

**SIZE AND HETEROGENEITY MATTER.
A MICROSTRUCTURE-BASED ANALYSIS
OF REGULATION OF SECONDARY MARKETS
FOR GOVERNMENT BONDS**

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BANCO DE ESPAÑA

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Abstract

This paper deals with the economics of secondary markets for government bonds. Ultimately, the analysis is shaped by a public policy goal: assessing the elements of a regulatory framework for these markets. In that regard, the decisive role of market structure leads to a critical review of microstructure conclusions relevant specifically for government debt markets. It is argued that the nature of information asymmetries and matching costs in government debt markets determines a bias towards a fragmented microstructure at odds both with exchange-like arrangements and with ordinary regulatory approaches. Hence, a generic conclusion highlights the risks of blindly transposing regulatory principles from the equity markets area without due regard to the specifics of the bond market. As a specific application of this idea, the paper critically reviews electronic trading platforms that emulate exchange-like order execution solutions. More specifically, the paper opposes the hybrid microstructure (pure limit order book plus affirmative quoting obligation) faced by European primary dealers and the arbitrage-based approach to market-making found in US inter-dealer markets. The Citigroup disruptive trade in August 2004 is analyzed from this perspective. Government bond regulation is argued to necessarily depart from ordinary approaches also because it captures the diverse interests of various governmental agencies. As an application of this principle, the paper discusses repo and short-selling regulation in government bond markets. The atypical market structure and the multi-agency endeavour around government bond markets raise the chances of regulatory failures. Nevertheless, it is argued that a reliance on competition, integrative infrastructure and basic systemic protections as overarching principles for regulation is consistent with recommendations from relevant economic theory. Finally, political economy issues arising in implementation of transparency, disclosure or retail investor protection will be addressed in the context of selected country cases.

JEL codes: D40, G28, K22

Keywords: government bonds, microstructure, regulation.

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1 Introduction

Government debt instruments and markets are key constituents of the universe of securities. However, their regulatory profile substantially differs from that of corporate securities. This is particularly true when the comparison is with equity instruments and markets.

This paper intends to shed some light on the rationale for the apparently special regulatory treatment of government debt securities. Two opposing hypotheses can be put forward as extreme explanations for the uniqueness of government debt. On the one hand, one might claim that government debt really is a special sort of security deserving a distinct regulatory treatment. The microstructure of government debt markets would thus be the explanatory factor for their special regulatory treatment. Alternatively, one might attribute the regulatory specialness enjoyed by government debt to a cynical choice made by sovereigns who, exploiting their dual capacity as issuers and regulators, intend to dodge the costs imposed by regulation. Admittedly, one may envisage explanations lying between the efficiency and cynicism ones just put forward, but a dichotomous analysis is clearer.

The paper examines the economics of government debt markets and concludes that the microstructure of government debt markets truly poses specific challenges that account for its distinctive regulation. In particular, the paper examines in depth the bias of government debt markets towards a fragmented market structure and the role of electronic trading platforms. The microstructure explanation is not meant to preclude the possibility of regulatory failure. In particular, the paper critically reviews electronic trading solutions for government debt markets based on exchange-like regulatory concepts. More specifically, the paper opposes electronic venues where US dealers act as market makers on an arbitrage basis and European solutions based on pure limit order books and affirmative quote obligations.

As regards regulatory protections, it will be argued that a reliance on competition, integrative infrastructure and basic systemic protections, as overarching principles for regulation, satisfies recommendations derived from economic theory.

The relevance of the analysis contained in this paper may be judged from three different angles. From a purely regulatory perspective, the discussion presented here serves as an interpretative guide of the applicability of IOSCO regulation principles in the context of government debt markets. From this perspective, the paper qualifies the scope for deriving global regulatory solutions from a set of high-level principles irrespectively of the structure of the market.

From a policy perspective, the analysis sheds light on the risks arising from the atypical market structure and the multiplicity of roles played by governments as

issuer, regulator and liquidity contractor. In this regard, the choices as regards trading technology and basic infrastructure will be analyzed in depth.

From a market microstructure perspective, the paper identifies the basic economic constraints faced by issuers and regulators. It will be argued that the limits to concentrated trading of government debt and the informational constraints posed by fragmented venues define a playing field to which regulators should accommodate.

The structure of the paper will be made clear in Section 2, where we will establish the conceptual background defining the scope for bond market regulation and summarize in more detail the main conclusions of the paper. The economic analysis contained throughout the paper is supplemented in Section 7 with some selected references to actual cases.

2 A conceptual framework for government debt market regulation

To a large extent, this paper can be thought of as an exercise in comparative regulation. This ambitious goal calls for some effort to frame government debt secondary market regulation in a broader context. The purpose of this section is to define the conceptual framework for such comparative analysis and to anticipate some of the conclusions drawn in the rest of the paper.

A widely used diagnostic for general economic regulation is market failure, i.e. situations where markets fail to efficiently provide goods or services either because there are inherent difficulties in internalizing the benefits or costs of that provision, or because providers enjoy market power. Regulation is accepted as able to redress distortions in economic behaviour caused by market failure. The observation that financial markets are typically plagued by market failures, based on the effects of information asymmetries, seems to advocate a uniform approach to their regulation.

However, the notion of market failure is not by itself fully operational as a diagnostic for regulation. Information imperfections are pervasive in all spheres of the economy without this triggering public intervention. In a seminal contribution, Coase (1974) operationalized the presence of market failures as an indicator of the need of regulatory initiatives. He noticed that market failures warrant public intervention when the cost of dealing with them by private means (contracting) is too high. This insight has provided a broad operational approach to regulation: public intervention should focus on, and be geared to, the magnitude of transaction costs. Moreover, as a corollary, regulation is warranted when the benefits it brings are higher than the costs entailed.

Transaction costs and market power thus constitute the unifying concepts for regulation. The scope for government debt secondary market regulation should therefore depend primarily on the existence of similar distortions. This analysis will

benefit considerably from a comparative examination of the (transaction cost-based) foundations of banking and securities regulation.

In the banking area, the market failures addressed by regulatory initiatives are those potentially having a systemic impact. Consistent with this focus, banking rules are mainly concerned with the reliability of the credit intermediation channel and with its basic fragility arising from the supply of liquid nominal deposits backed by risky and illiquid assets. Deposit insurance regulation is a prominent example of regulatory measures primarily aimed at avoiding devastating collective uninformed runs on banks. Capital adequacy requirements are another prominent example of key bank prudential regulations, i.e. rules aimed at promoting a substrate of prudence and confidence in the system as a whole.

Contrary to common perception, the potential for systemic disruptions in government debt markets cannot be neglected. Their large amount outstanding and the widespread distribution of holdings in the economy put considerable pressure on the workings of custodial arrangements for government bonds. In fact, the scant legislation specifically enacted for government securities typically focuses on the area of safekeeping. In some countries, like the US, this reflects the relevance of historical episodes of crisis as a trigger for rule-making initiatives, which ultimately suggests that government securities do not escape the political economy forces of regulation¹. In other countries, like Spain, the attention paid by government securities regulation to custodial arrangements has gone beyond purely systemic concerns, since it is also intended to endow the market with a framework that allows it to transcend its intrinsic over-the-counter nature.

Security market regulation typically addresses efficiency and fairness issues for financial markets whose behaviour exhibits a marked sensitivity to a range of informational asymmetries. Its practical emphasis is on the transaction costs that information imperfections impose on the different stages of market processes. Securities rules arising from these general concerns cover a broad range of investor protection regulations (disclosure standards, registration requirements, conduct of business practices, market abuse and insider trading, etc.) as well as market structure and transparency criteria. In particular, securities regulators gathered under the auspices of the IOSCO (International Organization of Securities Commissions) have distilled the common objectives and principles underlying securities regulation across the world.

The functional spirit of those high-level principles might wrongly lead to conclude that the structure and rules of government securities markets fall under the same umbrella. On the contrary, we will argue that the nature and intensity of

1. In this regard, it must be recalled that the globally influential US securities and markets legislative set-up can be traced back to the social and political unrest triggered by the crisis in the 1920s. In the same vein, recent corporate governance rule-making initiatives in the US cannot be understood without the Enron crisis.

transaction costs in government debt markets significantly depart from those in markets for private securities. Hence, an un-pondered application of high-level regulatory principles does not necessarily lead to efficient outcomes. In particular, we will see that this conclusion somewhat downplays the decisiveness of market transparency in government debt markets. Still, observance of disclosure standards is regarded as a valuable goal also in the world of government debt markets and one in which European jurisdictions could improve considerably.

The bulk of this paper (Sections 3 to 6) will be devoted to the economics of transaction costs in government debt markets. The unifying thread of this analysis and the point of contact with rule-making in practice (see Section 7) is market structure. Information asymmetry-related costs, search costs and execution costs tend to shape market structure endogenously. Actually, either explicitly or implicitly, market structure issues are a perennial subject in the agenda of securities regulators². In the case of government debt markets, the involvement of a diverse group of public authorities (issuers, central banks, securities regulators) means that decisions in that regard acquire an important political economy dimension.

Exchange-like trading venues have typically been the implicit “choice” made by securities regulators as to the optimal market structure. Actually, centralized trading and the presence of regulatory arrangements are highly correlated. Admittedly, the recent removal of concentration rules in European equity markets has paved the way for the coexistence of regulation and fragmented market structures. The US equity markets, where centralized and fragmented venues together form a “national market system” subject to an integrated regulatory framework, are a long-standing exemplar of an encompassing concept of market structure.

Against this backdrop, the economic analysis of transaction costs relevant to government debt markets leads us to conclude that a trade-off between (centralized) market structure and efficiency operates in broad segments. In fact, the need for “upward segments”, i.e. trading venues separated from the focal one, is well documented also for equity markets. However, the need for them is much greater in markets for instruments like government bonds, which are traded in sizable lots, have a time-decaying liquidity profile, exhibit inherent heterogeneity and are not subject to cash-flow asymmetry information effects (Section 4). Under those conditions, liquidity discovery can proceed more efficiently in upward markets.

Furthermore, upward markets for government bonds will be argued to be largely incompatible with implementations based on pure limit order book matching solutions (Section 5). Electronic platforms applying exchange-like order matching solutions may thus offer certain benefits, but this may come at the cost of straining

2. Seligman (2004) confirms this remark for the history of the US SEC.

the operation of the market. Alternatively, electronic platforms that emulate the operation of upward markets are robust.

The robustness analysis of order matching procedures especially applies to inter-dealer markets. Government debt issuers typically rely on primary dealers to bridge temporary gaps between funding needs and the demand for bonds. Primary dealers are thus placed at the tip of an iceberg of intermediaries in charge of debt distribution. Their position renders them also very active in the secondary market. Actually, in some jurisdictions primary dealers maintain themselves a commitment to supply liquidity in the secondary market. Section 7.6 argues that electronic platforms may effectively facilitate to the issuer contracting those services. However, they may come at a cost, if the availability of such a monitoring technology leads to the imposition of affirmative quoting obligations. The Citigroup disruptive trade in August 2005 is interpreted from this perspective.

A version of that liquidity promotion practice, based on mandatory exposure, has also been criticized as a regulatory failure in the regulation of NYSE specialists. In government debt markets, the potential intensity of this distortion is larger, because direct trading in the over-the-counter market is an alternative. The elements of the subtle “ecology” between centralized and direct trading are outlined in Section 5.3.

The economics of transaction costs thus seem to render anonymity and fragmentation as a natural environment for government debt trading, although other features cannot be ruled out. These features are the basic determinants in rule-making in practice, because of basic observability constraints. The largely OTC dealership-based structure of government debt markets is a major obstacle to instituting classical regulatory protections. Monitoring regulatory compliance in a fragmented trading setting may become extraordinarily expensive. The funding of regulation thus becomes a decisive issue for actual rule-making.

A cynical view might be taken that government debt markets are largely exempted from investor protection rules, especially in respect of transparency in Europe, because governments try to dodge the burdens and costs of regulation. Nasdaq could serve as an example of a fragmented market where, nevertheless, ordinary regulation applies. However, this paper discards the cynical view of government debt market regulation.

The solution adopted in Nasdaq to the regulation funding problem reveals much about the practical challenges posed by rule enforcement in fragmented markets. The major funding source is fees charged for the dissemination of market quotes and trades. In other words, there is no ex-ante clear ranking as to the superiority of transparency-based or search-based trading if investors are professionals. Moreover, economic theory asserts that the most important threat to investors in fragmented markets is not opaqueness but clientele-building, i.e. the

absence of competition (Section 5.5). In this regard, Section 7.4 presents examples of initiatives aimed at protecting the most disadvantaged, i.e. retail, investors.

Admittedly, more could be done to promote disclosure, transparency and integrity of the overall market at no significant cost. In this regard, Section 7.3 briefly describes the Spanish measures to implement transparency, based on the exploitation of post-trade information, and the GovPx experience in the US.

Section 6 deals with another important reason why government debt trading is incompatible with stock-exchange practices: short selling. The ability to short-sell bonds has been accepted in most developed markets as an automatic stabilization mechanism. This tool and the forces of arbitrage enable liquidity-motivated pricing distortions to be flattened out. Short-selling and repurchase agreements (repos) raise many specific regulatory issues. But the uses of repos go far beyond just short selling. Notably, repos are a nexus between money markets and capital markets and gather the diverse interests of central banks, issuers and banking regulators. As discussed in Section 7.1, this confluence of diverse regulatory authorities and functions has shaped some of the specific features of government debt market microstructure and regulation.

Ultimately, this paper takes the position that political economy considerations do not explain the differences between equity and government bond market structure and regulation. The application of the Coasean principle that no regulatory protections are needed if they can be privately contracted at a similar cost, leads to outcomes similar to Fx markets in wholesale segments of the government bond market. However, initiatives to protect small investors, to stabilize the market and to facilitate the enforcement of private agreements are valuable.

The detailed discussion starts in Section 3 of the paper with an analysis of the government debt market peculiarities attributable to the size and recurrence of government debt gross financing needs. It is followed by an analysis of the special meaning of information asymmetry in secondary markets for government securities (Section 4). Then comes a critical assessment of electronic platforms based in pure limit order book mechanisms and an evaluation of the economics of and regulation in fragmented market settings (Section 5). Next, Section 6 is devoted to idiosyncratic features ascribed to repo activity. The paper closes with a discussion of different practical challenges and solutions in government bond market regulation (Section 7) and a section devoted to conclusions.

3 Sizable funding requirements shape market structure

The sizable volume of public finances is known to often trigger financial reforms. Kroszner (1997) confirms anecdotal evidence that financial reform and government bond market development take place mostly when public financing needs are growing rapidly. In particular, the diversification of funding sources has led to the advent of primary dealers in many countries. Primary dealers are

assumed to mainly contribute to bridging the gap between borrowing requirements and buy-and-hold investment decisions. Importantly, this concept of the role of primary dealers underscores the limited feasibility of buy-and-hold investors as a reliable direct funding source for the typically large and recurrent gross government financing needs.

Admittedly, the direct access of institutional and retail investors to government debt investments is a concern shared by many public issuers. However, in practice these initiatives have rarely gone beyond an ancillary contribution to the intermediated channels of government debt distribution. Still, it has to be recognized that the experience of some countries, like Germany, challenges the rationale of the primary dealer notion. All in all, the fact is that most governments across the world “buy” distribution services from primary dealers.

Remuneration of these services is seldom explicit. An implicit incentive offered by Treasury departments to financial intermediaries to encourage them to act as primary dealers consists of granting them quasi-rents from restricted or preferred access to government debt auctions (see Table 1). The quasi-rents earned by the sell-side of the industry should thus compensate it for the capital committed to maintain inventories of bonds that will ultimately end in buy-and-hold portfolios.

Table 1 Primary dealer rewards							
	FRA	GER	ITA	JPN	SP	UK	US
Access to regular auctions	Preferred	—	Preferred		Preferred	Preferred	Equal footing
Access to other prim. business*	Excl. rights	—	Excl. rights	Excl. rights	Excl. rights	Excl. rights	No preferred
Central bank counterparty	Unrelated	—	Unrelated	Unrelated	Unrelated	Unrelated	Exclusive
*Exclusive rights vary in scope (re-openings, non-competitive auctions, syndications, etc) and degree (restricted access, technically advantaged, etc).							

Importantly, an oligopolistic structure on the primary side of the market has two structural consequences for the secondary market. First, at least in part, transactions are sizeable not only because of the substantial funding needs, but also because of the verticality of distribution. And second, this blunt conclusion singles out banks as the main players in government debt markets, due to their financial muscle. Moreover, the structure of the secondary market is also shaped by the economies of scale in the asset management industry, which also imply a vertical differentiation on the buy-side along with a size factor.

Admittedly, activity and structure of secondary markets for government debt cannot entirely be explained in terms of the size of government borrowing requirements. Financial structure descriptors, like the ratio of bond finance to bank finance, also indirectly condition the level of activity in secondary markets for government debt. The fact that this ratio in the US is approximately 10 times larger

than in Europe can be assumed to significantly contribute to the multiplicative factor between US and European turnover ratios³.

At any rate, the paper analyzes how transaction size and the largely institutional nature of participants radically alter the presumptions underlying market structure and regulation for retail investors. Admittedly, simply asserting the feasibility of structure and/or regulation segmentation based on size is an incomplete answer. Responding to this question in detail will be the task of the rest of the paper. However, as a preview of the economic mechanism leading to a size-based segmentation of secondary markets, we can say that the execution of large trades crucially impinges on government debt market structure. More specifically, we will argue that minimizing the transaction costs arising from market impact entails significant specificity in government debt market microstructure.

4 What type of information asymmetry?

Order flows and liquidity discovery

Ordinary information asymmetries play almost no role in the world of government debt securities. Transparency rules on macroeconomic data releases typically place investors on an equal footing. Moreover, pay-offs of domestic currency denominated fixed-rate government debt are largely immune to asymmetric information between borrower and investors, leaving aside situations close to default.⁴ Admittedly, inflation-indexed bonds and other forms of macroeconomic variable indexed bonds could depart from this principle if statistical agencies in charge of index compilation do not act independently⁵⁶.

The irrelevance of payoff-information asymmetry in government debt markets thus contrasts with its crucial role in shaping private security market regulation. In the primary markets for private securities, disclosure rules are, broadly speaking, intended to minimize price discovery risk to investors. Note that price discovery risk is understood here as the possibility of trading at an unfair price because of lack of relevant information potentially affecting the security's pay-offs. Still, it must be recognized that the release of public information about macroeconomic fundamentals significantly moves government debt markets, even if

3. According to the Release of Primary Dealer Positions, Transactions, and Financing by the New York Federal Reserve Bank, the daily average of outright transactions of primary dealers is around \$500 bn. A similar estimate for Europe made by BearingPoint (2005) sets the figure at €60 bn.

4. This argument does not apply to foreign currency denominated debt; hence the efforts deployed at multilateral agencies (IMF) to increase transparency with regard to net and gross fx country position. Inter alia, SDDN standards are aimed at fulfilling this goal.

5. Even if statistical agencies act independently, investors in inflation-protected bonds cannot avoid index calculation risks. Notice that in order to minimize the extent of model risk, CPI indexes underlying inflation-protected bond pay-offs are usually not corrected for seasonal effects.

6. A survey conducted by Schröder et al (2004) on the potential role of GDP-linked bonds shows that monitoring of GDP compilation by a multi-lateral organization was considered essential by potential investors.

the mechanism largely operates in terms of shocks to aggregate discount rates⁷. In this regard, Section 7.3.1 will argue against the differing regulatory emphasis on disclosure rules in US and European markets.

A distinctive feature of secondary markets for government debt that will surface time and again throughout the paper is the looser pre-trade transparency rules. In equity markets, pre-trade transparency is mainly predicated on the basis of its contribution to enhancing the process of information revelation brought about by price mechanisms. Unsurprisingly, the specificity of government debt instruments in terms of (lack of) cash-flow information asymmetry loosely justifies such difference of emphasis. Moreover, as we will discuss later on, the contrast becomes still less sharp when one realizes that the optimal degree of transparency is still a contentious issue in the private securities markets literature. The core reason for this puzzle seems to be the subtle and intricate interplay between price discovery and liquidity provision.

This paper looks more deeply into the specifics of the relationship between price discovery and liquidity provision for the case of government bonds. Importantly, the analysis breaks with standard assumptions made in the literature based on conclusions gained in studies on equity markets. In other words, the asserted irrelevance of payoff-related information asymmetries precludes a blind transposition to government debt of the results from equity markets literature. However, the fact that we still address the interplay between price discovery and liquidity discovery highlights the crucial point that, despite the irrelevance of ordinary comparisons, other sources of asymmetric information are fundamental for the performance of government debt markets and, consequently, deserve adequate attention from policymakers. More specifically, this paper emphasizes the specific role of asymmetric information on order flows and distribution of holdings in shaping government debt market structure and regulation.

The previous assertion may sound somewhat obvious: a smaller price discovery risk must necessarily entail a larger relative importance for liquidity-related risks⁸. However, the practical implications of this observation is far less evident. The reason lies in the slippery nature of the “liquidity risk” concept. Grossly stated, market liquidity refers to the quality and capacity attributes of a trading environment for the execution of buying/selling interests. Liquidity risk thus refers to the economic value of any uncertainty surrounding order flow execution. Incidentally, notice that

7. Balduzzi et al. (1997) find a total of seventeen economic announcements to have a significant impact on the price of at least one of the following instruments: a three-month bill, a two- and ten-year note, and a thirty-year bond.

8. An examination of how relative value assessment is made in debt markets, in practice, confirms that liquidity factors are more important than price discovery ones. Even if quotes are formulated in terms of prices, zero-coupon curves set the basic reference framework for price discovery throughout the curve. Actually, on a market value basis, government debt trades basically express bets on the whole yield curve. The set of effects discussed so far basically acts by shaping on the yield curve a complicated pattern of kinks reflecting liquidity conditions. The fact that a bond value is typically assessed on the basis of its spread with respect to the undistorted notional zero-coupon curve confirms the distinctive asymmetry information effect prevailing in the government debt market.

this definition includes in its component factors, not just the features of the order matching algorithm, but also any institutional feature that leads to heterogeneity across market participants in terms of their ability and willingness to trade. In particular, different configurations of the market as to the inventory holdings of securities available for sale potentially determine distinct states of liquidity.

A natural corollary of the concept of liquidity is liquidity discovery. Similar to price discovery, liquidity discovery refers to the information aggregation process whereby private information is reflected in prices. Obviously, their conceptual difference boils down to the nature of the information being aggregated.

As an alternative formulation of the pre-eminence of information asymmetries in flows and holdings over intrinsic values, one can say that liquidity discovery is the most relevant information aggregation process in government debt markets. The relevance of this effect has been evidenced empirically by Brandt and Kavajecz (2004), who have shown that order-flow imbalances account for up to 26% of day-to-day variation in yields on days without major macroeconomic announcements. Moreover, the operation of liquidity discovery is shown to differ for bonds having different time to maturity and/or seasonedness. Importantly, Brandt and Kavajecz also identify that microstructure features have macro implications for governments, by showing that price response to order flow is larger when indicators of existing liquidity look better. Unsurprisingly, the scope for liquidity promotion by public authorities will be a recurrent topic in the paper.

Massa and Simonov (2001) report another relevant empirical facet of the working of liquidity discovery in debt markets. They manage to show that trading generates information about traders themselves and that this information is actively used by peers. In particular, Massa and Simonov uncover the operation of reputational effects in the Italian government debt market. Trading anonymity or controlled dissemination of trade information thus assure the efficient functioning of the market. In fact, ex-ante anonymity is a widespread practice in inter-dealer markets. Incidentally, it should be noted that the feasibility of the study by Massa and Simonov proofs itself the relevance of efforts being made to institute in the market, not just pre-trade, but also post-trade, anonymity. Obviously, pre-trade and post-trade anonymity raise important infrastructure issues, but, more specifically, ex-post unnamed trading highlights the need for multilateral risk arrangements⁹.

Still another aspect of liquidity discovery practices having great relevance in government bond markets refers to the learning strategies used by investors to overcome their asymmetric information about the prices at which they may find

9. The Spanish government debt market serves as an example of this. A virtual CCP closely linked to the operation of the securities settlement system was put in place in the early 1990s. CCPs have become a hot topic in the context of European market integration.

liquidity in the future¹⁰. Gallmeyer, Hollifield and Seppi (2004) highlight that a precondition for the operation of this sort of effects is the existence of information asymmetry in systematic components of investors' preferences. The feasibility of this condition in fixed-income markets is underpinned by the marked heterogeneity of investors' horizons and of their instruments. Ultimately, as we will shortly stress, it is the finite time to maturity of debt instruments which brings about a complex market scenario.

All in all, one can say that liquidity-related considerations acquire in government debt markets a relevance that goes beyond their significance in ordinary securities regulation. The interplay between government debt market microstructure, liquidity risk and discovery considerations thus deserve careful analysis. In this regard, Section 5 will posit an argument that reinforces the critical role of asymmetric information in liquidity: government debt markets exhibit a bias towards a fragmented structure. More specifically, it will be argued that pure limit order books are not suitable as execution mechanisms for sizable trades like those taking place in wholesale markets for government debt securities. From a different perspective, we will examine the reasons for the reluctance of block order suppliers of liquidity to express it under a pure limit order book format (unexpressed liquidity). The significance of this idea for the operation of asymmetric information effects in government debt markets is immediate: liquidity pools face specific difficulties in matching each other in a fragmented setting and, consequently, liquidity discovery processes face specific challenges.

As a matter of fact, less than perfect "expression" of liquidity pools in government debt markets may be strengthened by various other mechanisms. One of them relates to the cost of continuously participating in the market. Grossman (1992) has made the compelling case that the price mechanism of a centralized venue or "downstairs market"¹¹ is more inefficient than an environment based on informed dealers when unexpressed liquidity is quantitatively important. Put differently, the fact that brokers and dealers may be repositories of information on silent liquidity pools leads to an increase of the effective liquidity of upstairs markets over that of downstairs markets. Obviously, the ultimate microstructure reason for this conclusion is the lower risk of posting bids when it is known ex-ante that there is some unexpressed demand that could "match" the potential exposure.

Downstairs markets would thus tend to prevail when knowledge of silent demand is not important. Below, the case will be made that the opposite is true for government debt instruments. Moreover, it is important to bear in mind another conclusion of Grossman. Namely, downstairs markets are unstable if there is no way

10. Notice that this is an immediate implication of the fact that the value of securities depends on the expected liquidity of the security over its entire life. Goldreich, Hanke and Nath (2005) have demonstrated this by tracking US Treasury value over liquidity cycles.

11. A downstairs market roughly refers to an organized exchange where all members agree that trades take place publicly in a central venue. In an upstairs market trades take place privately.

to prevent flows from be directed to the upstairs segment. Notice that this conclusion does not even presume that unexpressed demand is very large. In other words, free-riding and internalization practices may themselves be a sufficient incentive for participants to shy away from downstairs markets.

Unquestionably the relevance of unexpressed flows on market structure is not specific to government debt markets. Fx markets serve also as an example of a market where information on customer-specific flows and needs is more easily available to their relationship banks. The special intensity of a similar phenomenon in the case of debt instruments has to do with the dynamic effects arising from their finite life to maturity.

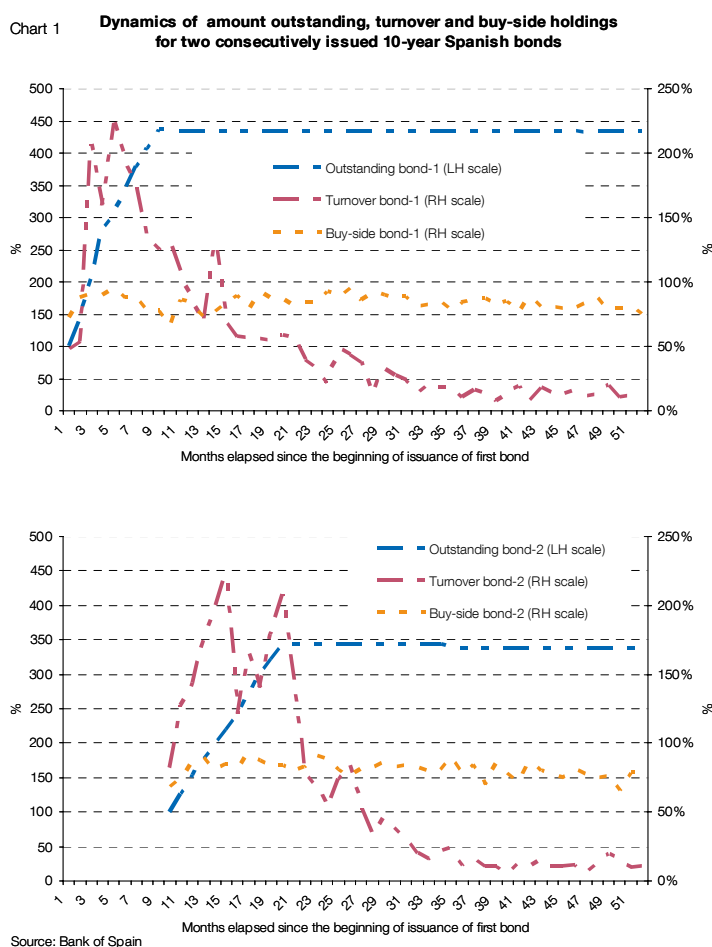
Finite life to maturity decisively conforms the liquidity profile of debt instruments. In the most general terms, its working is based on the heterogeneity effects triggered by the mere flow of time. More specifically, finite life to maturity segments the overall pool of liquidity for a well defined asset-class of bonds into much smaller portions. The precise segmentation mechanism may vary. For example, asset-liability matching may lead to the emergence of investor clienteles with defined preferences in terms of duration. Tax distortions also tend to segment the overall pool outstanding between seasoned and new issues. Importantly, finite life to maturity implies, in addition, that a pre-programmed mechanism of liquidity provision is accessible to investors. Importantly, this intrinsic source of liquidity provision in the case of debt securities may work at times as a substitute for market-based liquidity.

All in all, the operation of those segmentation mechanisms leads to an inexorable tendency of bonds to become illiquid as time goes by. Debt holdings on the buy-side thus gradually tend to abandon markets that operate exclusively on the basis of price signals. Chart 1 provides an example of the dynamics of liquidity, nominal outstanding and holdings on the buy-side for the Spanish market.

Information amassed by brokers and dealers on the distribution of inventory holdings bonds across investors empowers them to revive the expression of those liquidity pools in the market. Importantly, the operation of this information-based location of trading interests precludes total anonymity in secondary markets. However, as mentioned earlier, identity revelation is not unimportant. Madigan and Stehm (1994) report as an important reason for anonymity in the US brokered Treasury market the need to protect information on speculative positions, inventories and proprietary flows. In this regard, it is significant that direct bilateral trading, i.e. non-anonymous trading, still guarantees some opacity.

Liquidity segmentation typically deserves public efforts to redress its consequences, in both the primary and the secondary government debt markets. In

this regard, it is worth recalling that liquidity-building considerations also shape widespread practices in this field, such as benchmark-based issuance policies¹². Government debt issuers thus recognize that bond placement in the primary market may end up reflecting any transaction costs prevailing downwards in the debt distribution chain.



However, the focus of the paper is liquidity in the secondary market. Section 7.2 will address examples of public initiatives in the secondary markets for government debt that depart from practices seen in equities markets. But previously we must address in detail how microstructure conditions those interventions. Finally, we conclude this section by referring to a largely private innovation which has been highly significant in developed bond markets as a way to overcome the effects of liquidity segmentation across debt instruments, namely futures on government debt. These facilitate price discovery and hedging by concentrating trading interests on a notional bond backed by a basket of deliverable bonds that can be transferred on a single date. Although derivatives regulation is outside the scope of this paper, it is

¹² Issuance policies based on fungible benchmarks have received broad acceptance as a way to make gradual funding compatible with liquid instruments build-up.

noteworthy that futures market structure and regulation have typically followed specific routes quite distinct from those followed by the cash market.

5 Which sort of market structure?

Trade size, execution mechanism and fragmentation

The preceding section stressed that information asymmetry about latent liquidity pools favours upstairs markets over centralized venues for government debt trading. However, that case is still incomplete in a number of important points. To start with, the impact of trade size on preferred structure is an argument that was taken for granted in the preceding section. In this regard, Sections 5.1 and 5.2 will discuss the reasons why the execution of large trades in limit order books exhibits intrinsic pricing inefficiencies. Recall that this general conclusion reinforces the importance of unexpressed liquidity search mechanisms, as noted in Section 4.

However, the analysis will be based on considerations broader than just pricing efficiency. The arguments take into account the fact that limit order books and dealer markets also differ in terms of immediacy, anonymity, visibility of order flows, scope for manipulation, post-trade reporting and re-trading opportunities.

Assuredly, broadening the scope of the discussion limits the optimality of results. This remark is of practical relevance because it is rather the opposite situation, i.e. the achievement of unequivocal conclusions, which potentially entails two types of errors. The first arises because of convenient assumptions often made in microstructure literature to avoid the complex economics of fragmented trading venues. Hence, the echo from economic theory received by regulators and policy-makers emphasizes the merits of transparent centralized venues as liquidity enhancing environments (see Pagano and Röell (1996) and Glosten (1994)). However, such recommendations essentially rely on the alleged mitigation of information asymmetry effects: the more transparently the market operates, the more price-setters know about order flow and, consequently, the better they can protect themselves against insiders. The bid-ask spread in an auction market would thus be tighter than in a dealership-based one. However, the irrelevance of classical asymmetric information effects calls into question the outright validity of these conclusions. Moreover, one also needs to consider trading environments based on search-bargain mechanisms to reach generally valid conclusions (see Section 5.3).

A second potential type of error has a more direct policy-making component: the lack of a clear understanding of the relative merits of different trading arrangements may bias regulatory arrangements towards the controllability afforded by stock exchange-like arrangements. Actually, historical inertia works in favour of such a situation, since exchanges were conceived to a large extent as trading settings also serving for regulatory purposes. High-level regulatory protection is still a distinctive feature of exchanges nowadays, even though rule-makers have struggled to make them compatible with block trading, internalization practices and other activities above and beyond the direct monitoring of the exchange operator.

Based on a faulty economic model, lighter regulation of government debt markets might thus invite the cynical conclusion that political economy reasons, rather than efficiency considerations, account for their special treatment. As a matter of fact, such thinking might also find support in the apparent paradox that the public-law profile of stock exchanges has historically been closely linked in most countries to their role as a venue for government securities trading¹³. Currently, such extensive public involvement in stock exchange matters contrasts strongly with the widespread detachment of government debt trading from the physical and regulatory constraints imposed by exchange-like venues.

However, the paradox is just apparent. Fragmentation is not an exclusive feature of government debt markets. The range of financial instruments traded in over-the-counter settings is much broader than that of exchange-based instruments. In fact, the National Market System (NMS) in the US and the European Directive on Markets in Financial Instruments (MiFID) have struggled to make a diversity of trading venues compatible with far-reaching investor protection in equity markets. In this regard, the difficulties met by the NMS concept in simultaneously satisfying those goals will be highlighted in Section 5.5, due to their relevance for (fragmented) debt markets.

5.1 Trade size and price discrimination

Viswanathan and Wang (2002) analyze the influence of trade size on market structure. They compare customers' welfare across three different market structures: limit order books, dealership markets and hybrid markets. They conclude that pure dealership markets perform poorly for small orders and limit order books are inefficient in handling large order sizes. Furthermore, they also manage to establish the superiority of hybrid market structures where smaller orders are directed to a limited order book and large orders are executed on the dealership side of the market.

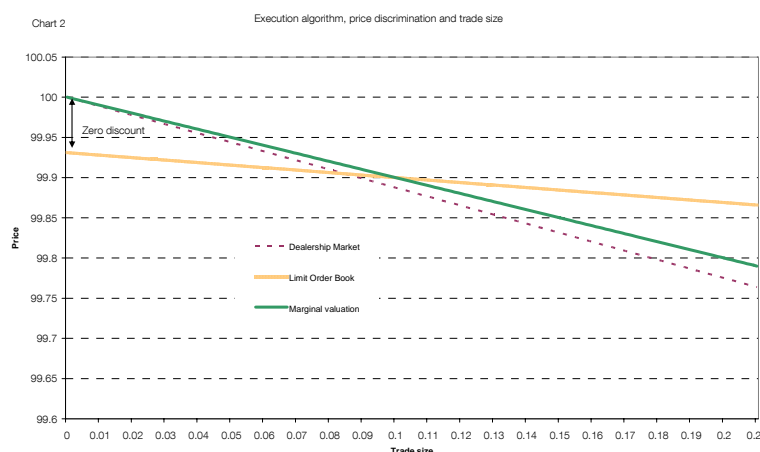
Their conclusions are thus consistent with the increasing convergence of equity markets towards hybrid arrangements. Importantly, their comparative analysis sheds light on another reason for the fact that government debt markets tend to be structured as dealership ones. The scale of trades in government bonds makes limit order book algorithms a costly way to provide liquidity.

A brief inspection of the economic mechanisms underlying these results helps to gauge their broad scope. In essence, the results on trade size and market

13. For example, the Austrian empire is reported to have mandated the creation of an exchange back in 1771 and the closure of existing ones so as to facilitate trading of government bonds heavily issued during the period. A strong role for the government either as owner, operator or supervisor of exchanges also features in the French, German or Spanish traditions, although these functions were not exclusively linked to government debt trading. The New York Stock Exchange was also originally the place to trade government debt Levitt (1998).

architecture are driven by a trade-off between two features of liquidity provision in equilibrium: bid-shading and a zero-quantity bid-ask spread.

Bid shading, i.e. posting price schedules inferior to the marginal valuation of the asset being traded, is a practice that affects both limit order book and dealership markets where intermediaries exhibit some market power. However, whereas the amount of bid-shading in a dealership market is increasing in the quantity effectively traded, that in a limit order book is negatively related to it. Ultimately, this conclusion is understandable because the price bid for a given quantity in a limit order book affects the effective price paid for higher allocations, whereas the cost paid under the single-price mechanism underlying dealership-based execution is independent of prices quoted for smaller quantities. The discriminatory nature of limit order books thus increases bidding aggressiveness, albeit at a cost. Since the bid for the first marginal unit affects the total payment for any allocation to the dealer, he rationally concentrates at that point the whole amount of his bid-shading for the expected traded size. In other words, leaving aside other costs, dealers tend to quote a zero-quantity bid-ask spread in a limit order book. Note that the trade-off can be graphically portrayed (see Chart 2) as the one affecting total trading costs when bidding distortions are channelled through both the inside quote and the slope of the book or through only the latter.



Interestingly, the dominance of a dealership market for risk-averse customers is not unrestricted. The winner's curse mechanism that determines the spread widening effect just described is more intense when the number of intermediaries is large enough. Viswanathan and Wang demonstrate that in these highly competitive environments a hybrid limit order/dealership structure dominates. Thus segmentation of retail and professional trading environments also finds a microstructure support. Section 7.4 briefly describes secondary market arrangements specifically devised for retail investors.

Flögel and Keszy (2004) empirically confirm for the German market that, in effect, trade size is a differentiating variable in the three segments for which data are available, namely stock exchange, direct trading and brokered trading. BearingPoint

(2005) also finds for the German debt market that larger inter-dealer trades are made bilaterally, whereas smaller ones tend to be matched in electronic limit order books.

5.2 Trade size, electronic debt market platforms and immediacy

“Electronic debt markets” is too broad a topic to be covered entirely in this short section. The remarks made here will basically focus on conceptual issues bearing on the type of electronic platforms suitable for government debt trading. Sections 7.2 and 7.6 will discuss some regulatory implications of the conclusions drawn here.

Electronic technology enables both innovation and alternative implementation of ordinary processes. Consistent with this general principle, it must be recognized that a discussion of the suitability of electronic technology in government debt markets is an ill-posed one. Decisively, emulation of over-the-counter market practices by electronic means is also an alternative, as we will see later on. The range of architectures is certainly broader. As a basic reference, an Annex contains a glossary of the different types of fixed-income electronic trading platforms and providers as compiled by the Bond Markets Association.

Therefore, the relevant question addressed in this section relates to the connection between platform architecture and trade size. However, the formulation of a vague question serves to highlight a (mistaken) association often made between electronic markets and limit order books, i.e. the Walrasian-like way of conducting search, price discovery and order execution. Glosten (1994) offers a remarkable example of such an affiliation between electronic markets and limit order book-based trading systems. In this regard, this section asserts not only that the association proves to be wrong, but also that, were it correct, electronic trading would not suit wholesale government bond trading.

The structural stability of limit order books has been cogently questioned by Black (1995). Participation in trading environments based on visible limit order books operating under price-time priority criteria is subject to appreciable hindrances. More concretely, a conventional limit order sent to the market means that valuable options are given away for free to the rest of the market participants. Moreover, a limit order rapidly becomes outdated as the market moves and, consequently, private management of order book exposure is costly. Even social costs may emerge, because bandwidth and other unpriced resources are lavished on frequent cancellations/updates of orders sent to the market.

Obviously, reconciling such categorical criticism of limit order book-based markets and their prevalence in stock exchange environments requires that noise traders play an important role. Indeed, there is evidence that individual investors may earn money speculating on stock exchanges, but they tend to lose money trading (see Barber and Odean (2003)). In other words, the criticism of limit order books

would apply more specifically to their adoption in wholesale markets. Constituting a puzzle in this regard is the fact that European government debt markets have embraced of late platforms operating similarly to limit order books, namely MTS and SENAF¹⁴. They function under such architecture, albeit with the important additional feature that they are endowed with participants acting as specialists. The specialist component of the arrangement will be analyzed in Sections 7.2 and 7.6.

Let us now delve into the economic nature of this puzzle by first examining the way in which the interaction between the features of limit order book-based markets and the large size of trading interests distorts the cost of liquidity provision. By definition, limit orders are digital American options with strike equal to the execution price. Importantly, they are “sold” without an explicit premium as reward. Obviously, the magnitude of this free-options problem is magnified when traders must post simultaneously free options to buy and sell, as has been long the case in MTS due to the specialist component of the arrangement.

The theory goes that limit order traders are possibly paid for with the bid-ask spread. However, the odds for this contingent premium crucially depend on the presence of numerous noise traders, i.e. agents ready to unconditionally buy at the ask and sell at the bid. However, the chances of such a remuneration mechanism being operational diminish when the minimum trade size is large or when traders are professionals. In this sort of context, there is an incentive for liquidity providers to contain their risk exposure by widening their quoted spreads or by reducing inside depth. Notice that in this way, the scope to carry out trades inside the spread outside the electronic platform, something already pointed out in Section 5.1, gets reinforced. Furthermore, the intensity of this elusive behaviour tends to increase in conditions of market turmoil. Hence, reliance on just one centralized trading venue can be problematic under market distress conditions.

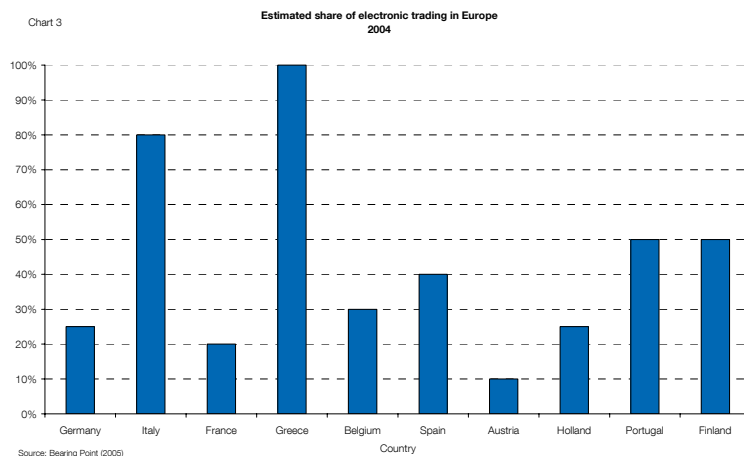
The uneven performance of different MTS domestic markets across Europe¹⁵ (see Chart 3) is not inconsistent with the notion that a significant number of noise traders may be needed to ensure limit order book stability. In effect, MTS is a network of different segments for domestic government debt across Europe. Domestic MTS markets across Europe exhibit a core of analogous features, leaving aside the number and variety of trader types. In this regard, it is notable that the most successful segment, MTS Italy, has a larger group of market participants constrained so as only to be able to submit market orders, i.e. orders whose execution is not subject to a particular price.

The above-described distorting effect of limit order exposure cannot be substantially mitigated by recourse to hidden limit orders, i.e. to staged partially visible ones. Hidden orders definitely express the same pre-committed exposure to

¹⁴. See Annex 1 for a brief description of the systems.

¹⁵. BearingPoint (2005) reports that electronic trading contracted by nearly 30% in 2004.

risk as pure limit orders. In addition, they may alleviate a second problem that limit order books exhibit when large trade interests have to be matched, i.e. that sizable and visible limit orders may entice free-riding among the trading community if size is interpreted as a signal of valuable information. Free-riding is documented as taking the form of parasitic behaviour, i.e. attempts to trade ahead of the large quoted depth¹⁶. Consequently, large traders have incentives to lower visible quoted depth as a pre-emptive protection.



As already pointed out, hidden orders are a potential solution to the problem. Most stock exchanges include this type of order in their palette, and MTS also does. In stock exchanges, the use of hidden orders has been traced mainly to large liquidity motivated investors (see Pardo and Pascual (2004)). Interestingly, there are indications that the hidden portion of limit orders would never be exposed if that possibility was ever abolished (see Anand and Weaber (2004)). In other words, if they could not resort to hidden orders, large traders would either trade outside the transparent venue or trade dynamically.

Dynamic splitting of orders is an alternative to hidden order placement even when these are accessible in the electronic system considered. Dynamic management of execution provides large liquidity suppliers with two clear benefits. First, they can control the amount of options given away for free. And, more importantly, their dynamic control over order placement enables them to efficiently discover liquidity, i.e. to minimize the price-impact costs of large trades. The crucial condition for the dynamic splitting of orders is that traders can learn from market conditions and accommodate their response without revealing information themselves.

Interestingly, the brokered inter-dealer market for government debt in the US seems to have been specifically designed with such size-of-trade concerns in mind. Boni and Leach (2001) provide evidence that dealers use “expandable limit order

¹⁶. Actually, MTS adopted anonymous pre-trading 1997 in order to avoid problems from free-riding. See Scalia and Vacca (2001).

strategies” to reduce costs associated with information leakage and stale limit orders, especially when their trading interests are sizable. “Expandable limit order placement” describes the trading protocol used in the relatively opaque brokered US market, in which a limit order that gets some accepting response does not lead automatically to a trade, but triggers a negotiating period, during which the dealers involved grant each other a series of right-of refusal options (“work-ups”) to transact additional volume at the initial price.

Liquidity discovery can thus evolve to a large extent confidentially: only inside quotes and posted depths are visible to the community during the whole process. The US brokered markets thus seem on the surface to be more “opaque” than their European counterparts, where typically prices and depths up to the five best buy and sell positions are visible. On the negative side, Boni and Leach note that the “expandable limit order” protocol may constrain execution immediacy because of its inherent tendency to create queues during work-ups. A feature of the US market that alleviates this risk is competition among brokers. In other words, a diversity of limit order books managed by different brokers enables them to circumvent queues built during work-ups. Interestingly, this insight renders invalid any effort to apply a similar protocol in a trading framework with just a single platform.

From a conceptual perspective, it is worthwhile to contrast the alternative execution mechanisms examined so far in this section. Electronic brokers in the US inter-dealer market try to respond to the trade-off between price discovery and liquidity discovery with features that minimize risk exposure and foster participation. On the contrary, European inter-dealer markets operate on the basis of highly transparent pure limit order books. Section 7.6 will argue that the significance of inter-dealer markets (see Section 5.4) together with the flexibility and monitoring capabilities afforded by electronic technology may have created an incentive to over-regulate the wholesale market in Europe.

It would be misleading if this section on electronic platforms did not mention the role of trading architectures that circumvent the drawbacks of limit order books. In this regard, multi-dealer and single dealer systems (see Annex) enable dealers to compete in terms of price for customers’ liquidity. As mentioned above, the incentive to shade bids is lower under such a form of competition that emulates the request-of-quote trading protocol found in bilateral markets. As a matter of fact, anecdotal evidence indicates that leading markets exhibiting this architecture, like Tradeweb, are chasing significant market share in the dealer-institutional customer business. Furthermore, the complementary roles of inter-dealer trading and internalization (see Section 5.4) might lead to a contraction of inter-dealer platforms if eventually customer-dealer electronic platforms directly cater for the needs of both dealers and customers.

Admittedly, multi-dealer markets also pose some risks. Section 7.2 briefly points out the competition-related challenges they may pose. Still, it must be

recognized that electronic customer-dealer markets enable both internal and external controllers to smoothly monitor compliance with rules.

5.3 Fragmented markets

Sections 5.1 and 5.2 have highlighted the fact that the widening of inside spreads or the tightening of inside depth in exchange-like trading venues leaves room to trade outside the centralized market. An examination of insights from the economics of fragmented markets is, thus, a necessary input for the analysis of government bond markets.

Liquidity provision outside centralized venues typically must rely on dealers. Grossman and Miller (1988) have stressed the role of dealer markets as environments where liquidity is understood to guarantee immediacy and certainty. Dealers stand ready to bridge the time gap separating large buyers and sellers accumulating inventories. Customer order executions can thus be completed without delays and without impact costs. Importantly, Grossman and Miller downplayed the usefulness of the bid-ask spread as a valid measure of liquidity in a dealer environment: the asynchronous matching of buyers and sellers necessarily implies that the dealer must maintain some exposure to risk in the form of inventories before a round-trip is completed. A similar line of reasoning asserts that the spread quoted is not a valid measure of the cost of immediacy for the customer when his order is large. If he wishes to sell, he is likely to pay more attention to the change in the bid over time than to the size of the bid-ask spread.

The assessment of dealer-based government debt markets inexcusably requires search costs to be factored into the analysis. Their typically opaque OTC features must be overcome with search efforts that in the past took place mostly by telephone. Admittedly, one might envisage costly implementations of dealer markets that nevertheless exhibit a “skeleton”, like Nasdaq. Actually, electronic multi-dealer platforms that emulate the workings of the OTC market and offer lower search costs are thriving, as pointed out before. Still, the easier market exploration provided by this type of platforms may come at an explicit price that, ultimately, should be regarded as similar to search costs¹⁷. A deeper understanding of the specific mechanisms brought about by the presence of OTC segments where government bonds can also be traded requires us to take a broader perspective, because search-based markets operate on the basis of bargain mechanisms.

In a search-bargain framework, Rubinstein and Wolinsky (1987) have shown that middlemen are active in search-based markets if they are able to meet buyers more easily than sellers can find buyers themselves. This reflects the fact that the

¹⁷. Interestingly, multi-dealer platforms have altered the qualitative economics of (search) costs in secondary markets for government debt in that it is mainly dealers who pay for the matching services provided by the platform. This feature, also found in other double-sided markets, raises interesting questions about the long-term stability of such pricing arrangements.

probability of a buyer and a seller coming across each other determines the magnitude of search frictions together with impatience. In this regard, a low probability depends critically on two idiosyncratic features of fixed-income instruments when the services of middlemen are not present. These are the aforementioned tendency of bond liquidity to “abandon” the market and the heterogeneity-driven complexity that debt instruments exhibit.

Specifically, the empirical result reported by Barclay et al. (2004) confirms the previous point by establishing the comparative advantage of voice brokers at finding counterparties in off-the-run US government debt. Barclay et al. model the role of brokers in the pure search process that matches buyers and sellers. They show that the benefits of the better matching technology of voice brokers decline as markets become more active and matches are easier to find. Voice brokers' market share increases dramatically for more difficult trades in less liquid securities and falls off for easier trades in more liquid securities. Having said this, electronic trading platforms nevertheless have a lower marginal cost per trade and are, consequently, in the position to charge lower marginal commissions.

Moreover, Barclay et al. confirm insights given in Section 4 as to the nature of valuable information in government debt markets. When a dealer calls a broker he may get more information than just the price and quantity to which the dealer is willing to commit. This additional qualitative information is most graphically referred in the US market as “market colour”, i.e. the sort of non-payoff relevant information about short-lived variations in supply and demand resulting from interactions between brokers and customers. Human interaction seems to be also fundamental in practice for the execution of other more complex trades like switches and bases, i.e. trades involving various debt instruments and their relative prices.

The role of “market colour” indicates that stylized models in the Rubinstein tradition necessarily fall short of modelling the multilayered intermediation structure observed in fragmented government debt markets. Liquidity pools are segmented according to multifaceted and dynamic mechanisms, where the “network” of clientele-intermediary relationships is determinant. In other words, competition for liquidity pools is the driver of the network “geometry”. Segmentation in clientele markets has significant regulatory implications. Vayanos and Wang (2002) show that clientele effects quite naturally bring about liquidity premia and endogenous concentration of liquidity. Sections 7.2 and 7.4 will elaborate on the regulatory protections that need to be instituted in fragmented settings where clientele can be exploited.

Notice that the “network” of customers-intermediaries naturally exhibits a vertical structure defined in terms of their scale of operations. A market participant can act either as an intermediary or as an investor, depending on the size of the trade and on its legal personality. Ultimately, this reflects the existing diversity of intermediation capabilities, i.e. of variables like capital endowment, risk tolerance and knowledge that support inventories of securities to facilitate trading.

Given that complex overall structure, it comes as no surprise that the academic literature comparing the performance of pre-trade transparent and fragmented markets is scant, even if the context considered is free of adverse selection problems. In this regard, Yin (2004) has settled the impasse arising from the diverging conclusions reached by Biais (1993) and Frutos and Manzano (2002) with regard to the relative spreads expected to prevail in otherwise equal auction-based and dealership-based markets where liquidity-motivated traders rely on voluntary liquidity supply by risk-averse market makers. Biais claimed the irrelevance of market structure, whereas Frutos and Manzano made the case that smaller spreads had to be found in a fragmented setting.

Interestingly, Yin demonstrates that the spread in a dealership market has to be wider than the inside spread in a centralized one. The key argument reversing the result of previous studies is search costs. If one neglects them, dealer competition is found to be as fierce as that in an auction setting. One might thus be inclined to assume that the competition triggered by market exposure visibility is the main culprit of the intermediaries' apparent preference for fragmented settings. However, caution should be exercised in accepting this conclusion because the relative impact of trade-size driven execution costs and search costs is not factored in by the analysis of the aforementioned authors.

In any event, an undisputed remark made in all these papers is that fragmented markets lead to inefficient risk sharing among dealers relative to the performance of centralized markets in that regard. The reason is that in a centralized market it is always the dealer with the largest (smallest) inventory who effectively sells to (buys from) the public, whereas in a fragmented market the force of search costs and uncertainty mean that deals are not necessarily inventory efficient. In other words, *ceteris paribus*, a fragmented market results in a more uneven post-trade distribution of inventories, and, consequently, the dealers in the fragmented market have to bear greater aggregate price risk.

5.4 Inter-dealer markets

Inefficient risk sharing in the OTC market confers a special role on inter-dealer markets. In effect, a divergence between the distributions of risk exposure and risk-bearing ability across dealers leads either to inter-dealer trading (Ho and Stoll (1983)) or to revisions in the prices quoted to customers. Internalization and inter-dealer trading may thus act as partial substitutes in a fragmented market in terms of their contribution to risk sharing. Importantly, futures on bonds are instrumental for the first alternative, since they enable dealers to temporarily run excess inventories with less risk. Also, less than perfect risk sharing in the lower levels of the "market pyramid" ends up having a cumulative impact on risk-sharing requirements in the upper inter-dealer market. In other words, efficient wholesale re-insurance mechanisms at the wholesale "pinnacle" are a precondition for a fluid development of the overall market.

We will see later on how the central status of inter-dealer government debt markets makes them the main regulatory targets if they trade in a somewhat centralized venue. Public authorities may get a sense of control over the whole market by regulating some aspects of the inter-dealer government debt market.

However, it is important to stress that the feasibility of any potential regulatory initiatives affecting inter-dealer markets may be subject to the relevant participation constraints. Direct trading among larger players is an alternative to brokered or electronic inter-dealer operations. In this regard, it should be pointed out that the coexistence of bilateral and brokered inter-dealer trading operates under the rules of a subtle “ecology”. Miao (2004) shows in a very stylized setting how the balance between search-based friction costs and execution costs may shift dealers from one type of venue to the other.

Brokered inter-dealer government debt markets can be said to basically conform to two different working principles. On the one hand, there are inter-dealer markets like those in the US, where brokerage services are arranged with the basic aim of facilitating arbitrage of price dispersion across member dealers (see Garbade (1978)). Therefore, participation in these systems balances risk-sharing and profit seeking.

On the other hand, an economic model of inter-dealer government debt markets is widespread in Europe where members must engage in explicit trading commitments. The economic role ascribed to the qualified members of these markets thus amounts to the production of a public good called “liquidity”. As already mentioned in Section 5.3, MTS is an example of an inter-dealer market where specialists commit themselves to two-way quotes for minimum amounts. The apparently mutual commitment made by MTS dealers has merited the revealing name of “liquidity pact” (see Pagano and von Thadden (2005)).

From an economic perspective, it should be kept in mind that as a matter of principle the robustness of pacts is limited by the operation of time-inconsistency effects. As we will discuss in Section 7.5, the disruptive trades by Citigroup in MTS in August 2005 vividly illustrate this point. Ultimately, the economic lesson that will be drawn from this episode is that the design of an inter-dealer broker system should not overlook its dual nature in that cooperation in terms of risk-sharing and competition for business sets up a subtle balance for participants’ incentives¹⁸. From this perspective, it is no surprise that inter-dealer markets driven by arbitrage forces are more robust. The old Friedman dictum applies, that speculators and proprietary traders convey stabilizing properties to the market.

¹⁸. In addition, the market may serve as a vehicle for speculation.

Arbitrage-based inter-dealer systems cannot be expected to be equivalent to market-maker based ones in any features other than robustness. Actually, they should not be, because participants play a similar game, albeit with different strategies. Therefore, the designers and regulators of inter-dealer markets must ascertain the sort of inter-dealer strategy that best suits the market as a whole.

Such assessment should consider the unconstrained incentives on the participants' side. In this regard, the Fx market offers a valid example of inter-dealer market strategy choice. Lyons (1996) notes that order flow is the sole channel through which private information is revealed in the inter-dealer Fx market, since using quotes to signal information is never optimal. This is a direct consequence of avoidance of arbitrage in a market where quoted sizes are large and spreads thin, i.e. where there is little room for signalling with quotes without being arbitrated.

A second disincentive to the posting of quote signals pointed out by Lyons has to do with the balance that results in terms of risk-sharing. More specifically, in an inter-dealer setting, where simultaneous trading prevails, posting quote signals increases the volatility of the quoting dealer's position due to the effect of other dealers' hits. Ultimately, this is so because providing information in quotes reduces the price risk faced by the dealer receiving the quote, which increases quantity demanded, *ceteris paribus*. The quantity demanded becomes the quoting dealer's position disturbance.

In other words, posting quote signals has destabilizing properties in an inter-dealer market that operates in a seamless, simultaneous manner. From this perspective, the US market inter-dealer trading protocol described in Section 5.2 can be said to better address the nature of the problem than European versions. In this regard, the quotation rules faced by MTS specialists correspond more closely to price-based competition.

The participation constraint emphasized so far reflects that the strategies of dealers are determined not only by the trading environment, but also by dealers' underlying preferences. Saporta (1997) provides an analysis in this respect. She models their choice between direct and brokered inter-dealer trading, as one between price and price-schedule competition. The aforementioned obstacles to quote-based competition in a multilateral setting are not expected to arise in an opaque bilateral one. Although Saporta's analysis does not model the "hot potato"¹⁹ profile of inter-dealer trading, she sheds light on the delicate ecology governing dealer preferences for one or another type of trading venue.

Dealer profits and their variance depend on the type of market structure and on exogenous parameters like risk-aversion, asset volatility, number of players, etc. The endogenous choice of market structure is ultimately determined by the balance

19. The term 'hot potato trading' describes the repeated passing of inventory imbalances between dealers.

between the beneficial effects in terms of risk-sharing under price-schedule competition and the advantage of price-based competition, as well as by the effects that different parameter configurations have on that balance. In particular, a relevant conclusion drawing on this analysis states that dealers prefer a multilateral setting when their number exceeds some critical level. Otherwise, they would stick to bilateral trading²⁰.

From a policy perspective, the endogeneity of inter-dealer market structure has a clear implication regarding the impact of regulatory market structure solutions. This is that the only way they would yield similar intermediation conditions for the buy side would be either to compensate dealers for a second-best market structure or to force them to operate in an unaltered way. The latter alternative is obviously not feasible.

5.5 Fragmented markets and regulatory protections

The analysis of government debt markets has so far indicated its propensity to adopt a fragmented structure and the need for certain inter-dealer trading venues. Furthermore, electronic technology has been found to be capable of facilitating the operation of government debt markets without necessarily altering their microstructure, by emulating the OTC functionality. Electronic pure limit order books are considered to be rather unstable in applications to wholesale government debt markets.

Fragmented market structures decisively alter the feasibility and type of regulation. Two basic features account for this. Firstly, the observability of relevant market developments is seriously impaired. Secondly, some regulatory protections justified in centralized trading environments are no longer reasonable public goals in disperse trading environments.

These problems and challenges are not fully specific to government debt markets²¹. The regulatory challenges faced in U.S. equity markets when the National Market System (NMS) was updated highlight the regulatory trade-offs arising in disperse trading environments. A brief discussion of this case is also enlightening for the purposes of this paper, because it illustrates the role played by competition in securities markets as an overarching regulatory protection.

The NMS is a US regulatory construct for equity markets with a set of high-level goals, a crucial one of which is competition across markets. In other words, intrinsic to the NMS concept is the recognition of the benefits of a diversity of trading

20. Other static comparative results from Saporta's conclusions are that sufficiently large decreases in risk-aversion, volatility or liquidity trading shift inter-dealer preferences from the IBD to the direct market.

21. See Board, Sutcliffe and Wells (2001) for a general discussion of the challenges of regulating fragmented environments.

venues. Achieving a functioning single market required some mechanism for linking different venues. The Intermarket Trading system (ITS) has long provided that nexus via a consolidated quotation system and an order-routing rule based on the priority of prices. However, this costly arrangement has been widely criticized as a faulty regulatory solution. Macey and O'Hara (1997) have shown that best-execution is not a feasible goal in such a fragmented setting. More generally, most authors have criticized the one-size-fits-all framework that the NMS concept enshrines.

More specifically, there is wide agreement that the multidimensional attributes of liquidity render inefficient any scheme that directs order routing on the basis of some uniform metric like best price. Arrangements aimed at ensuring market-wide transparency also exhibit structural weaknesses. As pointed out by O'Hara (2004)²², remunerating quote and trade dissemination somehow expropriates the real providers of the public good, i.e. buyer and sellers rather than the markets themselves. All in all, the reform of NMS has become a hot topic on the SEC agenda. As O'Hara has summarized, "the challenge facing the SEC is to enhance the competition for order without [...] weakening the market fundamentals of liquidity and price discovery...".

In government debt markets, competition has long been a surrogate of various regulatory protections. Notwithstanding registering requirements, access of intermediaries to the condition of dealer ensures a level of participation only limited by dealers' reservation utility. Grossman and Miller (1988) show that the number of dealers entering a free market is proportional to price and flow volatility, and inversely proportional to entry costs.

Admittedly, their model does not represent adequately the actual degree of competition in every market segment of government debt markets if a primary dealer system is in place. More specifically, a primary dealer system operates by limiting the number of dealers allocated the largest chunks of any bond placement. Viswanathan and Wang (2004) show that part of the "hot potato" pattern of trading found in dealer markets may be due to the materialization of oligopolistic rents in the dealer distribution pyramid. Interestingly, this view suggests that a large volume of trading in the dealer market may be indicative of scant competition in layers below the primary dealer one, i.e. an excessively high pyramid. An issuer concerned about its issuance cost should thus foster a broad, shallow distribution pyramid.

The efficiency of competition as a surrogate of other regulatory protections has not been studied in depth. To start with, observability constraints tend to render unfeasible such an endeavour in totally fragmented government debt markets, i.e.

22. Maureen O'Hara, (2004), "Searching for a New Center: U.S Securities Markets in Transition", Economic Review, Fourth Quarter, Federal Reserve Bank of Atlanta.

those lacking some regulatory backbone akin to the NMS²³. However, economic theory still gives us some hints as to the impact of competition on transparency, welfare and resiliency in a securities dealership market.

Gotardi and Serrano (2004) study the interaction between intermediaries' market power and information revelation through dynamic trading in a search model where buyers resort to the services of intermediaries. The market power of the latter is determined by two factors: their market share and their informational status. The fact that trade with the buy side takes place over an extended period of time means that current competition between intermediaries has dynamic effects on future competition. In this set-up resembling the essence of OTC trading venues, Gotardi and Serrano identify the microstructure pillars of transparency and competition as facilitators of information revelation. Wolinski (1990) had shown before that the operation of "raw" pairwise-meeting markets does not guarantee trading based information revelation.

On the contrary, Gotardi and Serrano report that transparency, i.e. observability of prices and trades, and freedom to choose the intermediary, assure information revelation. Interestingly, they also show that this conclusion is most sensible to assumptions about price competition among intermediaries. Specifically, information revelation cannot be assured if the trading set-up allows for clienteles, i.e. if some buyers are restricted to purchasing from a particular intermediary. Furthermore, they show that competition is a high-powered protection: even if the trading set-up is not transparent, information revelation is fully achieved if the number of intermediaries is high enough.

Undoubtedly, resorting to competition as a sort of "intermediate target" of regulatory goals requires a revision of long-standing attitudes in securities regulation. The regulator must come to terms with the possibility that Walrasian convergence towards one price does not apply. In other words, economic equilibrium may be achieved on the basis of a distribution of prices reflecting an underlying heterogeneity. Regulators have over many years attempted to protect investors against the possibility that they might not get the best price available in the market when they want to trade. However, customers in other contexts seem quite content to receive prices for identical products that differ depending on how much research or effort went into the purchase process. One wonders why a commodity like liquidity provision should obey different rules. To draw a practical conclusion from these remarks, the guidelines employed in characterization of the best execution of a trade should recognize their prospective and statistical nature.

23. In some debt markets, like the Spanish one, the post-trade infrastructure has traditionally been exploited as a (cheap) backbone serving public policy goals pertaining to the primary and secondary markets. See section 7 for further details.

In the same vein, government debt regulators should understand the subtle effects of competition in search-bargain trading environments for assets free from classical asymmetric information effects. As pointed out by Duffie et al. (2003), bid-ask spreads quoted to investors are lower if they can more easily find other counterparties by themselves or if they can more easily approach other dealers. In other words, “sophisticated” investors get tighter spreads. This result contrasts with the traditional conclusion from information-based theories, which predict that more sophisticated investors would get wider spreads to compensate the risk they pose to the market maker. In line with these arguments are the results reported by Green, Hollifield, and Schurhoff (2004), who find a negative relationship between bid-ask spreads and deal size in the US municipal bond market, as well as conclusions by Mende et al. (2004), who identify a similar pattern in the FX market.

In practice, the implementation of a competition-based regulatory approach requires putting the focus on open architecture. OTC trading venues tend to naturally accommodate to this feature. Still, investor-dealer relationships may be blocked by the effect of bundled services provision. In the same vein, centralized trading venues may develop incentives to lock in participants and to limit their interaction with other market centres. Retail investors definitely suffer most seriously from clientele-related extractions of rent when trading with professional counterparties who have more information and a local monopoly. Section 7.4 describes some practical initiatives to limit the scope of these anti-competitive practices in government debt markets. A conclusion that may be drawn from this cursory examination is that open architecture and retail protection are the main protective features across markets.

Admittedly, transparency can reinforce competition in fragmented markets where search costs are significant. It may thus become a valuable regulatory principle also for government debt markets. However, the subtle working of transparency in debt markets seems to prevent a blanket application of that protection to the overall market. Retail investors are expected to benefit from transparency because their search costs are highest. Competition, integrity and confidence in the retail market should therefore improve together with quote and trade transparency. However, the need for high pre-trade and post-trade transparency in a professionals’ market is more contentious.

It may be argued that transparency accelerates price discovery in government debt markets. However, pre-trade transparency requirements are not a *sine qua non* for the actual survival of this market due to its low levels of adverse selection risk. Actually, the potential of price discovery based on non-binding signals is firmly rooted in large segments of the foreign exchange and secondary bond markets. Signalling mechanisms in institutional markets typically operate on the basis of reputational mechanisms that eliminate “cheap talk” and possible trigger bargaining. Incidentally, the pre-opening session of some stock exchanges also relies on signalling mechanisms to set initial prices.

Bloomfield and O'Hara (1999) have analyzed the role of transparency in a dealer-based market on a less conjectural basis. Their experiment-based analysis also underpins the need for caution in interpreting market transparency. More specifically, they offer evidence that higher transparency does not necessarily lead to greater aggregate welfare. Rather, the improved informational efficiency of the market may be "purchased at the expense of greater transactional inefficiency" because of its potentially detrimental effect on competition for order flow. Moreover, based on their general analysis, Bloomfield and O'Hara also conjecture that the higher the extent of liquidity-based trading the greater the preference for market opaqueness. In the same vein, liquidity for large trades is considered to improve when existing transparency rules are waived, as usual in upstairs markets.

Government debt markets' features fit quite well with the type of settings where Bloomfield and O'Hara would recommend less transparency. However, two caveats should be made on the validity of those conclusions. First, search costs are not included in the analysis. This may invalid the results if search cost heterogeneity plays a significant role. For example, this might well be the case in a market with significant number of foreign investors. Second, the experiment considered by Bloomfield and O'Hara does not apply to inter-dealer settings, where, as pointed out in Section 5.4, trading rules differ substantially from those in the direct market. More specifically, the trade-off between liquidity and transparency is more intense in the inter-dealer market.

These remarks paradoxically contrast with the regulatory role sometimes ascribed to inter-dealer government debt markets in terms of contribution to price discovery. In other words, inter-dealer government debt markets often become a key target of regulatory actions as a proxy for interventions intended for the overall market. More specifically, a case for a pure limit order book in the inter-dealer market is sometimes wrongly made on transparency grounds. The nature of the temptations that lead to this outcome will be analyzed under the political economy determinants of government debt market regulation, in Section 7.6.

The advance of dealer-customer platforms may further shift the regulatory focus away from transparency. Lyons (1996) shows that, even though dealers may prefer incomplete transparency in a multiple-dealer set-up, an overly radical reduction would inhibit their ability to share risk with customers. In other words, (partial) transparency is a good that multi-dealer platforms will provide.

6 Government debt, central banks and repurchase operations

The specifics of government debt markets cannot be properly judged without a discussion of central banks and repurchase operations (repos). Obviously, the monetary policy implementation scheme in place determines the scope of central bank involvement in the market as an actor in the cash or repo market. In particular, this involvement may reach the point in some countries, like the US, that primary dealers are effectively selected by the central bank. Government debt and

bank reserves distribution thus appear as joint services that primary dealers can provide to the public sector.

It would thus be a surprise if central banks did not contribute to shaping different aspects of government debt markets. The monetary policy origin of repos is a good example of this. However, the utility of repos today goes far beyond monetary policy implementation. Repos serve as a sort of flexible bridge between money-markets and capital markets. In other words, repos can be said to serve two different market communities: the one wishing to buy/sell marketable assets and the one wishing to lend money. Importantly, the importance of a satisfactory integration of these two communities establishes a certain bias for the cash side of government debt markets to exhibit a fragmented structure paralleling that of money markets²⁴.

Ultimately, one can also ascribe to that dual role the key function of repos in modern monetary policy-making: they lend themselves to being exploited by central banks as a lever in the transmission of monetary policy actions to terms relevant for the economic behaviour of agents. Consequently, central banks have traditionally been key sponsors of repo market development and regulation as shown by the fact that the history of the repo dates back to 1917 with the US Federal Reserve executing trades in order to lend funds within the Federal Reserve System. In Europe, the French and Spanish central banks undertook in the late 80s the legal and operational arrangements necessary to set up a repo market that decisively contributed to underpinning the liquidity of the government debt market as well as serving monetary policy implementation purposes.

Banking regulation may also exert significant influence on repo practices²⁵. The credit component of repo activity has understandably deserved specific coverage under Basel II²⁶: the apparently risk-free nature of repos may enable speculators to flexibly take on leveraged positions in government debt. However, the need to contain credit and systemic risks without impairing the smooth provision of finance poses challenges that go beyond capital requirements. Post-trade infrastructure²⁷ and contract law must also conform to the high-leverage, high-

24. Despite several initiatives to set up electronic repo markets (MTS, SENAF, EUREX, etc.), the bulk of repo activity is still in the over the counter market. According to the latest (8th) European Repo Market Survey the market share of electronic repo trading is 21%. Notice that this figure is on the high side due to sample selection bias.

25. One example of this is provided by the Bundesbank minimum reserve requirement for repo financing before 1997. This local monetary policy rule led to a swing of repo business from Frankfurt to London in search of shelter from regulation-induced costs. The competitive conditions required for smaller local players to be active in German government distribution were thus handicapped. The rescission of the rule in January 1997 remedied the situation to some extent.

26. Basel II addresses risks arising in repo business in a richer way than the previous Accord. For example, haircuts acquire for the first time international regulatory recognition as a tool conducive to lower losses given default (comprehensive approach to risk mitigation). Moreover, master netting agreements are also recognized as altering the net risk exposure resulting from repo portfolios. However, roughly speaking, the overall effect for government debt repos is expected to be low due to the higher credit quality of sovereigns.

27. Central Counterparties (CCP) have been viewed as of late as crucial elements of government debt market infrastructure because of their ability to provide lower transaction costs (settlement netting) and risks (set-off). Regulation and design of CCPs is outside the scope of this paper. Nevertheless, it can be pointed out that CCPs exhibit the

turnover and (apparently) low-risk features of repo activity. These remarks are indicative of the breadth of potential issues for discussion in connection with repos. However, I will focus on just two regulatory issues, both essential in shaping further specificities in government debt markets: short-selling and legal contracting practices.

The “bridge-financing” that repos instrument operates on a basis typically not allowed in equity markets. Repurchase and reverse repurchase agreements amount to a temporary exchange (typically a short-term one) of funds in the form of a sale of securities and a simultaneous agreement to repurchase them (or similar ones)²⁸ after a specified time at a given price. Repo trading thus requires that implicitly or explicitly forward transacting is not forbidden. However, the opposite has been the state of affairs in most jurisdictions in the world of equities.

Some of the reasons for restricting forward trade in individual stocks are analyzed in Martinez Resano (2002). Interestingly, similar concerns for government debt instruments either have not surfaced or have been treated differently. UK and Japan are jurisdictions that epitomize the evolutionary nature of criteria in that regard. Even if sometimes reputed as an early promoter of repo markets, the UK government debt market has been a relatively late-comer to liberalized repo markets, precisely because of short-sales concerns. The Central Gilts Office run by the Bank of England had set up in the mid-80s the basis for a repo market restricted to just market makers. However, a fully fledged repo market was introduced only in 1996 after a reform that overcame those concerns. Interestingly, in Japan, after being implicitly restricted, short-selling regained a respectable status as a way to stabilize market fluctuations after 1989. Meanwhile, evidence of the absence of discomfort in other jurisdictions with government debt short-selling practices is provided by the fact that repo markets have developed, not just because of their financing virtues, but also because they enable traders to cover short positions or to support the launch of new products.

In a search for explanations of the differences between short-selling regulation in equity markets and government debt markets, a cynical view that governments treat themselves better than they do private issuers should come to terms with some objective facts. Namely, the fragmentary nature of debt markets across both instruments and markets endows repos with the unique role of flattening liquidity-driven pricing distortions between similar instruments. The “bridging” ability of repos thus affords easy arbitrage of liquidity-motivated

potential to alter the pre-trade structure of markets. For example, repo traders clearing in a CCP may be more likely to engage in longer-term repo transactions than they otherwise would or even trade without knowing their counterparty.

28. It is outside the scope of the paper to cover in detail contracting practices with high legal and idiosyncratic content across jurisdictions. However, it is relevant to point out that substitution, terms used in generic repo contracts, try-party repo arrangements etc. are practicalities that intend to address specific transaction costs.

distortions. In fact, it is becoming best regulatory practice that issuers resort directly to repos to even out distortions in the secondary market (see 7.2).

Legal contracting practices for repo trades crucially shape the regulatory profile of repos. Actually, this accords with recommendations from the transaction costs theory of regulation that the provision of an adequate “enforcement technology”, i.e. law, suffices to prevent market failures. However, the important point stressed here is that different legal traditions may not allow analogous allocation of rights. The existing variety of repo contracts illustrates these difficulties.

Table 2: Repo contractual forms		
	Classic repo	Buy/Sell-back
Return paid to	Cash provider	Cash provider
Return form	Interest	Capital gains
Interim coupons paid to	Cash recipient	Cash provider
Countries	Germany, France US, UK	Italy, Spain

The key legal insight stemming from the economic definition of repos given above lies in the fact that they combine in one transaction buying/selling and borrowing/lending characteristics. In effect, “securities” sold in a repo appear to be bought by one counterparty but only lent by the other. However, the ability of repos to combine both perspectives crucially depends on the scope offered by contract law to simultaneously assign the legal and beneficial title to the buyer while maintaining the economic benefits of the seller. In practice, the solution to this challenging definition of a hybrid instrument has favoured the buying/selling perspective²⁹. However, traces of the dual perspective have remained in the features of the so-called classic repo, whereas sell/buy-backs are free (see Table 2). In effect, in a classic repo the securities seller normally continues to accrue interest on the securities temporarily sold and any coupons which are actually paid during the term of the repo must be passed back to the seller.

Notice that in some jurisdictions an undifferentiated use of both types of contracts entails important legal risk. Courts might re-characterize a classic repo contract as a sort of secured borrowing, with the effect that the bankruptcy of the counterparty would not enable disposal of the securities held, as it happens when the transaction is a buy/sell-back³⁰. Table 2 also shows the standard contract

²⁹. It is interesting to recall the crisis context that triggered standardization of repo contracting, along with other legislative measures on government debt markets. During the 1980s various disasters occurred in the US repo market (Drysdale Securities, Lombard Wall, etc.). Small institutions which were overtrading collapsed leaving repo customers with credit exposures. The inclusion of accrued interest in margin calculations, tighter documentation and the development of tri-party repos can be ascribed to those events.

³⁰. As a reaction to this problem, counterparties in countries with classic repo contracts developed formal contract documentation. Such formal contract documentation, generically known as master agreements, seeks to preserve the right to set off and that to obtain operational benefits. One of the key legal features of these atypical contracts is that they are intended to build single legal relationships between signatories. However, this is not always recognized in every jurisdiction, particularly as regards its effects in bankruptcy situations.

employed in different jurisdictions. In turn, the multiplicity of standards causes difficulties whenever areas with different traditions engage in a process of financial integration.

7 Political economy and descriptive analysis

The analysis so far of the economics of government debt markets has emphasized liquidity preservation, competition and retail investor protection as the main guiding principles for public intervention in design and/or regulation. This section discusses political economy issues arising in the actual “production” of regulation.

More specifically, the aim of this section is to discuss in the context of specific examples the actual forces that have shaped some regulatory initiatives across countries. The overall conclusion is that government debt market regulation has in practice largely taken on board the economics of government debt markets. Moreover, regulatory protections in government debt markets have typically preceded similar initiatives in corporate debt markets. However, selected efforts could be deployed in both the disclosure and the transparency areas. Major regulatory initiatives in government debt markets tend to be driven in practice by the force of crisis events and address the custody side of the business. Electronic technology elicits a critical remark in that exchange-like trading arrangements seem to have elevated the “regulatory profile” of government debt markets.

7.1 A multi-Institutional endeavour

A discussion of the political economy determinants of actual regulation of secondary markets for government debt must highlight from the outset the multi-institutional nature of the endeavour. The discussion so far has made clear that the issuer, the central bank and the securities regulator have a shared interest in influencing its structure and rules. This may be a positive feature specific to government debt market regulation if the resulting balance of power overcomes the difficulties of coordination between regulators. In this regard, Section 7.6 will briefly discuss a (conceptual) case of a regulatory failure arising from an overly large concentration of rule-making capacity on secondary market issues in the hands of the issuer.

The details of the actual balance of government debt market rule-making power differ across countries owing to the influence of multiple idiosyncratic features. However, in more advanced countries one tends to find that issuers have a leading regulatory role, whereas the exchange commission and the central bank tend to engage in supervisory and oversight tasks, respectively.

It is not easy to assess the efficiency of this allocation of powers, because ultimately it depends on the concept that underlies the goals mandated to different actors. However, one may guess that such distribution is consistent with the

economics of government debt markets to the extent that it does not impose a restricted model for them, i.e. one where exchange-like trading venues would be preferred because of their “regulatory” profile. However, in that regard Section 7.6 makes the case that some electronic trading platforms may have had a perverse effect.

A necessary feature for the efficacy of any multi-agency endeavour is clarity in the actual allocation of competences. In this regard, existing evidence indicates that inter-agency coordination between countries is not typically formalized in terms of high-ranking legislative precepts. Thus, government securities regulation is more often dealt with by a patchwork of exceptions to securities regulation, together with specific rules and initiatives, than by an integrated government securities act.

The US offers an interesting case of a country with an explicit government securities act. The US Treasury Department’s authority over the market for its securities was established by the Government Securities Act of 1986 (GSA). Burnham (1990) recounts the struggle of legislative interests which brought about such an allocation of competences whereby the SEC and banking regulators were initially charged with the role of enforcing regulation. For its part, the US Treasury was initially granted rulemaking authority only in matters involving the financial responsibility of government securities brokers and dealers, including capital adequacy, custody and use of customer securities and funds, and the transfer and control of government securities subject to repurchase agreements.

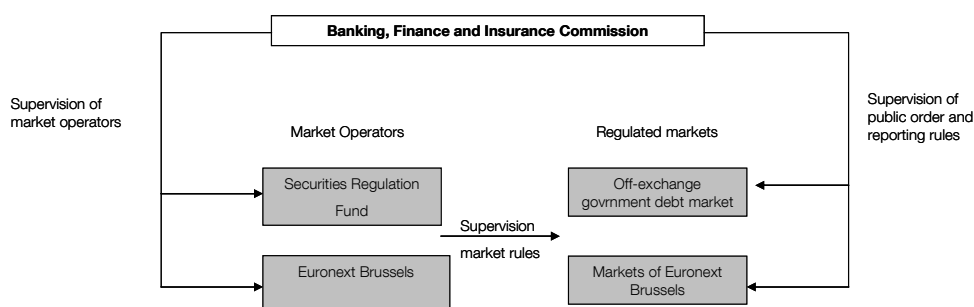
This attribution of competences is also revealing in two other respects. First, the custody and systemic risk issues targeted by the 1986 version of the US GSA are revealing in regard to the crisis background that triggered the regulation. Second, the Treasury received at that time no rule-making authority regarding secondary market integrity issues. Regulation in this direction would finally arrive after the Salomon Brothers scandal. However, the SEC was the agency put in charge of adopting rules intended to prevent government securities brokers and dealers from engaging in any fraudulent, deceptive, or manipulative act, and from making fictitious quotations in connection with government security trades. Finally, constituting further evidence of the collaborative effort deployed is the fact that the Federal Reserve System is responsible for appointing primary dealers.

The Spanish government debt market provides an alternative example of attribution of responsibilities across agencies. Its radical reform in 1987 evidences the uneasy relationship between government debt trading and stock exchanges. The Bank of Spain received from the Ministry of Finance a mandate to deploy the necessary infrastructure for the efficient and secure operation of an open market for government debt. Proponents of the incumbent setup criticized the fragmentation and “bancarization” of the market that such a step would lead to (see Rojo (1987)). However, the trade-off between flexibility and security reached at that time, through the design of a regulatory structure that leveraged on settlement and custodial arrangements, has ultimately proved very successful.

Integrating trade and post-trade arrangements yields appreciable informational benefits in terms of regulatory enforcement in fragmented market environments. The alternative is costly compilation of trade records by market participants or trade associations³¹. However, vertical integration tends often to clash with the goals of public agencies responsible for the consolidation of different markets or for the promotion of competition. This in Europe is the subject of an as-yet unresolved debate among regulators, which underlies another perspective of the multi-institutional nature of the endeavour. A case in point here is issue 10 in the second Giovanini report, which interprets primary dealer clearing and settlement requirements as restrictions to their activity without considering the possibility that they may also serve legitimate regulatory goals.

Chart 4

Institutional incardination of government debt markets regulation inside securities regulation. The Belgium case.



Source: National Bank of Belgium

Putting specific institutions other than the issuer, the central bank or the securities commission, in charge of secondary market issues has been traditionally a rarity. In this regard, the Spanish and Belgian markets are two leading examples of attempts to embrace regulation of an over-the-counter government debt market within a formal institutional setup. The “Fonds de Rentes” in Belgium and the “Órgano Rector” in Spain have traditionally acted as (atypical) market operators in charge of market rules³², surveillance and liquidity. However, it must be recognized that this form of organization has been challenged as of late by trends to de-link trade and post-trade infrastructure and by the awkward coexistence of specific regulatory models inside integrated ones. Chart 4 displays the solution found in Belgium to the latter problem.

31. In addition to any explicit cost that trade reporting may have, one should also consider implicit ones. Reporting of trades can become deadweight costs if the supervisor is unable to adequately monitor or exploit these reports. Moreover, reporting may also create a false impression of security in the market.

32. The scope for market rules in a fragmented market can be a fuzzy subject. However, it reasonably should define market membership, general conduct issues (trade protocol, confirmation practices and settlement communication), rules governing buying and selling, treatment of settlement fails and reporting requirements.

The role of market participants as self-regulators exhibits a mixed profile. Their ability to concert soft rules such as codes of conduct, dealer accreditation standards and training or provision of secondary market information is well proven. Trade associations are also at times clearly in a better position to identify issues that regulators are not addressing, for example because they affect some arcane transaction costs arising in bond markets. The US Bond Market Association (BMA) constitutes a good example of a team effort to define operational aspects of practices and contracts in bond markets. In this regard, one can argue along with Partnoy (2002) that some aspects of repo regulation have been privatized in the US: the Master Repurchase Agreement (MRA) and the Global Master Repurchase Agreement (GMRA) developed by the BMA are enforced by public courts.

However, unrestricted public enforcement of private contracts is not possible in every jurisdiction. Agreements covering the treatment of substantive issues, like default events, may be void ex-post if they are not congruent with “public” law. Ultimately, this remark is intended to highlight the risks of blindly exporting across countries certain aspects of regulation. The temptation may be understandable in increasingly integrated markets. However, potential transaction costs may ultimately remain under a legal risk profile, if the deeper aspects of the legal background have not been adapted.

Furthermore, one should also note that trade associations or trader clubs exhibit intrinsic weakness when it comes to enforcing “hard rules”, i.e. those significantly affecting the business model of their members. The Citigroup-MTS episode described in Section 7.5 is a vivid example of the fragility of multilateral self-imposed commitments.

As final remarks on the multi-agency profile, let us recall that running inventories of securities is not possible without adequate hedging instruments and accounting frameworks. The span of institutional issues raised by these needs is beyond the scope of this paper in almost every respect. In short, accounting standards and the design of derivatives are not government debt market specific.

However, their relevance still offers some room for some political economy issues to surface. As a long standing example of this, the composition of the basket of deliverables to a future bond can become an issue itself in a financially integrated area with multiple sovereign issuers. The bund contract in Eurex is a valid example of this. In this regard, the point to be noted is that standards lock market participants into an “old” hedging technology, i.e. one where the basket of deliverables does not reflect the multi-issuer base of bonds to be hedged. Curiously, however, European issuers and/or regulators have not been reported to exert significant influence on any update of the design of European bond futures³³.

33. The meaning of these remarks becomes clearer when one recalls the impact of squeezes around German futures contracts. The externality to the rest of the euro-denominated market has not been addressed by means of regulatory

7.2 Liquidity promotion and competition

The central role of liquidity and open competition in government debt markets have been emphasized throughout the paper. This section, devoted to a discussion of lessons from actual initiatives in that regard, is necessarily too short to justice to the variety of efforts made. However, it will be of interest to contrast two models of liquidity promotion³⁴.

The institution of primary dealership systems has been broadly understood to promote liquidity. Table 3 summarizes the type of obligations that primary dealers face in a sample of markets. A feature common to countries having a primary dealer system in the sample is liquidity requirements on the primary side. Significantly, obligations to quote in the secondary market are absent in the US and Japan, but widespread in European markets.

Table 3 Primary dealer commitments							
	FRA	GER	ITA	JPN	SP	UK	US
To bid in auctions	Yes	—	Yes	Yes	Yes	Yes	Yes
To quote in sec. markets							
Continuity	Yes	—	Yes	No	Yes	Yes	No
Two-way spread	Yes	—	Yes	No	Yes	Yes	No
Minim. depth	Yes	—	Yes	No	Yes	Yes	No
To report	Yes	—	Yes	Yes	Yes	Yes	Yes

The hint of a dual model regarding secondary market liquidity is confirmed by the close involvement of some European national authorities in the development of electronic platforms for government debt. Evidencing this are the history and features of MTS.

Originally (back in 1988), MTS was a joint creation of the Italian Treasury and the Bank of Italy aimed at improving the liquidity of the Italian government bond market. The platform was privatized in 1997 and, afterwards, it exploited the financial integration challenges triggered by EMU to expand throughout Europe into various domestic markets³⁵ and a pan-European inter-dealer platform (EuroMTS) where only the largest and most liquid European government bonds (benchmarks) can be traded. As already seen in Section 5.1, the platform operates technically as a

support to Europe-wide contracts. Matif privately tried to exploit the situation to launch a multi-national contract which eventually failed.

34. It must be stressed that experience across markets is far from bipolar. For example, as already pointed out in Section 3, Germany does not have a primary dealership system. Moreover, liquidity and competition have been interpreted in the past in some jurisdictions as values that should not be fostered but rather exploited. Section 7.8 sets forth the elements of a model that distils the essence of such “regulatory failure”.

35. MTS created subsidiaries or divisions in Austria, Belgium, France, Denmark, Germany, Greece, Ireland, Holland and Portugal.

limit order book that allows for hidden orders, i.e. one where counterparts trade ex-ante anonymously and where the five best buy and sell positions are visible to the dealer community.

However, the economic essence of MTS and analogue platforms, like that of SENAF in Spain, is a market-maker based concept of liquidity promotion. More specifically, dealers commit to quote continuously two-way firm prices with a maximum spread and minimum depth. Actually, the upper level of participants in MTS could just input spread orders, i.e. simultaneous buy and sell orders. Sections 7.6 will critically review the robustness of a liquidity promotion scheme drawing on stock exchange-like arrangements.

Crucial to that discussion will be an issue that also affects the degree of competition in the market, namely that primary dealers must be remunerated for their services in some way. Table 1 presented a summary of the reward policies practiced in a sample of countries. In essence, all of them amount to the concession of a monopolistic or advantaged position in some segment of the government debt market. Nonetheless, two distinct types of approaches can be identified: oligopolistic concessions in the primary market versus grants to exclusively operate vis-à-vis the central bank.

Leaving aside the practical feasibility of these alternatives in different institutional environments, one should notice their different implications. Whereas the first reward modality involves some trade-off between primary market goals and the degree of competition in the secondary market, the second formulation enables liquidity goals to be achieved more easily on both the primary and the secondary side of the market³⁶.

Liquidity promotion has unquestionably drawn sovereigns closer to the secondary market. Certainly, re-openings and exchanges belong to the traditional toolkit of issuers for “market liquidity maintenance”. However, disruptive pricing dislocations in the cash market are increasingly being addressed by means of repo facilities, whereby the issuer or the central bank temporarily increases the outstandings of the abnormally demanded bond. It should come as no surprise that a clear rule-based concept is needed to undertake such reactive management of market liquidity, because it entails wealth re-distribution among market participants³⁷. Nevertheless, discretionary interventions are also envisaged in some jurisdictions in certain circumstances, like the U.K.

As already pointed out, primary dealer systems may constraint the scope of competition in the secondary market. However, the degree of competition can still

36. Notice that this statement does not intend to mean that restricting the set of central bank counterparties necessarily should lead to an enhancement of government debt market liquidity. Furthermore, no claim is made that monetary policy implementation should be designed with secondary market liquidity goals in mind.

37. Typically, rules are triggered by the degree of specialness of market repo rates.

be fostered by the adoption of open and cheap market models. Therefore, decisions on the number of primary dealers typically have regard to the trade-off between primary market liquidity and competition. The answer to this question depends on institutional issues that go beyond the intent of this paper. However, it is important to realize that competition in the lower layers of the debt distribution chain also matters. From this perspective, cheap post-trade infrastructure (custody and settlement) reduce entry costs for smaller dealers and increase competition in market layers not reached by major players. Obviously, this presumes open membership requirements³⁸.

Electronic markets may challenge competition on different counts. First, membership requirements may be overly restrictive in inter-dealer markets, as an alternative way to grant market power. Second, cross-matching systems facilitate collusion among dealers³⁹. Close communication between the typically small number of dealers sponsoring the platform could increase the possibility of price-fixing. Countering these potentially negative effects on competition from platform governance, joint concurrence of dealers in the day-to-day activity tends to enhance the degree of competition in electronic markets over the one found in over-the-counter ones.

7.3 Disclosure and transparency

7.3.1 Disclosure

Transparency practices by governments is a topic whose scope goes well beyond any impact on government debt markets⁴⁰. Section 4 emphasized that, in practice, public information is not an important contribution to the sources of information asymmetry in government bond markets. Still, public information is empirically significant in aggregate terms. Moreover, there is nothing to preclude that unfair access to significant issuer information may be detrimental from a public policy perspective also in government bonds. Hence, a brief discussion of disclosure regulation for public issuers seems warranted.

A highly relevant aspect of disclosure policy for government debt markets is the diffusion of economic information. Practices in this regard are quite diverse. In Europe, there is no consistent policy on the dissemination of statistical information across countries.⁴¹ Certainly, the multiplicity of indicators disseminated in Europe dilutes the individual impact that most of them on government debt markets.

38. Typically, dealer registration requirements for operating in government debt markets prescribe unrestrictive capital criteria and technical capabilities.

39. In November 2000 the US Department of Justice probed several bond and fx cross-matching platforms on fears of antitrust practices.

40. Governments are subject to IMF oversight as regards compliance with broad transparency standards through the "Reports on the Observance of Standards and Codes" (ROSCs).

41. As a concrete example of the relevance of loose controls on information dissemination, the Financial Times of 1 March 2005 reports on German unemployment figures as follows: "German unemployment shot up to 5.2m last month,

In the US, Federal agencies are subject to strict laws on the compilation and release of the principal economic indicators⁴². In particular, statistical agencies must ensure that no information or data estimates are released before some official release time. Moreover, pre-release access to information can only take place under the assurance that no unauthorized dissemination of information will take place. Interestingly, violations of these rules in the government debt context have brought about enforcement actions by the SEC. SEC litigation release no. 18322 contains an interesting case for the purposes of this section.

The SEC complaint refers to an alleged violation of the information embargo during a quarterly refunding press conference of the US Treasury. Thus, the regulatory framework does not exempt the government debt markets from the principle that securities laws prohibit trafficking in confidential market-sensitive information about government securities and corporate securities.

7.3.2 Transparency

Section 5.5 has made the case that transparency does not rank highly as a regulatory protection in professional trading environments where assets have an inherent tendency to become illiquid. Moreover, market transparency is most valuable to participants when there is a structural need to trade frequently the security in question (see Warga (2004)). Actually, low and/or decaying liquidity can itself be a market determinant of low levels of transparency in debt markets.

Still, transparency has found its way through into government debt markets, albeit with different and varying intensities. The promotion of confidence and trust among non-professional investors has fostered the adoption of aggregate post-trade reporting schemes. In this regard, it is noteworthy that the daily publication in Spain of a government debt market bulletin covering both cash and repo dealer transactions in their entirety has leveraged on information from securities settlement.

Achieving the widespread availability of pre-trade information has posed more of a challenge. The dissemination of real-time information on pricing and liquidity conditions in the inter-dealer markets to customers has traditionally been perceived with reluctance by intermediaries as a threat to their position vis-à-vis the buy side industry. However, both theory (Section 5.5) and practice show that sufficient pre-trade transparency can be achieved with minimum impact.

its highest level in 73 years....The statistics, to be released today, have been obtained by Financial Times Deutschland, the FT's sister newspaper in Germany...."

42. See Federal Register, September 25, 1985, US Government Printing Office.

In this regard, the US government debt market provides some interesting lessons. First, competition can bring some transparency to the buy side as a new service. Traditionally, inter-dealer brokers (IDBs) displayed current bids and offers only to their dealer clients. However, at some point in time a pioneering IDB arranged to sell “indicative prices” through a single vendor under an exclusive arrangement. Later, a primary dealer made a similar arrangement to distribute its prices through a vendor of which it was a part owner. A final boost to a formal and encompassing arrangement to foster transparency came under official pressure from the Congress.

Still, it was the industry itself that organised a response to the threat of formal regulation in the form of GovPX, a private information vendor that distributes both quotation and transaction information for US Treasury bills, bonds, and notes, as well as other information⁴³. Today, real-time Treasury bond prices are available widely to all market participants. Transparency in the US market was, thus, achieved without actual government intervention but only under the threat of it (see Williams (2000)).

From a political economy perspective, it is interesting to highlight that the GovPx predates efforts in the corporate debt market⁴⁴. In other words, a cynical view on transparency in government debt markets seems unwarranted. Nevertheless, it has to be recognized that access to market transparency has been implemented either as a private good or as a public good of lower quality⁴⁵. Hence, a reasonable assessment of the value of transparency must compare the costs of “self-provided transparency” in fragmented markets and the explicit and/or implicit expenses in formally transparent venues.

As proof of the impact of market fragmentation on transparency, mention may be made of two results that shed some light on the representativeness of information collected in particular segments of the market. Barclay and Hendershott (2004) show that GovPX’s coverage of overall inter-dealer trading was around 25% for all maturities in 2001 and 2002. They conclude that GovPX may no longer provide a representative picture of this market. Interestingly, their conclusions are based on information from the Fixed Income Clearing Corporation. This confirms

43. One of the largest IDBs, Cantor Fitzgerald, did not participate in the project. Currently, GovPX is owned by the other major US IDB, i.e. ICAP-Garban.

44. In 1998 Chairman Levitt called for the creation of a trade reporting facility for the corporate bond markets (TRACE), and directed the NASD to assume responsibility for implementing such a system. The prescribed elements were (i) reporting of all transactions in US corporate bonds and preferred stocks and the development of systems to receive and distribute prices “on an immediate basis”; (ii) the development of a database of the reported information; and (iii) the creation of a surveillance program utilizing this database. Chairman Levitt stated that this initiative was not intended to replicate for debt securities the national market system created for equities, but rather “to protect the interests of investors by tailoring requirements to the manner in which bond markets operate.” Trade reports on transactions between NASD members would be submitted by the selling member. If a transaction involves a NASD member and the other party is a customer or non-member broker-dealer, the NASD member would be obligated to report the trade regardless of whether the NASD member represents the buy or sell side of the transaction.

45. Some markets, such as MTS, may disseminate market information for free, albeit with some time delay (15 minutes).

that that post-trade infrastructures may play a pivotal role in market structure and regulatory issues of government debt markets.

A second notable result by Hortacsu and Sareen (2005) highlights the intrinsically elusive nature of transparency. They show for the equivalent of GovPx in the Canadian market (CanPx) that when-issued trades and quotes do not show up in CanPx, even if an active market for them is documented by alternative means. In other words, it appears that dealers grant special value to information contained in when-issued quotes and they tend to conduct them exclusively as bilateral trades. Nyborg and Sundaresan (1996) report a similar conclusion for the US case.

7.4 Retail protection

The economics of government debt markets has identified retail investors as the main target of regulatory protections. Moreover, the smaller size of their trades make exchanges a suitable trading venue. Actually, both predictions are confirmed by a casual glance at the various countries' practices with regard to secondary markets for retail investors. The widespread presence of specialists for the retail debt market thus conforms to the economics and to the regulatory tradition of exchanges.

From a political economy perspective, the institution of separate arrangements for retail investors has been interpreted as clashing with egalitarian views on access to public goods. In particular, controversy has surfaced in India in the context of a reform of government debt markets (see Varma (2005). In practice, a comprehensive regulatory framework for government securities that encompasses both professionals and retail investors does not reflect their differing ability to provide themselves with the necessary protections.

Retail investors face local trading monopolies regardless of whether they can trade only on stock exchanges or they can buy/sell directly from/to banks. Liquidity features of bonds make it unfeasible that retail investors can match their sell interest with the buy interests of other retail customers. Moreover, the limited search efforts that retail investors can deploy limit their ability to protect themselves. The intensity of these effects has been evidenced in a recent study for the US municipal and corporate markets⁴⁶. Bid-ask spreads in these markets are more than eight times those in equity markets. In practice, more worrisome for retail customers are mark-ups, i.e. charging prices which bear no reasonable relation to the one prevailing in the market.

The most widespread way to deal with these problems in government debt markets is transparency requirements. This is relatively straightforward in stock exchange segments where specialists operate. It is less so in the bilateral market. In

⁴⁶. See Edwards et al. (2004)

Spain, dealers serving retail customers are obliged to post trade prices accessible at branches. Notice that generic transparency arrangements whose value cannot be exploited by customers at the point of sale may not bring about the effects sought. As reported by Warga (2004), the limited success so far of TRACE (see Section 7.3.2) in reducing the bid-ask spread in the US corporate fixed-income market and the reporting system instituted by municipal market authority confirm this assessment.

The feasibility of anti-fraud legislation for combating mark-ups is plagued by the problems posed by fragmented trading. Many regulatory protections needed by retail investors trading with their banks can best be provided when the market, as a regulated institution, retains some connection with a centralized post-trade processing system. Both market and systemic protections can thus be provided at minimum cost. However, that requires a process of careful design that is often at variance with the dynamics of regulation once it is in place. The reform of the Spanish debt market in 1987 exploited that opportunity to set in place an informative and secure market infrastructure.

7.5 Market manipulation and settlement fails

Market manipulation rules seek to create a trading environment where trust and fairness prevail. The range of potentially manipulative market conducts can be classified in three economic categories. Borrowing the terminology of the European Directive on insider dealing and market manipulation (2003/6/EC), unwarranted market activities can be termed: information-based, i.e. originating in the quality of information available to investors; action-based, i.e. deeds that seek to promote an artificial impression of market activity and prices; and trade-based manipulations, i.e. transactions and orders that send misleading signals on demand/supply conditions.

Market manipulation is not indifferent to market structure and asset class. Other than in situations where public information disclosure may be relevant (see Section 7.3.1), this paper has emphasized the relatively limited role of classical information asymmetries and their associated ways to deceive other players in government debt markets. On the contrary, the potential to create false impressions is large in fragmented settings. Therefore, it is no surprise that in the absence of adequate post-trade infrastructure, wash trades and matched orders have sprouted in government debt markets whenever there was any margin for tax or “regulatory” arbitrage.

As regards trade-based manipulations, they have acquired notable prominence of late in government debt markets. However, traditionally squeezes and corners have been perceived in government debt markets more in terms of “local” disruptions to the working of the market than as threats to its integrity. In essence, the reason for this traditional diagnostic and its remedies (already discussed in Section 7.2) have to do with the nature of fragmented markets. Their

unconnected multiplicity of players and government bonds makes it unlikely that manipulation attempts backed by limited capital will have a systemic impact ⁴⁷.

On the contrary, the systemic fragility of pure limit order books was tested in the Citigroup episode of disruptive transactions in August 2004. The well-founded tradition that new regulation often arises around episodes of crises is reason for analysing its nature closely. The trade-based disruption orchestrated by Citigroup in a series of European government debt markets (MTS group markets and SENAF) and EUREX consisted of four different stages⁴⁸: (1) a large position in European government bonds was built up prior to the actual execution of the trade; (2) Bund futures were bid up, thus driving the cash price also upwards; (3) a large amount of sell orders (much bigger than the maintained position) was dumped on the cash markets, reaping the profits and forcing down prices; (4) shortly after prices had fallen, Citigroup bought back around one-third of its effectively sold quantity and closed the transaction with significant profits.

The outcome of this aggressive strategy is quite revealing as to the difficulties of ascertaining trade-based manipulations in the cash market on the basis of statutory ruling. Citigroup has already been cleared in some jurisdictions based on the legislation applicable at the date of trade execution⁴⁹. The UK FSA has imposed a penalty to Citigroup on grounds just dealing with internal due diligence and organization considerations (see FSA (2005)). Actually, the FSA decision may open serious issues for business involving large trades, because decision-makers seem to be required to ex-ante consider whether their trading might "adversely affect" the price, quotation levels or market confidence. Certainly, as highlighted by Donald (2005), the Citigroup trades would have been punishable under the law fully implementing the Directive on insider trading and market manipulation.

Ultimately, the reason for those difficulties lies in the dubious basis for classing as fraudulent any profits made purely from trading, regardless of how aggressive this trading has been. Admittedly, the Citigroup strategy was not loyal to its peers, because its execution exploited their commitments vis-à-vis European issuers or the market itself to unconditionally post quotes.

Section 7.6 analyzes the status and economic rationality of those obligations. More specifically, their potential to bring about regulatory failures will be stressed. However, it is still relevant to highlight that the enforcement of existing

47. Manipulations are traditionally addressed by a diverse set of measures depending on the jurisdiction. Included in the preventive category are rank limits to allocations in the primary market and large positions reports. Importantly, reactive measures based on repo facilities require that anti-manipulation legislation envisages safe harbours for the implementation of market stabilization. In particular, the European Directive provides this protection for public debt management activities.

48. See Ascarelli (2005) and FSA Final Notice To CGML dated 28 June 2005.

49. German prosecutors in Frankfurt cleared Citigroup of any bond market offence in the cash market. However, BaFin still found grounds for charges with regard to the derivatives side of the transaction. The case is still being investigated by authorities in other European countries.

manipulation rules may entail potential distortions of professional market players' practice.

One example of this type of concerns is that expressed by the International Primary Markets Association (IPMA) secretary general that "if FSA takes punitive action against Citigroup in this case, there could be consequences for the liquidity of many markets if it prevents traders from carrying out large trades". In order to put this remark in context, it should be recalled that following the Citigroup transactions, managers of MTS decided to limit the amount of bonds that could be traded within a two-minute period in the market in the future. This restriction was effectively lifted afterwards by the MTS committee representing market players.

This quickly abolished rule came to exemplify one of elements of circumstantial evidence for the assessment of market manipulation, as contained in Directive 2003/124/EC, i.e. normal trade size. Short-selling is another valuable aspect of government debt markets practice that might be challenged by the enforcement of a rule that outlaws orders to trade "which give, or are likely to give, false or misleading signals as to the supply or demand...". Let us remember that Citigroup trades would not abide by this rule, because total sell orders exceeded around 30 % the amount needed to come back to a flat position (see FSA (2005)). Alternatively, around 30% of the orders submitted were expected to fail since the inception of the trade.

Short-selling would be banned in practice if the reference for supply and demand conditions is as at the date of trade. Alternatively, government debt markets practice has traditionally reconciled the merit of short sales and the transaction costs due to settlement failures by penalizing the latter. In this regard, existing alternatives differ in terms of their efficacy.

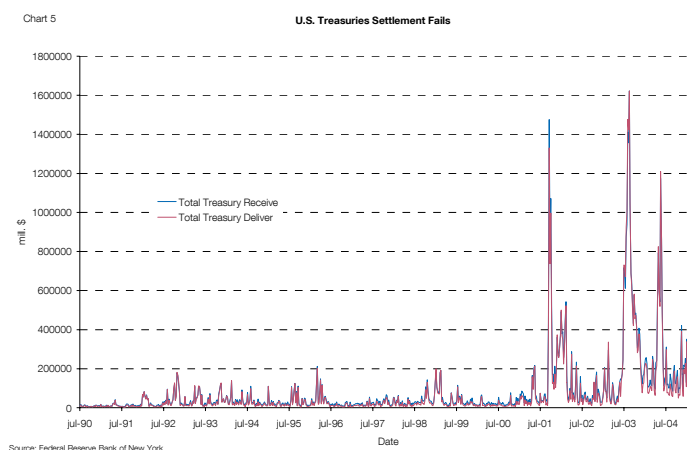
Self-regulatory guidance and market practice standards have been extensively used as pre-trade or post-trade tools⁵⁰ aimed at preventing any negative impact arising from the possibility of short selling. Examples of detrimental outcomes are increases in the rate of settlement failures or in the incentives for manipulation. Admittedly, the disciplinary capacity of this sort of rules intended to contain the scope of settlement failures is quite often tested when the size of members is large or when misbehaviour is generalized. More contentious is the adoption of a "fail practices" arrangement, i.e. the recognition of an option to short-sellers to fail at delivery date if squeezes against their position have developed⁵¹.

In contrast to the limited efficacy of self-imposed rules, the imposition of penalties on dealers failing to settle is more in line with market forces. Significantly,

⁵⁰ The prohibition to trade with members who have not yet settled previous obligations and the multi-lateral oversight of the fulfilment of reciprocal obligations are examples of pre-trade and post-trade measures.

⁵¹ The Japanese Securities Dealers Association guideline allows for fail practice.

the US Bond Market Association has, however, traditionally ruled out this possibility on the grounds that it would distort repo rates. Fleming and Garbade (2002) recognize the merits of instituting a penalty fee system for failing dealers, after noting the persistent disruption to settlement following September 11 and the indications that it could be due to strategic behaviour (see Chart 5). However, so far no measure in this direction has been implemented.



The management of rules mandating the imposition of penalties based on settlement events can be best accomplished by organizational arrangements exploiting the economies of concentration provided by a centralized securities settlement system. The Spanish government debt market constitutes a good example of this. A voluntary multilateral scheme set up by dealers under the coordination of the Spanish securities settlement system assures the end-of-day settlement of outstanding balances of any clearing member. The operation is instrumented as a buy-sell back transaction granted at a penalty rate to the otherwise failing member. Furthermore, the Bank of Spain backs this set-up by acting as securities lender of last resort⁵². The success of this policy is evidenced by the virtual absence of fails⁵³.

7.6 Regulatory failures

Modern regulation theory emphasizes the benefits arising from a recognition of the possibility of regulatory failures in actual rulemaking processes. In a more negative tone, Stigler's (1964) seminal analysis considered the regulation of the securities markets as "an appropriately antiseptic area in which to see how public policy is formed". Therefore, no matter the perspective one must confront the potentially negative influence of political economy considerations.

⁵². Since the beginning of the Third Phase of EMU, Bank of Spain last-resort interventions are in the form of temporary switches of securities with the failing clearing member.

⁵³. The ratio of loaned to (gross) settlement amounts hovers around 0.002%.

In this regard, one may reasonably guess that the potential for regulation failures in the government debt markets area is large for three reasons. First, any market rule is expected to have a direct financial impact on the regulator itself, via its influence on market interest rates⁵⁴. The regulator might therefore refrain from adopting socially beneficial but privately detrimental measures. Second, as argued throughout the paper, the nature of regulatory protections needed in the government debt markets do not fit standards in the securities markets. Hence, there is a larger potential for misjudgements. Third, the multiplicity of roles played by the government as issuer, regulator and sponsor of legislation may also give rise to various avenues of departure of government debt markets regulation from standard forms of securities regulation. We will provide examples or cases of each of these categories.

As an example of the first type of market failure in government debt markets, Boudoukh and Whitelaw (1993) provide a model of the potential distortions brought about by a public focus strictly on issuer costs. Incidentally, notice that the authors' claim the plausibility of their assumptions and conclusions for real-life decision-making at the Japanese Ministry of Finance in the eighties. Specifically, Boudoukh and Whitelaw show that segmentation of the government debt market can be a decision variable for an issuer that engages in price discrimination and extraction of consumer surplus so that investors are charged for their (heterogeneous) liquidity services demand. The working of the model requires institutional features enabling sustained liquidity segmentation: a syndicate of dealers cooperating with the issuer, lack of competition among them and short-selling restrictions⁵⁵.

A financing-cost optimization approach to government debt market structure, like the one modelled by Boudoukh and Whitelaw, is difficult to sustain over time because it lacks the flexibility to adapt afforded by market mechanisms. The OECD and World Bank recommended best practices for the primary market emphasize caring for market liquidity⁵⁶. Actually, it is becoming best regulatory practice that the issuer makes efforts to also even out pricing distortions caused by secondary market squeezes or by liquidity dislocations.

However, the extraordinary nature of this practice in the context of ordinary securities regulation might hinder its adoption. Thus, a second sort of regulatory failure may thus arise if a lack of clarity of the nature of regulatory protections needed by government debt market participants delays direct interventions by the

54. The potential for distortions may be still larger if no clear separation between government assets and liabilities applies. For example, government holdings of its own securities in Japan amount to close to 50% of JGBs outstanding.

55. In the past the assumptions matched the features of the Japanese government debt market. However, reforms have been undertaken in different phases. In 1989 the Ministry of Finance relaxed formal restrictions on short-selling. In December 2003, the introduction of a primary dealer system and the gradual phase-out of the syndicate-based system to distribute bonds were announced.

56. See IMF/World Bank (2001).

issuer or regulator in the secondary market⁵⁷. As pointed out in Section 7.5, anti-manipulation legislation should enable safe harbours for the deployment of market stabilization activities by debt managers.

The example we will cite of the third type of regulatory failure, which has been mentioned throughout the whole paper, is that the benefits of market liquidity may encourage public authorities to promote it by contracting its provision. Certainly, this temptation is not exclusive to government debt markets. Initiatives aimed at stimulating stocks liquidity are not uncommon in stock exchanges around the world. An examination of the two basic types of measures implemented in equity markets helps to understand the potential for regulatory failures that their emulation in government debt markets might bring about.

Specifically, both the New York Stock Exchange and the Paris Bourse have specialists, i.e. a category of participants in charge of promoting liquidity in stocks assigned to them. However, NYSE specialists and Paris Bourse “animateurs” represent two different concepts of liquidity sponsorship because their commitment has a regulatory character in the first case, and a contractual one in the second case. In a nutshell, this difference boils down to the type of remuneration received by the specialist. As compensation for the affirmative quote obligations that they face, NYSE specialists are granted a monopoly on stocks assigned to them. In contrast, “animateurs” engage in liquidity promotion commitments against explicit payment and/or privileged access to business with the firm whose stock is sponsored.

Against this backdrop, the explicit contracting of secondary market liquidity services appears to be a potentially contentious undertaking for a public issuer because of the poor verifiability of their actual provision and of fair pricing in a fragmented market setting. Notice that these difficulties do not jeopardize the value of liquidity itself but its contractibility. In this context, incomplete contract theory shows that institutions have no option but to adapt to the imperfect contracting set-up .

A widespread way of circumventing the political economy difficulties in price liquidity services is to contract them in an implicit way, i.e. to pay for them by using some basket of entitlements as currency. As pointed out in Section 7.2, liquidity provision in both the primary and the secondary markets is typically jointly contracted with primary dealers in exchange for certain rights, such as restricted access to all/special auctions, preference to act as partner in other business, etc. The important point here is the potentially undesired effects that particular

57. Another concrete example that reflects less than clear views as to the regulatory protections contained in a regulatory arrangement for government debt markets is the diverse status of domestic MTS markets in different European jurisdictions. In some of them they are recognized as regulated markets, in others as multilateral trading facilities and in others as brokers.

contracting arrangements might have on the organization of the secondary market. Let us see this point in more detail.

Any arrangement to “contract” liquidity services in a fragmented trading environment needs to specify the metric for liquidity provision and the venue/s where it will be measured. A multiplicity of roles of policy-makers as issuer, as securities regulator and as sponsor of legislation may well imply that the implementation of some “contractual” clause unnoticedly passes unheeded as a pseudo-regulatory mandate. Let us see a concrete case of this general remark.

Affirmative obligations mandating dealers to make two-way quotes within some maximum spread and over a certain size appear to unaware decision-makers as a rule that provides the best of two worlds, i.e. both liquidity and price discovery. However, Section 5.4 made clear that multi-lateral inter-dealer markets do not easily lend themselves to quote-based strategies. In these circumstances, tightness and depth quotation end up being jointly determined by a trade-off relationship and, as a consequence, realistic round-trip execution costs may be much larger than quoted bid-ask spreads.

Pagano and von Thadden (2005) confirm the operation of some “underlying” regulatory approach by European issuers when they state that the “the formal rules of MTS do not prescribe spreads as tight as those actually quoted: the actual spreads are 5 times tighter than the required ones. But issuers informally require banks to quote the tightest possible spreads, and this induces them to take such positions with so little reward...”.

Ultimately, the distortion affects the strategic incentives of dealers to provide liquidity. The Citygroup “episode” (see Section 7.5) and other “raids” suffered in the past by MTS seem to confirm this point. In practical terms, liquidity provision is not robust when affirmative quote obligations are in place. Ho and Stoll (1998) have extensively documented the poor performance of a similar regulatory tool for specialists in US exchanges. Most of their arguments are amenable also to the context of government debt markets. But particularly relevant here is the one referring to the questionable rationale for maintaining affirmative obligations when profit-seeking behaviour on the dealers’ side is consistent with the same outcome. This critique, together with the documented ability of dealers to shirk their commitments by engaging in “phantom” trades, makes it difficult to conclude that arbitrage-based liquidity provision is the only robust way to proceed. Importantly, one should further notice that this alternative approach is just as much measurable in electronic trading platforms as in the pure market-making one.

Another potential distortion leading to quasi-regulatory effects arises from the specification of a certain trading venue as the place where liquidity provision is effectively “contracted”. Granting privileges to some market segment entails a diverse set of distortions. Most significantly, the risk of monopolistic practices and the likelihood of corporate governance troubles are raised. Confering a preferred

status on some segment as a liquidity provision outpost elevates its value for dealers when their relationship with the issuer is itself valuable. In this situation, the sponsors of the preferred platform have an incentive to price more expensively their own matching services. Furthermore, their position may easily end up being that of a delegated regulator.

Governance arrangements to mitigate these strains may prove unstable if the scale and/or profile of the platform is conducive to the erosion of members' earnings. Some issuers in Europe have implicitly recognized the scope for corporate governance troubles in these privileged platforms, as evidenced by the shareholder status that some European issuers exhibit in their respective domestic MTS markets⁵⁸.

8 Conclusions

The paper covers the economics of secondary markets for government bonds. Most microstructure conclusions have been traditionally based on results drawn from equity markets. This source of intellectual inspiration to structure and regulatory design proves to be misleading. Indeed, the nature of information asymmetries prevailing in government debt markets and trade-size driven execution costs mean that they exhibit an intrinsic bias towards a fragmented structure. This conclusion is relevant for the ultimate goal of the paper, i.e. the assessment of the elements of a regulatory framework for government debt markets. In this regard, the paper warns against the risks of blindly transposing regulatory principles from the equity markets to the government bond markets area without paying due regard to the specifics of bond markets.

A specific and timely application of that general remark can be seen in the role and architecture of electronic trading platforms in government debt markets. More specifically, the paper examines the basic microstructure features of inter-dealer markets in Europe and the US as well as those of dealer-customer networks. Electronic technology is argued to enable a reduction in transaction costs if the implementation architecture respects the underlying economics of the market. Moreover, the paper reviews critically electronic trading models that leverage on monitoring capabilities to profile the market as an exchange-like trading venue. More specifically, the paper opposes the hybrid microstructure faced by European primary dealers (pure limit order book plus affirmative quoting obligation) and the arbitrage-based approach to market-making found in US inter-dealer markets.

The relevance of the analysis has been heightened by the Citigroup disruptive set of trades in August 2004. In view of the regulatory difficulties in handling the situation and the prospective production of new rules as a response to them, it has to be clarified that government bond regulation necessarily departs from

58. This is the case of Portugal, Poland, Belgium and Holland.

ordinary approaches. One important reason stressed in this paper is the various public policy goals and governmental agencies involved in the market. As a specific application of this conclusion, the paper discusses repo and short-selling regulation in government bond markets. The atypical market structure and the multi-institutional endeavour around government debt markets are argued to raise the chances of regulatory failure. In a more practical tone, the paper argues that reliance on competition, integrative infrastructure and basic systemic protections as overarching principles for regulation, as typically found in practice, is consistent with recommendations from relevant economic theory. Finally, political economy issues arising in implementation of transparency, disclosure or retail investors' protections are also addressed by reference to selected country cases.

ANNEX

ELECTRONIC TRADING PLATFORMS FOR FIXED INCOME INSTRUMENTS. A BRIEF GLOSSARY.

The Bond Market Association classifies and reviews every year developments in electronic trading technology for fixed income instruments. This annex draws on the catalogue of systems contained in the 2004 Review to offer a basic glossary of terms and systems mentioned in the main text.

Auction systems: Electronic systems that enable participants to organize auctions for secondary market offerings. The seller posts the details of the security and the auction (amount, single-price, multi-price, etc.) in some network. Buyers may post anonymous or visible bids (depending on the system) and get the corresponding allocation. An example of an auction system is that operated by Bloomberg for municipal securities in the US.

Cross-Matching systems: Electronic platforms that gather both intermediaries and institutional investors in networks that operate cross-matching sessions either periodically or in real time. To a large extent, they rely on the double coincidence of wills since intermediaries play no distinctive role in execution. Most stock exchange segments for debt operate as cross-matching systems.

Inter-dealer systems: These allow intermediaries to execute transactions with other dealers, mostly through fully anonymous platforms. The operation of the matching algorithm varies. **MTS** operates a network of inter-connected inter-dealer platforms which combine features of pure limit order books and dealership markets. **SENAF** resembles MTS, although restricted to the Spanish market. **ICAP-Garban** operates a hybrid (voice-electronic) platform. **eSpeed**, the electronic platform operated by Cantor Fitzgerald, relies on a proprietary technology called "Interactive Matching" that recognizes the need to provide incentives to dealers to post exposures in the system.

Multi-dealer systems: Customers view or request quotes from a limited number of dealers that sponsor the system. Hence, customer-dealer platforms like Tradeweb, Bloomberg BondTrader and Bondvision emulate electronically the operation of direct search and execution in the telephone-based market.

Single-Dealer systems: Direct execution with the dealer that sponsors the system is facilitated by the ample penetration of electronic distribution technologies.

REFERENCES

- ANAND, A and WEABER, D, (2004), "Can order exposure be mandated?", *Journal of Financial Markets* 7, 405-426.
- ASCARELLI, S, (2005), "Citigroup Euro-Bond Push Sparked Market Firestorm", *Wall Street Journal*, 3 February 2005, at A1.
- BALDUZZI, P., ELTON, E. J. and GREEN, T. C., (October 1997), "Economic News and the Yield Curve: Evidence from the US Treasury Market".
- BARBER, B.M., and T. ODEAN, 2000, "Trading is hazardous to your wealth: The common stock investment performance of individual investors", *Journal of Finance*, 55, 773-806.
- BARCLAY, M. J., HENDERSHOTT, T. and KOTZ, K., (2004), *Automation versus Intermediation: Evidence from Treasuries going off-the-run*, mimeo.
- BEARINGPOINT, (2005), *The Electronic Bond Market 2005*.
- BIAIS, B., (1993), "Price Formation and Equilibrium Liquidity in Fragmented and Centralized Markets", *Journal of Finance*, 48, 157-185.
- BLOOMFIELD, R. and O'HARA, M., (1999), "Market Transparency: Who Wins and Who Loses?", *Review of Financial Studies*, Spring, Vol.12, No. 1, pp 5-35.
- BONI, L. and LEACH, C., (2001), *Depth Discovery in a Market with Expandable Limit Orders: An Investigation of the US Treasury Market*, Working Paper.
- BOARD, J., SUTCLIFFE, C. and WELLS, S., (2001), *Orderly Markets: Regulation in a Changing Environment*, mimeo.
- BRANDT, M and KAVAJECZ, K., (December 2004), "Price Discovery in the US Treasury Market: The Impact of Orderflow and Liquidity on the Yield Curve", *Journal of Finance*, Vol. LIX, No. 6.
- BURNHAM, J., (Summer, 1990), "The Government Securities Act of 1986. A Case Study of the Demand for Regulation", *Regulation*, Vol. 13, No. 2.
- COASE, R. H., (1974), "The Lighthouse in Economics", *Journal of Law and Economics* Vol. 17, 357.
- CHARLES, C., GYHYSELS, E. and HATHEWAY, F., (June 2000), "Price Discovery Without Trading: Evidence from the Nasdaq Pre-opening", *Journal of Finance*, Vol. LX, No. 2,
- COPELAND, T. and GALAI, D.. (1983). "Information Effects on the Bid-Ask Spread", *Journal of Finance*, Dec. 1983, pp. 1453-69.
- DONALD, D. C., (March 2005), "Applying Germany's Market Manipulation Rules to Disruptive Trades on the Eurex and MTS Platforms", *German Law Journal*, Vol. 6, No. 3-1, pp. 1-17.
- EDWARDS, A. K., HARRIS, Lawrence, E. and PIWOWAR, Michael S. (2004), "Corporate Bond Market Transparency and Transaction Costs", September 21, 2004,
- LEVITT, A., (1998), "The Importance of Transparency in America's Debt Market", Speech at the Media Studies Center, New York, N.Y., available at <http://www.sec.gov/news/speech/speecharchive/1998/spch218.htm>.
- FSA, (2005), Final Notice to Citigroup Global Markets Limited dated 28th June 2005.
- FINANCIAL TIMES, March 1st 2005, page 2.
- FLEMING, M., and GARBADE, K., (November 2002), "When the Back Office Moved to the Front Burner: Settlement Fails in the Treasury Market After 9/11", *FRBNY Economic Policy Review*
- FLEMING, M. J., and E. M. REMOLONA, 1997, "What moves the bond market?", *Federal Reserve Bank of New York Economic Policy Review*, 31-51.
- FLEMING, M. J., and Eli M. REMOLONA, (1999), "Price formation and liquidity in the US Treasuries market: The response to public information". *Journal of Finance* 54, 1901-1915.

- FLÖGEL, V. and KESY, C., (2004), „Organization des Sekundärhandels von Bundeswertpapieren: Historisch Gewachsen! Ökonomisch Begründbar?“, *Kredit und Kapital*, 37. Jahrgang, Heft 4, 500-536.
- FRUTOS, M. A., and C. MANZANO, 2002, "Risk Aversion, Transparency, and Market Performance", *Journal of Finance* 57, 959-984.
- GALLMEYER, M., HOLLFIELD, B. and SEPPI, D., (2004), *Liquidity Discovery and Asset Pricing*, Working Paper, mimeo.
- GARBADE, K. D., (1978), "The Effect of Inter-dealer Brokerage on the Transactional Characteristics of Dealer Markets", *Journal of Business*, Vol. 51, n° 3, 477-498.
- GIOVANNINI GROUP, (2003), Second Report on EU Clearing and Settlement Arrangements
- GLOSTEN, L., (1994), "Is the electronic limit order book inevitable?", *Journal of Finance* Vol. 49, pp. 1127-1161.
- GOLDREICH, D., HANKE, B., NATH, P., (March 2005), "The Price of Future Liquidity in the US Treasury Market", *Review of Finance*, Vol. 9.
- GOTARDI, P. and SERRANO, P., (2004), *Market Power and Information Revelation in Dynamic Trading*, mimeo.
- GROSSMAN, S. J., (1992, Oct.), "The Informational Role of Upstairs and Downstairs Trading", *Journal of Business*, Vol.65, No. 4, 509-528.
- GROSSMAN, S. J. and MILLER, M., (July 1988), "Liquidity and Market Structure", *Journal of Finance*, 617-637.
- LYONS, R., (1996), "Optimal Transparency in a Dealer Market with an Application to Foreign Exchange", *Journal of Financial Intermediation* 5, pp. 225-254.
- MACEY, J. and O'HARA, (1997), "The Law and Economics of Best Execution", *Journal of Financial Intermediation*, 6, pp 188-223.
- MADIGAN, B. and STEHM, J. (1994), *An Overview of the Secondary Market for US Treasury Securities in London and Tokyo*, Working Paper, mimeo.
- MARTINEZ RESANO, J. R., (2004), "Futuros sobre Acciones: Demanda e Implicaciones sobre los Mercados de Renta Variable", *Documento de Trabajo 0218*, Banco de España.
- PAGANO, M. and RÖEL, A. (June 1996), "Transparency and Liquidity: A Comparison of Auction and Dealer Markets with Informed Trading", *Journal of Finance*, Vol. LI, No. 2, pp. 579-611.
- PAGANO, M. and VON THADDEN, E., (2005), "The European Bond Markets Under EMU", forthcoming Oxford Review of Economic Policy.
- PARDO, A. and PASCUAL, R., (2004), *On the Hidden Side of Liquidity*, Working Paper, mimeo.
- PARTNOY, F., (2002), *ISDA, NASD, CFMA, and SDNY: The Four Horsemen of Derivatives Regulation?*, Brookings-Wharton Paper on Financial Services, 230-253.
- ROJO, A., (1987), "El Sistema Español de Anotaciones en Cuenta, Análisis del proyecto del Real Decreto Regulator, en Anotaciones en Cuenta del Estado", ciclo de conferencias, Centro de Formación del Banco de España.
- SAPORTA, V., (1997), *Which Inter-dealer Market Prevails? An Analysis of Inter-dealer Trading in Opaque Markets*, Working Paper, Bank of England.
- SCALIA, A. and VACCA, V., (2001), *Does transparency matter? A case study*, BIS Papers No. 2.
- SCHRÖDER, M., HEINEMANN, F., KRUSE, S., MEITNER, M., (2004), *GDP-linked Bonds as a Financing Tool for Developing Countries and Emerging Markets*, Discussion Paper No. 04-64, ZEW.
- SELIGMAN, Joel, (2004), *Cautious Evolution or Perennial Irresolution: Self-Regulation and Market Structure During the First 70 Years of the SEC*, Working Paper, mimeo.
- STIGLER, G. J., (1964, Apr.), "Public Regulation of the Securities Markets", *Journal of Business*, Vol. 37, No. 2, 117-142
- SOLL, H., (Sep-Oct 1998), "Reconsidering the Affirmative Obligation of Market Makers", *Financial Analysts Journal*, pp 72-82 .
- VARMA, J., (2004), *Towards a Unified Market for Trading Gilts in India*, IIMA Working Paper No. 2004-11-05, mimeo.

VAYANOS, D. and WANG, T., (2002), *Search and Endogenous Concentration of Liquidity in Asset Markets*, Working Paper, mimeo.

VISWANATHAN, S and WANG, J., (2002), "Market architecture: limit-order books versus dealership markets", *Journal of Financial Markets* 5, 127-167.

VISWANATHAN, S and WANG, J., (2004), "Inter-dealer trading in Financial Markets", *Journal of Business*, Vol. 77, No. 4.

WARGA, A., (2004), "An Overview of the Regulation of the Bond Markets", *Report to the Senate Banking Committee*, June 17th 2004.

WILLIAMS, S., (2000), remarks in a OECD Roundtable on Capital Markets Reform in Asia.

WORLD BANK /IMF, (2001), "Developing Government Bond Markets: A Handbook", World Bank Publications.

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