Ministry of Economy and Finance

Department of the Treasury

Analisi e Programmazione Economico Finanziaria

Working Papers

N°5 – June 2008

ISSN 1972-411X

Watering the Garden of Government Securities: Measuring the "Bunching" Effect in Euro Sovereign Bond Markets

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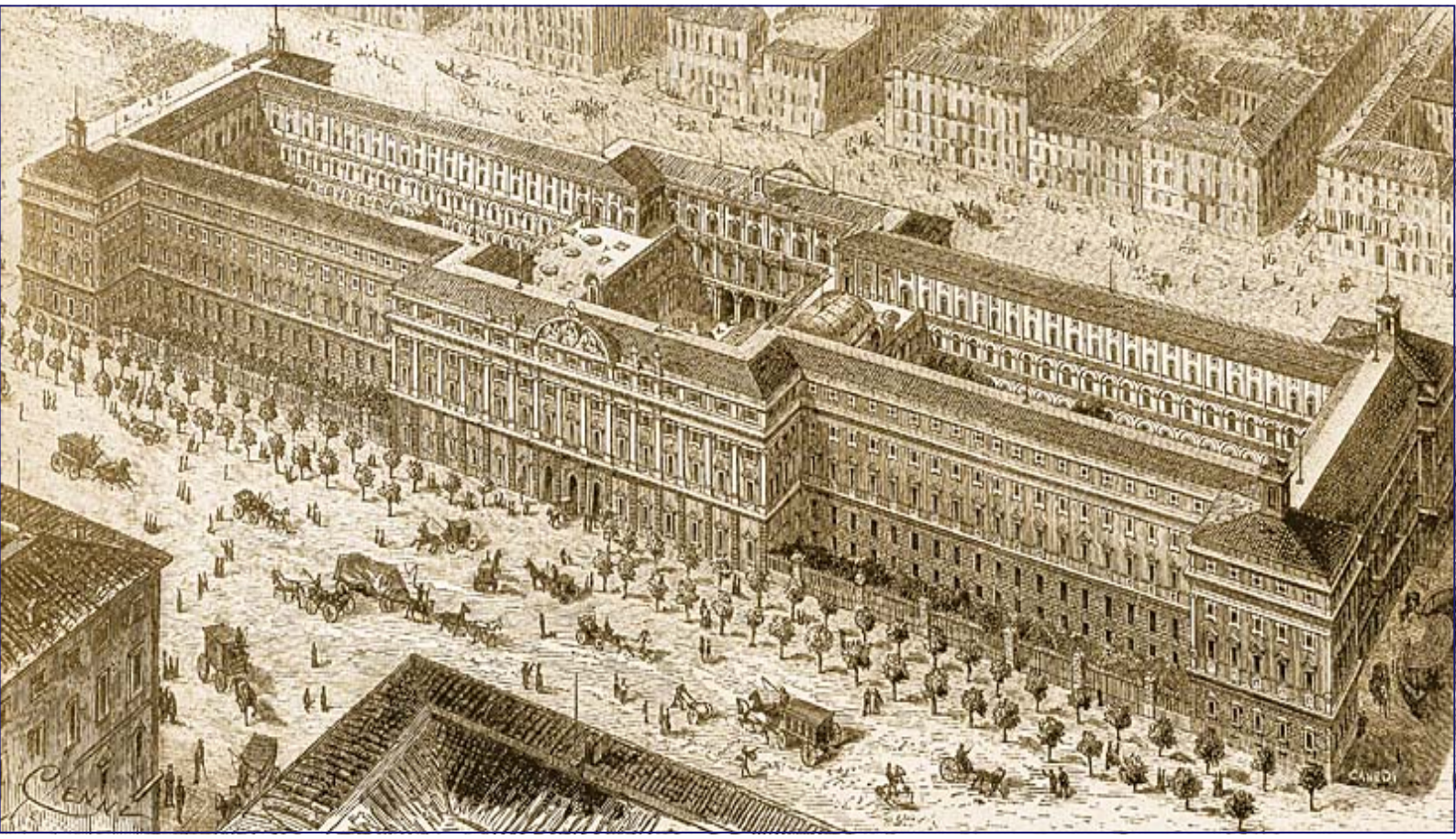

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Watering the Garden of Government Securities: Measuring the "Bunching" Effect in Euro Sovereign Bond Markets[1]

Andrea Coppola (*), Gustavo Piga (**)

Abstract

The adoption of a common currency raised the degree of substitution between financial instruments supplied by EU Member States to finance their national debts. In this framework, our paper looks at a particular determinant of liquidity-related spreads in euro-area government bonds. Simultaneous issuance of similar bonds floods the market with paper and could lead to higher funding costs for sovereign borrowers. We test the significance of this problem, over-supplying liquidity due to a bunching of contemporaneous issues, in a government bond market where borrowers do not coordinate their issuance plans. We find that there is a significant relationship between bunching in issues and higher yield spreads. Moreover, in line with the existing literature, we find a negative correlation between liquidity and bond yields.

JEL Classification: H63, H69
Keywords: EMU; government bond yields; liquidity; calendar of issuance.

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[1] The authors are indebted for constructive comments and suggestions to Michele Bagella, Leonardo Becchetti, Carlo Andrea Bollino, Maria Cannata, Luigi Cappugi, Lorenzo Codogno, Chiara Coluzzi, Alfonso Dufour, Marco Lyrio, Pietro Masci, Alessandro Missale, Riccardo Pacini, Alberto Pozzolo, Lucio Sarno, Stefano Scalera, Wing Wah Tham, Juan Zhang, an anonymous referee and participants in the presentations held at the Italian Ministry of Economics and Finance and University of Rome "Tor Vergata". The authors alone are responsible for any errors that may remain.

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1 INTRODUCTION

With the attainment of EMU's Stage 3, euro-area Member States have redenominated their outstanding debts and have begun to issue a dominant share of their debts using the same national currency (i.e. the euro). This milestone of the European financial integration has removed the exchange rate risk between currencies of participating countries and raised the degree of substitution between financial instruments supplied by Member States to finance their national debt. As a consequence, yield spreads on Euro-area sovereign bonds have reduced significantly. However, they have not fully converged, which leaves the literature room to investigate the determinants of these persistent differentials.

Liquidity factors, beyond credit ones, might have gained in relative importance in explaining the remaining level of these differentials. This paper looks at a particular determinant of liquidity-related spreads in euro-area government bonds.

Imagine the market as a field where investors are planning to plant their beans. A sudden and circumscribed drought would seriously undermine the appeal of the field. Investors would look for other fields to invest their money in, since growing beans in a dry ground would certainly involve higher costs. In a bond market, too little paper offered by borrowers would make investors struggle for liquidity and hence leave the market or require higher yields for the greater risk of holding more volatile securities. On the other hand, too much water would flood the field. This would temporarily challenge the capacity of absorption of the soil, leaving some beans floating and losing value. This description could well be suited to bond markets as well. If several borrowers issue similar bonds at the same time, the market would be flooded with too much paper. As a consequence, it would be more costly, i.e. it would require higher yields, to encourage the market to absorb the amount of debt proposed. The contribution of our paper lies in testing the significance of this latter problem, over-supplying liquidity due to a bunching of simultaneous issues, for the cost of debt in a government bond market where borrowers do not coordinate their issuance plans.

To do this, we exploit the information embedded in the issuance calendars published by Member States of the euro area. The analysis of issuance calendars allows us to identify some bunching phenomena, i.e. the contemporaneous issuance of bonds proposed by different countries but characterized by similar maturities. For example, between the 7th and the 8th of January 2004, Germany, France and Austria issued debt instruments with the same time to maturity (ten years). If the market is flooded with too much paper, a bunching in issues could end up raising the cost of issuance for sovereign borrowers. The present paper is the first attempt to test empirically for this hypothesis. Results obtained show the significance of the link between bunching in issues and higher yield spreads. Moreover, in line with existing literature, we find a negative correlation between liquidity (proxied by bid/ask spreads) and bond yields. Policy-making implications of our findings are important: agreements between euro-sovereign borrowers on dates and frequency of debt issuances could lower the cost of funding for Member

States.[2]

The paper is set out as follows. Section 2 consists of a brief description of the relevant literature and of data used in the analysis. Section 3 presents the outcomes of the study and tests the robustness of the results. Section 4 concludes.

2 THEORY AND DATA

The importance of liquidity and market microstructure variables for the bond market finds support in the strand of the literature which investigates the main determinants of government securities yield spreads. Several studies belonging to this literature consider both market microstructure and credit risk variables as the main determinants of yield spreads. Favero, Pagano and Von Thadden (2005) offer a two-period general equilibrium model of bond pricing that predicts that yield differentials should decrease in liquidity and increase in risk. Hund and Lesmond (2006) test the importance of liquidity and credit risk in 16 emerging debt markets and conclude that liquidity appears to dominate credit risk in explaining cross-sectional variations in yield spreads. Moreover, Poterba and Rueben (2001) point out that credit risk influence should be less important if the countries considered are committed to follow anti-deficit rules. This finding is coherent with the evidence collected in EU (where Member States signed the Stability and Growth Pact) since German government bond yields are still below those of bonds issued by Member States which have better budget position, like Austria (Bernoth, von Hagen and Schuknecht, 2004). Codogno, Favero and Missale (2003) consider the issue of distinguishing the influence of credit risk and microstructure variables while analyzing the determinants of yield spreads. They highlight the heterogeneity between market microstructure and credit risk relative speed of evolution: while microstructure variables impact yields at high frequency, risk-related variables reflect slow-moving economic fundamentals. Their article faces this issue by estimating: firstly, a model which considers the role of credit risk by using monthly series; and then, another model that studies the effect of liquidity factors in daily data. Biais et al. (2004) analyze empirically the determinants of Eurozone Treasury bill yields by focusing on market microstructure and macroeconomic variables. Particularly, their paper considers the percentage spreads between the Treasury security yield and the Euribor to control for exogenous changes in the general level of interest rates. Both the contributions of Codogno et al. (2003) and Biais et al. (2004) underline how issuance calendars could affect yield differentials. The importance of the timing of the issuance is also suggested by the contribution of Newman and Rierson (2004) which focus on corporate bonds and find that large debt issuances temporarily inflate yield spreads of bonds belonging to the same sector. Finally, the idea that bunching in issues could raise the costs of funding for sovereign borrowers that emit in the same date has been proposed in different articles (Coppola and Pacini, 2006; Bagella et al., 2007) but it has never been empirically tested.

The empirical estimates in this paper are based on the MTS Domestic Market Data Set for 11 European countries that we consider: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain. Each data set lists the whole yield

[2] This does not necessarily imply to switch to the establishment of a single-issuer of debt responsible for issuing some part of euro-zone government bonds, as long ago suggested by de Silguy (1999).

curve of the government bond market of the respective European country. A more detailed description of the debt instruments considered in the analysis is presented in Table 1.[3]

For each market, each bond and each day considered, we focus on daily data regarding yields and liquidity. It is crucial to consider "high frequency" in the assessment of liquidity effects on yield spreads. Following Codogno et al. (2003), we use daily data to analyze the impact of liquidity and liquidity-related variables since in the medium and long run the effect of these factors is reduced and credit risk becomes the main determinant of yield spreads. Keeping with the topic of gardening, in the medium and long run the level of watering is not so important. It is the kind of plant grown which really matters.

According to the approach described in Dufour and Skinner (2004), yields used in the analysis are based on mid-quote prices, which are the prices collected from a quote at or before 5pm[4] Central European Time (CET) having bid/ask spread within 3*Basis Point Value (BPV). If the spread is beyond this limit, the mid-price is supposed to be non-representative. In other words, the yields considered for each bond are based on the last valid best proposals before 5pm CET. Following Biais et al. (2004), we computed a percentage spread (s) between the bond yield (Y) and the Euribor (E) to control for exogenous changes in the general level of interest rates:

$$s = \frac{Y - E}{E}. \qquad (1)$$

The analysis performed by Codogno et al. (2003) considered the difference between total yield differentials and relative asset swap spreads to control for the exchange rate effect on yield differentials. The current paper does not compute this swap differential because it considers term spreads (between long-term rates *s* and short-term rates *E*) in a post-EMU period, when relative asset swaps coincide with yield differentials (Codogno et al., 2003).

Liquidity is proxied by the daily average bid/ask (A)[5]. Bid/ask spread measures the tightness of the market, namely the distance between the transaction price and the mid-market price for each bond considered. In the same way we described for yields, in order to exclude non-tradable couples, the average bid/ask spread is computed using only observations having bid/ask spread within 3*BPV.

The whole analysis is focused on government bonds characterized by a current maturity equal or greater than two years. There are two main reasons for doing this. The first reason has an economic basis: the bunching effect tested in this paper should be negligible for some debt instruments with shorter maturity, like T-bills, due to their lower substitutability across member States, caused by preferences of national investors to hold same nationality-securities. The second reason is practical: bonds with a shorter current maturity have been replaced once or

[3] Both the contributions of Codogno, Favero and Missale (2003) and Favero, Pagano and von Thadden (2005) use MTS Data to investigate the determinants of yield spreads. Luxembourg is not included in the analysis since there is not any Luxembourgian bond quoted in MTS markets in the sample period considered, which spans from the 1st of January to the 31st of December 2004.

[4] MTS data about daily prices refer to a quote at 5pm because the market provides a fixing at that time. The choice looks appropriate. The lower trading intensity normally registered towards the end of the day should imply a lower volatility. Besides, the market closes at 5:30pm and hence it seems reasonable to select a time away from the closing time in order to avoid the effect of technical trading in the last few minutes before the close.

[5] Market depth data (bid and ask quantities and prices) were also considered to be used in order to add robustness to the analysis. However, this is not viable because the very high frequency of these data (tick-by-tick) is not consistent with the daily frequency of the calendar data used to proxy bunching phenomena.

even several times by securities issued more recently and there is no quoting obligation for these "well off-the-run" bonds. The presence of these bonds among the data analyzed involves missing data problems (with respect to yield quotes and bid/ask prices) and entails spurious results. Time to maturity is indeed one of the main features of a government bond. In order to obtain more accurate results, the data sets have been disaggregated by grouping maturities into three main buckets: bonds with a current maturity around three years (maturity bucket A), five years (maturity bucket B) and ten years (maturity bucket C).

Issuance calendars are a very powerful source of information while studying government bond markets and sovereign borrowers' strategic behavior. In particular, we use issuance calendars to shed light on the issuance frequencies of each country considered, the degree of information disclosure related to different calendars and the presence of bunching in issuances, namely a situation where two different countries issue a security with similar features in a contemporaneous (same day) or nearly contemporaneous (the previous day or the following day) way.

A first evaluation of the data available from issuance calendar focuses on issuance frequencies. A simple computation of the average numbers of issuances per month points out how small borrowers issue less frequently than large borrowers like Italy, France and Germany (see Table 2 - Panel A). As their financing and rolling over needs are rather limited in absolute terms, they are required to issue in one shot a large share of their yearly needs so as to entice investors immediately to relatively liquid issuances. For large countries, such a need is less urgent; rather, they have to carefully smooth market issuances to avoid flooding the market with so much paper that the cost of issuance is negatively affected by it.

Furthermore, in our period, it appears that each country considered follows a certain pattern of within-the-week issuances. For example, Germany issues debt on Wednesday, while France and Spain issue the first and the third Thursday of each month. All regularities identified are summarized in Table 2 - Panel B. Accuracy of issuance calendar and the timing of their publication is a useful proxy to assess the degree of information disclosure provided by each one of the countries considered. Publishing calendars ahead of time and providing greater information to primary dealers may represent a competitive advantage for sovereign borrowers with respect to competing issuers. Results of this qualitative analysis show clearly that large borrowers provide a higher degree of information disclosure (see Table 3).

Beside the information extracted about issuance frequencies and information disclosure, we draw our attention on using issuance calendars to detect the presence of bunching phenomena and assess their effect. Since the attainment of EMU's Stage 3, a dominant share of Member States' debt is issued using the same national currency (i.e. the euro). As a consequence, yield spread differentials narrowed and debt issued by different European countries became close substitutes. In this framework, the higher degree of competition between Member States is the main reason of the inefficiencies related to a bunching strategy: contemporaneous or nearly contemporaneous issuances from competing borrowers could raise the costs of funding for each Member State[6]. The hypothesis tested in this paper stems from the idea that "bunching in issues" floods the market with so much paper that borrowers are forced to

[6] That bunching impacts costs of funding has been already argued for the private bond market (Newman and Rierson, 2004). However, there are substantial differences between the private bond market and the sovereign bond one. This underlines the importance to test for the effect of simultaneous issuances from sovereign borrowers.

offer higher spreads to convince primary dealers to absorb their debt (Coppola and Pacini, 2006; Bagella et al., 2007). In the attempt to test the significance of this effect given by contemporaneous or nearly-contemporaneous issuances[7], we considered a series of "bunching" dummy variables ($B_{j,t}$), which are able to describe if two or more countries issue together. The first dummy variable takes value 1 if at least two countries issue together and 0 otherwise; the second dummy takes value 1 if at least three countries issue together and 0 otherwise; and so on. This approach allows us to evaluate the overall significance of the bunching effect and to assess the additional effect induced by further sovereign borrowers contemporaneous issuances.

The overall impact of contemporaneous issuances on yield spreads is probably driven by a set of different reasons (amount of debt issued, auction risks, hedging needs). For policy reasons, we are interested in the global effect of bunching in issues. The aim of the present paper is to test the significance of the bunching effect and the model proposed does not investigate its specific determinants. In this framework, it could be pointed that contemporaneous issuances from large borrowers (like France, Germany and Italy) could have a different impact with respect to the bunching produced by small borrowers. This issue will be directly tackled in a specific robustness section.

3 EMPIRICAL ANALYSIS

3.1 The Baseline Model

We verify if contemporaneous or nearly-contemporaneous issuances by different euro-area members have a significant impact on yield spreads. To test this hypothesis, a simple model based on market microstructure variables is used. There are already several studies in the literature which test the effect of microstructure variables on yield spreads. Biais et al. (2004) tested the impact of microstructure variables on T-bills spreads. Codogno, Favero and Missale (2003) faced the issue of distinguishing between microstructure and credit risk components of bond spreads. The importance of distinguishing between credit risk and microstructure variable is connected with the policy-making implications of the results obtained. To the extent that spreads reflect structural differences in credit standings between different countries, there is not much room to manoeuvre to reduce yield differentials further. On the other hand, if differentials are provoked by inefficiencies in the functioning of the primary market where bonds are issued, it is possible to tackle these market inefficiencies to minimize the costs of funding for sovereign borrowers.

For each country and each maturity bucket considered, the baseline model we estimate is:

$$s_{i,t}^{c} = \alpha^{c} + \beta^{c} A_{i,t}^{c} + \gamma^{c} I_{t} + \sum_{j=2}^{n} \delta_{j}^{c} B_{j,t} + \varepsilon_{i,t}^{c} , \qquad (2)$$

[7] According to the definition provided in Bagella et al. (2007), there is a "bunching in issues" when one country issues in the same day (t), in the previous day (t-1) or in the following day (t+1) with respect to other countries issuances.

where the dependent variable ($s_{i,t}^{c}$) is the percentage spread at time *t* for the bond *i* issued by country *c*[8]. $A_{i,t}^{c}$ is the daily average bid/ask spread for the same bond at time *t*. I_t is a dummy variable that is able to control for the effect produced by a debt issuance in the euro primary market[9]. $B_{j,t}$ are the dummy variables[10] built to measure the bunching effect. Since the analysis is based on the hypothesis of substitutability between euro bonds with similar maturity, when computing the issuance effect and the bunching effect on the percentage spread for the bond *i*, I_t and $B_{j,t}$ are built considering only the issuances of securities belonging to the same maturity bucket of the bond *i*[11]. Finally, $\varepsilon_{i,t}^{c}$ is a mean zero process with covariance matrix Σ, where $\Sigma = \sigma^2 \Omega$. The model is estimated by applying generalized least squares (GLS) with pooled time-series cross-sectional data. Since we consider separately each country and each maturity bucket, we specified a common conditional mean across the groups (bonds), with heterogeneity taking the form of different variances rather than shifts in the means.

It is very important to distinguish between the issuance effect and the bunching effect, both of which basically produce a similar impact in the bond market, possibly raising yield spreads. However, the significance of these effects has different policy-making implications. With the issuance effect we refer to the impact of the choice of how often to issue on the market, a choice somehow constrained as a country naturally needs to finance its own debt. Whereas with the bunching effect, provoked by issuance-overlapping, potential inefficiencies can be avoided if Member States agree to smooth the amount of paper totally issued weekly or monthly in the primary market. From an econometric point of view, a model which does not discern these two effects could entail omitted variable problems: the "issuance effect" could be captured by the bunching variable and the statistical significance of the effect given by contemporaneous issuances could be biased. Moreover, to consider the issuance dummy variable is useful to control for potential causes of overpricing which do not depend from bunching in issues, like the on-the-run/off-the-run effect[12].

3.2 Estimation Results

Estimation results for maturity bucket A (bonds with three years of current maturity) are presented in Table 4 - Panel A. When two countries issue together ($B_{2,t} = 1$), the bunching of issues significantly raises yield spreads. In other words, when two Member States issue similar bonds (with a similar time to maturity) at the same time, the cost of issuance for each sovereign

[8] Newly issued bonds are not quoted in MTS Time Series. As a consequence, these bonds are excluded from the analysis until their quotes are available.

[9] Dummy variable I_{t} takes value 1 if there is a debt issuance in t, 0 otherwise.

[10] Given that in the sample period considered there are maximum three countries bunching in issues, the number of bunching dummy variables is not greater than two. See the previous section for a detailed description of these dummy variables.

[11] Variance Inflation Factor (VIF) analysis excluded the presence of collinearity among the explanatory variables.

[12] Once a new bond of any maturity is issued, the previously issued bond with the same maturity becomes the off-the-run bond. Because off-the-run securities are less frequently traded, they typically carry a slightly greater yield.

borrower is greater. Similarly, when three countries issue together ($B_{3,t} = 1$), yield spreads are significantly higher for the majority of the countries considered. The issuance effect is positive and significant for large borrowers (Italy, France and Germany). The liquidity effect, proxied by average bid/ask spread, is positive and significant for large borrowers and for the majority of small borrowers. This result is consistent with the findings of the literature. Wider bid/ask spreads characterize less liquid markets and force investors to require higher yields. Adjusted R^2 statistics show high values for all the regressions estimated[13].

Results obtained when considering maturity bucket B (bonds with five years of current maturity, see Table 4 - Panel B) shed further light on the bunching effect. The coefficients for the bunching variable are significant at the 1% level for the great majority of the countries considered, both when considering the bunching effect provoked by two countries issuing together and when considering the effect caused by an additional country bunching in issues. However, it is interesting to focus on the sign of the relationships estimated. When two countries contemporaneously issue the same kind of security, yield spreads are lower whereas a bunching of issues raises yield spreads when there are three countries issuing at the same time 5-year bonds. This non-linear effect could be explained in the following way. When two countries issue together 5-year bonds, the liquidity in secondary markets improves (given the high degree of substitution between the two debt instruments) and the yields offered are consequently lower. However, if the amount of paper exceeds a certain threshold (for example, when there are three countries issuing together 5-year bonds) the bunching effect changes sign and contemporaneous issuances raise the costs of funding for sovereign borrowers. The issuance effect estimated for maturity bucket B is positive and significant at the 1% level. The comparison of this result with the estimations for maturity bucket A suggests that the overpricing caused by an on-the-run/off-the-run effect is more significant when considering bonds with a longer time-to-maturity. Liquidity effect for maturity bucket B is positive and significant at the 1% level for the majority of the countries considered. With respect to adjusted R^2 statistics, estimation results are lower than those obtained when analyzing maturity bucket A.

Finally, estimation results for maturity bucket C (bonds with ten years of current maturity, see Table 4 - Panel C) confirm what it has been inferred considering bonds with shorter maturity. The bunching effect is significant at the 1% level for all the countries considered[14]. Similar to 5-year bonds, the bunching in issues caused by two Member States raises the liquidity in secondary markets and reduces the yield spreads but the excess supply of similar securities (that could be provided by three countries issuing together 10-year bonds) lowers bond prices and consequently increases the yields offered. The issuance effect estimated for maturity bucket C is positive and significant at the 1% level for all the countries confirmed. Therefore, this result confirms that the on-the-run/off-the-run effect is more significant when considering bonds with a longer maturity. Like for maturity bucket A and B, the liquidity effect is positive and significant for the majority of the countries considered. The fit measure shows higher values than those obtained for maturity bucket B.

Overall, the bunching variable has the sign and significance predicted by our hypothesis

[13] There is no precise counterpart for R^2 in the generalized regression model (Greene, 2003). The fit measure used in this article (R^2) is based on the residuals of the original model, computed by using the GLS estimator.

[14] The only exception is given by Ireland. However, estimation results for this country could be biased by small sample problems, given the little amount of data available.

for all the countries analyzed and for all the maturity buckets considered. It is only the result of an empirical exercise based on a very simple model. Nevertheless, these results support the hypothesis that an excess supply of securities with similar features force borrowers to offer higher yield spreads and imply that euro area public debt managers should carefully take into account the information derived by issuance calendars to minimize the cost of funding for Member States. Moreover, the significance of the effect estimated gains weight if we consider the chance that the model proposed does not fully perceive the importance of the bunching effect, given the structure of the sovereign bond market. Since all the countries considered publish in advance their issuance calendars (see Table 3), the market knows in advance when there will be a bunching in issues. As a consequence, the global bunching effect could be underestimated since the model proposed is considering the effect produced in the bunching dates but it is not taking into account the effect originated when calendars are published or amounts to be issued are announced.

3.3 The Impact of Large and Small Borrowers Issuances

The analysis of the bunching effect can be deepened by distinguishing between the bunching in issues caused by large borrowers (Italy, France and Germany) and the one due to small borrowers (the remainder of the countries considered). In fact, it makes sense to consider separately the impact of large borrowers bunching in issues and the small borrowers' one, since the amount of debt issued each year by Italy or France or Germany is evidently larger than the amount issued by small borrowers like Ireland, Finland or Austria. As a consequence, it is worthwhile to re-consider the baseline model by estimating separately the following equations:

$$s_{i,t}^{c} = \alpha^{c} + \beta^{c} A_{i,t}^{c} + \gamma^{c} I_{t} + \sum_{j=2}^{n} \delta_{j}^{c} B_{j,t}^{L} + \varepsilon_{i,t}^{c} , \qquad (3)$$

where $B_{j,t}^{L}$ is the bunching dummy variable built by considering only large borrowers issuances belonging to the same maturity bucket of the *i*-th bond and

$$s_{i,t}^{c} = \alpha^{c} + \beta^{c} A_{i,t}^{c} + \gamma^{c} I_{t} + \sum_{j=2}^{n} \delta_{j}^{c} B_{j,t}^{S} + \varepsilon_{i,t}^{c} , \qquad (4)$$

where $B_{j,t}^{S}$ is the bunching dummy variable built by considering only small borrowers issuances belonging to the same maturity bucket of the *i*-th bond.

Results obtained (see Table 5 and 6) show the value added of these additional analyses since there is evidence of some differences between the bunching effect caused by large borrowers and that one provoked by small borrowers' contemporaneous issuances. When considering the bunching in issues due to large borrowers, with respect to the maturity bucket including 3-year bonds, estimation results (see Table 5 - Panel A) confirm the findings previously obtained. The bunching effect significantly increases yield spreads for the majority of the countries considered. However, a closer look to the estimation results reveals that only the three smallest sovereign borrowers (Austria, Finland and Ireland) are not affected by the large borrowers bunching effect. This result gains interest when considering the bunching effect caused only by small borrowers (see Table 6 - Panel A). The small borrowers bunching effect on Austrian and Irish bonds is positive and significant at the 5% level and the effect on Finnish

bonds is even more significant (1% level). These results could reflect the higher degree of substitution between the bonds issued by Austria, Finland and Ireland and those issued by the other small borrowers compared with the relationship between the bonds issued by these three smallest borrowers and the largest ones (France, Italy and Germany). From a different point of view, it is an indirect confirmation that the high degree of substitution between Euro-bonds is the basic reason for the significance of the bunching effect and the inefficiencies related to a bunching in issues.

When considering bonds with 5 years of maturity, the distinction between large and small issuances provides a descriptive result. Small borrowers are never bunching in issues in the sample period considered. In particular, the analysis of the issuance calendars for 2004 indicates that small borrowers issue together but offering to the market bonds with different time-to-maturity. The aim of this behavior is likely to be one of generating a euro yield curve capable of increasing the strategic opportunities for traders and - hence - to raise the liquidity in the secondary markets (Bagella et al., 2007). Given this descriptive result, the bunching effect tested in the previous paragraph was the consequence of two large borrowers issuing together or a small borrower bunching in issues with one or two large ones. If we focus only on large borrowers issuances, estimation results support previous considerations about the existence of a liquidity threshold which discriminates the sign of the bunching effect. The amount of paper issued by two large borrowers is above the threshold for the 5-year bond market. Therefore, the large borrowers bunching effect significantly raises yield spreads (see Table 5 - Panel B).

Estimation results for the 10-year bond bucket confirm the significance of the bunching effect and provide further evidence about the existence of a liquidity threshold. The bunching effect of two small borrowers lowers yield spreads and this is consistent with the findings of the previous paragraph (see Table 6 - Panel B). Differently from what happens for the 5-year maturity bucket, yield spreads are lower even if two large borrowers are bunching in issues (like the amount of debt issued is still below the liquidity threshold). However, when three sovereign borrowers (either large or small) issue together, the bunching effect increases yield spreads. An additional finding stemmed from our results is that the threshold for 10-year bond market appears to be higher than the one for bonds with 5 years of maturity[15]. In other words, longer maturity government bond markets seem to have a higher capacity to absorb paper compared with shorter maturity bond markets. This hypothesis is supported by the empirical evidence[16].

Coefficients estimated for the other variables considered in the model (liquidity effect and issuance effect) are generally positive and significant at the 1% level for all the maturity buckets considered. This is consistent with the findings of the baseline model.

[15] This is the outcome of the analysis on the sample period considered. More generally, the level of this threshold is a function of several variables (maturity bucket considered, amount of expiring bonds, bond market liquidity, global financial market liquidity). The variability of the liquidity threshold supports the approach of measuring the bunching effect by considering the number of countries issuing together rather than using a quantitative variable such as the amount of debt issued.

[16] Indeed, given the sample period considered, the average size of the issuances increases with the time-to-maturity of the bonds issued.

4 CONCLUSION

Which are the determinants of yield spreads? Economic and financial literature investigated deeply this issue and pointed at different angles to look at the same problem. The present paper belongs to the strand of literature which considers how market microstructure might influence government bond yields. In particular, this paper tests for the significance of a liquidity effect and a bunching effect, i.e. the effect caused by contemporaneous issuances of bonds proposed by different countries but characterized by similar maturities.

In line with existing literature, we find a positive correlation between bid/ask spreads and bond yields, therefore a negative correlation between liquidity and yields offered. When bid/ask spreads are wider, bond yields are higher in order to compensate the higher transaction costs determined by illiquidity. Apart from this, the main contribution of this paper is to assess whether contemporaneous issuances have a significant impact on yield spreads. Some articles have already pointed out the potential effects of a bunching in issues, given the high degree of substitution between Euro bonds. Contemporaneous issuances could flood the market with so much paper that sovereign borrowers would be forced to offer higher spreads in order to convince primary dealers to absorb their debt. This contribution is the first attempt to empirically investigate the significance of the bunching effect.

Using daily data from the 1st of January to the 31st December 2004, we find that an excess supply of similar securities raises yield spreads. When considering government bonds with three years of maturity, the impact of contemporaneous issuances of two or more countries is positive and significant at the 1% level. When considering bonds with longer maturity, the impact is negative when two countries issue together and positive when three countries are bunching in issues. These results underline the importance of liquidity in government bond markets. When two countries issue together similar securities, the liquidity in secondary markets improves and the yields offered are consequently lower. However, if the amount of paper exceeds a certain threshold (for example, when three countries issue together) the bunching effect changes sign and contemporaneous issuances raise the costs of funding for sovereign borrowers. The robustness of the findings obtained has been tested by controlling for an issuance effect (i.e. the effect on yields spreads provoked by a single issuance) and by distinguishing between the bunching caused by large borrowers (like Italy, France or Germany) and that one due to small borrowers (the other countries considered). Moreover, robustness analysis results corroborate the hypothesis that the significance of the bunching effect is related to the degree of substitution across bonds.

Furthermore, the analysis has policy implications. To the extent that yield spreads depend on bunching in issues, agreement between sovereign borrowers on dates and frequency of debt issuances could significantly lower the costs of funding for Member States.

TABLES

Table 1. Debt Instruments Considered

Issuer Country	Bond Type	Description	Currency
Austria	ATS	Austrian Government Bonds	Euro
Belgium	OLO	Belgian Government Bonds	Euro
Belgium	BPO	Belgian Strip Principal	Euro
Finland	RFG	Finnish Government Bonds	Euro
France	BTAN	French Government Medium-Term Debt Instruments	Euro
France	OAT	French Government Long-Term Debt Instruments	Euro
France	FCO	French Zero Coupon	Euro
France	FPO	French Principal Strip	Euro
Germany	DEM	German Government Bonds	Euro
Greece	GGB	Greek Government Bonds	Euro
Ireland	IRL	Irish Government Bonds	Euro
Italy	BTP	Italian Government Bonds	Euro
Italy	CTZ	Italian Zero Coupon	Euro
Netherlands	DSL	Dutch Government Bonds	Euro
Portugal	PTE	Portuguese Government Bonds	Euro
Spain	BON	Spanish Government Medium-Term Debt Instruments	Euro
Spain	OBE	Spanish Government Long-Term Debt Instruments	Euro
Spain	CUP	Spanish Zero Coupon	Euro
Spain	PRL	Spanish Principal	Euro

Notes: Table 1 summarizes the bonds considered in the analysis. Bond type column indicates the abbreviations commonly used to describe the bonds considered.

Table 2. Issuance Frequencies

Panel A) Average Number of Issuances per month

Country	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain
Avg #	0.8	1.1	0.25	4.2	2	0.5	0.1	5.5	1.1	0.5	1.5

Panel B) Issuance Calendar – Patterns Identified

Country	M1	Tu1	W1	Th1	F1	M2	Tu2	W2	Th2	F2
Austria		Bonds								
Belgium										
Finland										
France				OATs						
Germany			Bunds					Bunds		
Greece							Bonds			
Ireland										
Italy						Bonds				
Netherlands							DSLs			
Portugal								OTs		
Spain				Bonds						

Country	M3	Tu3	W3	Th3	F3	M4	Tu4	W4	Th4	F4
Austria										
Belgium						OLOs				
Finland										
France				BTANs						
Germany			Bunds					Bunds		
Greece										
Ireland				Bonds						
Italy	Bonds					Bonds				
Netherlands										
Portugal										
Spain				Bonds						

Notes: In Panel A, Avg # stands for the average number of issuances per month. In Panel B, the first row identifies the day in which the different debt instruments are usually issued. For example, M2 stands for the second Monday of the month while F4 stands for the fourth Friday of the month. Tables are based on the patterns identified over the sample period considered.

Table 3. Information Disclosure

Country	Yearly Announcement	Periodical Announcements
Austria	**December:** an indicative issuance calendar* for the following year is published	n.a.
Belgium	**December:** an indicative issuance calendar* for the following year is published	n.a.
Finland	n.a.	A review published quarterly provides general information about debt management
France	**December:** an indicative issuance calendar** for the following year is published	A bimestrial calendar is available regularly in Agence France Tresor website
Germany	**December:** an indicative issuance calendar*** for the following year is published	A detailed issuance calendar is published quarterly
Greece	n.a.	Issuance calendar for every quarter is announced at the end of the previous month
Ireland	An indicative calendar is published before the first auction in the year	The calendar is revised at the end of each quarter
Italy	**December:** a detailed issuance calendar** for the following year is published	Additional information (maturity and coupons) about issued instruments is published quarterly
Netherlands	**January:** an indicative annual calendar* is published at the beginning of the year	Every Wednesday before the start of a new quarter, the calendar for the new quarter is announced
Portugal	n.a.	A Financing Programme is published quarterly
Spain	**January:** an indicative annual calendar* is published at the beginning of the year	Additional information (maturity and coupons) about issued instruments is published quarterly

Notes: Table 3 provides a qualitative assessment of the information disclosure provided by each Member States. Asterisks distinguish the information provided. Austria, Belgium, Netherlands and Spain (one asterisk) communicate in which days there will be auction procedures during the following 12 months without providing any additional information on the instruments which will be issued. France and Italy's calendars (two asterisks), with respect to Austria, Belgium, Netherlands and Spain, provide some additional information about the maturity of the instruments which will be issued. Finally, Germany's calendar (three asterisks) provides information about the issuance month, maturity and volume of the instruments which will be issued but no information on auction dates.

Table 4. Baseline Model Estimation Results

Panel A) Maturity Bucket A

Country	B_2	B_3	A	I	# Bonds	# Obs.	$\bar{R}^2$
Austria	0.054*	0.058	13.49***	−0.002	1	257	16.1%
Belgium	0.070***	0.010***	−1.307	−0.0014	5	900	7.5%
Finland	0.059**	0.0560	9.42***	−0.0088	1	257	12.5%
France	0.069***	0.015	13.30***	0.008***	5	1043	44.9%
Germany	0.048***	0.014	14.47***	0.013***	4	1028	52.5%
Greece	0.067***	0.040***	1.328	0.0001	2	389	14.4%
Ireland	0.052	0.062	5.562***	−0.009	1	257	4.2%
Italy	0.055***	0.048***	19.46***	0.012***	7	1666	49.1%
Netherlands	0.068***	0.025***	0.753	−0.003***	2	509	6.1%
Portugal	0.076***	0.040***	8.842***	−0.0004	2	382	76.2%
Spain	0.083***	0.026***	0.611***	−0.009	4	614	72.1%

Panel B) Maturity Bucket B

Country	B_2	B_3	A	I	# Bonds	# Obs.	$\bar{R}^2$
Austria	−0.015***	0.014***	6.895***	0.012***	2	514	3.53%
Belgium	−0.019***	0.040***	0.085	0.020***	6	1031	1.67%
Finland	0.001	0.023***	7.310***	0.019***	2	514	12.04%
France	−0.015***	0.022***	0.564	0.017***	14	2771	1.70%
Germany	−0.008**	0.030***	9.130***	0.016***	11	2534	10.05%
Greece	−0.017***	0.035***	−2.817	0.014***	4	904	5.15%
Ireland	0.006***	0.014	4.241***	0.022	1	257	1.77%
Italy	−0.002	0.031***	16.93***	0.013***	5	1158	19.38%
Netherlands	−0.087***	0.076***	−1.269	0.012***	4	822	7.23%
Portugal	−0.016***	0.027***	2.636***	0.015***	2	514	0.88%
Spain	−0.016***	0.035***	1.069*	0.015***	6	1302	9.56%

Panel C) Maturity Bucket C

Country	B_2	B_3	A	I	# Bonds	# Obs.	$\bar{R}^2$
Austria	−0.062***	0.106***	3.793***	0.012***	2	508	37.2%
Belgium	−0.076***	0.103***	0.183	0.020***	4	714	12.5%
Finland	−0.065***	0.105***	5.021***	0.023***	2	387	61.5%
France	−0.062***	0.115***	−0.008	0.023***	5	792	10.4%
Germany	−0.064***	0.123***	−0.364	0.017***	5	927	11.0%
Greece	−0.055***	0.104***	0.050	0.015***	4	772	7.3%
Ireland	−0.051	0.090	3.236***	0.017	1	257	4.0%
Italy	−0.066***	0.111***	3.473***	0.023***	4	844	10.6%
Netherlands	−0.051***	0.117***	−6.814***	0.020***	2	387	61.3%
Portugal	−0.050***	0.091***	8.050***	0.012***	2	514	83.7%
Spain	−0.073***	0.127***	0.448***	0.018***	6	1384	19.3%

Notes: The tables summarize the estimation results for model (2). B_2 measures the bunching effect caused by 2 countries issuing together. B_3 measures the additional effect of a third country bunching in issues. A is the proxy for the liquidity effect and I controls for the issuance effect. # Bonds and # Obs. stand for the number of bonds and observations available for the sample period considered. Asterisks identify the degree of significance of the coefficients estimated: one, two and three asterisks stand for the rejection of the null hypothesis at the 10% level, at the 5% level and at the 1% level, respectively.

Table 5. The Impact of Large Borrowers Issuances

Panel A) Maturity Bucket A

Country	B_2	A	I	# Bonds	# Obs.	$\bar{R}^2$
Austria	0.027	13.45***	0.006	1	257	15.2%
Belgium	0.041***	−1.295	−0.0031	5	900	3.8%
Finland	0.021	9.231***	0.0004	1	257	11.2%
France	0.067***	13.24***	0.024***	5	1043	42.6%
Germany	0.026***	14.55***	0.019***	4	1028	50.9%
Greece	0.038***	1.331	0.005	2	389	1.4%
Ireland	0.021	5.541***	−0.001	1	257	3.4%
Italy	0.034***	19.63***	0.018***	7	1666	47.4%
Netherlands	0.016***	0.513	0.005***	2	509	0.3%
Portugal	0.052***	8.362***	0.011***	2	382	83.9%
Spain	0.060***	0.611***	−0.002	4	614	68.2%

Panel B) Maturity Bucket B

Country	B_2	A	I	# Bonds	# Obs.	$\bar{R}^2$
Austria	0.016***	6.867***	0.007***	2	514	3.69%
Belgium	0.018***	0.083	0.016***	6	1031	1.29%
Finland	0.028***	7.368***	0.017***	2	514	12.14%
France	0.015***	0.566	0.012***	14	2771	1.69%
Germany	0.032***	9.216***	0.012***	11	2534	10.33%
Greece	0.021***	−2.801	0.009***	4	904	5.12%
Ireland	0.018	4.254***	0.022	1	257	2.19%
Italy	0.034***	16.951***	0.010**	5	1158	19.73%
Netherlands	−0.001	−1.093	0.002	4	822	0.29%
Portugal	0.017***	2.631***	0.011***	2	514	0.99%
Spain	0.025***	1.070*	0.010***	6	1302	9.58%

Panel C) Maturity Bucket C

Country	B_2	A	I	# Bonds	# Obs.	$\bar{R}^2$
Austria	−0.042***	3.950***	0.007***	2	508	24.3%
Belgium	−0.051***	0.185	0.014***	4	714	6.0%
Finland	−0.007	5.692***	0.019***	2	387	34.7%
France	0.002	−0.024	0.015***	5	792	1.3%
Germany	−0.108***	0.092	0.016***	5	927	11.4%
Greece	−0.114***	−0.018	0.015***	4	772	13.1%
Ireland	0.018	3.330***	0.012	1	257	3.3%
Italy	−0.024*	3.470***	0.017***	4	844	5.2%
Netherlands	−0.016**	−7.195***	0.014***	2	387	83.4%
Portugal	0.019***	8.046***	0.005*	2	514	65.9%
Spain	−0.114***	0.539***	0.017***	6	1384	27.1%

Notes: The tables summarize the estimation results for model (3). B_2 measures the bunching effect caused by 2 countries issuing together. A is the proxy for the liquidity effect and I controls for the issuance effect. # Bonds and # Obs. stand for the number of bonds and observations available for the sample period considered. Asterisks identify the degree of significance of the coefficients estimated: one, two and three asterisks stand for the rejection of the null hypothesis at the 10% level, at the 5% level and at the 1% level, respectively.

Table 6. The Impact of Small Borrowers Issuances

Panel A) Maturity Bucket A

Country	B_2	A	I	# Bonds	# Obs.	$\bar{R}^2$
Austria	0.102**	13.20***	−0.0002	1	257	16.9%
Belgium	0.085***	−1.275	−0.0013	5	900	6.1%
Finland	0.111***	9.240***	−0.0063	1	257	9.3%
France	0.085***	13.57***	0.0043	5	1043	46.1%
Germany	0.079***	14.26***	0.014***	4	1028	52.5%
Greece	0.098***	1.122	0.001	2	389	27.3%
Ireland	0.105**	5.211***	−0.008	1	257	5.2%
Italy	0.089***	19.27***	0.013***	7	1666	49.3%
Netherlands	0.101***	0.314	−0.004***	2	509	10.02%
Portugal	0.126***	8.697***	0.007***	2	382	91.2%
Spain	0.115***	0.607***	−0.008	4	614	69.3%

Panel B) Maturity Bucket C

Country	B_2	B_3	A	I	# Bonds	# Obs.	$\bar{R}^2$
Austria	−0.019*	0.065***	3.951***	0.006***	2	508	23.1%
Belgium	−0.027***	0.081***	0.179	0.013***	4	714	5.0%
Finland	−0.053***	0.095***	5.659***	0.019***	2	387	35.8%
France	−0.034***	0.092***	−0.026	0.017***	5	792	3.0%
Germany	−0.088***	0.182***	0.037	0.016***	5	927	19.7%
Greece	−0.012***	0.064***	−0.008	0.010***	4	772	0.9%
Ireland	−0.012	0.059	3.277***	0.012	1	257	3.1%
Italy	−0.023***	0.073***	3.530***	0.017***	4	844	5.2%
Netherlands	−0.008	0.088***	−7.077***	0.014***	2	387	61.1%
Portugal	−0.030***	0.090***	8.091***	0.007***	2	514	65.8%
Spain	−0.023***	0.074***	0.447***	0.013***	6	1384	13.9%

Notes: The tables summarize the estimation results for model (4). B_2 measures the bunching effect caused by 2 countries issuing together. B_3 measures the additional effect of a third country bunching in issues. A is the proxy for the liquidity effect and I controls for the issuance effect. # Bonds and # Obs. stand for the number of bonds and observations available for the sample period considered. Asterisks identify the degree of significance of the coefficients estimated: one, two and three asterisks stand for the rejection of the null hypothesis at the 10% level, at the 5% level and at the 1% level, respectively.

REFERENCES

Bagella, M., Coppola, A., Pacini, R. and Piga, G. (2007). "Euro debt primary market report", Global Research, *UniCredit Markets & Investment Banking*.

Bernoth, K., von Hagen J. and Schuhknecht, L. (2004). "Sovereign risk premia in the European government bond market", Working Paper Series N° 369, *European Central Bank*.

Biais, B., Renucci, A. and Saint-Paul, G. (2004). "Liquidity and the cost of funds in the European Treasury bill market", Working Paper N° 285, *IDEI*.

Codogno, L., Favero, C. and Missale, A. (2003). "Government bond spreads", *Economic Policy*, 18, 503-532.

Coppola, A. and R. Pacini (2006). "Il mercato primario dei titoli di Stato: procedure europee a confronto", pubblicato in Rapporto sul Sistema Finanziario Italiano 2006, *CEIS - Osservatorio sugli Intermediari e la Finanza Internazionale*, Aracne Editrice.

De Silguy, Y.T., (1999). "The euro: the key to Europe's lasting success in the global economy", speech given at the Corporation of London, 26 July.

Dufour, A. and F. Skinner, (2004). "MTS Time Series", *ISMA Centre Discussion Papers in Finance*.

Favero, C., Missale, A. and Piga, G. (1999). "EMU and Public Debt Management: One Money, One Debt?", Policy Report N° 3, *CEPR*.

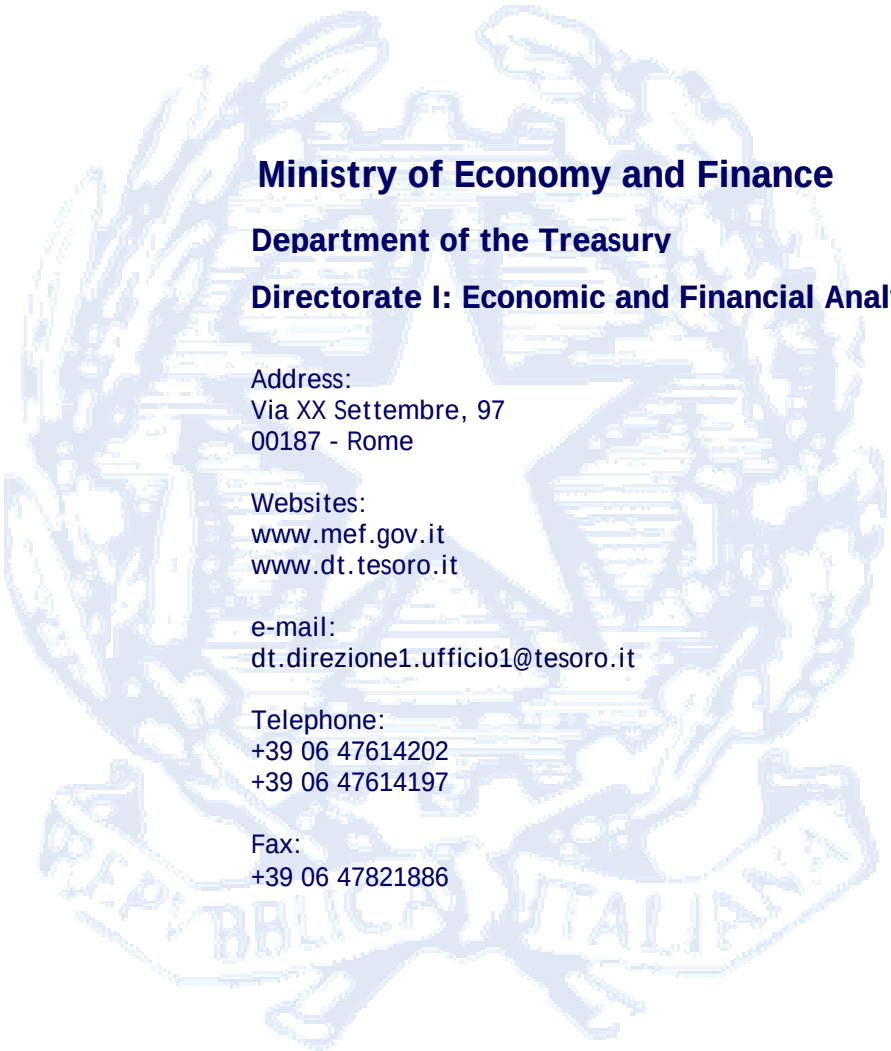
Favero, C., Pagano, M. and von Thadden, E. (2005). "Valuation, liquidity, and risk in government bond markets", Working Paper N° 281, *IGIER*.

Hund, J. and D.A. Lesmond, (2006). "Liquidity and credit risk in emerging debt markets", Working Paper, *University of Texas*.

Missale, A. and G. Piga, (2000). "Public Debt Management, Challenges and Prospects in the EMU", published in: "Fiscal Policy Imbalances, the Monetary Transmission Mechanism and Prudential Supervision: Issues Facing Europe's Central Bankers", *CEPR*.

Newman, Y. and M. Rierson, (2004). "Illiquidity spillovers: Theory and evidence from European Telecom bond issuance", *American Finance Association 2005 Philadelphia Meetings*.

Poterba, J.M. and K.S. Reuben, (2001). "Fiscal news, state budget rules, and tax-exempt bond yields", *Journal of Urban Economics*, 50, 537-62.



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