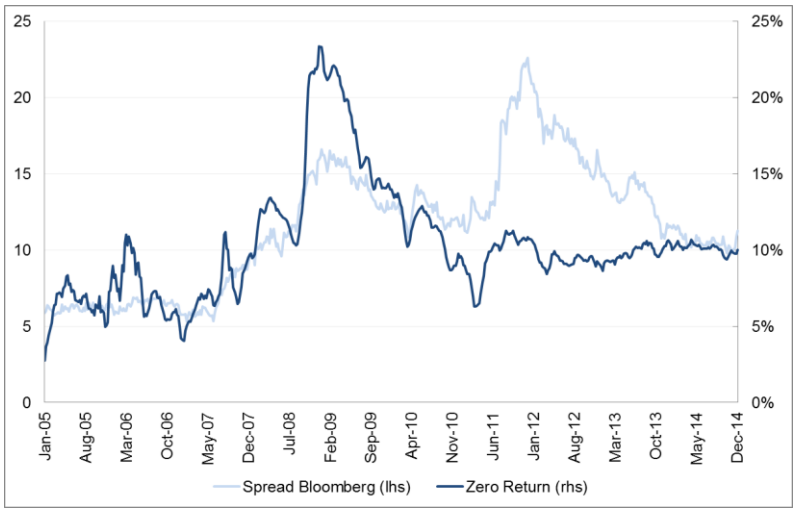
Sources: AMF, Bloomberg, ISP and platform.

- **Zero return**

The loss of quality of the Bloomberg bid-ask spread during periods of major stress (2008) is due to a decline in the number of contributions and ultimately to an absence or scarcity of trades. The zero return, defined here as the number of bonds for which the price is absent or constant relative to the previous period, can be used to address these imperfections and helpfully supplement the Bloomberg bid-ask indicator when analysing bond liquidity.

[26] The data cover 207 bonds whose "country of risk" is France.
[27] The data cover 102 French government bonds.

Chart 2 – Bloomberg spread and zero return



Sources: AMF, Bloomberg

An indicator combining the Bloomberg spread and the zero return can thus be constructed. It corresponds to the centred and reduced averages of the Bloomberg spread and the zero return indicator. Changes in this indicator are consistent with those of the ISP and platform spreads mentioned in the previous section, for corporate and government bonds alike.

Chart 3 – Composite indicator
(Bloomberg spread and zero return*)*

Sources: AMF, Bloomberg

Annexe 2: Methodology for measuring volumes in the PwC study (2015)

The PwC study published in August 2015 analyses European trade data obtained through Traxx, which is a UK Approved Reporting Mechanism (ARM). This data source is therefore the same kind as that used in this study: i.e. both studies use trade data obtained through the trade reporting required by MiFID.

However, PwC finds that liquidity has decreased in Europe, while our analysis of French data finds a different evolution. This reflects a selection bias in the PwC study, which looks only at bonds issued before 2008 to analyse volumes between 2010 and 2015. This means that a portion of the sample will mature without being replaced by new issues. Accordingly, the finding of a decline in volumes is necessaryly skewed because it does not take account of the fact that scope used to measure these volumes has decreased.

To capture the change in the size of bond issues, estimated volumes can be divided by outstanding amounts to determine a turnover ratio. In the case of French data, this measurement does not suggest a decline in bond liquidity between 2010 and 2014, as illustrated by the following table:

Table 2– Distribution of volumes by sector

Year	Monthly turnover ratio		
	Supra-Gov-Agencies	Bank-Financial	Non Financial
2010	18%	7%	8%
2011	21%	8%	9%
2012	19%	7%	7%
2013	20%	6%	7%
2014	21%	7%	7%
2015	19%	7%	8%

Source: AMF

Furthermore, volume data are all converted to USD in the PwC study. Bearing in mind that most bonds in Europe are denominated and traded in EUR and that the euro declined between 2010 and 2015 of approximately 22%[28], there is thus probably a currency effect that reduces the estimated volumes.

[28] Between January 2010 and September 2015. Bloomberg data.